

# CM Series

## Compact Coded Magnetic Safety Interlock Switch and Control Units

- A fully monitored system that meets Category 3 when 1 to 30 plus switches are used with the CM Control Units
- External Device Monitoring (EDM) with monitored manual or automatic reset
- NEMA 6 switch enclosures satisfy most application requirements
- Magnetically coded switches are tamper resistant to common magnets
- Misalignment tolerance of (5 and 9 mm) reduces nuisance tripping
- Dual channel N/C E-stop input is monitored by the CM-S41 control in addition to four CM switches
- Mechanical interlock switches may be used with the CM-S4 control unit
- CM control units may replace a safety relay in most applications
- CM-S221 switches with 2 N/C safety contacts and 1 N/O auxiliary contact may be used with many other safety monitoring relays accepting 2 N/C safety inputs including the SR103AM; CM-S221 switches are not compatible with Legacy Relay products or the SR203M/AM, SR208AD or SR209AD



Conforms to EN292, EN60204-1, EN954-1, EN1088, EN60947-5-3, EN947-5-3, EN50081, EN50082, EN61000-6-2  
UL and C-UL listed, TUV certified

### ■ Description

The CM switches are tamper resistant non-contact safety interlock switches that operate with their own control units except for the CM-S221 switch. The CM-S221 switch will work with many safety monitoring relays accepting 2 N/C safety inputs. The CM control units will monitor one to four CM switches to category 3 in accordance with EN954-1.

The CM-S4 controller is designed to work with with non-contact switches with dry contacts 1 N/C + 1 N/O. The CM-S21 and CM-S41 controllers and the CM-SE expansion module are designed to only accept CM-S11 and CM-S31 switches. These controllers sense voltage and current changes in the switch circuit when the actuator is presented to the switch.

The CM control units provide EDM (External Device Monitoring, also called MPCE monitoring) and an automatic reset function. This allows the CM control units to replace a safety relay in most applications.

The NEMA 6 encapsulated design of the CM Series switch makes it ideal for harsh environments.

Mechanical switches and CM Series switches may be used together with a single CM-S4 control unit for applications requiring both non-contact and mechanical safety interlock switches.

The CM Series switch and actuator are available in four sizes plus a stainless steel version to accommodate a variety of application requirements.

## Actual Size

### CM-S31 Read Head



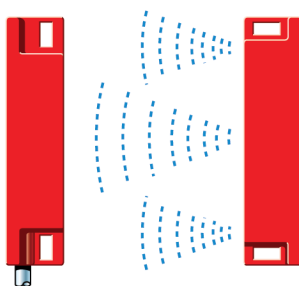
### CM-S2 and CM-S221 Read Heads



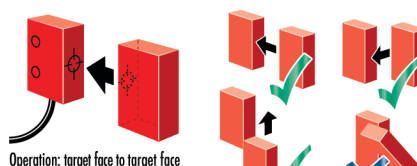
## Operation

### Operating Principle for Coded Magnetic Switch with Conventional Dry Contacts

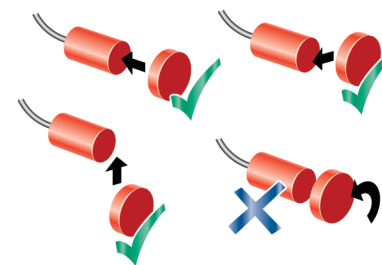
On presenting the actuator to the switch, the coded, high intensity magnetic field from the actuator causes the contacts to close. On removing the actuator (opening the door), the safety contacts open, isolating the machine.



