EN

Magnetically Coded Safety Switches CMS

EUCHNER

More than safety.

EUCHNER

More than safety.

Headquarters in Leinfelden-Echterdingen

Logistics center in Leinfelden-Echterdingen

Production location in Unterböhringen

Internationally successful – the EUCHNER company

EUCHNER GmbH + Co. KG is a world-leading company in the area of industrial safety technology. EUCHNER has been developing and producing high-quality switching systems for mechanical and systems engineering for more than 60 years.
The medium-sized family-operated company based in Leinfelden, Germany, employs around 800 people around the world.

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

Quality and innovation – the EUCHNER products

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

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

We define future safety technology with the highest quality standards and reliable technology. Extraordinary solutions ensure the great satisfaction of our customers. The product ranges are subdivided as follows:

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

made in Germany

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Magnetically coded safety switches CMS

Magnetically coded safety switches are interlocking devices that are designed to protect people and machines. Compared with electromechanical safety switches, they are used if:

- strict hygiene requirements must be met (e.g. in the food industry)
- a precise door guide is not possible
- compact dimensions are required.

The EUCHNER safety system CMS is based on the magnetic principle. The tamper-proof, coded system was specifically developed to monitor moving machine components and guards.

The **C**oded **M**agnetic **S**afety system consists of three components:

- Actuator
- Read head
- Evaluation unit

Several permanent magnets are arranged in the actuator housing. The number of magnets, their position (polarity in the housing) and the magnetic field strength of the individual magnets characterize the actuator type. For this reason, they are also called coded actuators.

Switching contacts are installed in the read head of the safety system CMS. The contacts are switched under the influence of a magnetic field emitted by the associated actuator. The evaluation unit is the system unit downstream from the read head. Using internal relays, it switches the safety circuit depending on the position of the switching contacts.

The advantages of magnetically coded safety switches

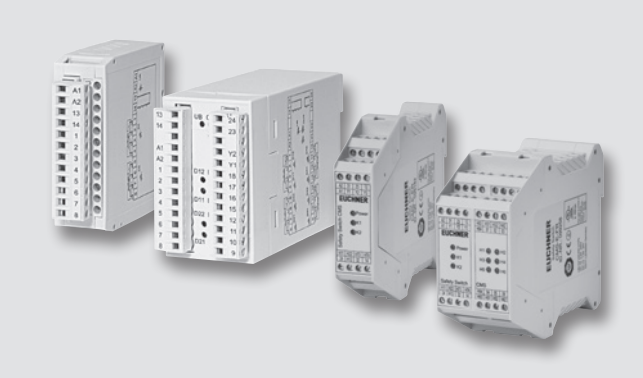
- Non-contact safety door monitoring: no mechanical wear on the sensor units
- The coding for all the actuators in a series is identical: fast replacement in the event of repair
- Actuator and read head have a high degree of protection IP67
- Actuator and read head can be fitted behind stainless steel
- Perfect operation under extreme environmental conditions, e.g. dirt and moisture
- Large actuating range with hysteresis
- The sensor units can be approached from different directions
- Low costs with maximum benefits
- The mounting rail in accordance with DIN EN 60715 TH35 ensures easy installation in the control cabinet
- Read heads available for direct connection to a safe control system
- LED displays: simplified diagnostics in case of service work
- Approvals: TÜV and UL

System components at a glance

Evaluation units

Using internal relays, CMS evaluation units switch the safety circuit depending on the position of the contacts in the read head. Selection of the evaluation unit depends on the number of read heads to be connected and on the Performance Level to be achieved according to EN ISO 13849-1 by the overall system. Depending on version, up to 30 read heads can be connected.

CMS evaluation units feature 1 to 2 safety contacts, an auxiliary contact and a connection for a feedback loop. Depending on version, the evaluation unit features additional monitoring outputs and a connection for a start button. CMS evaluation units are provided with the IP20 degree of protection and are mounted in the control cabinet.



Read heads

The read head is fastened to the fixed part of the guard and is connected to the evaluation unit via a cable. When the guard is closed, the actuator is moved towards the read head. The contacts in the read head switch as soon as the actuator enters the actuating range and reaches the operating distance s_{ao}. The safety contact is enabled if the evaluation unit detects that the contacts are in a specific position on all connected read heads.

The sensitivity of the contacts and the field strength of the magnets determine the operating distances between the actuator and the read head. The operating distances indicate the distance between the actuator and read head at which a corresponding switching operation is triggered (actuating range).

Design

The actuators and read heads are matched in pairs and are available in 4 different housings. Depending on the application, the user can select a cube-shaped or cylindrical design. The actuating range for the switching operation depends on the design. It is shown with the respective approach directions x, y and z in the operating diagrams. When ideally positioned, the read head is in the middle of the actuating range.
The actuator and read head sensor units have a large actuating range with hysteresis. This allows the door gap size to be variably adjusted within the actuating range.

Read heads with reed contacts

On read heads with reed contacts, the reed contact blades are closed by the magnetic field of the corresponding actuator.

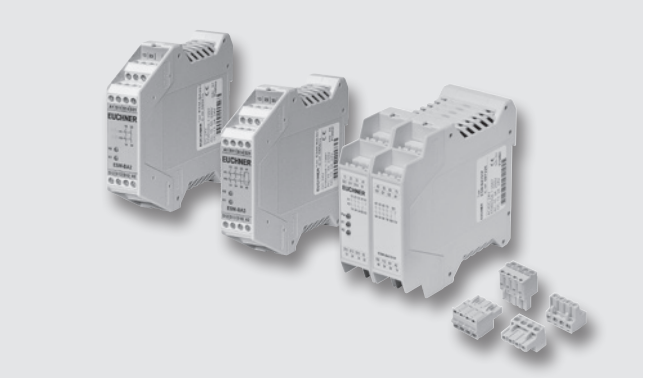
Read heads with Hall sensors

These read heads have purely electronic Hall sensors, enabling them to read the coded magnets of the actuators. Compared to the read heads with reed contacts, these read heads are insensitive to external influences such as vibrations or shaking. Furthermore, they are absolutely free from wear because they do not possess any electromechanical contacts.
The read heads with Hall sensors can be connected to the evaluation units CMS-E-ER and CMS-E-FR. A combination of CMS read heads with and without Hall sensors on the same evaluation unit is also possible.

System components at a glance

Safety Relays ESM

Safety relays series ESM perform safe evaluation of connected components such as mechanical safety switches, emergency stop devices and electro-sensitive protective equipment, and safely shut down the hazardous machine functions.



Various safety relays to which extension modules can be added on the output side are available for the safety system CMS. The advantage of the ESM modular principle is that different safety evaluations can be implemented with only a few module variants.

The safety relays can be operated with various types of starting. Depending on the wiring, the devices can be started manually or automatically. Monitoring of downstream relays or contactors, simultaneity monitoring, short circuit and earth fault/ground fault monitoring are also possible.

The relay outputs are electrically decoupled and of redundant design. Electrically isolated normally closed contacts are available as auxiliary contacts.

For detailed information, see *catalog Safety Relays ESM* and *Operating Instructions ESM*.

Evaluation unit	Read heads	Function	Category according to EN ISO 13849-1
	1...2	**CMS-E-AR** ▸ 1 safety contact ▸ 1 to 2 read heads (NO contacts wired in parallel) can be connected ▸ Category 3 according to EN ISO 13849-1 ▸ PL d according to EN ISO 13849-1 or ▸ 3 to 30 read heads (NO contacts wired in series) can be connected ▸ Category 1 according to EN ISO 13849-1 ▸ PL c according to EN ISO 13849-1 (see page 10)	Cat. 3 / PLd Cat. 1 / PLc
	1 2...4	**CMS-E-BR** ▸ 1 safety contact ▸ 1 auxiliary contact ▸ 1 feedback loop can be connected ▸ 1 read head can be connected ▸ Category 4 according to EN ISO 13849-1 ▸ PL e according to EN ISO 13849-1 or ▸ 2 to 4 read heads can be connected ▸ Category 3 according to EN ISO 13849-1 ▸ Up to PL d according to EN ISO 13849-1 (see page 14)	Cat. 4 / PLe Cat. 3 / PLd
	1 2...30 2...10	**CMS-E-ER** ▸ 2 safety contacts ▸ 1 auxiliary contact ▸ 1 feedback loop can be connected ▸ 1 read head can be connected ▸ Start button can be connected ▸ Category 4 according to EN ISO 13849-1 ▸ PL e according to EN ISO 13849-1 or ▸ 2 to 30 read heads with reed contacts can be connected 2 to 10 read heads with Hall sensors or ▸ Category 3 according to EN ISO 13849-1 ▸ Up to PL d according to EN ISO 13849-1 (see page 18)	Cat. 4 / PLe Cat. 3 / PLd
	1 2...6	**CMS-E-FR** ▸ 2 safety contacts ▸ 1 auxiliary contact ▸ 6 monitoring outputs ▸ 1 feedback loop can be connected ▸ 1 read head can be connected ▸ Start button can be connected ▸ Category 4 according to EN ISO 13849-1 ▸ PL e according to EN ISO 13849-1 or ▸ 2 to 6 read heads can be connected ▸ Category 3 according to EN ISO 13849-1 ▸ Up to PL d according to EN ISO 13849-1 (see page 24)	Cat. 4 / PLe Cat. 3 / PLd

»Evaluation and safety relay in one device – cost-effective solution for up to 30 safety doors.«

- Up to 30 read heads can be connected
- Can be used up to PL e/category 4 according to EN ISO 13849-1
- Combination of read heads with reed contacts and Hall sensors possible

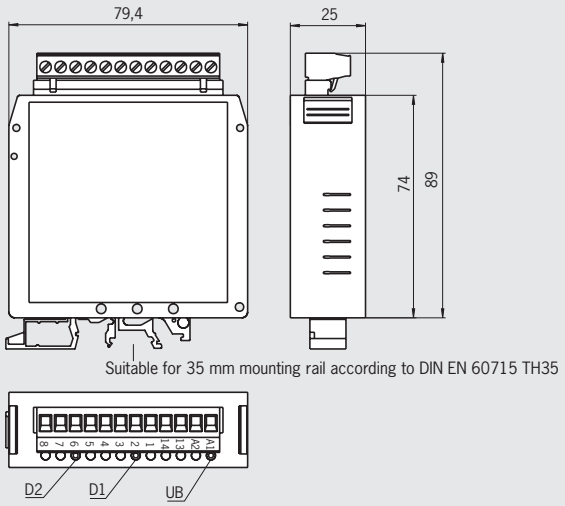

A1
A2
13
14
1
2
3
4
5
6
7
8
UB
D12
D11
D22
D21
24
23
Y2
Y1
18
17
16
15
12
11
10
9
EUCHNER
Safety Switch CMS
Power
K1
K2
Safety Switch
CMS
H1
H2
H3
H4
H5
H6

Evaluation unit CMS-E-AR

- **Up to 30 read heads can be connected**
- **1 safety contact**

Evaluation unit CMS-E-AR — Cat. 1 / PLc — Cat. 3 / PLd

Dimension drawing



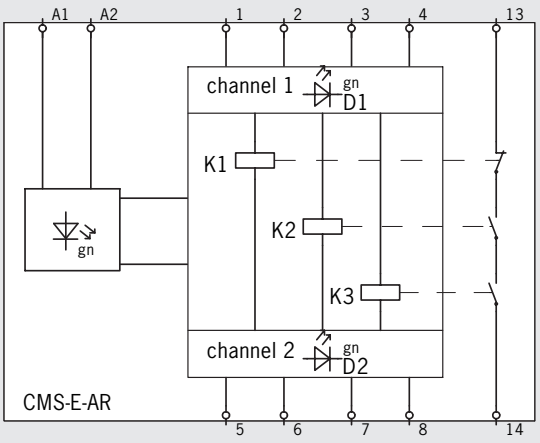
Functional description
The evaluation unit CMS-E-AR is suitable for the direct connection of up to 30 read heads.

Category / PL according to EN ISO 13849-1
- Category 1 / PL c with 3 … 30 connected read heads (NO contacts wired in series)
- Category 3 / PL d with 1 … 2 connected read heads (NO contacts wired in parallel)

LED displays

LED / Actuator	U_B Operating voltage green	D1 green	D2 green
Channel 1 in the actuating range	●	●	
Channel 2 in the actuating range	●		●

Block diagram



Ordering table

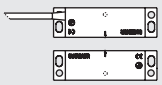
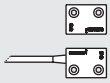
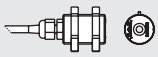
Evaluation unit	Scope of delivery	Order no./item
CMS-E-AR	Evaluation unit 1 3-pin jumper 1 4-pin jumper	**085536** CMS-E-AR

Technical data for evaluation unit CMS-E-AR

Parameter		Value min.	Value typ.	Value max.	Unit
Housing material			Polyamide PA6.6		
Dimensions			89 x 79.4 x 25		mm
Weight			0.13		kg
Ambient temperature		0	-	+50	°C
Storage temperature		-25	-	+70	°C
Degree of protection acc. to EN 60529			Terminals IP20/housing IP40		
Degree of contamination			2		
Mounting			35 mm mounting rail acc. to DIN EN 60715 TH35		
Number of read heads			1 … 30 serial [1]/2 parallel		
Connection			Plug-in connection terminals		
Operating voltage U_B			24 ±10% [2]		V AC/DC
Internal fuse (operating voltage) (automatically resetting fuse PTC)			0.75		A
Switching voltage U		-	-	250	V AC
Current consumption		-	70	-	mA
Switching current I at 24 V		2	-	3,000	mA
Breaking capacity P		-	-	750	VA
External contact fuse (safety circuit)			3 A gG		
Safety contacts			1		
Utilization category acc. to EN 60947-5-1			I_e [3]	U_e [3]	
		AC-1	3 A	250 V	
		AC-15	0.9 A	250 V	
		DC-13	1.8 A	24 V	
Switching load acc. to UL Class 2			Input: 24 V AC/DC Output: 30 V AC/24 V DC		
Rated insulation voltage U_i			250		V
Vibration resistance			Acc. to EN 60947-5-2		
Mechanical operating cycles, relay			10×10^6		
EMC compliance			Acc. to EN 60947-5-3		
Risk time acc. to EN 60947-5-3			10		ms
Reliability values acc. to EN ISO 13849-1					
depending on the switching current at 24 V DC		≤ = 0.1 A	≤ = 1 A	≤ = 3 A	
Number of switching cycles/year		< 96,000	< 75,000	< 18,000	
Mission time			20		years
Category	2 read heads > 2 read heads		3 1		
Performance Level (PL)	2 read heads > 2 read heads		d c		
PFH_d	2 read heads > 2 read heads		1.0×10^{-8} 1.1×10^{-6}		

1) The number depends on the cable length.
2) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
3) I_e = max. switching current per contact, U_e = switching voltage.

Selection table for read heads for non-contact safety system CMS-E-AR

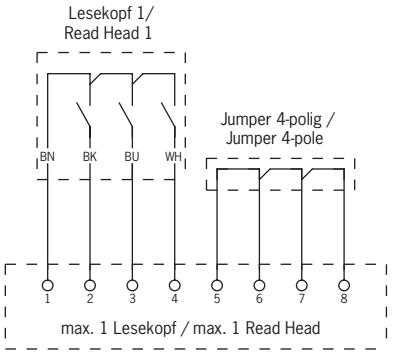
Read head design	Read head contact assembly	Number of read heads	Category / PL according to EN ISO 13849-1	Read head
Design A  Page 32 - 35		1 ... 2	3 / PL d	CMS-R-AXD...
				CSM-R-AXE...
				CMS-R-AXR...
		3 ... 30	1 / PL c	CMS-R-AXF...
				CMS-R-AXG...
Design B  Page 38		1 ... 2	3 / PL d	CMS-R-BXO...
		3 ... 30	1 / PL c	CMS-R-BXP...
Design C M25  Page 42		1 ... 2	3 / PL d	CMS-R-CXA...
		3 ... 30	1 / PL c	CMS-R-CXB...
Design E M30  Page 46		1 ... 2	3 / PL d	CMS-R-EXL...
		3 ... 30	1 / PL c	CMS-R-EXN...

Connection examples for safety system CMS-E-AR

Connection example 1

- One read head on one evaluation unit CMS-E-AR
- Read head 1: reed contacts wired in parallel

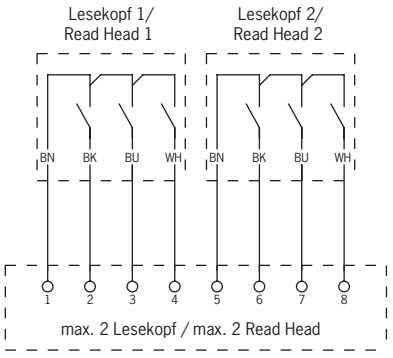
Cat. 3 / PLd



Connection example 2

- Two read heads on one evaluation unit CMS-E-AR
- Read heads 1 and 2: reed contacts wired in parallel

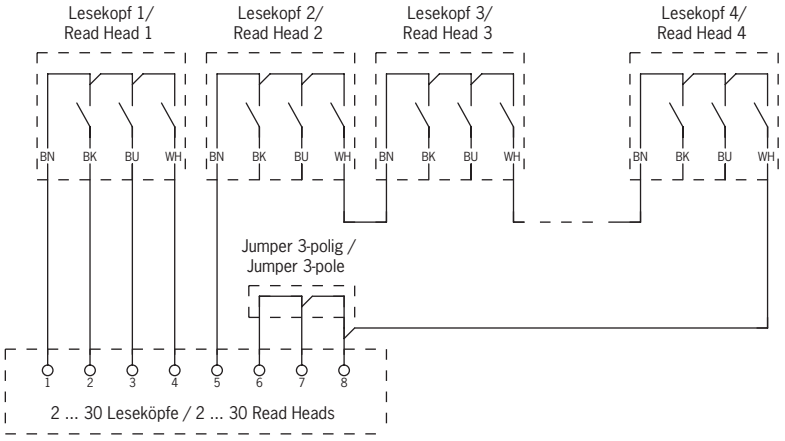
Cat. 3 / PLd



Connection example 3

- More than two read heads (max. 30) on one evaluation unit CMS-E-AR
- Read head 1: read contacts wired in parallel; read heads 2 … n: reed contacts wired in series

Cat. 1 / PLc



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

Evaluation unit CMS-E-BR

- **Up to 4 read heads can be connected**
- **1 safety contact**
- **1 auxiliary contact**
- **1 feedback loop can be connected**

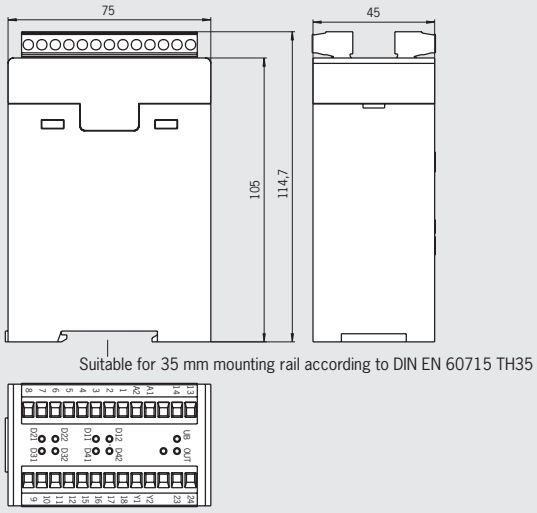
Functional description
The evaluation unit CMS-E-BR is suitable for the direct connection of up to 4 read heads.

