

## RFID Magnetic Locking Safety Switches

# D40ML Series

### Magnetic latching combines with RFID technology to deliver high holding force and tamper resistance

- RFID provides a high degree of tamper resistance.
- Clean/Sanitize in Place – stainless steel versions are rated IP69K
- LEDs support easy fault diagnosis
- Install up to 20 switches in series
- Residual magnetism acts as light door latch after unlocking
- Two actuator types
  - Basic – all actuators in the system are identically coded.
  - Unique – every actuator is individually coded. 32,000,000 codes
  - Both offer tolerance for misalignment
- Two switch sizes provide multiple holding force options
  - Medium Duty
    - Stainless Steel:  $F_{1\max}$  (typical) 600N,  $F_{zh}$  450N
    - Plastic and Diecast:  $F_{1\max}$  (typical) 900N,  $F_{zh}$  675N
  - Heavy Duty
    - Stainless Steel:  $F_{1\max}$  (typical) 950N,  $F_{zh}$  700N
    - Plastic and Diecast:  $F_{1\max}$  (typical) 1500N,  $F_{zh}$  1150N
- Three case materials
  - Plastic, diecast metal, 316 stainless steel
- For use on machines with no rundown time if power is lost



### Diagnostic Indicator Function

**Yellow LED**  
indicates OPEN



Shown in Guard Open Position

**Green LED**  
indicates CLOSED



Shown in Guard Closed Position

| Switch Status                 | Guard  | Green LED | Yellow LED | Safety Output |
|-------------------------------|--------|-----------|------------|---------------|
| Locked                        | Closed | Steady    | Off        | Closed        |
| Solenoid Power OFF (unlocked) | Closed | Flashing  | Off        | Open          |
| Guard Open                    | Open   | Off       | Steady     | Open          |
| Door Forced Open              | Open   | Off       | Flashing   | Open          |

## Ordering Information

| Case Material               | Holding Force $F_{1max}$ (typical) | Actuator Type | Cable Configuration      | Model Number    |
|-----------------------------|------------------------------------|---------------|--------------------------|-----------------|
| 316 Stainless Steel (IP69K) | 600N                               | Unique        | 5m Cable                 | D40ML-SS2-U-5M  |
|                             |                                    |               | 10m Cable                | D40ML-SS2-U-10M |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-SS2-U-M12 |
|                             |                                    | Basic         | 5m Cable                 | D40ML-SS2-B-5M  |
|                             |                                    |               | 10m Cable                | D40ML-SS2-B-10M |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-SS2-B-M12 |
|                             | 950N                               | Unique        | 5m Cable                 | D40ML-SS1-U-5M  |
|                             |                                    |               | 10m Cable                | D40ML-SS1-U-10M |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-SS1-U-M12 |
|                             |                                    | Basic         | 5m Cable                 | D40ML-SS1-B-5M  |
|                             |                                    |               | 10m Cable                | D40ML-SS1-B-10M |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-SS1-B-M12 |
| Plastic (IP67)              | 900N                               | Unique        | 5m Cable                 | D40ML-P2-U-5M   |
|                             |                                    |               | 10m Cable                | D40ML-P2-U-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-P2-U-M12  |
|                             |                                    | Basic         | 5m Cable                 | D40ML-P2-B-5M   |
|                             |                                    |               | 10m Cable                | D40ML-P2-B-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-P2-B-M12  |
|                             | 1500N                              | Unique        | 5m Cable                 | D40ML-P1-U-5M   |
|                             |                                    |               | 10m Cable                | D40ML-P1-U-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-P1-U-M12  |
|                             |                                    | Basic         | 5m Cable                 | D40ML-P1-B-5M   |
|                             |                                    |               | 10m Cable                | D40ML-P1-B-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-P1-B-M12  |
| Diecast Metal (IP67)        | 900N                               | Unique        | 5m Cable                 | D40ML-M2-U-5M   |
|                             |                                    |               | 10m Cable                | D40ML-M2-U-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-M2-U-M12  |
|                             |                                    | Basic         | 5m Cable                 | D40ML-M2-B-5M   |
|                             |                                    |               | 10m Cable                | D40ML-M2-B-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-M2-B-M12  |
|                             | 1500N                              | Unique        | 5m Cable                 | D40ML-M1-U-5M   |
|                             |                                    |               | 10m Cable                | D40ML-M1-U-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-M1-U-M12  |
|                             |                                    | Basic         | 5m Cable                 | D40ML-M1-B-5M   |
|                             |                                    |               | 10m Cable                | D40ML-M1-B-10M  |
|                             |                                    |               | Pigtail w/ M12 Connector | D40ML-M1-B-M12  |