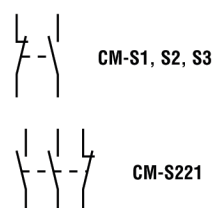
### Mounting Examples



Operation: target face to target face

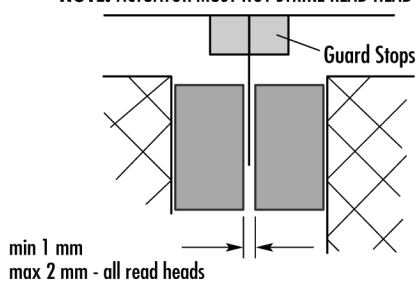


### Contact Arrangements

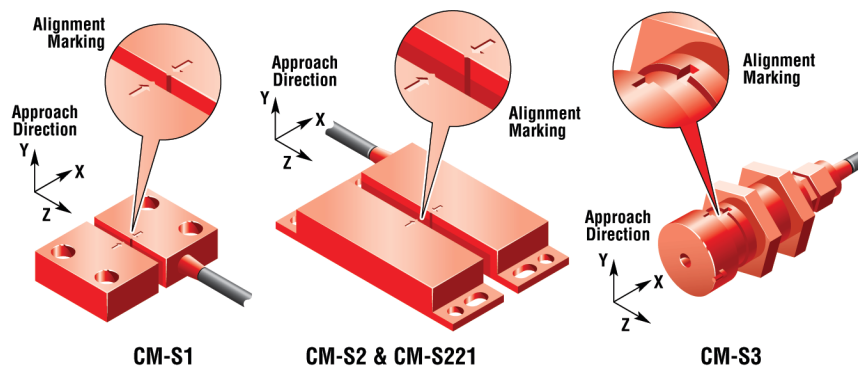


Note: The CM-S11 and CM-S31 switches are not conventional dry contacts.

**NOTE: ACTUATOR MUST NOT STRIKE READ HEAD**



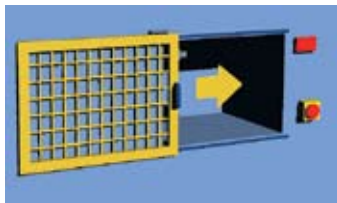
### Installation Alignments



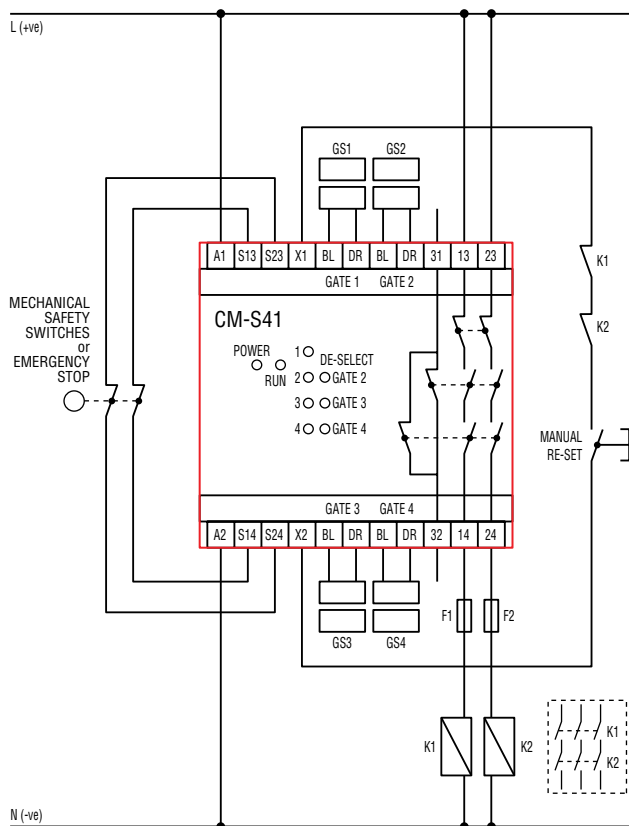
 Universal Mounting Brackets can be used with this product. See page G241 for details.

## ■ Applications

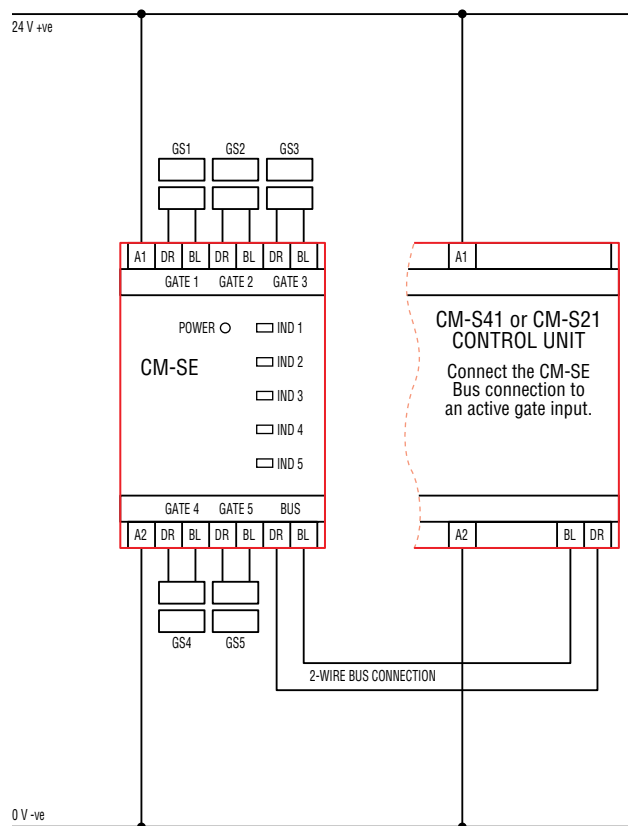
Typical applications are on sliding guard doors or swinging guard doors.