Category/PL according to EN ISO 13849-1
- Up to category 3/PL d with more than one connected read head
- Category 4/PL e with only one connected read head

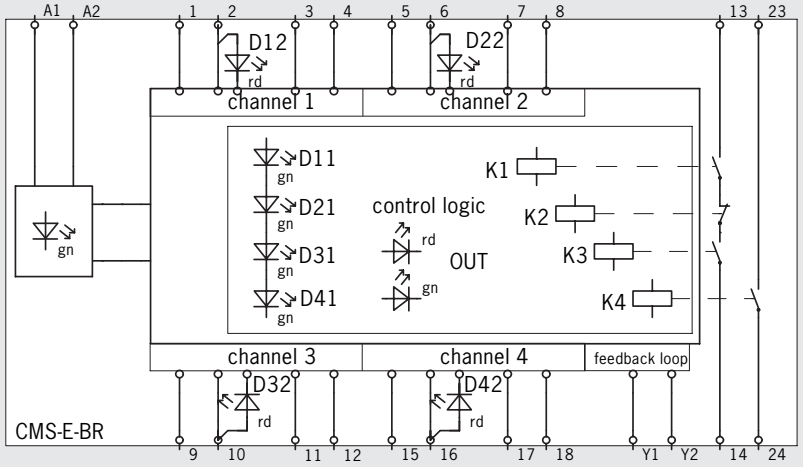
Notice:
At low approach speeds in the z direction, the time offset when switching the reed contacts must not be more than 150 ms.

Evaluation unit CMS-E-BR — Cat. 3 / PLd — Cat. 4 / PLe

Dimension drawing



Block diagram



LED displays

LED / Actuator	U_B Operating voltage green	Dx1 green	Dx2 red	OUT green	OUT red
in the actuating range [1]	●	●		●	
not in the actuating range [2]	●		●		●
not completely in the actuating range	●	●	●		●

1) NC contact in the read head is open, NO contact in the read head is closed.
All NO contacts in the previous channels are closed.
2) NC contact in the read head is closed, NO contact in the read head is open.

Ordering table

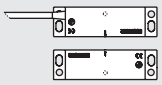
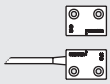
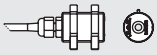
Designation	Scope of delivery	Order no./item
CMS-E-BR	Evaluation unit 4 2-pin jumpers	**085537** CMS-E-BR

Technical data for evaluation unit CMS-E-BR

Parameter		Value min.	Value typ.	Value max.	Unit
Housing material			Polyamide PA6.6		
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 acc. to EN 60529			Terminals IP20/housing IP40		
Degree of contamination			2		
Mounting			35 mm mounting rail acc. to DIN EN 60715 TH35		
Number of read heads			1 ... 4		
Connection			Plug-in connection terminals		
Operating voltage U_B			24 ±10% [1]		V AC/DC
Internal fuse (operating voltage) (automatically resetting fuse PTC)			0.5		A
Switching voltage U		-	-	250	V AC
Current consumption		-	250		mA
Switching current I at 24 V		13	-	3,000	mA
Breaking capacity P		-	-	750	VA
External contact fuse (safety circuit)			3 A gG		
Safety contact			1		
Auxiliary contact			1		
Utilization category acc. to EN 60947-5-1			I_e [2]	U_e [2]	
		AC-1	3 A	250 V	
		AC-1	3 A	24 V	
		AC-15	1 A	250 V	
		AC-15	1 A	24 V	
		DC-13	3 A	24 V	
Switching load acc. to UL Class 2			Input: 24 V AC/DC Output: 30 V AC/24 V DC		
Rated insulation voltage U_i			250		V
Vibration resistance			Acc. to EN 60947-5-2		
Mechanical operating cycles, relay			30×10^6		
EMC compliance			Acc. to EN 60947-5-3		
Risk time acc. to EN 60947-5-3			20		ms
Reliability values acc. to EN ISO 13849-1					
depending on the switching current at 24 V DC		≤ = 0.1 A	≤ = 1 A	≤ = 3 A	
Number of switching cycles/year		< 100,000	< 18,500	< 9,000	
Mission time			20		years
Category	1 read head > 1 read head		4 3		
Performance Level (PL)	1 read head > 1 read head		e d [3]		
PFH_d	1 read head > 1 read head		2.5×10^{-8} 1.0×10^{-7} [3]		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
2) I_e = max. switching current per channel, U_e = switching voltage
3) This value applies to cables laid with protection.
The following applies if cables are laid without protection and more than one door must be opened frequently or if cables are laid without protection and more than 5 doors are connected in series: **Performance Level = PL c, PFHd = 1.1×10^{-6}**.
On this topic, also see EN ISO 14119:2014, section 8.6, and ISO TR 24119.
Evaluation of the diagnostic coverage according to ISO TR 24119 must result in at least the value *low* in order to achieve PL d.

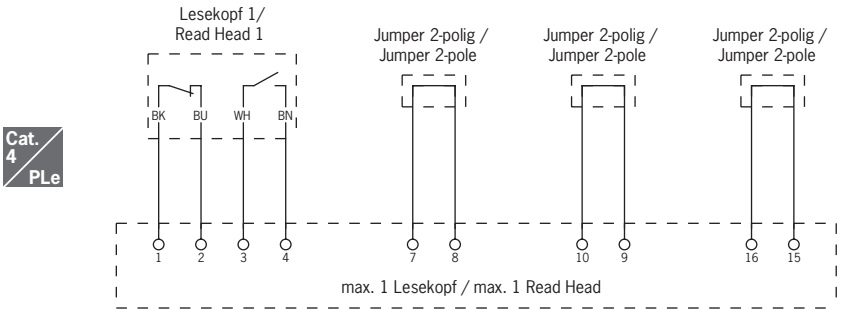
Selection table for read heads for non-contact safety system CMS-E-BR

Read head design	Read head contact assembly	Number of read heads	Category/PL according to EN ISO 13849-1	Read head
Design A  Page 36		1 2 ... 4	4/PL e 3/PL d	CMS-R-AXH...
Design B  Page 40		1 2 ... 4	4/PL e 3/PL d	CMS-R-BXI...
Design C M25  Page 44		1 2 ... 4	4/PL e 3/PL d	CMS-R-CXC...
Design E M30  Page 48		1 2 ... 4	4/PL e 3/PL d	CMS-R-EXM...

Connection examples for safety system CMS-E-BR

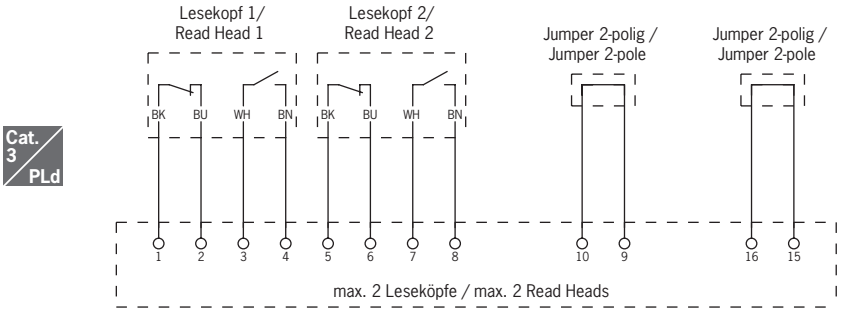
Connection example 1

▸ One read head on one evaluation unit CMS-E-BR (without feedback loop)



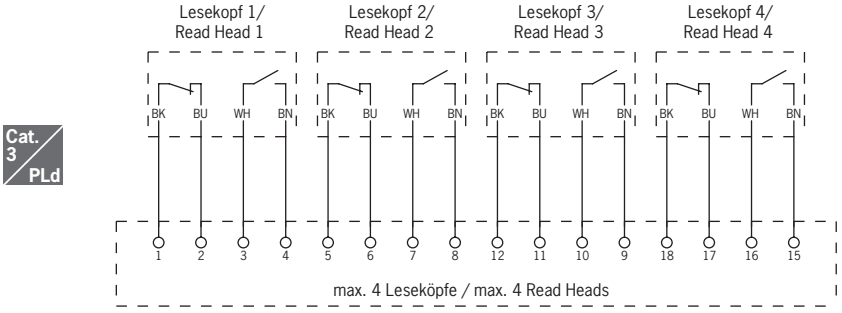
Connection example 2

▸ Two read heads on one evaluation unit CMS-E-BR (without feedback loop)



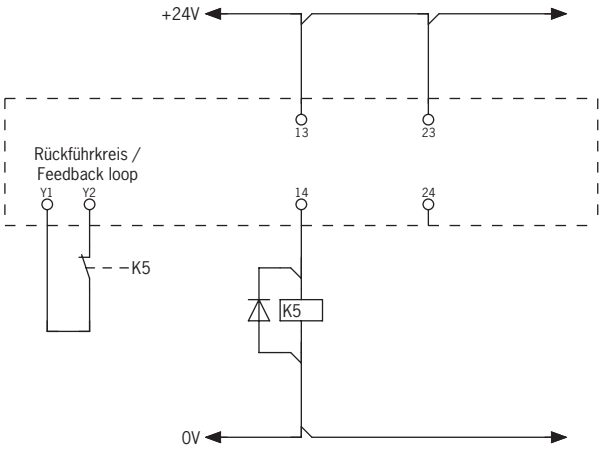
Connection example 3

▸ Four read heads on one evaluation unit CMS-E-BR (without feedback loop)

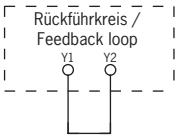


Connection examples for automatic start

▸ With feedback loop



▸ Without feedback loop



Notes

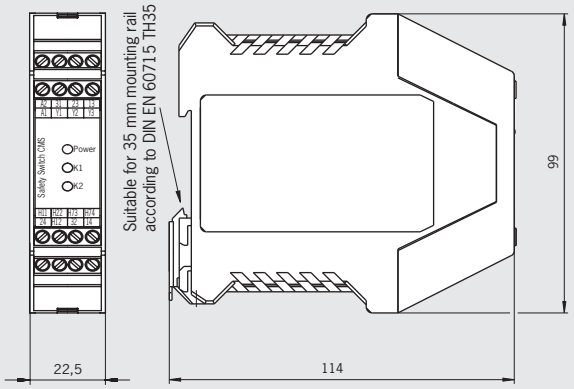
The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

Evaluation unit CMS-E-ER

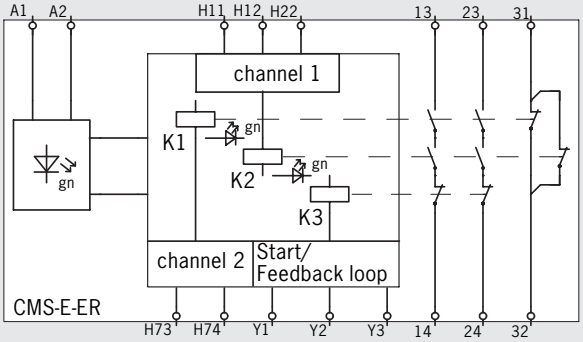
- **Up to 30 read heads with reed contacts or 10 read heads with Hall sensors can be connected**
- **2 safety contacts**
- **1 auxiliary contact**
- **1 feedback loop can be connected**
- **Start automatic/monitored/not monitored**
- **Suitable for the connection of read heads with Hall sensors**
- **Simultaneous connection of read heads with reed contacts and read heads with Hall sensors possible**

Evaluation unit CMS-E-ER — Cat. 3 / PLd — Cat. 4 / PLe

Dimension drawing



Block diagram



Functional description
The evaluation unit CMS-E-ER is suitable for the direct connection of up to 30 read heads with reed contacts or 10 read heads with Hall sensors.

Category/PL according to EN ISO 13849-1
- Up to category 3/PL d with more than one connected read head
- Category 4/PL e with only one connected read head

Notice:
At low approach speeds in the z direction, the time offset when switching the reed contacts must not be more than 0.6 s.

LED displays

LED / Actuator	U_B Operating voltage	K1 Channel 1	K2 Channel 2
	green	green	green
in the actuating range	●	●	●
not in the actuating range	●		
not completely in the actuating range	●	● or ●	

Ordering table

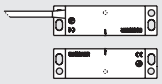
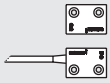
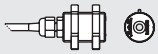
Designation	Scope of delivery	Order no./item
Evaluation unit CMS-E-ER	Evaluation unit 1 2-pin jumper	**099182** CMS-E-ER

Technical data for evaluation unit CMS-E-ER

Parameter		Value min.	Value typ.	Value max.	Unit
Housing material			Polyamide PA6.6		
Dimensions			114 x 99 x 22.5		mm
Weight			0.22		kg
Ambient temperature		0	-	+55	°C
Storage temperature		-25	-	+70	°C
Degree of protection acc. to EN 60529			Terminals IP20/housing IP40		
Degree of contamination			2		
Mounting			35 mm mounting rail acc. to DIN EN 60715 TH35		
Number of read heads			1 … 30 read heads with reed contacts, 1 … 10 read heads with Hall sensors		
Connection			Connection terminals		
Operating voltage U_B			24 ±10% [1]		V AC/DC
Internal fuse (operating voltage) (automatically resetting fuse PTC)			750		mA
Safety contacts			2 NO contacts		
Switching voltage U		-	-	240	V AC
Current consumption at DC 24 V		10	-	120	mA
Switching current I at 24 V		-	-	3	A
Switching current I at 24 V		10	-	-	mA
Breaking capacity P		-	-	720	VA
External contact fuse (safety circuit according to EN 60269-1)			4 A gG		
Auxiliary contact			1 NC contact		
Switching current I at 24 V		-	-	1.5	A
Utilization category acc. to EN 60947-5-1			I_e [2]	U_e [2]	
		AC-1	3 A	230 V	
		AC-1	3 A	24 V	
		AC-15	0.9 A	240 V	
		AC-15	0.9 A	24 V	
		DC-13	1.5 A	24 V	
Switching load acc. to UL Class 2			Input: 24 V AC/DC Output: 30 V AC/24 V DC		
Rated insulation voltage U_i			250		V
Vibration resistance			Acc. to EN 60947-5-2		
Mechanical operating cycles, relay			10×10^6		
EMC compliance			Acc. to EN 60947-5-3		
Risk time acc. to EN 60947-5-3			20		ms
Reliability values acc. to EN ISO 13849-1					
depending on the switching current at 24 V DC		≤ = 0.1 A		≤ = 1 A	
Number of switching cycles/year		< 166,000		< 70,000	
Mission time			20		years
Category	1 read head >1 read head		4 3		
Performance Level (PL)	1 read head >1 read head		e d [3]		
PFH_d	1 read head >1 read head		2.5×10^{-8} 1.0×10^{-7} [3]		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
2) I_e = max. switching current per channel, U_e = switching voltage
3) This value applies to cables laid with protection.
The following applies if cables are laid without protection and more than one door must be opened frequently or if cables are laid without protection and more than 5 doors are connected in series: **Performance Level = PL c, PFHd = 1.1 x 10^{-6}**.
On this topic, also see EN ISO 14119:2014, section 8.6, and ISO TR 24119.
Evaluation of the diagnostic coverage according to ISO TR 24119 must result in at least the value *low* in order to achieve PL d.

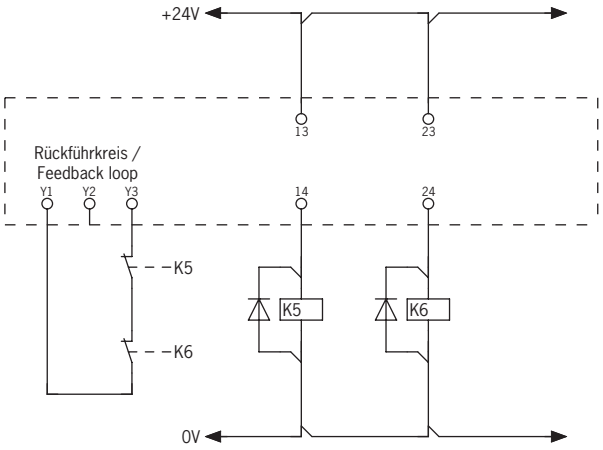
Selection table for read heads for non-contact safety system CMS-E-ER

Read head design	Read head contact assembly	Number of read heads	Category/PL according to EN ISO 13849-1	Read head
Design A 		1	4/PL e	With reed contacts: CMS-R-AXH… Page 36
		2 … 30 with reed contacts, 2 … 10 with Hall sensors	3/PL d	With Hall sensors: CMS-RH-AYA… Page 52
Design B 		1	4/PL e	With reed contacts: CMS-R-BXI… Page 40
		2 … 30 with reed contacts, 2 … 10 with Hall sensors	3/PL d	With Hall sensors: CMS-RH-BYB… Page 54
Design C M25  Page 44		1	4/PL e	CMS-R-CXC…
		2 … 30	3/PL d	
Design E M30  Page 48		1	4/PL e	CMS-R-EXM…
		2 … 30	3/PL d	

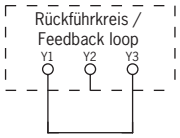
Connection examples for safety system CMS-E-ER

Connection examples for automatic start

▸ With feedback loop



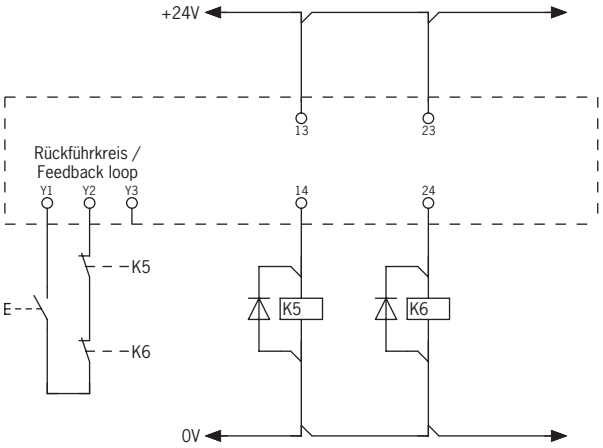
▸ Without feedback loop



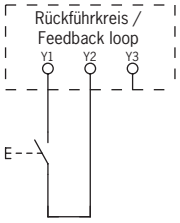
Manual start using start button with falling edge

The safety contacts are closed only when the start button is released.