## Spare Actuators

| Product Description                                | Model Number    |
|----------------------------------------------------|-----------------|
| Stainless Steel; IP69K; 950N; Basic Code; Actuator | D40ML-SS1-B-ACT |
| Stainless Steel; IP69K 600N; Basic Code; Actuator  | D40ML-SS2-B-ACT |
| Diecast Metal; IP67; 1500N; Basic Code; Actuator   | D40ML-M1-B-ACT  |
| Diecast Metal; IP67; 900N; Basic Code; Actuator    | D40ML-M2-B-ACT  |
| Plastic; IP67; 1500N; Basic Code; Actuator         | D40ML-P1-B-ACT  |
| Plastic; IP67; 900N; Basic Code; Actuator          | D40ML-P2-B-ACT  |

**Note:** Spare actuators are not available for uniquely coded switches.

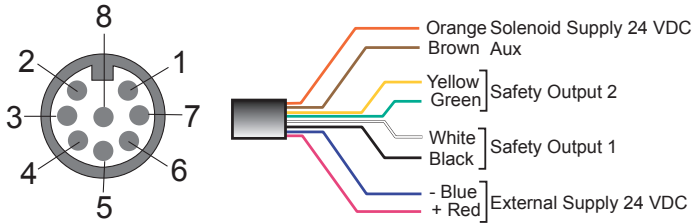
## Accessories

| Product Description                                                            | Model Number      |
|--------------------------------------------------------------------------------|-------------------|
| Quick Disconnect Cable, 8-pin M12 to Flying Leads, PVC Jacket, 5 Meter Length  | D40ML-CBL-M12-5M  |
| Quick Disconnect Cable, 8-pin M12 to Flying Leads, PVC Jacket, 10 Meter Length | D40ML-CBL-M12-10M |