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safety interlock switches



In the illustration above, the guard door is open and the machine is stopped. Machine will start when the guard door is closed, and the reset button is pressed.



In the illustration above, all of the guard doors are open and the machine is stopped. Machine will start when all the guard doors are closed, and the reset button is pressed.

**A** Go to the Engineering Guide  
For in-depth information on safety standards and use.

**N** For More Guarding Products  
See Section N for safeguarding cutting and turning machines

## ■ Control Unit Specifications

| Electrical                                | CM-S4                                                                                                                                                   | CM-S41, CM-S21 & CM-SE                                                                                                             |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power Supply:</b>                      | 24 VAC/DC $\pm$ 10%                                                                                                                                     | CM-S41 — 24 VAC/DC, 110 VAC<br>CM-S21 & CM-SE — 24 VAC/DC                                                                          |
| <b>Power Consumption:</b>                 | 2.4 VA typical                                                                                                                                          | CM-S41 — 6 VA; CM-S21 & CM-SE — 3 VA                                                                                               |
| <b>External Fuse (Operating Voltage):</b> | 0.25 A quick acting                                                                                                                                     | —                                                                                                                                  |
| <b>Input Fuse (Supply Voltage):</b>       | —                                                                                                                                                       | 500 mA resetable                                                                                                                   |
| <b>Safety Inputs:</b>                     | 1 N/O + 1 N/C                                                                                                                                           | CM-S41 — 4 CM-S11 or CM-S31 switches<br>CM-S21 — 2 CM-S11 or CM-S31 switches<br>CM-SE — 5 CM-S11 or CM-S31 switches                |
| <b>Max Cable Length:</b>                  | —                                                                                                                                                       | 100 m (328 ft.)                                                                                                                    |
| <b>Max Input Resistance:</b>              | Contact factory                                                                                                                                         |                                                                                                                                    |
| <b>Min. Approach Speed:</b>               | Contact factory                                                                                                                                         |                                                                                                                                    |
| <b>Relay Outputs:</b>                     | 1 N/O safety + 1 N/O aux.                                                                                                                               | CM-S41 & CM-S21 — 2 N/O; CM-SE — N/A                                                                                               |
| <b>Auxiliary Contact of Controls:</b>     | 4 A, 24 VAC/DC                                                                                                                                          | CM-S41 & CM-S21 — 1 N/C; CM-SE — N/A                                                                                               |
| <b>Max Switched Current/Voltage:</b>      | 4 A / 24 VAC/DC                                                                                                                                         | 4 A / 230 VAC; 2 A / 24 VDC (resistive)                                                                                            |
| <b>Min Switched Current/Voltage:</b>      | 4 mA / 12 V                                                                                                                                             | 10 V / 10 mA                                                                                                                       |
| <b>Impulse Withstand Voltage:</b>         | 250 V                                                                                                                                                   |                                                                                                                                    |
| <b>Max Drop-Out Time:</b>                 | 18 ms                                                                                                                                                   | Deactivation by sensor 13 mS                                                                                                       |
| <b>Max Output Fuse:</b>                   | 4 A quick acting                                                                                                                                        | AC = 5 A; DC = 2.5 A; quick acting                                                                                                 |
| <b>Reset Mode:</b>                        | Automatic                                                                                                                                               | Monitored manual or automatic                                                                                                      |
| <b>External Device Monitoring:</b>        | N/C loop between Y1 and Y2                                                                                                                              | N/C loop between X1 and X2                                                                                                         |
| <b>Mechanical</b>                         |                                                                                                                                                         |                                                                                                                                    |
| <b>Mounting:</b>                          | 35 mm (1.38 in.) DIN rail                                                                                                                               | 35 mm (1.38 in.) DIN rail                                                                                                          |
| <b>Case Material:</b>                     | Polycarbonate                                                                                                                                           | Polycarbonate                                                                                                                      |
| <b>Max Wire Size:</b>                     | 2 x 2.5 mm <sup>2</sup> (12 AWG)                                                                                                                        | 1 x 2.5 mm stranded, 1 x 4 mm solid                                                                                                |
| <b>Weight:</b>                            | 240 g (8.5 oz.)                                                                                                                                         | CM-S41 — 575 g (20.3 oz.)<br>CM-S21 — 183 g (6.5 oz.)<br>CM-SE — 135 g (4.8 oz.)                                                   |
| <b>Color:</b>                             | Gray                                                                                                                                                    | Red                                                                                                                                |
| <b>Indication:</b>                        | U: Green = On<br>Outputs Open: Red = On<br>Outputs Closed: Green = On<br>D11, D12, D21, D22: Green = Gate closed<br>D31, D32, D41, D42: Red = Gate open | Power = Red<br>Outputs Closed: Green = On<br>Outputs Open: No Light = Off<br>Gate Closed: Yellow = On<br>Gate Open: No Light = Off |
| <b>Mechanical Life:</b>                   | 30 x 10 <sup>6</sup>                                                                                                                                    | 10 x 10 <sup>6</sup>                                                                                                               |
| <b>Environmental</b>                      |                                                                                                                                                         |                                                                                                                                    |
| <b>Protection:</b>                        | IP40 (NEMA 1)                                                                                                                                           | Housing IP40, Terminals IP20                                                                                                       |
| <b>Operating Temperature:</b>             | 0 to 50°C (32 to 122°F)                                                                                                                                 | 10 to 55°C (50 to 131°F)                                                                                                           |
| <b>Humidity:</b>                          | 95% RH at 55°C (131°F)                                                                                                                                  | 85% max                                                                                                                            |
| <b>Compliance</b>                         |                                                                                                                                                         |                                                                                                                                    |
| <b>Standards:</b>                         | EN292, EN60204-1, EN954-1, EN1088, EN60947-5-3, EN947-5-3, EN50081, EN50082, EN61000-6-2                                                                |                                                                                                                                    |
| <b>Approvals/Listings:</b>                | CE marked for all applicable directives, UL and C-UL, TUV                                                                                               |                                                                                                                                    |
| <b>Safety Category:</b>                   | Cat 3 per EN954-1 (internal operation)                                                                                                                  |                                                                                                                                    |