▸ With feedback loop

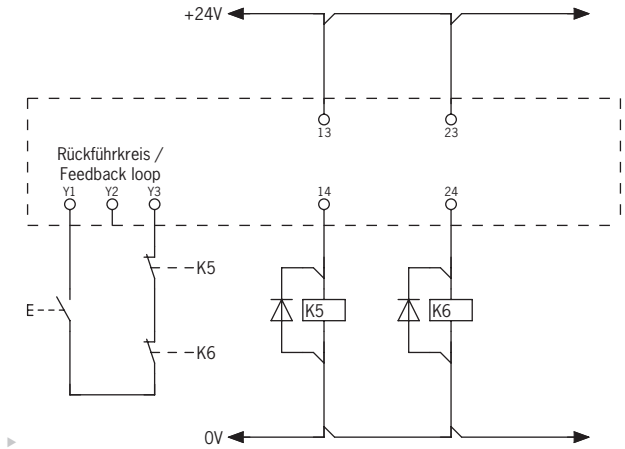


▸ Without feedback loop

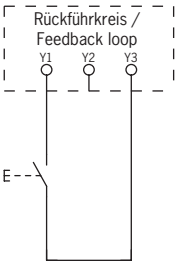


Manual start using start button with rising edge

▸ With feedback loop



▸ Without feedback loop



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

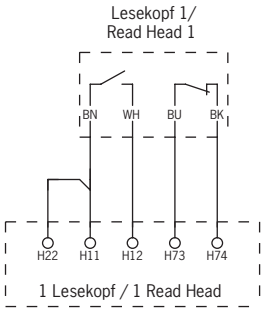
Connection examples for safety system CMS-E-ER

Read heads with reed contacts

Connection example 1

▸ One read head on one evaluation unit CMS-E-ER

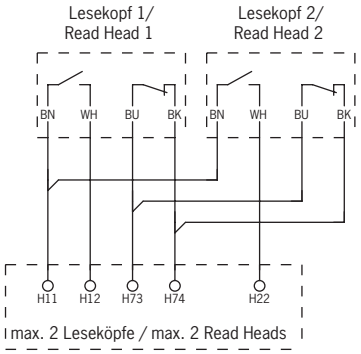
Cat. 4 / PLe



Connection example 2

▸ Two read heads on one evaluation unit CMS-E-ER

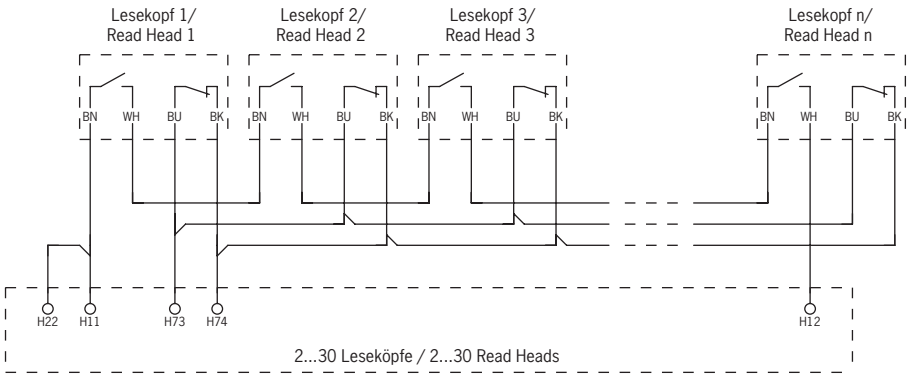
Cat. 3 / PLd



Connection example 3

▸ More than 2 to 30 read heads on one evaluation unit CMS-E-ER

Cat. 3 / PLd



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

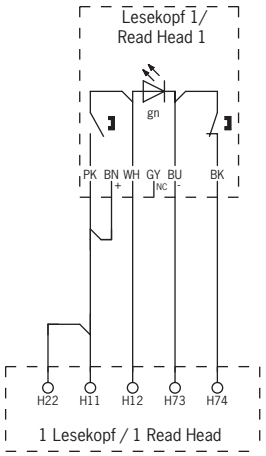
Connection examples for safety system CMS-E-ER

Read heads with Hall sensors

Connection example 4

▸ One read head on one evaluation unit CMS-E-ER

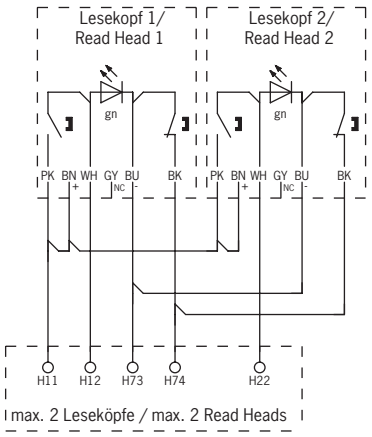
Cat. 4 / PLe



Connection example 5

▸ Two read heads on one evaluation unit CMS-E-ER

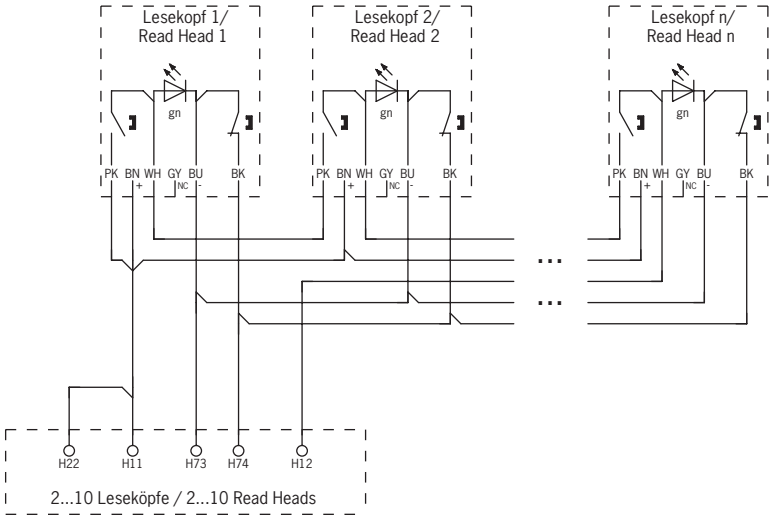
Cat. 3 / PLd



Connection example 6

▸ More than 2 to 10 read heads on one evaluation unit CMS-E-ER

Cat. 3 / PLd



Notes

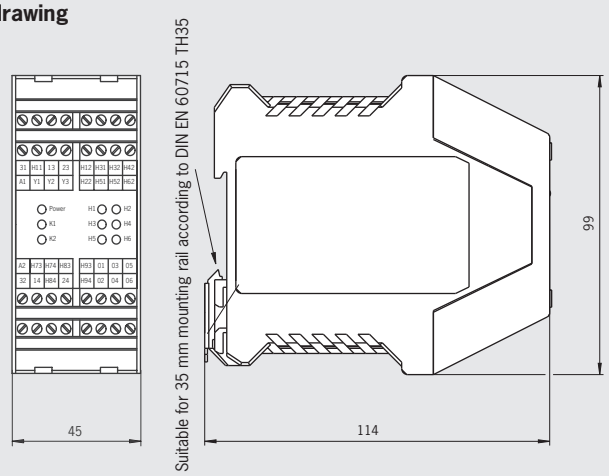
The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

Evaluation unit CMS-E-FR

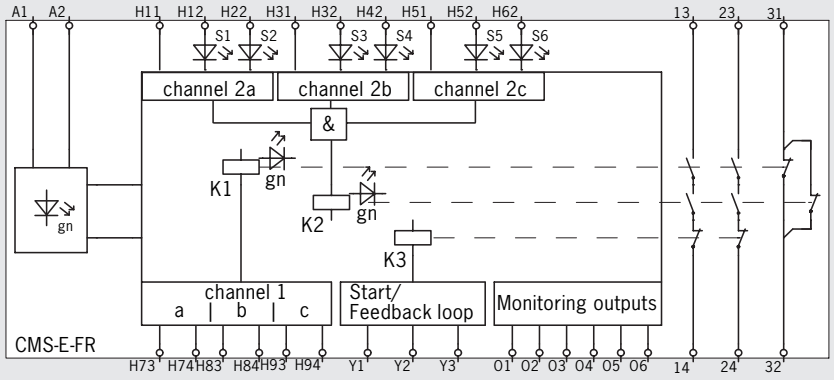
- **Up to 6 read heads can be connected**
- **2 safety contacts**
- **1 auxiliary contact**
- **6 monitoring outputs**
- **1 feedback loop can be connected**
- **Start automatic/monitored/not monitored**
- **Suitable for the connection of read heads with Hall sensors**
- **Simultaneous connection of read heads with reed contacts and read heads with Hall sensors possible**

Evaluation unit CMS-E-FR — Cat. 3 / PLd — Cat. 4 / PLe

Dimension drawing



Block diagram



Functional description
The evaluation unit CMS-E-FR is suitable for the direct connection of up to 6 read heads.

Category/PL according to EN ISO 13849-1
- Up to category 3/PL d with more than one connected read head
- Category 4/PL e with only one connected read head

Notice:
At low approach speeds in the z direction, the time offset when switching the reed contacts must not be more than 0.6 s.

LED displays

LED / Actuator	U_B Operating voltage green	K1 Channel 1 green	K2 Channel 2 green	H1 ... H6 green
in the actuating range	●	●	●	● 1)
none in the actuating range	●			
not completely in the actuating range	●	● or ●		
at least one not in the actuating range	●			● 1)

1) The LED display shows which actuators are in the actuating range.

Ordering table

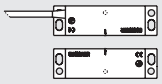
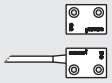
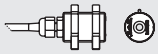
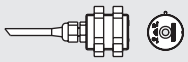
Designation	Scope of delivery	Order no./item
Evaluation unit CMS-E-FR	Evaluation unit 2 3-pin jumpers	**099258** CMS-E-FR

Technical data for evaluation unit CMS-E-FR

Parameter		Value min.	Value typ.	Value max.	Unit
Housing material			Polyamide PA6.6		
Dimensions			114 x 99 x 45		mm
Weight			0.3		kg
Ambient temperature		0	-	+55	°C
Storage temperature		-25	-	+70	°C
Degree of protection acc. to EN 60529			Terminals IP20/housing IP40		
Degree of contamination			2		
Mounting			35 mm mounting rail acc. to DIN EN 60715 TH35		
Number of read heads			1 ... 6		
Connection			Connection terminals		
Operating voltage U_B			24 ±10% [1]		V AC/DC
Internal fuse (operating voltage) (automatically resetting fuse PTC)			750		mA
Safety contacts			2 NO contacts		
Switching voltage U		-	-	240	V AC
Current consumption at DC 24 V		10	-	120	mA
Switching current I at 24 V		-	-	3	A
Switching current I at 24 V		10	-	-	mA
Breaking capacity P		-	-	720	VA
External contact fuse (safety circuit according to EN 60269-1)			4 A gG		
Auxiliary contact			1 NC contact		
Switching current I at 24 V		-	-	1.5	A
Monitoring outputs O1 ... O6			DC 24 V/50 mA per contact		
Utilization category acc. to EN 60947-5-1			I_e [2]	U_e [2]	
		AC-1	3 A	230 V	
		AC-1	3 A	24 V	
		AC-15	0.9 A	240 V	
		AC-15	0.9 A	24 V	
		DC-13	1.5 A	24 V	
Switching load acc. to UL Class 2			Input: 24 V AC/DC Output: 30 V AC/24 V DC		
Rated insulation voltage U_i			250		V
Vibration resistance			Acc. to EN 60947-5-2		
Mechanical operating cycles, relay			10×10^6		
EMC compliance			Acc. to EN 60947-5-3		
Risk time acc. to EN 60947-5-3			20		ms
Reliability values acc. to EN ISO 13849-1					
depending on the switching current at 24 V DC		≤ = 0.1 A		≤ = 1 A	
Number of switching cycles/year		< 166,000		< 70,000	
Mission time			20		years
Category	1 read head >1 read head		4 3		
Performance Level (PL)	1 read head >1 read head		e d [3]		
PFH_d	1 read head >1 read head		2.5×10^{-8} 1.0×10^{-7} [3]		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
2) I_e = max. switching current per channel, U_e = switching voltage
3) This value applies to cables laid with protection.
The following applies if cables are laid without protection and more than one door must be opened frequently or if cables are laid without protection and more than 5 doors are connected in series: **Performance Level = PL c, PFHd = 1.1 x 10^{-6}**.
On this topic, also see EN ISO 14119:2014, section 8.6, and ISO TR 24119.
Evaluation of the diagnostic coverage according to ISO TR 24119 must result in at least the value *low* in order to achieve PL d.

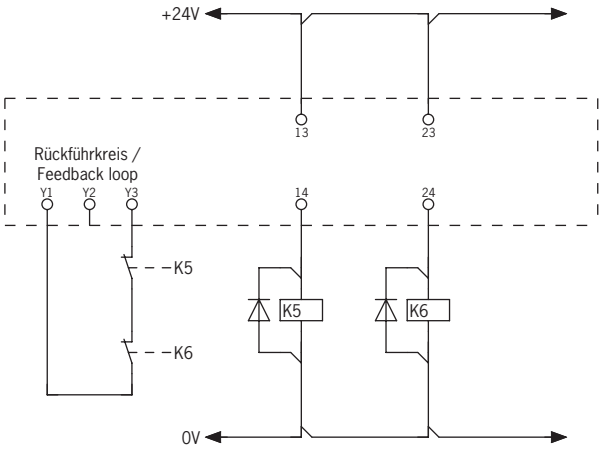
Selection table for read heads for non-contact safety system CMS-E-FR

Read head design	Read head contact assembly	Number of read heads	Category/PL according to EN ISO 13849-1	Read head
Design A 		1	4/PL e	With reed contacts: CMS-R-AXH… Page 36
		2 … 6	3/PL d	With Hall sensors: CMS-RH-AYA… Page 52
Design B 		1	4/PL e	With reed contacts: CMS-R-BXI… Page 40
		2 … 6	3/PL d	With Hall sensors: CMS-RH-BYB… Page 54
Design C M25  Page 44		1	4/PL e	CMS-R-CXC…
		2 … 6	3/PL d	
Design E M30  Page 48		1	4/PL e	CMS-R-EXM…
		2 … 6	3/PL d	

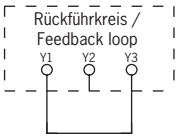
Connection examples for safety system CMS-E-FR

Connection examples for automatic start

▸ With feedback loop



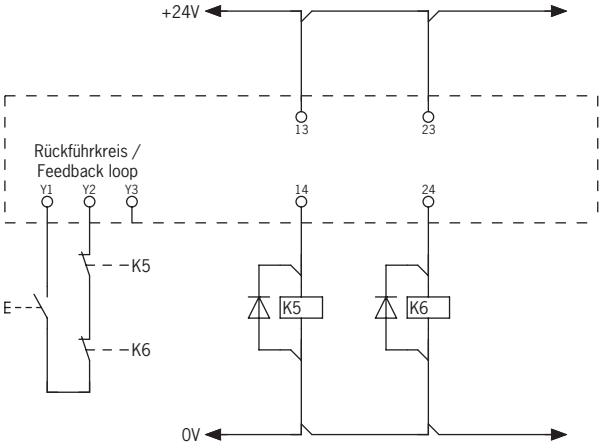
▸ Without feedback loop



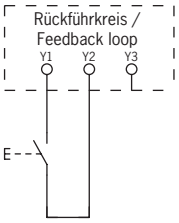
Manual start using start button with falling edge

The safety contacts are closed only when the start button is released.