## Specifications

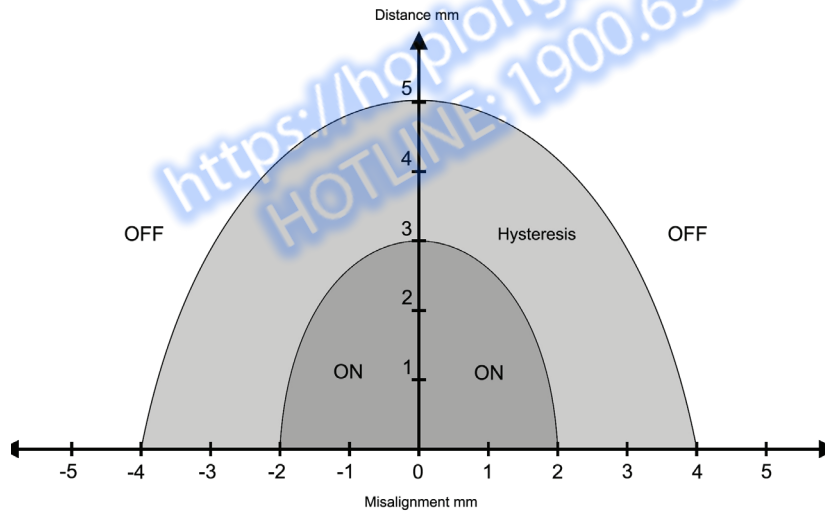
|                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Codes and Standards:                                                                                                                      | IEC 60947-5-3:2013, EN 60947-5-1:2004 + AC:2005 + A1:2009, EN 60947-1:2007 + A1:2011, EN ISO 13849-1:2008 + AC:2009, EN 62061:2005 + AC:2010 + A1:2013, ISO 14119:2013, UL508                                                                                                                                                                           |
| Safety Classification and Reliability Data:                                                                                               |                                                                                                                                                                                                                                                                                                                                                         |
| Minimum Switched Current:                                                                                                                 | 10V DC 1mA                                                                                                                                                                                                                                                                                                                                              |
| Dielectric Withstand:                                                                                                                     | 250VAC                                                                                                                                                                                                                                                                                                                                                  |
| Insulation Resistance:                                                                                                                    | 100 MΩ                                                                                                                                                                                                                                                                                                                                                  |
| Shock Resistance:                                                                                                                         | 11ms 30G                                                                                                                                                                                                                                                                                                                                                |
| Vibration Resistance:                                                                                                                     | 10 Hz to 55 Hz, 1 mm amplitude                                                                                                                                                                                                                                                                                                                          |
| Switching Distance:                                                                                                                       | S <sub>ao</sub> 1 mm Close; S <sub>ar</sub> 10 mm Open                                                                                                                                                                                                                                                                                                  |
| Misalignment                                                                                                                              | Between switch and actuator, 2 mm in any direction                                                                                                                                                                                                                                                                                                      |
| Switching Frequency:                                                                                                                      | 1.0 Hz maximum                                                                                                                                                                                                                                                                                                                                          |
| Response Time (On-->Off):                                                                                                                 | 10 ms max.                                                                                                                                                                                                                                                                                                                                              |
| Operating Time (Off -->On):                                                                                                               | 150 ms                                                                                                                                                                                                                                                                                                                                                  |
| Approach Speed:                                                                                                                           | 200mm/m to 1000mm/s                                                                                                                                                                                                                                                                                                                                     |
| Body Material:                                                                                                                            | D40ML-P_: Plastic<br>D40ML-M_: Diecast Metal<br>D40ML-SS_: 316 Stainless Steel<br>Actuator Seal: Silicone<br>Encapsulation: High Temperature Epoxy                                                                                                                                                                                                      |
| Operating Temperature Range:                                                                                                              | -25C to + 40C                                                                                                                                                                                                                                                                                                                                           |
| Ambient Operating Humidity:                                                                                                               | up to 90% at 25C ~ 40C                                                                                                                                                                                                                                                                                                                                  |
| Enclosure Protection:                                                                                                                     | IP67 (Plastic or Diecast Metal)<br>IP69K (Stainless steel versions with flying leads)                                                                                                                                                                                                                                                                   |
| Cable Type:                                                                                                                               | PVC 8 core, 6mm outer diameter                                                                                                                                                                                                                                                                                                                          |
| Mounting Bolts:                                                                                                                           | 2 x M5 Tightening torque 1.0 Nm                                                                                                                                                                                                                                                                                                                         |
| Mounting Position:                                                                                                                        | Any                                                                                                                                                                                                                                                                                                                                                     |
| Power Supply:                                                                                                                             | 24VDC ± 10% (selv / pelv)                                                                                                                                                                                                                                                                                                                               |
| Power Consumption:                                                                                                                        | Unlocked: 50 mA max.<br>Locked: 500 mA max.                                                                                                                                                                                                                                                                                                             |
| Holding Force:                                                                                                                            | Medium Duty<br>- Stainless Steel: F <sub>1max</sub> (typical) 600N, F <sub>zh</sub> 450N<br>- Plastic and Diecast: F <sub>1max</sub> (typical) 900N, F <sub>zh</sub> 675N<br>Heavy Duty<br>- Stainless Steel: F <sub>1max</sub> (typical) 950N, F <sub>zh</sub> 700N<br>- Plastic and Diecast: F <sub>1max</sub> (typical) 1500N, F <sub>zh</sub> 1150N |
| Max. Switched Current (Outputs):                                                                                                          | 200mA (min. internal resistance 8.5 Ohms)                                                                                                                                                                                                                                                                                                               |
| Auxiliary Signal                                                                                                                          | Door open (24 VDC), Door closed (12 VDC) 200 mA max.                                                                                                                                                                                                                                                                                                    |
| Characteristic Data according to EN ISO13849-1:                                                                                           |                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                           | PLe : If both channels are used in combination with a SIL3/PLe control device<br>Category : Cat. 4<br>MTTFd : 1100a<br>Diagnostic Coverage DC : 99% (high)<br>Number of operating days per year: d <sub>op</sub> = 365d<br>Number of operating hours per day: h <sub>op</sub> = 24h<br>B10d: Not mechanical parts implemented                           |
| Characteristic Data according to IEC62061 (used as a sub system):                                                                         | Safety Integrity Level: SIL3<br>PFH (1/h): 4.77E-10 Corresponds to 4.8% of SIL3<br>PFD: 4.18E-05 Corresponds to 4.2% of SIL3<br>Proof Test Interval T <sub>1</sub> : 20a                                                                                                                                                                                |
| Information with regard to UL508                                                                                                          | Use LVLC or Class 2 supply. Type 1 enclosure.                                                                                                                                                                                                                                                                                                           |
| When the product use deviates from these assumptions (different load, operating frequency, etc.) the values must be adjusted accordingly. |                                                                                                                                                                                                                                                                                                                                                         |

## Cable Wiring



| Quick Connect (CC) M12 8-way male plug | Conductor Colors | Function                            | Power Rating    |
|----------------------------------------|------------------|-------------------------------------|-----------------|
| 8                                      | Orange           | Lock Applied (24 VDC +/- 10%)       | 500mA Max       |
| 5                                      | Brown            | Auxiliary Signal (Door Open/Closed) | +24 VDC (200mA) |
| 4                                      | Yellow           | Safety Output 2                     | 200mA Max       |
| 6                                      | Green            | Safety Output 2                     |                 |
| 1                                      | White            | Safety Output 1                     | 200mA Max       |
| 7                                      | Black            | Safety Output 1                     |                 |
| 3                                      | Blue             | 0 VDC                               | 50mA Max        |
| 2                                      | Red              | +24 VDC +/- 10%                     |                 |