Specifications are subject to change without notice.

Note: The safety contacts of the Omron STI switches are described as normally closed (N/C) i.e., with the guard closed, actuator in place, and the machine able to be started.

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safety interlock switches

## ■ Switch Specifications

| Electrical                           | CM-S1, CM-S2, CM-S3                                                                      | CM-S221                   | CM-S11                             | CM-S31                             |
|--------------------------------------|------------------------------------------------------------------------------------------|---------------------------|------------------------------------|------------------------------------|
| <b>Safety Contacts:</b>              | 1 N/C + 1 N/O                                                                            | 2 N/C + 1 N/O             | Current Sensing Circuit            | Current Sensing Circuit            |
| <b>N/C Operating Distance:</b>       | CM-S1 —<br>On = 3 mm; Off = 8 mm<br>CM-S2 and CM-S3 —<br>On = 6 mm; Off = 13 mm          | On = 7 mm; Off = 12 mm    | On = 5-7 mm; Off = 8-12 mm         | On = 5-7 mm; Off = 8-12 mm         |
| <b>Minimum Gap:</b>                  |                                                                                          | 1 mm                      | 1 mm                               | 1 mm                               |
| <b>Max Switched Current/Voltage:</b> | 500 mA / 24 V                                                                            | 300 mA / 24 V             |                                    |                                    |
| <b>Mechanical</b>                    |                                                                                          |                           |                                    |                                    |
| <b>Mounting:</b>                     | 2 x M4 screws supplied                                                                   | 2 x M4 screws supplied    | 2 x M4 screws supplied             | 2 x M4 screws supplied             |
| <b>Case Material:</b>                | Glass filled SPS                                                                         | ABS                       | ABS                                | 316 stainless steel                |
| <b>Max Wire Size:</b>                | Pre-wired cable to 5 m                                                                   | Pre-wired cable to 5 m    | Pre-wired cable<br>various lengths | Pre-wired cable<br>various lengths |
| <b>Weight:</b>                       | 230 g (8.1 oz.)                                                                          | 230 g (8.1 oz.)           | 207 g (7.3 oz.)                    | 265 g (9.3 oz.)                    |
| <b>Color:</b>                        | Red                                                                                      | Red                       | Red                                | Stainless                          |
| <b>Mechanical Life:</b>              | 100 x 10 <sup>6</sup>                                                                    | 10 x 10 <sup>6</sup>      |                                    |                                    |
| <b>Environmental</b>                 |                                                                                          |                           |                                    |                                    |
| <b>Protection:</b>                   | IP67 (NEMA 6)                                                                            | IP67 (NEMA 6)             | IP67 (NEMA 6)                      | IP67 (NEMA 6)                      |
| <b>Operating Temperature:</b>        | -20 to 60°C (-4 to 140°F)                                                                | -10 to 55°C (14 to 131°F) | 10 to 55°C (50 to 131°F)           | 10 to 55°C (50 to 131°F)           |
| <b>Humidity:</b>                     | 95% RH at 55°C (131°F)                                                                   |                           |                                    |                                    |
| <b>Compliance</b>                    |                                                                                          |                           |                                    |                                    |
| <b>Standards:</b>                    | EN292, EN60204-1, EN954-1, EN1088, EN60947-5-3, EN947-5-3, EN50081, EN50082, EN61000-6-2 |                           |                                    |                                    |
| <b>Approvals/Listings:</b>           | CE marked for all applicable directives, UL and C-UL, TUV (TUV pending for CM-S221)      |                           |                                    |                                    |