▸ With feedback loop

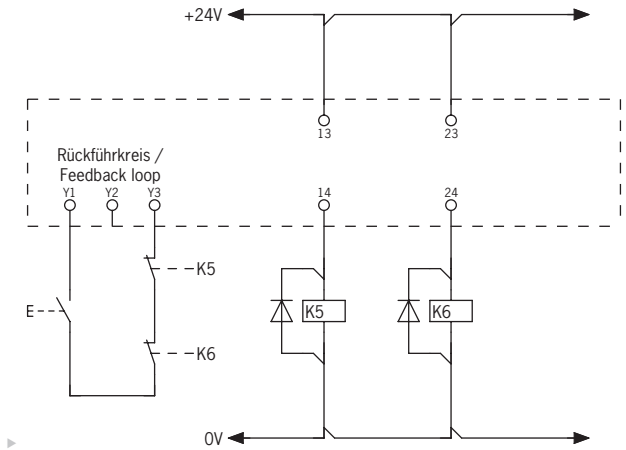


▸ Without feedback loop

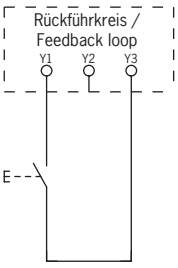


Manual start using start button with rising edge

▸ With feedback loop



▸ Without feedback loop



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

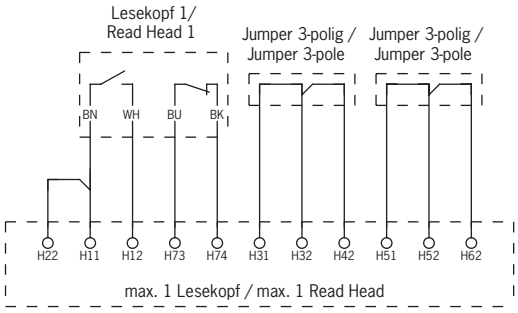
Connection examples for safety system CMS-E-FR

Read heads with reed contacts

Connection example 1

▸ One read head on one evaluation unit CMS-E-FR

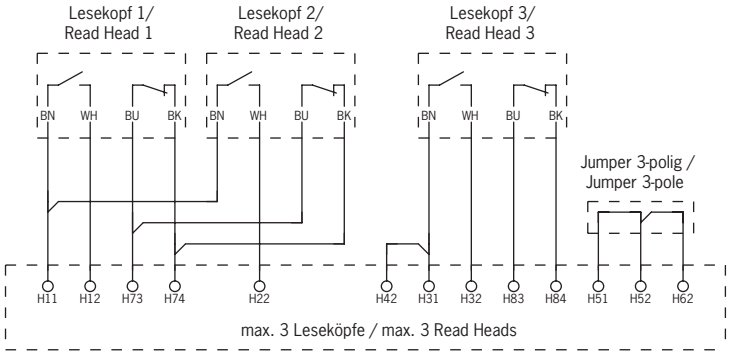
Cat. 4 / PLe



Connection example 2

▸ Three read heads on one evaluation unit CMS-E-FR

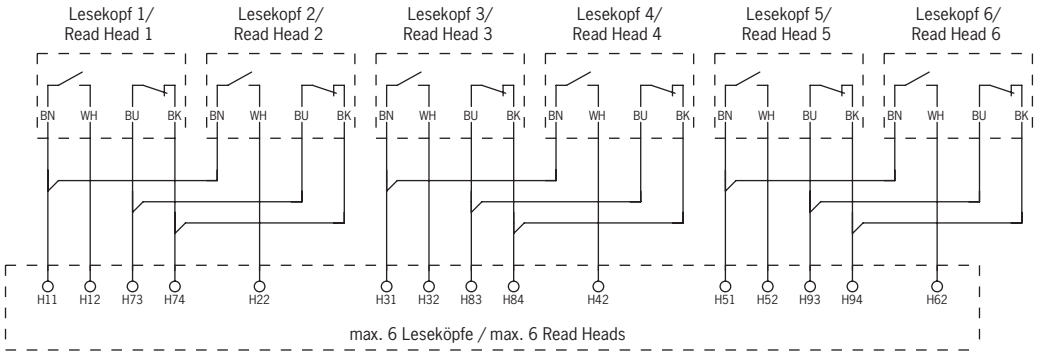
Cat. 3 / PLd



Connection example 3

▸ Six read heads on one evaluation unit CMS-E-FR

Cat. 3 / PLd



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

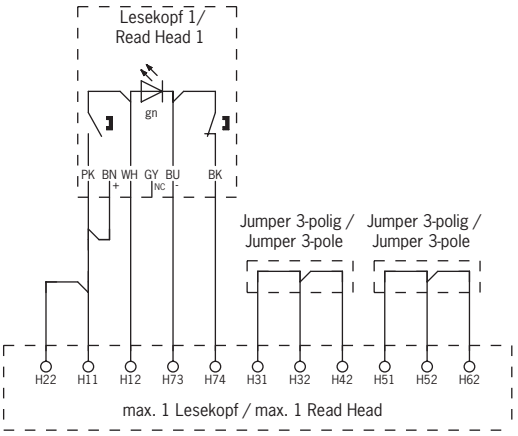
Connection examples for safety system CMS-E-FR

Read heads with Hall sensors

Connection example 4

▸ One read head on one evaluation unit CMS-E-FR

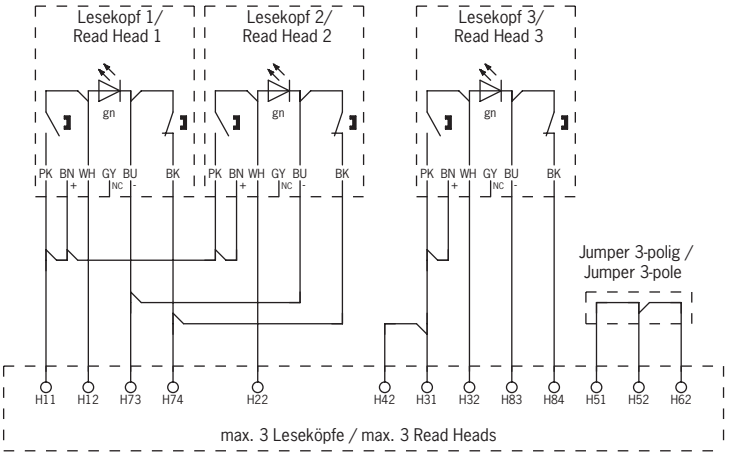
Cat. 4 / PLe



Connection example 5

▸ Three read heads on one evaluation unit CMS-E-FR

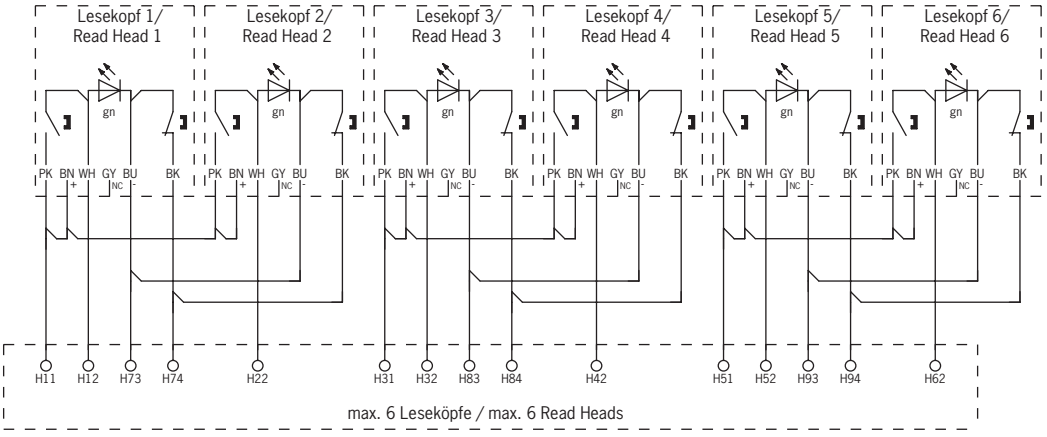
Cat. 3 / PLd



Connection example 6

▸ Six read heads on one evaluation unit CMS-E-FR

Cat. 3 / PLd



Notes

The following applies to all the illustrations:
Evaluation unit electrically isolated, actuator not in the actuating range.

»Large selection of read heads – find the right sensor for every purpose.«

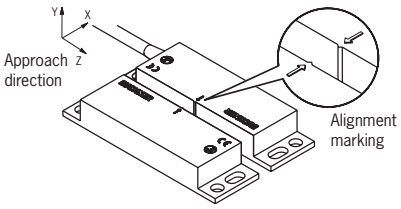
- Different designs for different applications
- Large actuating range with hysteresis for variable adjustment of the door gap
- Long mechanical life
- High degree of protection IP67
- Suitable for strict hygiene requirements because they can be installed behind stainless steel
- Compact design


EUCHNER
Safety Switch
CMS-E-FR
ID-Nr.: 099256
Power
K1
K2
Safety Switch
CMS
EUCHNER
Safety Switch CMS
CMS-E-FR
ID-Nr.: 099102
EUCHNER
CMS-R-AXH
24V AC/DC Class2
70771 Leinfelden-Germany

Read heads and actuators, design A

- **In combination with evaluation unit CMS-E-AR**
- **Cube-shaped version 88 x 25 mm**
- **With connecting cable**

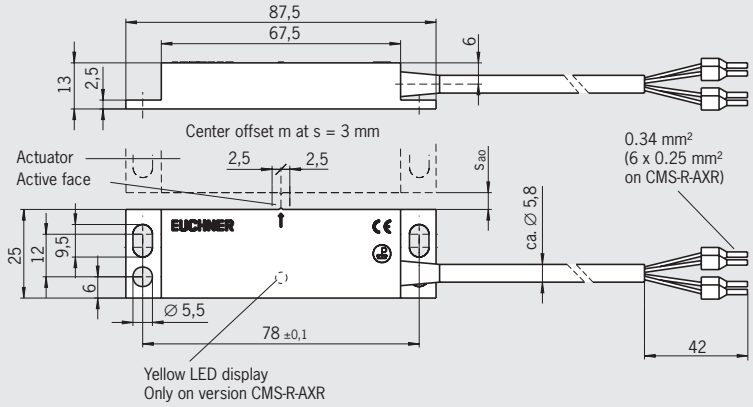
Alignment of read head and actuator



Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design A

Dimension drawing



Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

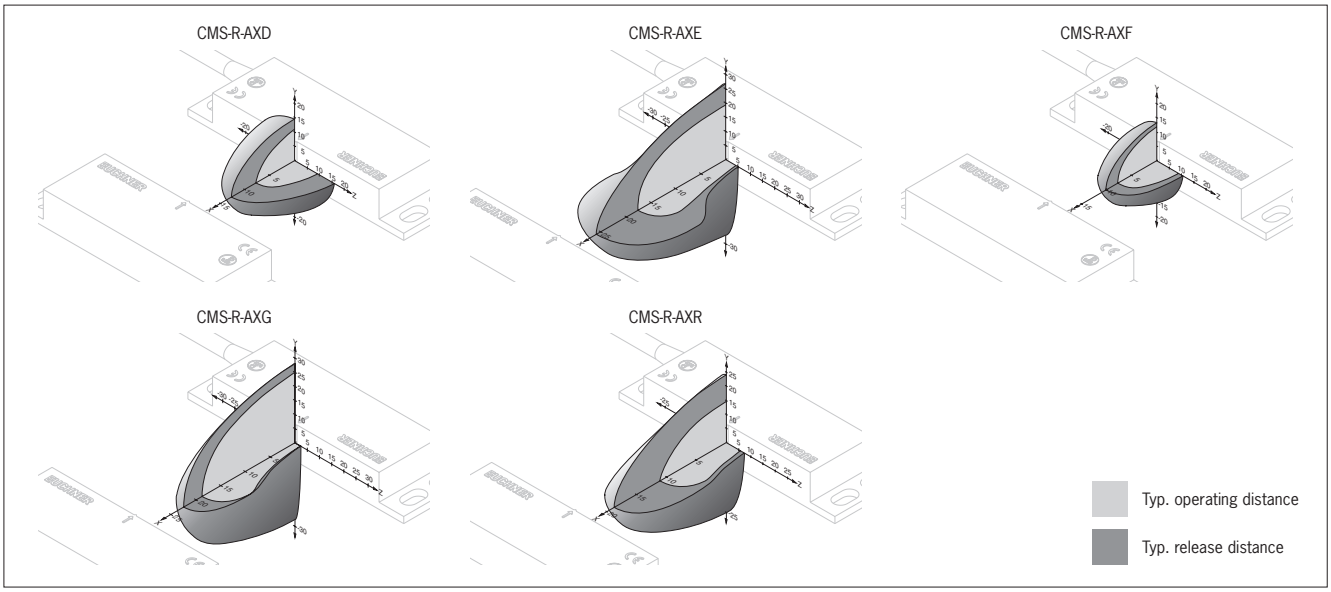
Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
BN BK (YE) BU (GN) WH	6	18	**V** PVC	**3**	**084583** CMS-R-AXD-03V	**084591** CMS-M-AB
				5	**085732** CMS-R-AXD-05V	
	18	34	**V** PVC	**1**	**102385** CMS-R-AXE-01V	**085654** CMS-M-AG
				3	**084584** CMS-R-AXE-03V	
				5	**085733** CMS-R-AXE-05V	
			P PUR	**5**	**103859** CMS-R-AXE-05P	
BN WH	6	18	**V** PVC	**3**	**084585** CMS-R-AXF-03V	**084591** CMS-M-AB
				5	**085734** CMS-R-AXF-05V	
	18	34	**V** PVC	**5**	**085735** CMS-R-AXG-05V	**085654** CMS-M-AG
BN BK (YE) BU (GN) WH RV PK GY	9 For contact status indication and LED: 7	23 For contact status indication and LED: 15	**V** PVC	**5**	**093975** CMS-R-AXR-05VL	**093976** CMS-M-AI

1) Old conductor coloring in brackets

Technical data for read heads and actuators, design A

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Contact status indication (only CMS-A-AXR…)				
Switching voltage	24			V
Switching current I_e	-	-	0.015	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

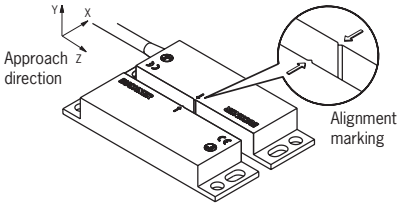
Operating diagrams, design A



Read heads and actuators, design A

- **In combination with evaluation unit CMS-E-AR**
- **Cube-shaped version 88 x 25 mm**
- **With plug connector M8**

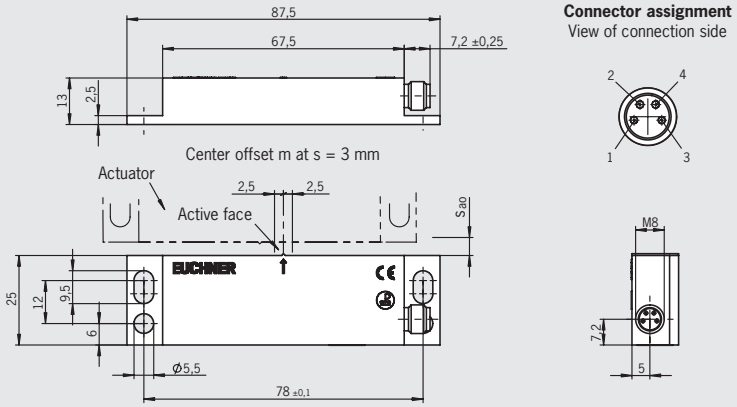
Alignment of read head and actuator



Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design A

Dimension drawing



Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

Circuit diagram not actuated	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Plug connector	Read head Order no./item	Actuator Order no./item
	18	34	**M8**	**100742** CMS-R-AXE-SC	**085654** CMS-M-AG
	6	18	**M8**	**100743** CMS-R-AXF-SC	**084591** CMS-M-AB
	18	34	**M8**	**100744** CMS-R-AXG-SC	**085654** CMS-M-AG

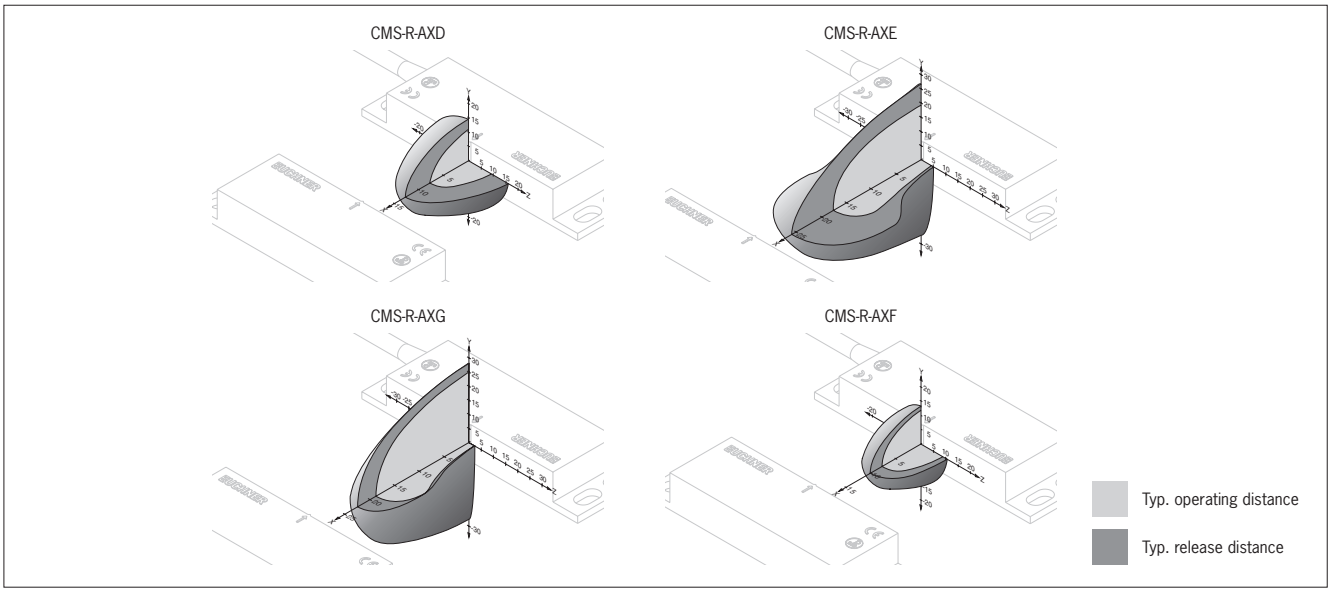
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design A

Parameter	Value min.	typ.	max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

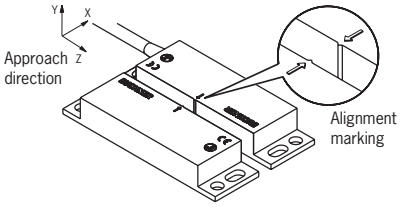
Operating diagrams, design A



Read heads and actuators, design A

- **In combination with evaluation units CMS-E-BR/CMS-E-ER/CMS-E-FR**
- **Cube-shaped version 88 x 25 mm**
- **With connecting cable or plug connector M8**

Alignment of read head and actuator

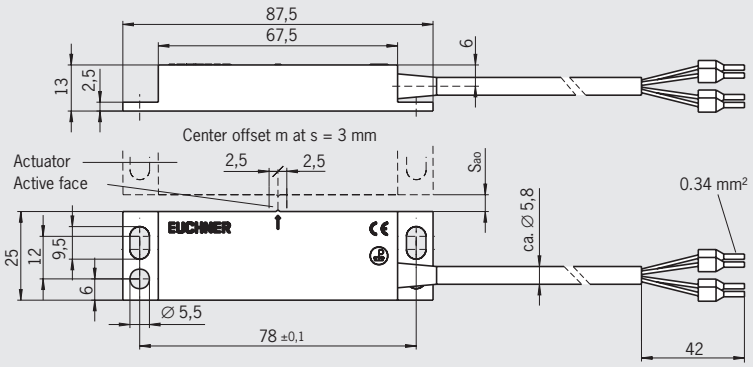


Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

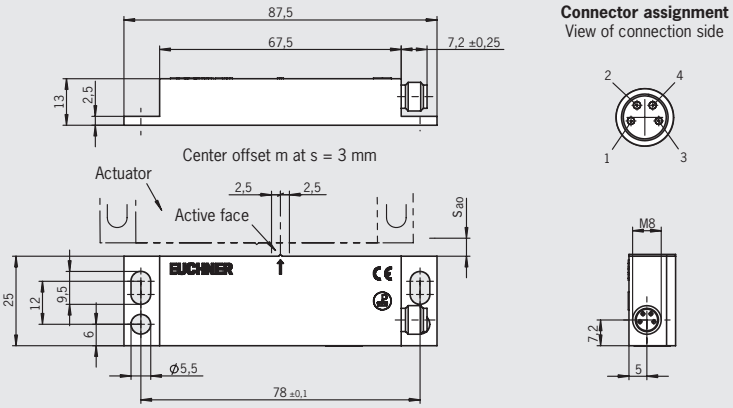
Read heads/actuators, design A

Dimension drawing

With connecting cable

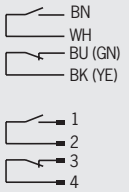


With plug connector M8



Connector assignment
View of connection side

Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN WH BU (GN) BK (YE) 1 2 3 4	6	31	**V** PVC	**3**	**084587** CMS-R-AXH-03V	**084592** CMS-M-AC
				5	**085736** CMS-R-AXH-05V	
			Plug connector **M8**		**100745** CMS-R-AXH-SC	