Specifications are subject to change without notice.

Note: The safety contacts of the Omron STI switches are described as normally closed (N/C) i.e., with the guard closed, actuator in place, and the machine able to be started.

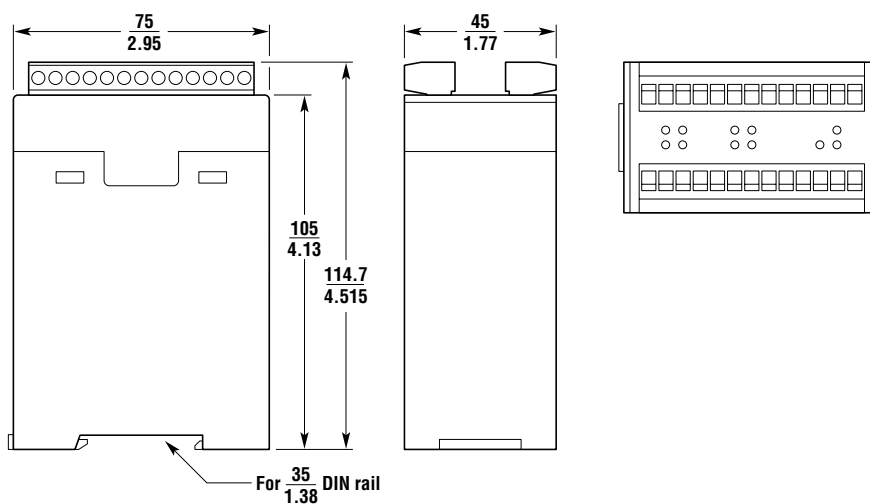
**A** **Go to the Engineering Guide**  
For in-depth information on safety standards and use.

**N** **For More Guarding Products**  
See Section N for safeguarding cutting and turning machines

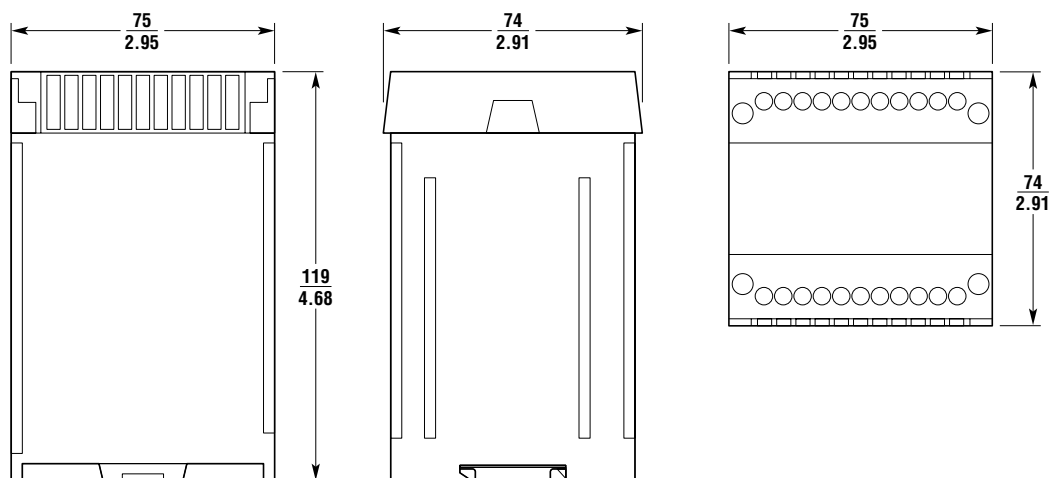
■ Dimensions — mm/in.

Control Units

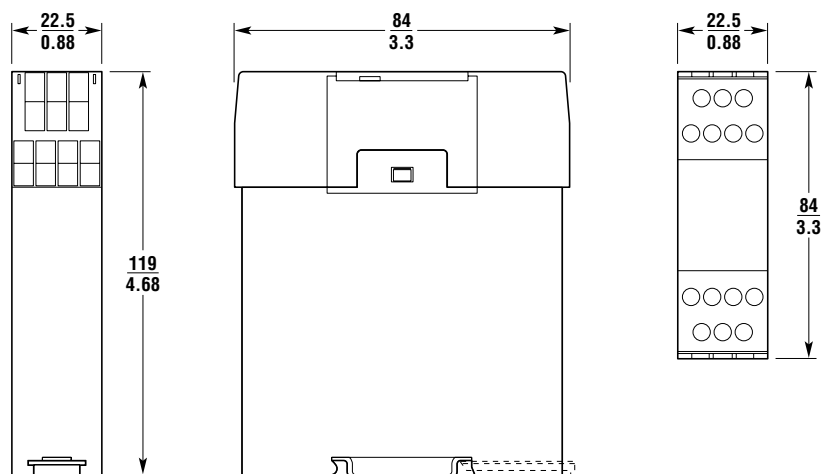
CM-S4



CM-S41



CM-S21/SE



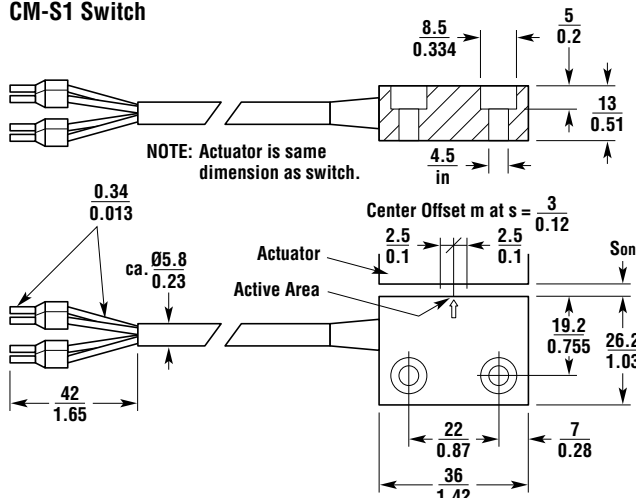
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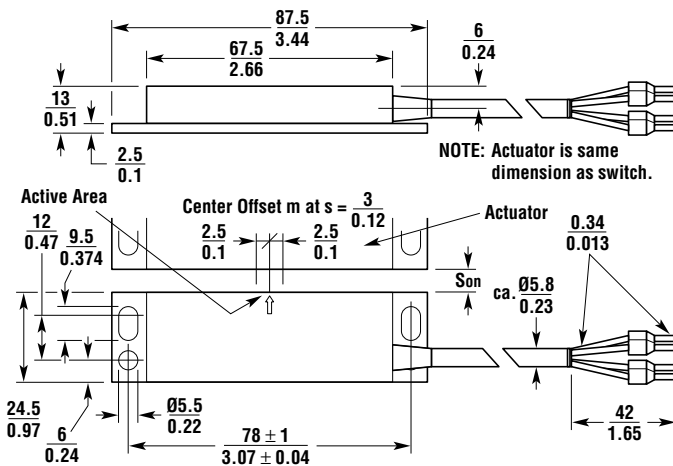
## ■ Dimensions — mm/in. (continued)