1) Old conductor coloring in brackets

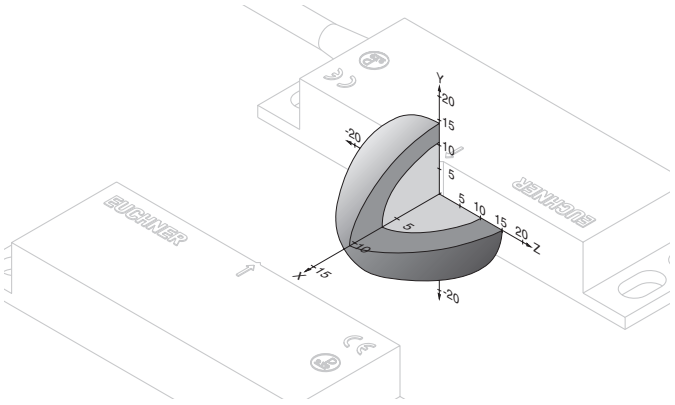
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design A

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

Operating diagrams, design A



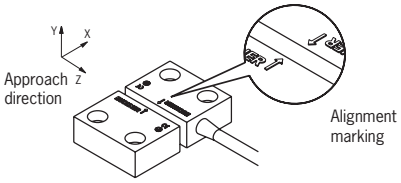
Typ. operating distance

Typ. release distance

Read heads and actuators, design B

- **In combination with evaluation unit CMS-E-AR**
- **Cube-shaped version 36 x 26 mm**
- **With connecting cable or plug connector M8**

Alignment of read head and actuator

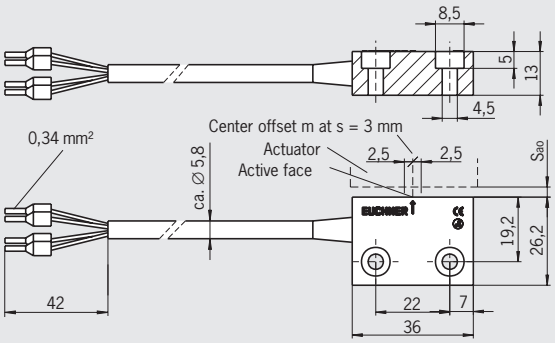


Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design B

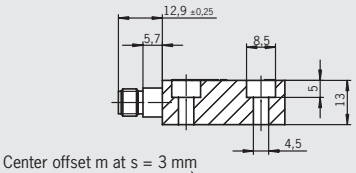
Dimension drawing

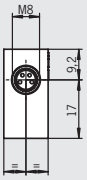
With connecting cable

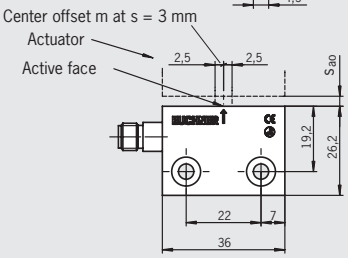


With plug connector M8

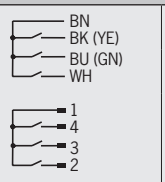
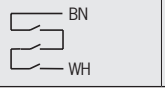
Connector assignment
View of connection side







Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN BK (YE) BU (GN) WH 1 4 3 2	6	17	**V** PVC	**5**	**092023** CMS-R-BXO-05V	**092025** CMS-M-BH
			P PUR	**5**	**103867** CMS-R-BXO-05P	
			Plug connector **M8**		**100755** CMS-R-BXO-SC	
 BN WH	6	17	**V** PVC	**5**	**092024** CMS-R-BXP-05V	

1) Old conductor coloring in brackets

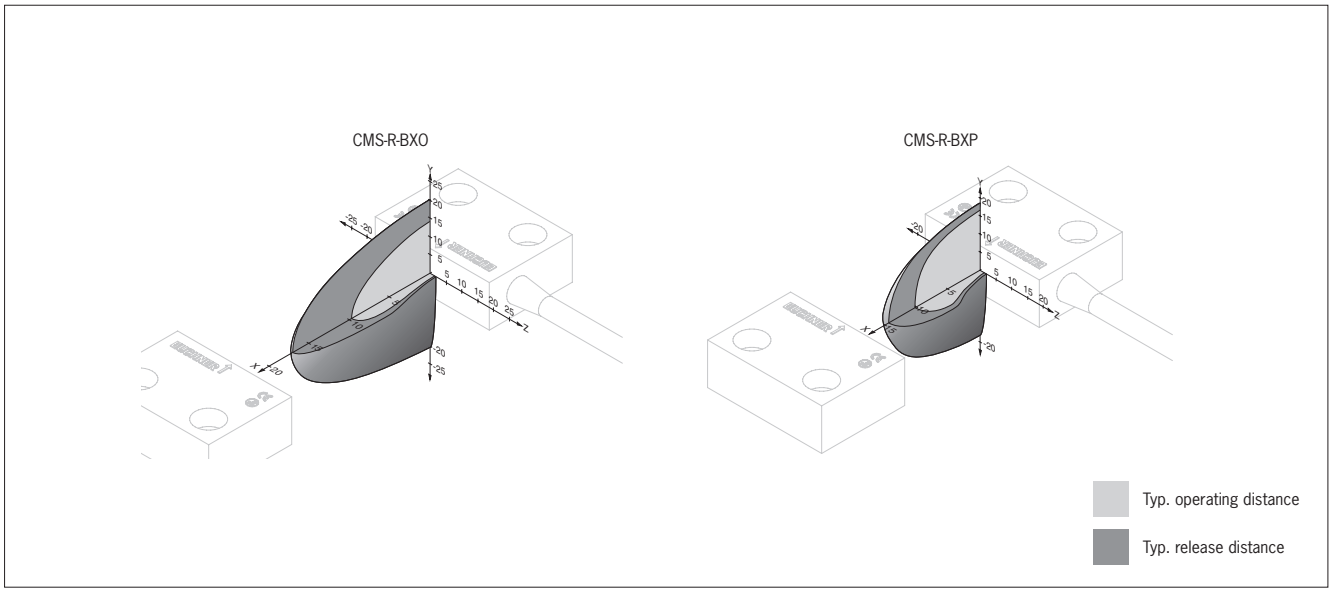
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design B

Parameter	Value min.	typ.	max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

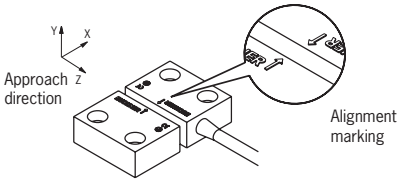
Operating diagrams, design B



Read heads and actuators, design B

- **In combination with evaluation units CMS-E-BR/CMS-E-ER/CMS-E-FR**
- **Cube-shaped version 36 x 26 mm**
- **With connecting cable or plug connector M8**

Alignment of read head and actuator

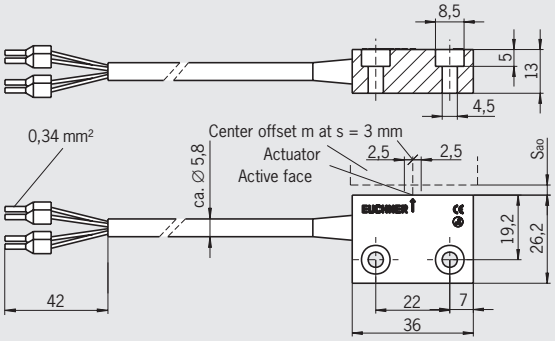


Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design B

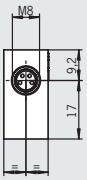
Dimension drawing

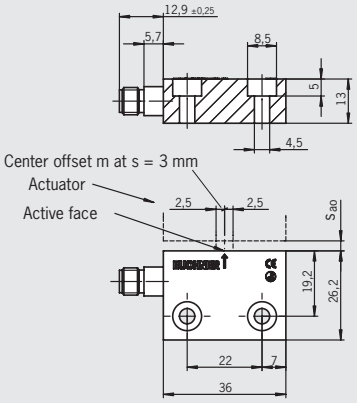
With connecting cable



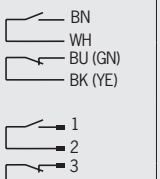
With plug connector M8

Connector assignment
View of connection side





Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN WH BU (GN) BK (YE) 1 2 3 4	3	12	**V** PVC	**3**	**085530** CMS-R-BXI-03V	**085531** CMS-M-BD
				5	**085737** CMS-R-BXI-05V	
			P PUR	**7**	**115117** CMS-R-BXI-07P	
			Plug connector **M8**		**100696** CMS-R-BXI-SC	

1) Old conductor coloring in brackets

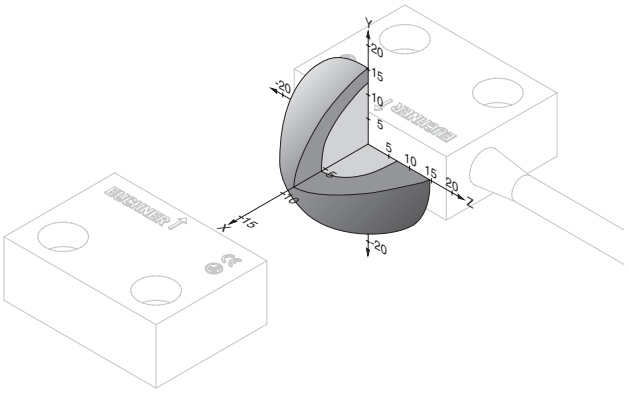
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design B

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

Operating diagrams, design B



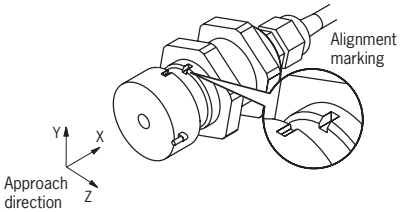
Typ. operating distance

Typ. release distance

Read heads and actuators, design C

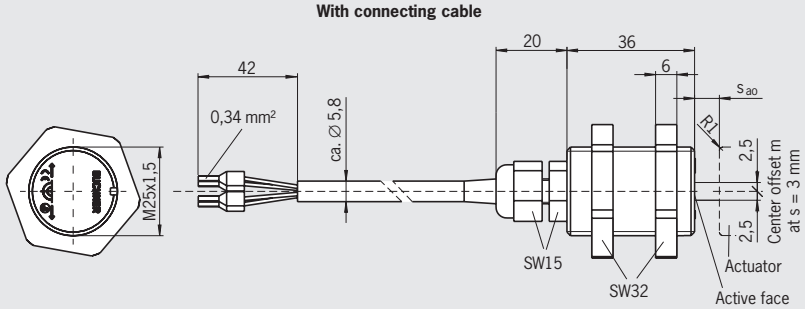
- **In combination with evaluation units CMS-E-AR**
- **Cylindrical version M25**
- **With connecting cable**

Alignment of read head and actuator



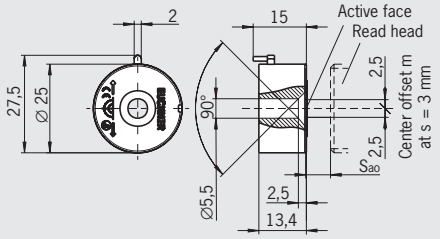
Read heads, design C

Dimension drawing

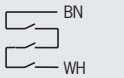


Actuator, design C

Dimension drawing



Ordering table for read heads and actuators (actuator including 1 screw M5 x 25)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN BK (YE) BU (GN) WH	7	16	**V** PVC	**3**	**084574** CMS-R-CXA-03V	**084577** CMS-M-CA
				5	**085739** CMS-R-CXA-05V	
 BN WH	7	16	**V** PVC	**3**	**084576** CMS-R-CXB-03V	

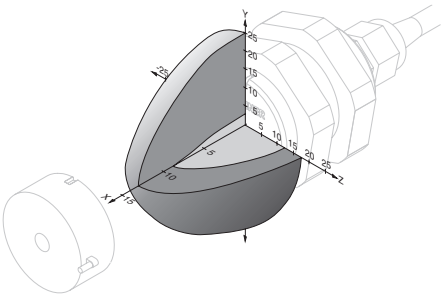
1) Old conductor coloring in brackets

Technical data for read heads and actuators, design C

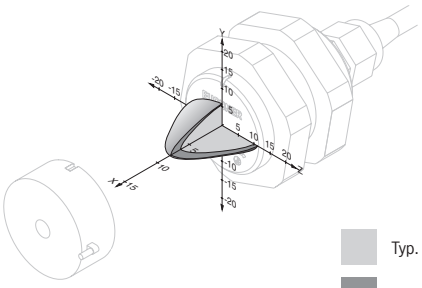
Parameter	Value min.	typ.	max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

Operating diagrams, design C

CMS-R-CXA



CMS-R-CXB



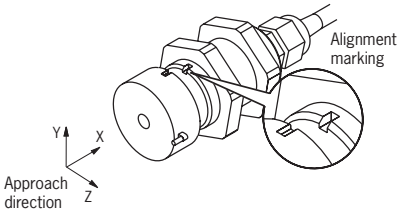
Typ. operating distance

Typ. release distance

Read heads and actuators, design C

- **In combination with evaluation units CMS-E-BR/CMS-E-ER/CMS-E-FR**
- **Cylindrical version M25**
- **With connecting cable or plug connector M8**

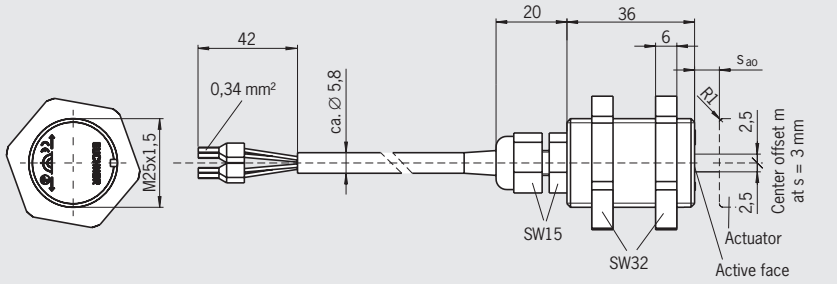
Alignment of read head and actuator



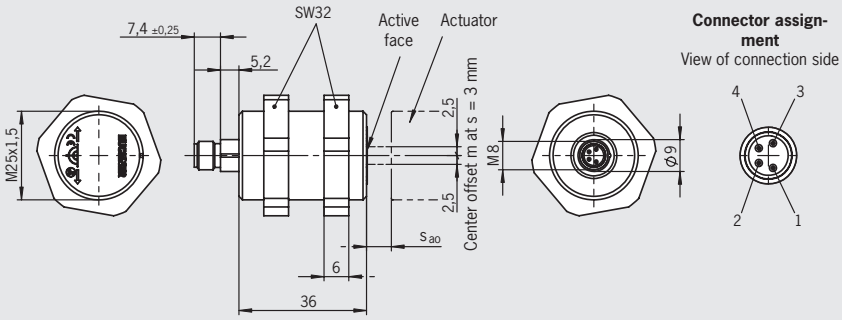
Read heads, design C

Dimension drawing

With connecting cable

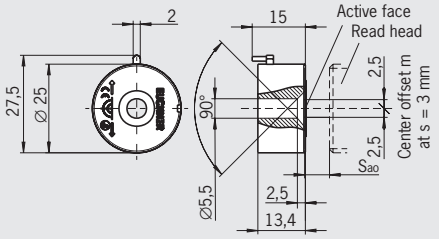


With plug connector M8

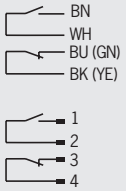


Actuator, design C

Dimension drawing



Ordering table for read heads and actuators (actuator including 1 screw M5 x 25)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN WH BU (GN) BK (YE) 1 2 3 4	6	14	**V** PVC	**3**	**084575** CMS-R-CXC-03V	**084577** CMS-M-CA
				5	**085741** CMS-R-CXC-05V	
			P PUR	**5**	**103872** CMS-R-CXC-05P	
			Plug connector **M8**		**103967** CMS-R-CXC-SC	

1) Old conductor coloring in brackets

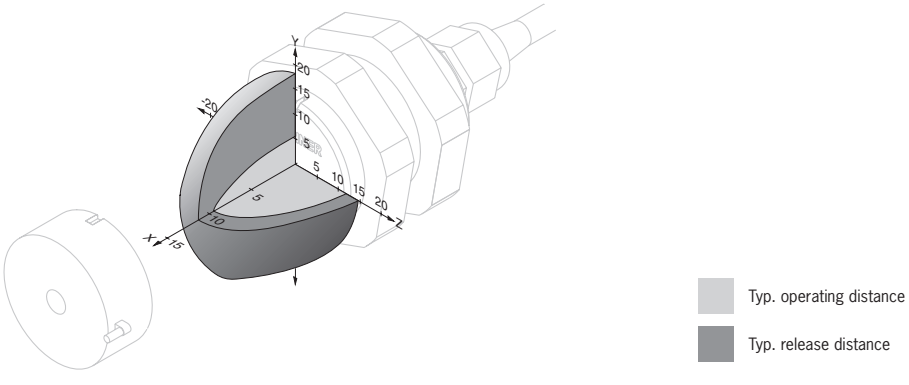
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design C