### Switches

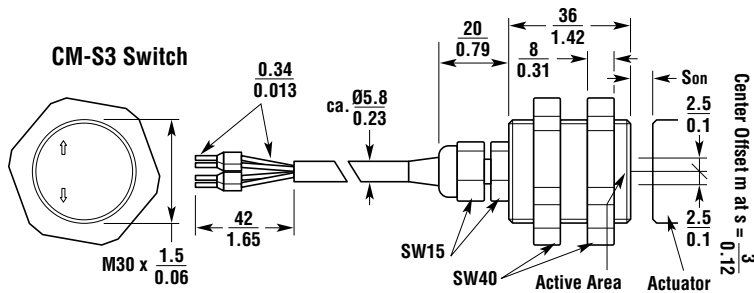
CM-S1 Switch



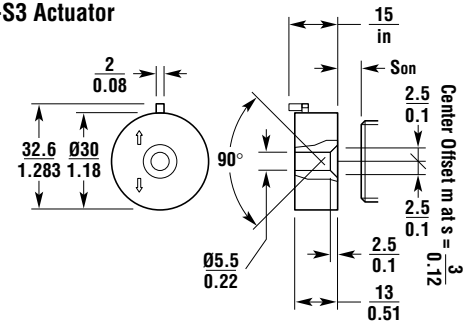
CM-S2 Switch



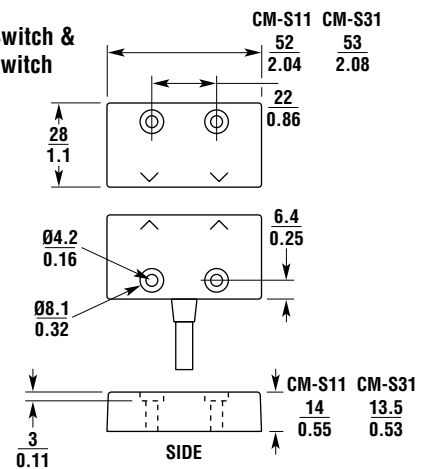
CM-S3 Switch



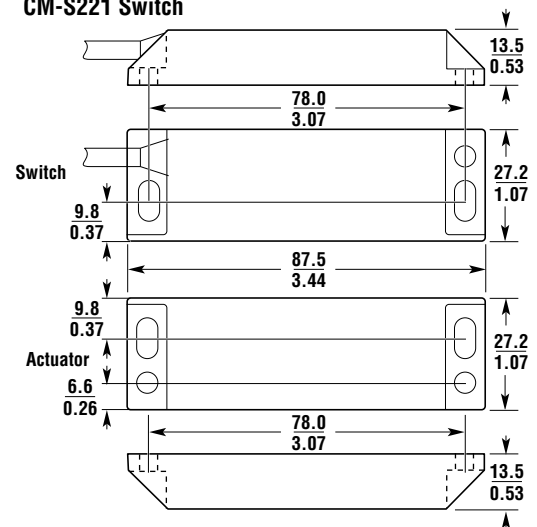
CM-S3 Actuator



CM-S11 Switch & CM-S31 Switch



CM-S221 Switch



**N** For More Guarding Products  
See Section N for safeguarding cutting and turning machines

## ■ Ordering

| Model                                                                           | Contacts                | Wiring Entry          | Part No.   |
|---------------------------------------------------------------------------------|-------------------------|-----------------------|------------|
| <b>CONTROL UNITS</b>                                                            |                         |                       |            |
| CM-S4 (24 VAC/DC) (for S1, S2, S3 Switches Only)                                |                         |                       | 44536-0040 |
| CM-S41-24 (24 VAC/DC) (for S11, S31 Solid-State Switches Only)                  |                         |                       | 44536-0140 |
| CM-S41-110 (110 VAC) (for S11, S31 Solid-State Switches Only)                   |                         |                       | 44536-0141 |
| CM-S21-24 (24 VAC/DC) (for S11, S31 Solid-State Switches Only)                  |                         |                       | 44536-0120 |
| CM-SE-24 (24 VAC/DC) (for S11, S31 Solid-State Switches Only)                   |                         |                       | 44536-0170 |
| <b>PLASTIC CASE SWITCHES</b>                                                    |                         |                       |            |
| <b>Model 1</b>                                                                  |                         |                       |            |
| CM-S1PC3                                                                        | 1 N/O + 1 N/C           | 3 m cable             | 44536-0100 |
| CM-S1PC5                                                                        | 1 N/O + 1 N/C           | 5 m cable             | 44536-0105 |
| CM-S11PC3                                                                       | Current Sensing Circuit | 3 m cable             | 44536-1100 |
| CM-S11PC5                                                                       | Current Sensing Circuit | 5 m cable             | 44536-1105 |
| CM-S11PC10                                                                      | Current Sensing Circuit | 10 m cable            | 44536-1110 |
| CM-S11PCC5                                                                      | Current Sensing Circuit | Connector + 5 m cable | 44536-1159 |
| <b>Model 2</b>                                                                  |                         |                       |            |
| CM-S2PC3                                                                        | 1 N/O + 1 N/C           | 3 m cable             | 44536-0200 |
| CM-S2PC5                                                                        | 1 N/O + 1 N/C           | 5 m cable             | 44536-0205 |
| CM-S221PC5 (not compatible with Legacy Relays or SR203M/AM, SR208AD or SR209AD) | 2 N/C + 1 N/O           | 5 m cable             | 44536-0221 |
| <b>Model 3</b>                                                                  |                         |                       |            |
| CM-S3PC3                                                                        | 1 N/O + 1 N/C           | 3 m cable             | 44536-0300 |
| CM-S3PC5                                                                        | 1 N/O + 1 N/C           | 5 m cable             | 44536-0305 |
| <b>STAINLESS CASE SWITCHES</b>                                                  |                         |                       |            |
| <b>Model 1</b>                                                                  |                         |                       |            |
| CM-S31SC3                                                                       | Current Sensing Circuit | 3 m cable             | 44536-3100 |
| CM-S31SC5                                                                       | Current Sensing Circuit | 5 m cable             | 44536-3105 |
| CM-S31SCC5                                                                      | Current Sensing Circuit | Connector + 5 m cable | 44536-3159 |
| Replacement Actuator for CM-S1, Red ABS Plastic                                 |                         |                       | 44536-0710 |
| Replacement Actuator for CM-S2, Red ABS Plastic                                 |                         |                       | 44536-0720 |
| Replacement Actuator for CM-S221, Red ABS Plastic                               |                         |                       | 44536-0721 |
| Replacement Actuator for CM-S3, Red ABS Plastic                                 |                         |                       | 44536-0730 |
| Replacement Actuator for CM-S11, Red ABS Plastic                                |                         |                       | 44536-0711 |
| Replacement Actuator for CM-S31, Stainless Steel                                |                         |                       | 44536-0731 |
| Mounting Bracket for CM-S3                                                      |                         |                       | 44536-0800 |
| Accessories (see page G238)                                                     |                         |                       |            |