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

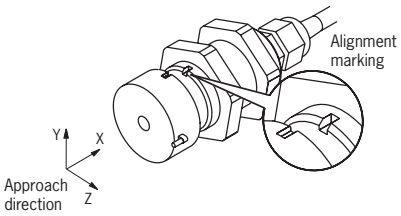
Operating diagrams, design C



Read heads and actuators, design E

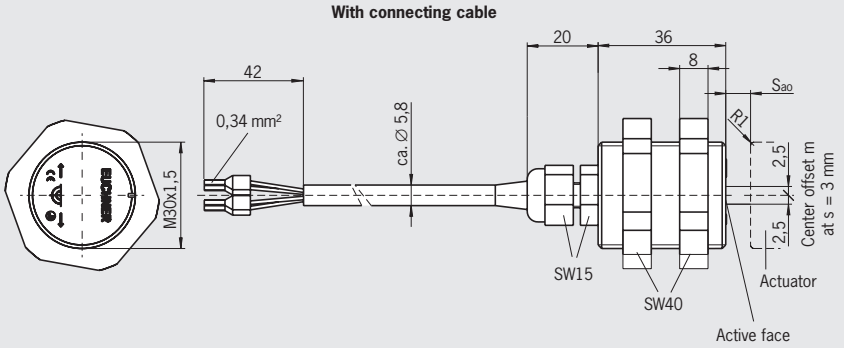
- **In combination with evaluation units CMS-E-AR**
- **Cylindrical version M30**
- **With connecting cable**

Alignment of read head and actuator



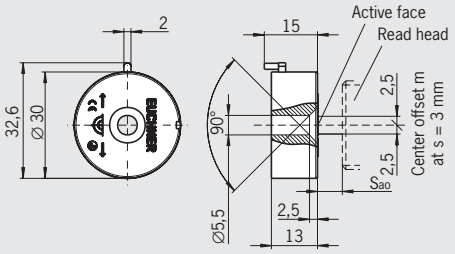
Read heads, design E

Dimension drawing



Actuator, design E

Dimension drawing



Ordering table for read heads and actuators (actuator including 1 screw M5 x 25)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
BN BK (YE) BU (GN) WH	7	16	**V** PVC	**3**	**085633** CMS-R-EXL-03V	**085636** CMS-M-EF
BN WH	7	16	**V** PVC	**3**	**085635** CMS-R-EXN-03V	

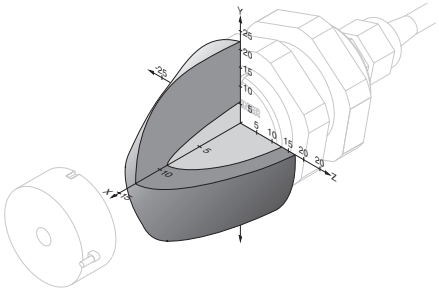
1) Old conductor coloring in brackets

Technical data for read heads and actuators, design E

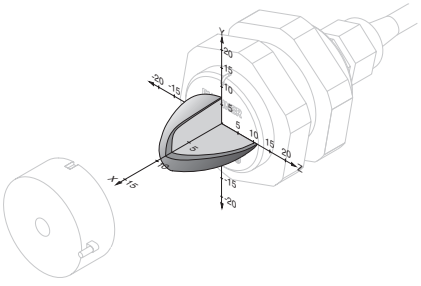
Parameter	Value min.	typ.	max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves			
Switching voltage	24			V
Switching current I_e	-	-	0.5	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

Operating diagrams, design E

CMS-R-EXL



CMS-R-EXN



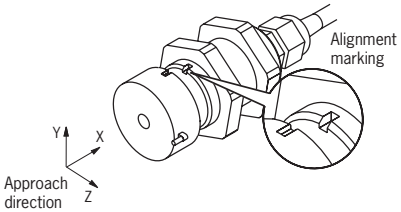
Typ. operating distance

Typ. release distance

Read heads and actuators, design E

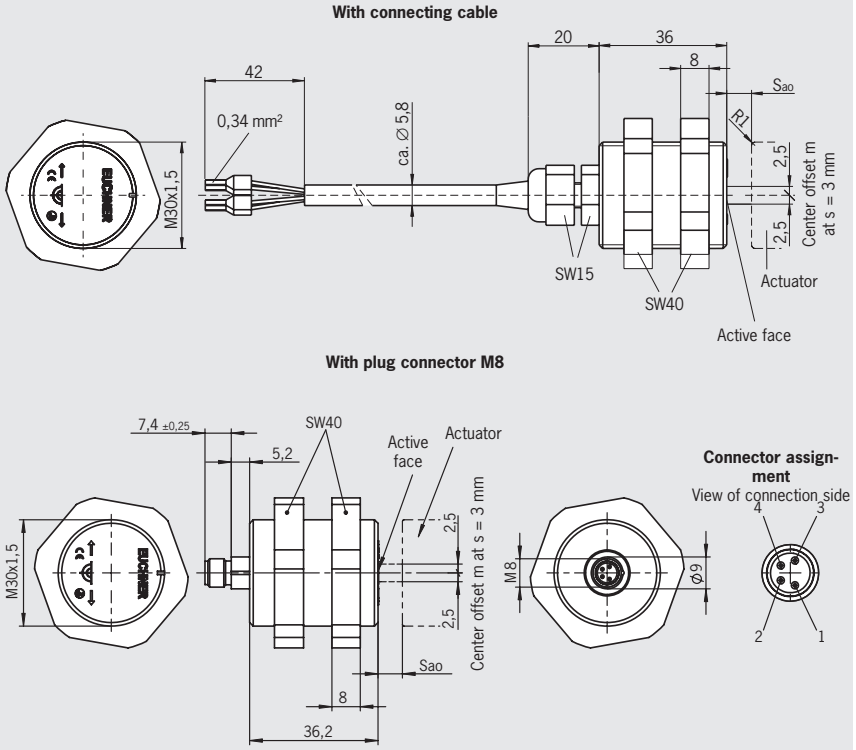
- **In combination with evaluation units CMS-E-BR/CMS-E-ER/CMS-E-FR**
- **Cylindrical version M30**
- **With connecting cable or plug connector M8**

Alignment of read head and actuator



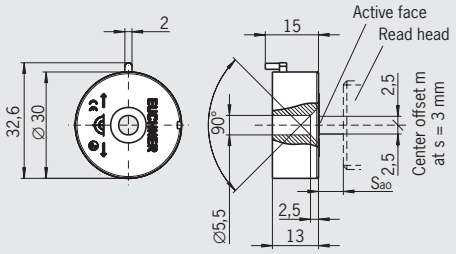
Read heads, design E

Dimension drawing



Actuator, design E

Dimension drawing



Ordering table for read heads and actuators (actuator including 1 screw M5 x 25)

Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
BN WH BU (GN) BK (YE) 1 2 3 4	6	17	**V** PVC	**3**	**085634** CMS-R-EXM-03V	**085636** CMS-M-EF
				5	**085743** CMS-R-EXM-05V	
			Plug connector **M8**		**103969** CMS-R-EXM-SC	

1) Old conductor coloring in brackets

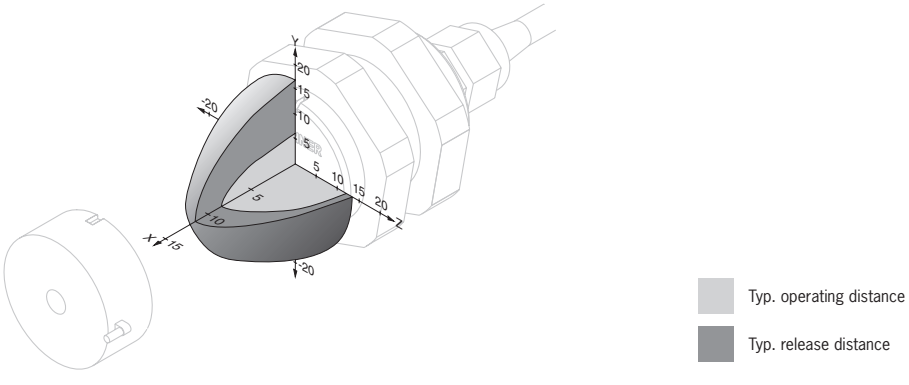
Accessory ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814

Technical data for read heads and actuators, design E

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material		Fiberglass reinforced PPS		
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529		IP67		
Installation orientation		Any, alignment with actuator should be kept in mind (markings)		
Connection		Molded cable with cable end sleeves/M8 plug connector		
Switching voltage		24		V
Switching current I_e	-	-	0.5	A
Method of operation		Magnetic, reed contact		
Mechanical life		100 x 10^6 operating cycles		
Vibration resistance		10 … 55 Hz, amplitude 1 mm		
Shock resistance		30 g/11 ms		
EMC compliance		Acc. to EN 60947-5-3		
Center offset m from actuator		± 2.5 mm at distance s = 3 mm		
Operating distance s_{ao}		See ordering table and operating diagrams		
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material		Fiberglass reinforced PPS		
Ambient temperature	-20	-	+60	°C
Degree of protection acc. to EN 60529		IP67		
Installation orientation		Any, alignment with read head should be kept in mind (markings)		
Method of operation		Magnetic		
Vibration resistance		10 … 55 Hz, amplitude 1 mm		
Shock resistance		30 g/11 ms		
Center offset m from read head		± 2.5 mm at distance s = 3 mm		
Operating distance s_{ao}		See ordering table and operating diagrams		
Release distance s_{ar}				

Operating diagrams, design E



»Hall sensors – the right choice in applications with vibration or shaking.«

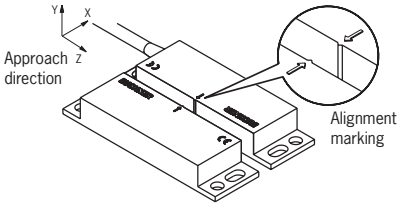
- Less susceptible to external influences (vibration)
- Different designs for different applications
- Large actuating range with hysteresis for variable adjustment of the door gap
- Long mechanical life
- High degree of protection IP67
- Suitable for strict hygiene requirements because they can be installed behind stainless steel
- Compact design


EUCHNER
Safety Switch
CMS-E-FR
ID-Nr.: 096258
Power
K1
K2
H1
H2
H3
H4
H5
Safety Switch
CMS
EUCHNER
Safety Switch
CMS-E-FR
ID-Nr.: 096182
Safety Switch CMS
Power
K1
K2
EUCHNER
CMS-RH-ATA
EUCHNER
CMS-RH-HA

Read heads and actuators, design A, with Hall sensors

- **In combination with evaluation units CMS-E-ER/CMS-E-FR**
- **Cube-shaped version 88 x 25 mm**
- **With connecting cable**

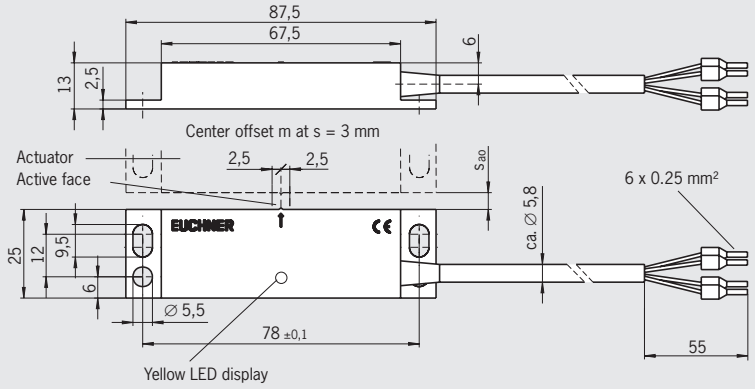
Alignment of read head and actuator



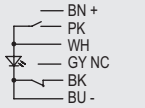
Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design A

Dimension drawing



Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

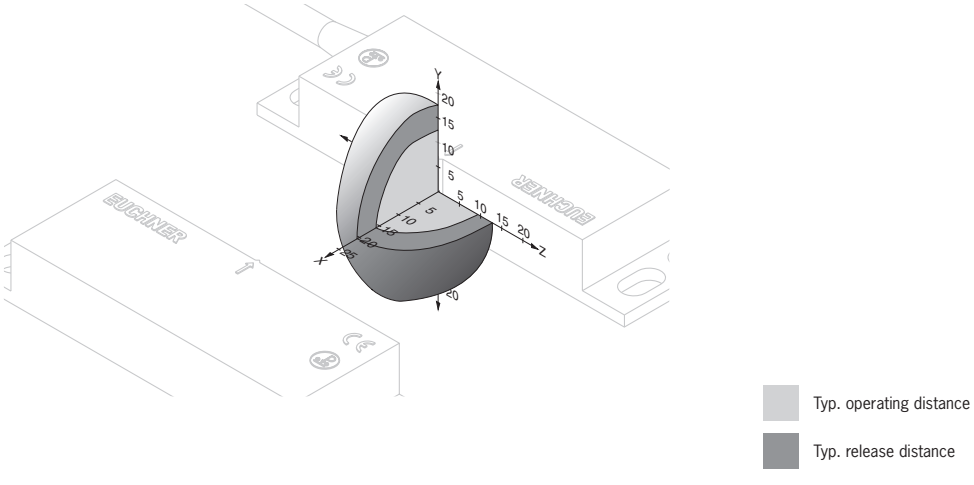
Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm] [2]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
 BN + PK WH GY NC BK BU -	10	20	**V** PVC	**3**	**113207** CMS-RH-AYA-03VL	**113212** CMS-MH-AA
				5	**113208** CMS-RH-AYA-05VL	

1) There must be no ferromagnetic material in the vicinity of the read head or the actuator. With a frontal approach direction, all data refer to a center offset of m = 0.7 mm.
2) The assured release distance s_{ar} corresponds to the reset distance.

Technical data for read heads and actuators, design A, with Hall sensors

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-5	-	+55	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves			
Switching voltage	20 … 35			V
Switching current I_e	-	-	15	A
Contact status indication (only CMS-A-AXR…)				
Switching voltage	24			V
Switching current I_e	-	-	0.015	A
Method of operation	Hall sensor			
Mechanical life	100 x 10^6 operating cycles			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

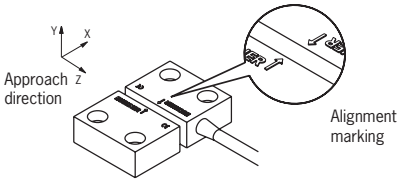
Operating diagrams, design A, with Hall sensors



Read heads and actuators, design B, with Hall sensors

- **In combination with evaluation units CMS-E-ER/CMS-E-FR**
- **Cube-shaped version 36 x 26 mm**
- **With connecting cable**

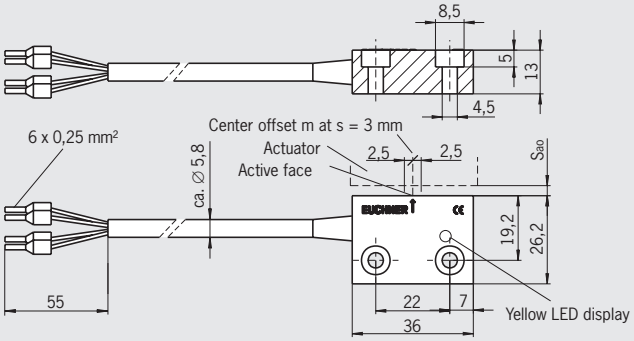
Alignment of read head and actuator



Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design B

Dimension drawing



Ordering table for read heads and actuators (each including 2 safety screws M4 x 14)

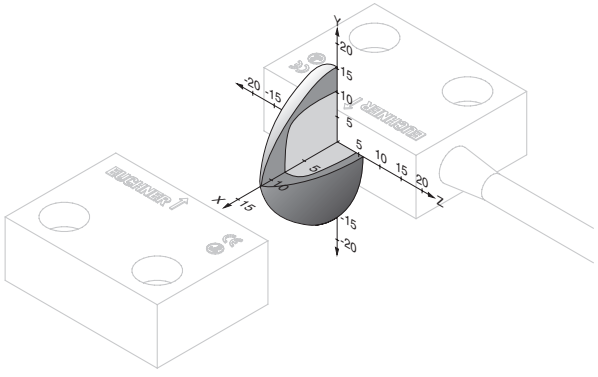
Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm] [2]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
BN + PK WH GY NC BK BU -	6	13	**V** PVC	**5**	**113210** CMS-RH-BYB-05VL	**113213** CMS-MH-BB

1) There must be no ferromagnetic material in the vicinity of the read head or the actuator. With a frontal approach direction, all data refer to a center offset of m = 0.7 mm.
2) The assured release distance s_{ar} corresponds to the reset distance.

Technical data for read heads and actuators, design B, with Hall sensors

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	-5	-	+55	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves			
Switching voltage	20 … 35			V
Switching current I_e	-	-	15	A
Contact status indication (only CMS-A-AXR…)				
Switching voltage	24			V
Switching current I_e	-	-	0.015	A
Method of operation	Hall sensor			
Mechanical life	100 x 10^6 operating cycles			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				

Operating diagrams, design B, with Hall sensors

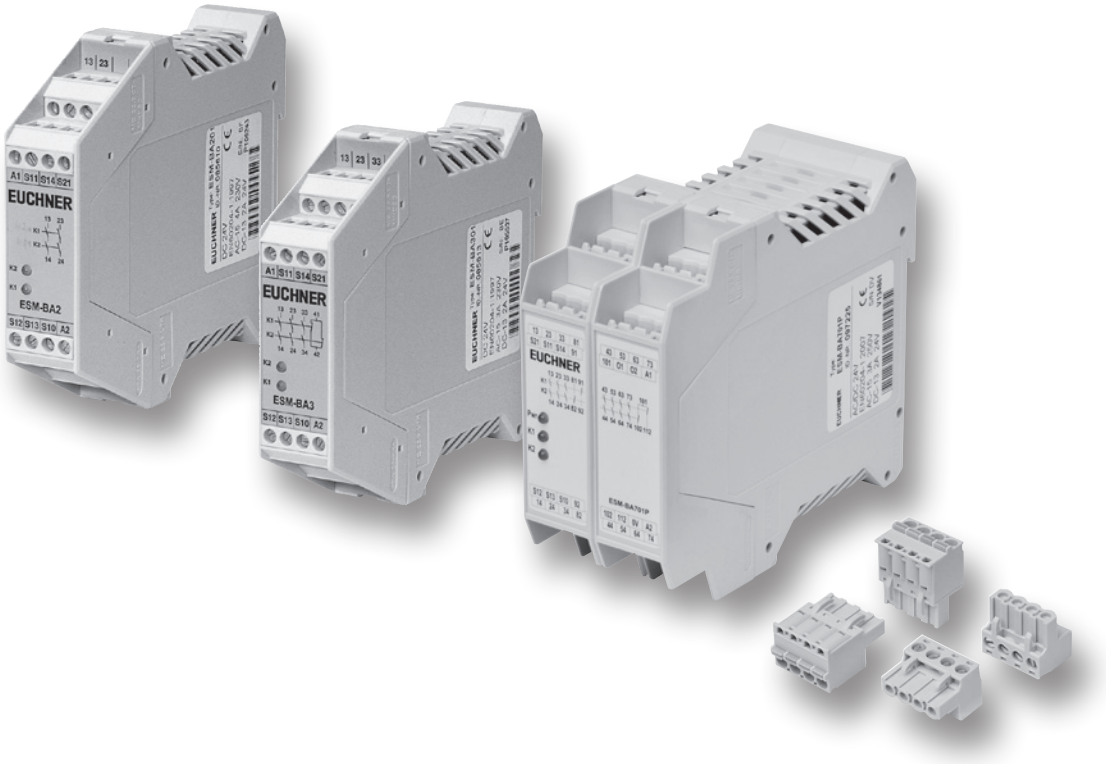


Typ. operating distance

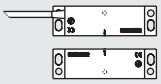
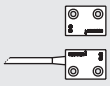
Typ. release distance

»The ESM modular system – compact, highly versatile safety relays«

- Can be used up to PL e/category 4 according to EN ISO 13849-1
- Many combination and expansion options
- Up to 7 redundant safety contacts
- 2 safe, redundant relay outputs
- Various types of starting


EUCHNER
ESM-BA2
EUCHNER
ESM-BA3
EUCHNER

Selection table for non-contact safety system ESM

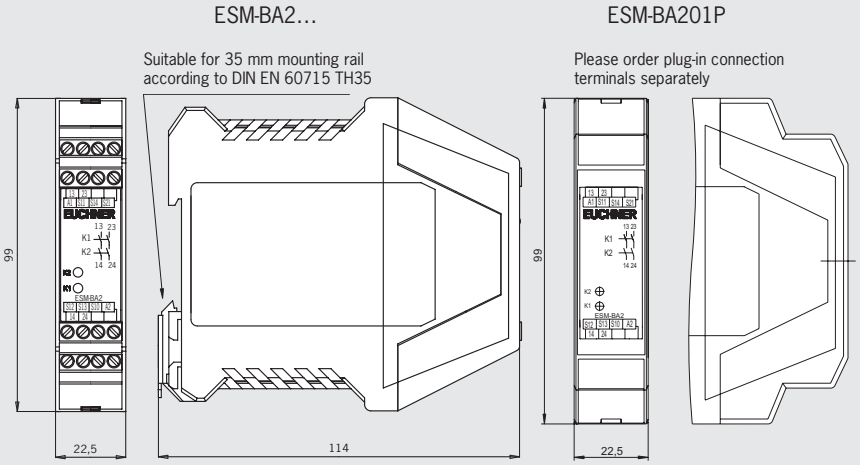
Evaluation units	Design	Read head contact assembly	Category/PL according to EN ISO 13849-1	Read head
ESM -BA...  Page 60 - 65	Design A  Page 66		4/PL e	CMS-R-AZA...
			4/PL e	CMS-R-AZC...
	Design B  Page 68		4/PL e	CMS-R-BZB...
			4/PL e	CMS-R-BZD...

Safety relays ESM-BA...

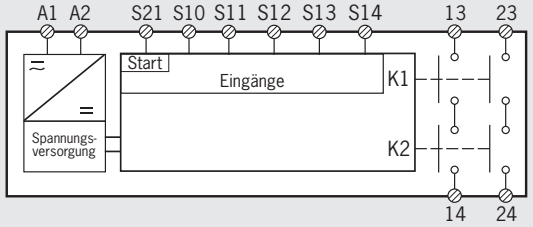
- **ESM-BA... Use up to category 4 according to EN ISO 13849-1**
- **LED status indicators**
- **1-channel or 2-channel control**
- **Up to 7 redundant safety contacts**
- **Auxiliary contact (monitoring contact) optional**
- **Short circuit and earth fault/ground fault monitoring optional**

Safety relay ESM-BA2... **Cat. 4**

Dimension drawing



Block diagram



Technical data for outputs

Parameter	Value			
Min. switching current at DC 24 V	20 mA			
Switching voltage, max.	DC 24 V/AC 250 V			
Utilization category acc. to EN 60947-5-1		U_e	I_e	ΣI_e
	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	

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

Ordering table

Series	Variant	Contacts	Version	AC/DC 24 V
ESM	**BA** Safety relay	**2** 2 NO	Screw terminals	**085610** ESM-BA201
			Plug-in connection terminals [1]	**097226** ESM-BA201P

1) Please order plug-in connection terminals separately (see accessory ordering table)

Accessory ordering table

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

Technical data for safety relay ESM-BA2...

Parameter		Value			Unit
Housing material		Polyamide PA6.6			
Dimensions		114 x 99 x 22.5			mm
Weight		Approx. 0.25			kg
Connection terminals		0.14 ... 2.5			mm^2
Ambient temperature	At U_B = 24 V DC	-15 ... +60			°C
	At U_B = 115/230 V AC	-15 ... +40			
Degree of protection acc. to EN 60529		IP20			
Degree of contamination		2			
Mounting		Mounting rail 35 mm acc. to DIN EN 60715 TH 35			
Mechanical life	Mechanical	1×10^7			operating cycles
Operating voltage	ESM-BA201	24 ± 10% [1]			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. 3 VA/1.8 W			
Control voltage for start button		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm^2)		Max. 1,000			m
Control current for start button		Approx. 40			mA
External contact fuse (safety circuit) acc. to EN 60269-1		10 A gG (T4A/F6A)			
Rated impulse withstand voltage, leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Rated insulation voltage		250			V
Safety contacts		**2 NO contacts (redundant)**			
Switching current, min., at DC 24 V		20			mA
Switching voltage, max.		24			V DC
		250			V AC
Breaking capacity acc. to UL		6 A 250 V AC 2 A 24 V DC			
Utilization category acc. to EN 60947-5-1		**U_e**	**I_e**	**ΣI_e**	
	AC-12	250 V	6 A	12 A	
	AC-15	230 V	4 A		
	DC-12	24 V	1.25 A		
	DC-13	24 V	2 A		
LED displays		2, status display for relays K1 and K2			
Reliability values acc. to EN ISO 13849-1 depending on the switching current at 24 V DC		≤ 0.1 A	≤ 1 A	≤ 2 A	
Number of switching cycles/year		< 400,000	< 73,000	< 17,000	
Mission time		20			years
Category		4			
Performance Level (PL)		e			
PFH_d		1.2×10^{-8}			

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

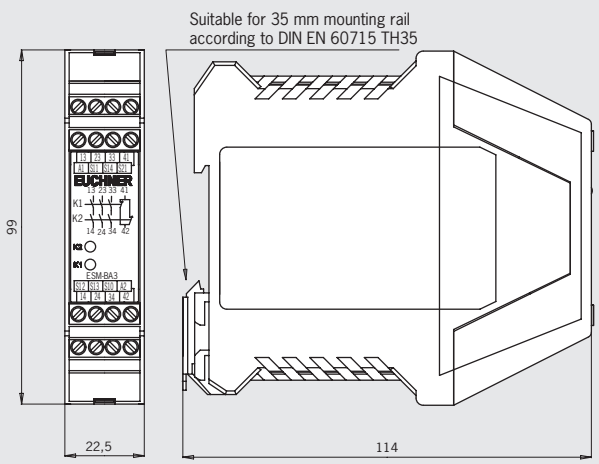
U_e = switching voltage I_e = max. switching current per contact ΣI_e = max. switching current of all safety contacts (cumulative current)

Safety relays ESM-BA...

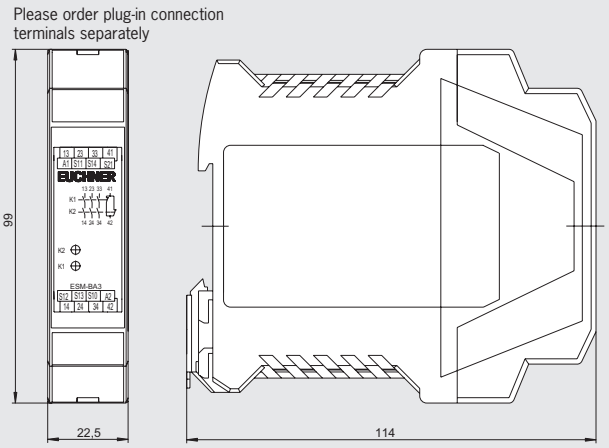
Safety relay ESM-BA3... **Cat. 4**

Dimension drawing

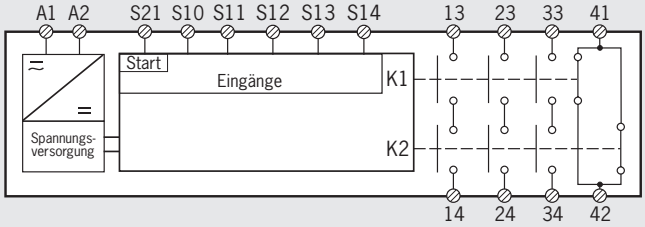
ESM-BA3...



ESM-BA301P



Block diagram



Technical data for outputs

Parameter	Value			
Min. switching current at DC 24 V	5 mA			
Switching voltage, max.	DC 24 V/AC 250 V			
Utilization category acc. to EN 60947-5-1		U_e	I_e	ΣI_e
	AC-12	250 V	8 A	15 A [1]
	AC-15	250 V	3 A	
	DC-12	50 V	8 A	
	DC-13	24 V	3 A	

1) With a housing distance of 10 mm. 8 A closely spaced at 40 °C.
U_e = switching voltage
I_e = max. switching current per contact
ΣI_e = max. switching current of all safety contacts (cumulative current)

Ordering table

Series	Variant	Contacts	Version	AC/DC 24 V	AC 115 V	AC 230 V
ESM	**BA** Safety relay	**3** 3 NO + 1 NC	Screw terminals	**085613** ESM-BA301	**087412** ESM-BA302	**087413** ESM-BA303
			Plug-in connection terminals [1]	**097230** ESM-BA301P	-	-

1) Please order plug-in connection terminals separately (see accessory ordering table)

Accessory ordering table

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

Technical data for safety relay ESM-BA3...

Parameter		Value			Unit
Housing material		Polyamide PA6.6			
Dimensions		114 x 99 x 22.5			mm
Weight		Approx. 0.25			kg
Connection terminals		0.14 ... 2.5			mm^2
Ambient temperature	At U_B = 24 V DC	-15 ... +40			°C
	At U_B = 115/230 V AC	-15 ... +40			
Degree of protection acc. to EN 60529		IP20			
Degree of contamination		2			
Mounting		Mounting rail 35 mm acc. to DIN EN 60715 TH 35			
Mechanical life	Mechanical	1×10^7			operating cycles
Operating voltage	ESM-BA301	24 ± 10% [1]			V AC/DC
	ESM-BA302	115 ± 10%			V AC
	ESM-BA303	230 ± 10%			V AC
Reverse polarity protection		On ESM-BA301			
Rated supply frequency		50 ... 60			Hz
Power consumption		Approx. 7			VA
Control voltage for start button		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm^2)		Max. 1,000			m
Control current for start button		Approx. 60			mA
External contact fuse (safety circuit) acc. to EN 60269-1		10 A gG (T6A/F8A)			
Rated impulse withstand voltage, leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Rated insulation voltage		250			V
Safety contacts		**3 NO contacts (redundant)**			
Cumulative current of all contacts acc. to UL		Max. 15			A
Switching current, min., at DC 24 V		5			mA
Switching voltage, max.		50			V DC
		250			V AC
Breaking capacity acc. to UL	ESM-BA301	8 A 250 V AC/2 A 24 V DC			
	ESM-BA302	8 A 250 V AC/3 A 24 V DC			
	ESM-BA303				
Utilization category acc. to EN 60947-5-1			U_e	I_e	ΣI_e
		AC-12	250 V	8 A [2]	15 A [3]
		AC-15	250 V	3 A	
		DC-12	50 V	8 A [2]	
		DC-13	24 V	3 A	
LED displays		2, status display for relays K1 and K2			
Monitoring contact		**1 NC contact**			
Switching voltage, max.		24			V DC
		250			V AC
Breaking capacity acc. to UL	ESM-BA301	2 A 250 V AC/1.5 A 24 V DC			
	ESM-BA302	2 A 250 V AC/2 A 24 V DC			
	ESM-BA303				
Utilization category acc. to EN 60947-5-1			U_e	I_e	
		AC-12	250 V	2 A	
		AC-15	250 V	1.5 A	
		DC-12	50 V	2 A	
		DC-13	24 V	1.25 A	
Reliability values acc. to EN ISO 13849-1 depending on the switching current at 24 V DC		≤ 0.1 A	≤ 1 A	≤ 2 A	
Number of switching cycles/year		500,000	350,000	50,000	
Mission time		20			years
Category		4			
Performance Level (PL)		e			
PFH_d		1.2×10^{-8}			

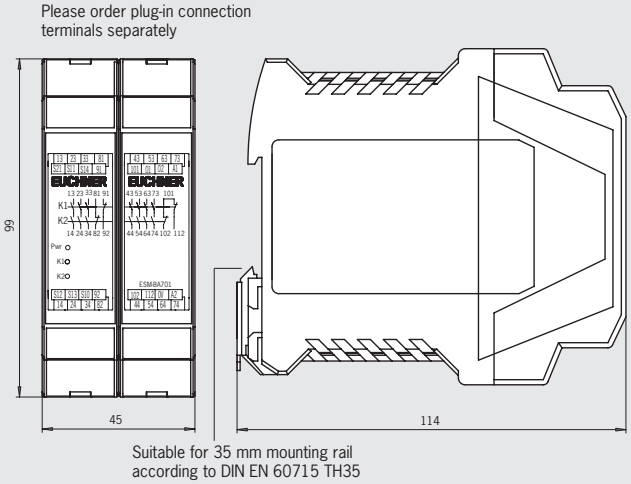
1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
2) With ohm resistive load.
3) If several ESM-BA3.. are closely spaced under load, the max. cumulative current at an ambient temperature of 20 °C = 9 A; at 30 °C = 3 A; at 40 °C = 1 A. If these currents are exceeded, a spacing of 5 mm between the devices must be observed.

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

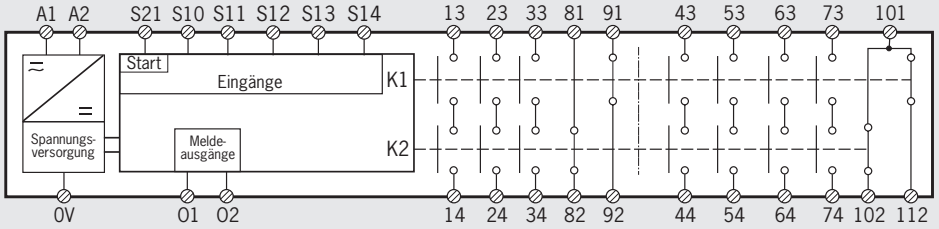
Safety relays ESM-BA...

Safety relay ESM-BA7... — **Cat. 4**

Dimension drawing



Block diagram



Technical data for outputs

Parameter	Value			
Min. switching current at DC 24 V	5 mA			
Switching voltage, max.	DC 50 V/AC 250 V			
Utilization category acc. to EN 60947-5-1		U_e	I_e	ΣI_e
	AC-12	250 V	8 A	35 A [1]
	AC-15	250 V	3 A	
	DC-12	50 V	8 A	
	DC-13	24 V	3 A	

1) With a housing distance of 10 mm. 25 A closely spaced at 40 °C.
U_e = switching voltage
I_e = max. switching current per contact
ΣI_e = max. switching current of all safety contacts (cumulative current)

Ordering table

Series	Variant	Contacts	Version	AC/DC 24 V	AC 115 V	AC 230 V
ESM	**BA** Safety relay	**7** 7 NO + 4 NC	Plug-in connection terminals [1]	**097225** [2] ESM-BA701P	-	-

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

2) No approvals available in combination with CMS read heads.