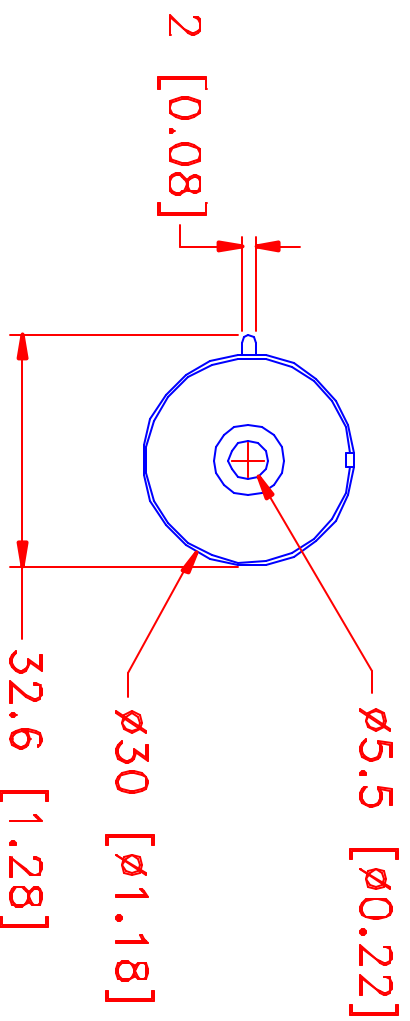
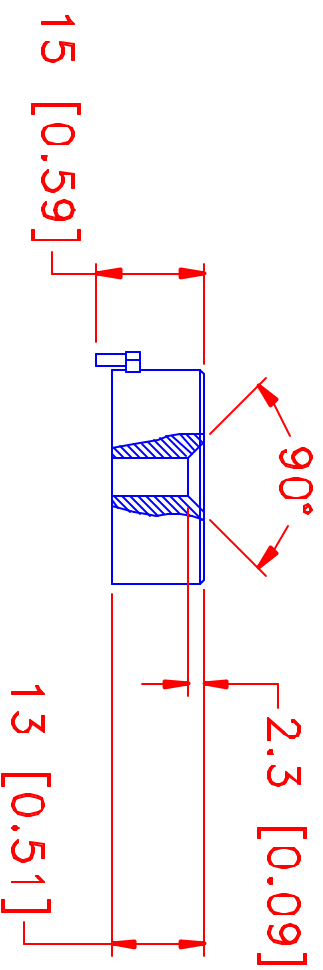
■ = New product



Universal Mounting Brackets can be used with this product. See page G241 for details.

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safety interlock switches



## ACTUATOR CM-S3

Drawn to Scale in Decimal Inches  
For Metric units (mm), multiply by 25.4  
Dimension as Required  
For Detailed Dimensions, refer to Catalog