Accessory ordering table

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

Technical data for safety relay ESM-BA7…

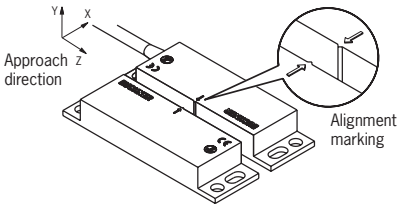
Parameter		Value			Unit
Housing material		Polyamide PA6.6			
Dimensions		114 x 99 x 45			mm
Weight		Approx. 0.35			kg
Connection terminals		0.14 … 2.5			mm^2
Ambient temperature	At U_B = 24 V DC	-15 … +40			°C
	At U_B = 115/230 V AC	-15 … +40			
Degree of protection acc. to EN 60529		IP20			
Degree of contamination		2			
Mounting		Mounting rail 35 mm acc. to DIN EN 60715 TH 35			
Mechanical life	Mechanical	1×10^6			operating cycles
Operating voltage		24 ± 10% [1]			V AC/DC
Reverse polarity protection		Yes			
Rated supply frequency		50 … 60			Hz
Power consumption		Approx. 7			VA
Control voltage for start button		18.6 … 26			V DC
Control cable length (cross-section 0.75 mm^2)		Max. 1,000			m
Control current for start button		Approx. 100			mA
External contact fuse (safety circuit) acc. to EN 60269-1		10 A gG (T6A/F8A)			
Rated impulse withstand voltage, leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Rated insulation voltage		250			V
Safety contacts		**7 NO contacts (redundant)**			
Switching current, min., at DC 24 V		5			mA
Switching voltage, max.		50			V DC
		250			V AC
Breaking capacity acc. to UL		8 A 250 V AC 2 A 24 V DC			
Utilization category acc. to EN 60947-5-1		**U_e**	**I_e**	**ΣI_e**	
	AC-12	250 V	8 A	35 A [2]	
	AC-15	250 V	3 A		
	DC-12	50 V	8 A		
	DC-13	24 V	3 A		
LED displays		2, status display for relays K1 and K2			
Monitoring contacts		**4 NC contacts**			
Switching voltage, max.		50			V DC
		250			V AC
Breaking capacity acc. to UL		2 A 250 V AC 1.5 A 24 V DC			
Utilization category acc. to EN 60947-5-1		**U_e**	**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		
Monitoring outputs		**2 semiconductor outputs**			
Semiconductor output current		Max. 30			mA
Semiconductor output voltage		24			V DC
Reliability values acc. to EN ISO 13849-1 depending on the switching current at 24 V DC		≤ 0.1 A	≤ 1 A	≤ 2 A	
Number of switching cycles/year		500,000	350,000	50,000	
Mission time		20			years
Category		4			
Performance Level (PL)		e			
PFH_d		2.5×10^{-8}			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
2) With a housing distance of 10 mm. 20 A closely spaced at 40 °C.
U_e = switching voltage I_e = max. switching current per contact ΣI_e = max. switching current of all safety contacts (cumulative current)

Read heads and actuators, design A, for ESM

- **In combination with evaluation units ESM-BA...**
- **Cube-shaped version 88 x 25 mm**
- **With connecting cable, plug connector M8 or plug connector M12**

Alignment of read head and actuator

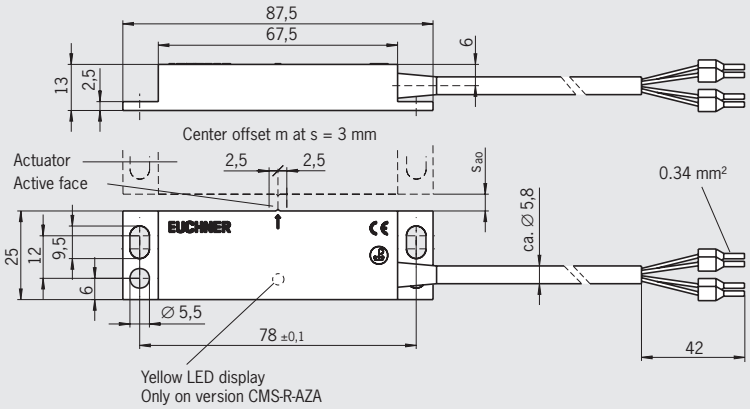


Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

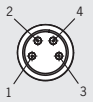
Read heads/actuators, design A, for ESM

Dimension drawing

With connecting cable

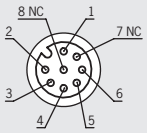


With plug connector M8

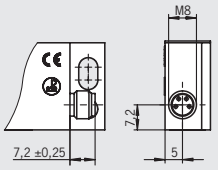


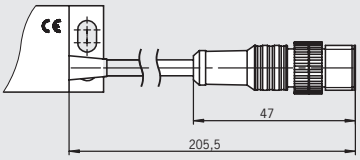
Connector assignment
View of connection side

With plug connector M12



Connector assignment
View of connection side





For connecting cables, see accessories Page 72

Ordering table (read heads and actuators each including 2 safety screws M4 x 14)

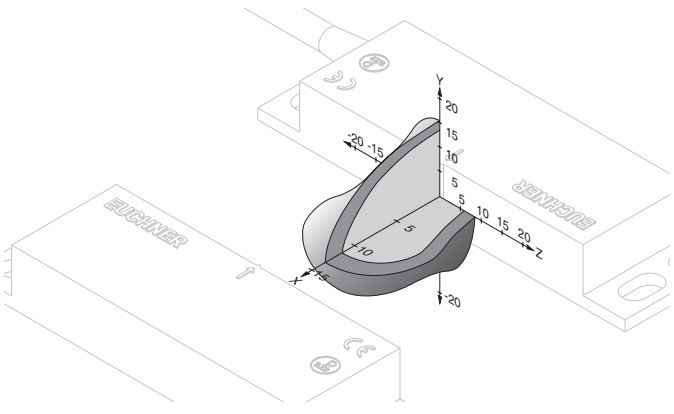
Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
F1 BN WH; F2 BU (GN) BK (YE); Rv PK GY	9 For contact status indication and LED: 7	20 For contact status indication and LED: 15	**V** PVC	**2**	**124191** CMS-R-AZA-02VL	**093976** CMS-M-AI
				5	**094702** CMS-R-AZA-05VL	
				10	**095558** CMS-R-AZA-10VL	
			P PUR	**5**	**103864** CMS-R-AZA-05PL	
				10	**103865** CMS-R-AZA-10PL	
F1 1 2; F2 3 4	9	22	Plug connector **M8**		**102275** CMS-R-AZC-SC	
F1 1 2; F2 3 4; Rv 5 6	9 For contact status indication and LED: 7	20 For contact status indication and LED: 15	**V** PVC	**0.2** With plug connector **M12**	**106738** CMS-R-AZA-ST0,2V	

1) Old conductor coloring in brackets

Technical data for read heads and actuators, design A, for ESM

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	- 20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector/M12 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.1	A
Contact status indication (only CMS-R-AZA…)				
Switching voltage	24			V
Switching current I_e	-	-	0.015	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	- 20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Reliability values acc. to EN ISO 13849-1				
B_{10D}	20 x 10^6 operating cycles			

Operating diagrams, design A, for ESM



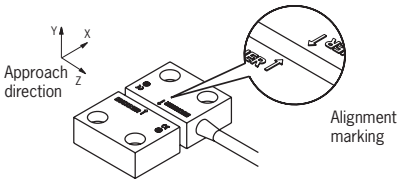
Typ. operating distance

Typ. release distance

Read heads and actuators, design B, for ESM

- **In combination with evaluation units ESM-BA...**
- **Cube-shaped version 36 x 26 mm**
- **With connecting cable or plug connector M8**

Alignment of read head and actuator

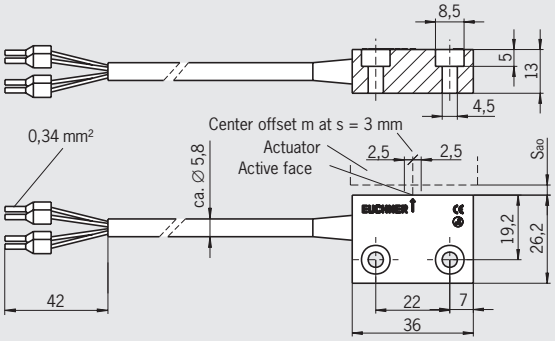


Notice:
The dimensions of the actuators are the same as those of the read heads, although the former have no connecting cable or plug connector.

Read heads/actuators, design B, for ESM

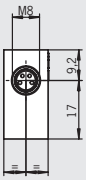
Dimension drawing

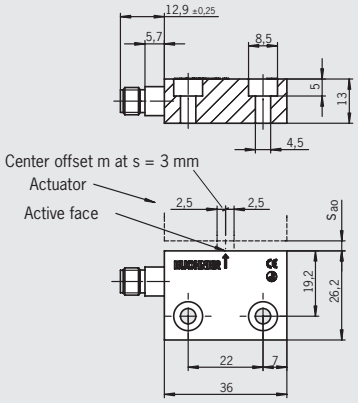
With connecting cable



With plug connector M8

Connector assignment
View of connection side





For connecting cables, see accessories Page 72

Ordering table (read heads and actuators each including 2 safety screws M4 x 14)

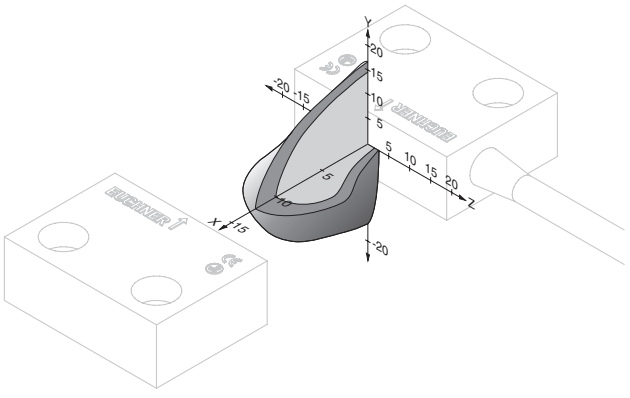
Circuit diagram, not actuated [1]	Assured operating distance s_{ao} [mm]	Assured release distance s_{ar} [mm]	Cable type	Cable length [m]	Read head Order no./item	Actuator Order no./item
F1: BN, WH F2: BU (GN), BK (YE)	7	20	**V** PVC	**3**	**097368** CMS-R-BZB-03V	**092025** CMS-M-BH
			P PUR	**5**	**103869** CMS-R-BZB-05P	
F1: 1, 2 F2: 3, 4	7	20	Plug connector **M8**		**100753** CMS-R-BZB-SC	
F1: BN, WH F2: BU (GN), BK (YE) PK, GY	7	20	**V** PVC	**5**	**159518** CMS-R-BZD-05V	

1) Old conductor coloring in brackets

Technical data for read heads and actuators, design B, for ESM

Parameter	Value min.	Value typ.	Value max.	Unit
Read heads				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	- 20	-	+60	°C
Degree of protection acc. to EN 60529	IP67			
Installation orientation	Any, alignment with actuator should be kept in mind (markings)			
Connection	Molded cable with cable end sleeves/M8 plug connector			
Switching voltage	24			V
Switching current I_e	-	-	0.1	A
Method of operation	Magnetic, reed contact			
Mechanical life	100 x 10^6 operating cycles			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
EMC compliance	Acc. to EN 60947-5-3			
Center offset m from actuator	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Switching contacts				
Actuator				
Housing material	Fiberglass reinforced PPS			
Ambient temperature	- 20	-	+60	°C
Degree of protection acc. to EN IEC 60529	IP67			
Installation orientation	Any, alignment with read head should be kept in mind (markings)			
Method of operation	Magnetic			
Vibration resistance	10 … 55 Hz, amplitude 1 mm			
Shock resistance	30 g/11 ms			
Center offset m from read head	± 2.5 mm at distance s = 3 mm			
Operating distance s_{ao}	See ordering table and operating diagrams			
Release distance s_{ar}				
Reliability values acc. to EN ISO 13849-1				
B_{10D}	20 x 10^6 operating cycles			

Operating diagrams, design B, for ESM



Typ. operating distance

Typ. release distance

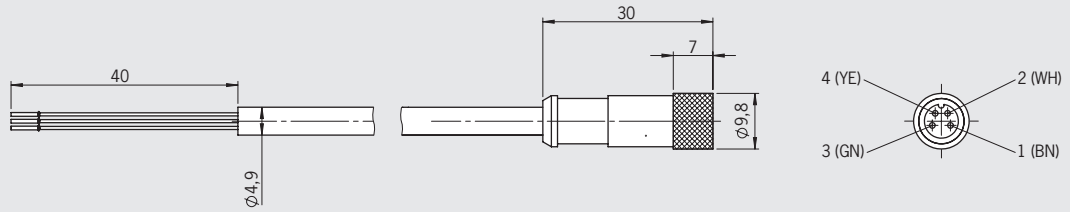
»Exploit all the advantages – with well thought-out original accessories from EUCHNER.«

- Connection material – connect safely and easily; no long search for cables and plug connectors
- Fixing material – secure and easy mounting for many installation situations

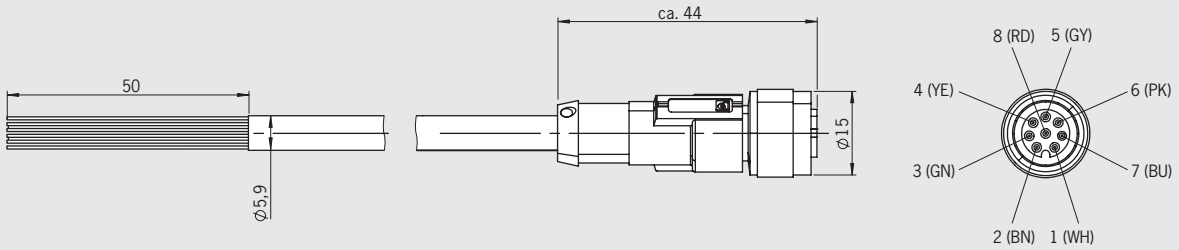
Accessories for CMS read heads

▶ **Connecting cables for CMS read heads**

Connecting cable M8, 4-pin



Connecting cable M12, 8-pin



Ordering table

Designation	Use	Cable length [m]	Order no./item
Connecting cable PVC 4 x 0.25 mm² with plug connector M8 4-pin	For read heads CMS with plug connector M8	**2**	**088812** C-M08F04-04X025PV02,0-ES-088812
		5	**088813** C-M08F04-04X025PV05,0-ES-088813
		10	**088814** C-M08F04-04X025PV10,0-ES-088814
Connecting cable PVC 8 x 0.25 mm² with plug connector M12 8-pin	For read heads CMS with plug connector M12	**5**	**100177** C-M12F08-08X025PV05,0-MA-100177
		10	**100178** C-M12F08-08X025PV10,0-MA-100178

Accessories for safety modules ESM

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

Important: Depending on the device, a connection kit might be required (see information on the corresponding product page). Two connection kits are required for devices from series ESM-BA701P.

Ordering table

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

Index by item designation

Item	Order no.	Page
C-M08F04-04X025PV02,0-ES-088812	088812	34, 36, 38, 40, 45, 49, 72
C-M08F04-04X025PV05,0-ES-088813	088813	34, 36, 38, 40, 45, 49, 72
C-M08F04-04X025PV10,0-ES-088814	088814	34, 36, 38, 40, 45, 49, 72
C-M12F08-08X025PV05,0-MA-100177	100177	72
C-M12F08-08X025PV10,0-MA-100178	100178	72
CMS-E-AR	085536	10
CMS-E-BR	085537	14
CMS-E-ER	099182	18
CMS-E-FR	099258	24
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CMS-M-AC	084592	36
CMS-M-AG	085654	32, 34
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CMS-M-BH	092025	38, 68
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CMS-MH-BB	113213	54
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CMS-R-AXD-05V	085732	32
CMS-R-AXE-01V	102385	32
CMS-R-AXE-03V	084584	32
CMS-R-AXE-05P	103859	32
CMS-R-AXE-05V	085733	32
CMS-R-AXE-SC	100742	34
CMS-R-AXF-03V	084585	32
CMS-R-AXF-05V	085734	32
CMS-R-AXF-SC	100743	34
CMS-R-AXG-05V	085735	32
CMS-R-AXG-SC	100744	34
CMS-R-AXH-03V	084587	36
CMS-R-AXH-05V	085736	36
CMS-R-AXH-SC	100745	36
CMS-R-AXR-05VL	093975	32
CMS-R-AZA-02VL	124191	66
CMS-R-AZA-05PL	103864	66
CMS-R-AZA-05VL	094702	66
CMS-R-AZA-10PL	103865	66
CMS-R-AZA-10VL	095558	66
CMS-R-AZA-ST0,2V	106738	66
CMS-R-AZC-SC	102275	66
CMS-R-BXI-03V	085530	40
CMS-R-BXI-05V	085737	40
CMS-R-BXI-07P	115117	40
CMS-R-BXI-SC	100696	40
CMS-R-BXO-05P	103867	38
CMS-R-BXO-05V	092023	38
CMS-R-BXO-SC	100755	38
CMS-R-BXP-05V	092024	38
CMS-R-BZB-03V	097368	68
CMS-R-BZB-05P	103869	68
CMS-R-BZB-SC	100753	68
CMS-R-BZD-05V	159518	68
CMS-R-CXA-03V	084574	42
CMS-R-CXA-05V	085739	42
CMS-R-CXB-03V	084576	42
CMS-R-CXC-03V	084575	44
CMS-R-CXC-05P	103872	44
CMS-R-CXC-05V	085741	44
CMS-R-CXC-SC	103967	44
CMS-R-EXL-03V	085633	46
CMS-R-EXM-03V	085634	48
CMS-R-EXM-05V	085743	48
CMS-R-EXM-SC	103969	48
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084584	CMS-R-AXE-03V	32
084585	CMS-R-AXF-03V	32
084587	CMS-R-AXH-03V	36
084591	CMS-M-AB	32, 34
084592	CMS-M-AC	36
085530	CMS-R-BXI-03V	40
085531	CMS-M-BD	40
085536	CMS-E-AR	10
085537	CMS-E-BR	14
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085613	ESM-BA301	62
085633	CMS-R-EXL-03V	46
085634	CMS-R-EXM-03V	48
085635	CMS-R-EXN-03V	46
085636	CMS-M-EF	46, 48
085654	CMS-M-AG	32, 34
085732	CMS-R-AXD-05V	32
085733	CMS-R-AXE-05V	32
085734	CMS-R-AXF-05V	32
085735	CMS-R-AXG-05V	32
085736	CMS-R-AXH-05V	36
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085739	CMS-R-CXA-05V	42
085741	CMS-R-CXC-05V	44
085743	CMS-R-EXM-05V	48
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087413	ESM-BA303	62
088812	C-M08F04-04X025PV02,0-ES-088812	34, 36, 38, 40 45, 49, 72
088813	C-M08F04-04X025PV05,0-ES-088813	34, 36, 38, 40 45, 49, 72
088814	C-M08F04-04X025PV10,0-ES-088814	34, 36, 38, 40 45, 49, 72
092023	CMS-R-BXO-05V	38
092024	CMS-R-BXP-05V	38
092025	CMS-M-BH	38, 68
093975	CMS-R-AXR-05VL	32
093976	CMS-M-AI	32, 66
094702	CMS-R-AZA-05VL	66
095558	CMS-R-AZA-10VL	66
097194	ESM-F-AK4	60, 62, 64, 72
097195	ESM-F-KK4	60, 62, 64, 72
097225	ESM-BA701P	64
097226	ESM-BA201P	60
097230	ESM-BA301P	62
097368	CMS-R-BZB-03V	68
099182	CMS-E-ER	18
099258	CMS-E-FR	24
100177	C-M12F08-08X025PV05,0-MA-100177	72
100178	C-M12F08-08X025PV10,0-MA-100178	72
100696	CMS-R-BXI-SC	40
100742	CMS-R-AXE-SC	34
100743	CMS-R-AXF-SC	34
100744	CMS-R-AXG-SC	34
100745	CMS-R-AXH-SC	36
100753	CMS-R-BZB-SC	68
100755	CMS-R-BXO-SC	38
102275	CMS-R-AZC-SC	66
102385	CMS-R-AXE-01V	32
103859	CMS-R-AXE-05P	32
103864	CMS-R-AZA-05PL	66
103865	CMS-R-AZA-10PL	66
103867	CMS-R-BXO-05P	38
103869	CMS-R-BZB-05P	68
103872	CMS-R-CXC-05P	44
103967	CMS-R-CXC-SC	44
103969	CMS-R-EXM-SC	48
106738	CMS-R-AZA-ST0,2V	66
113207	CMS-RH-AYA-03VL	52
113208	CMS-RH-AYA-05VL	52
113210	CMS-RH-BYB-05VL	54
113212	CMS-MH-AA	52
113213	CMS-MH-BB	54
115117	CMS-R-BXI-07P	40
124191	CMS-R-AZA-02VL	66
159518	CMS-R-BZD-05V	68

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