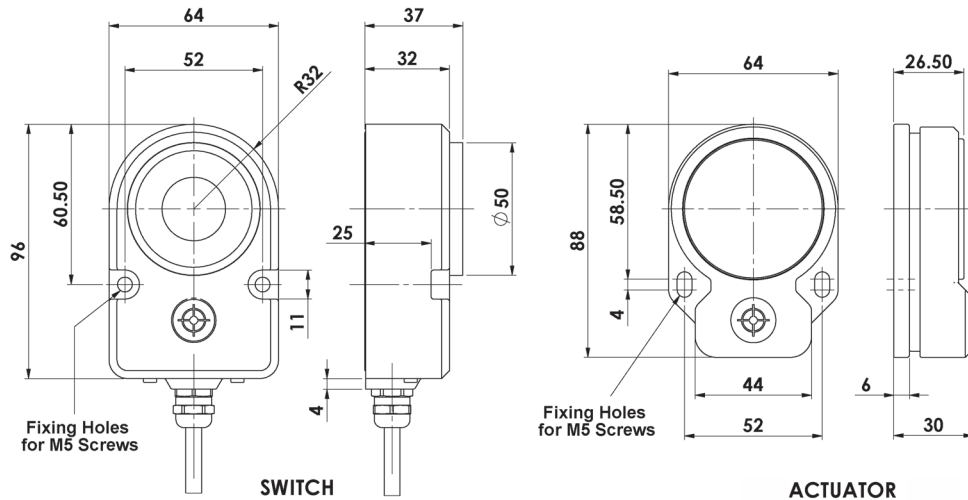
## Typical Operating Distance



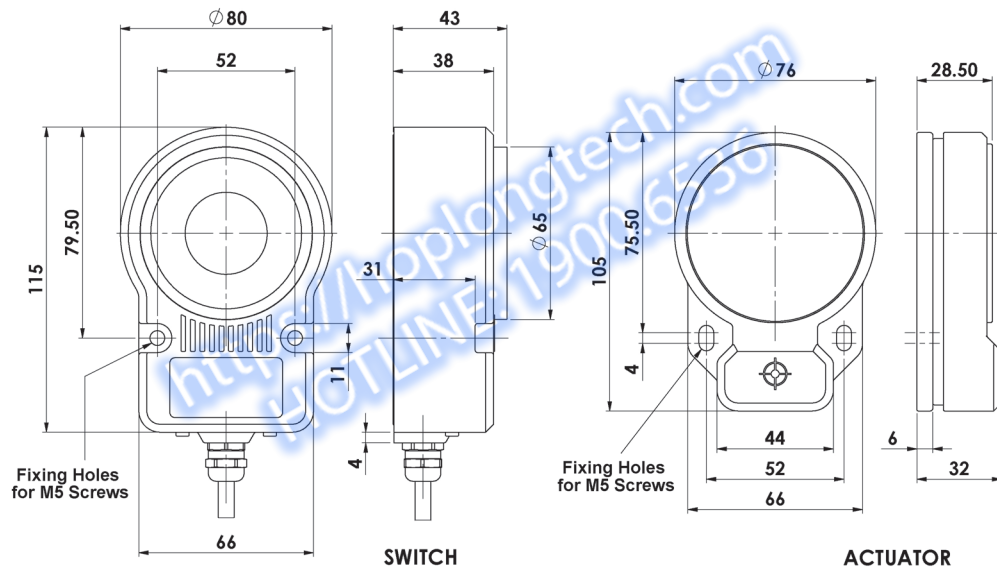
**Note:** DO NOT use switch and actuator as a guard door stop.

## Dimensions

**D40ML Medium Duty Switch Dimensions (mm)**



**D40ML Heavy Duty Switch Dimensions (mm)**



### Installation:

- Installation of all D40ML series safety switches must be in accordance with a risk assessment for the individual application.
- The use of a safety relay is required for monitoring RFID coded switches. These relays monitor two redundant circuits as per ISO13849-1 for up to PLe/Category 4 protection.
- D40ML series switches are designed to operate with most dual channel safety relays to satisfy EN60947-5-3.
- M5 mounting bolts must be used to mount the switches. Tightening torque for mounting bolts to ensure reliable fixing is 1.0 Nm. Always mount on non-ferrous materials.
- Do not mount adjacent switches or actuators closer than 30mm.
- To achieve nominal holding force ensure face-to-face alignment of magnetic parts.
- After installation always check each switch function by opening and closing each guard individually in turn and ensuring that the Green LED on the switch and the LEDs on the safety relay are illuminated when the switch is closed and are extinguished when the switch is open. Check that the machine stops and cannot be re-started when each switch is open.

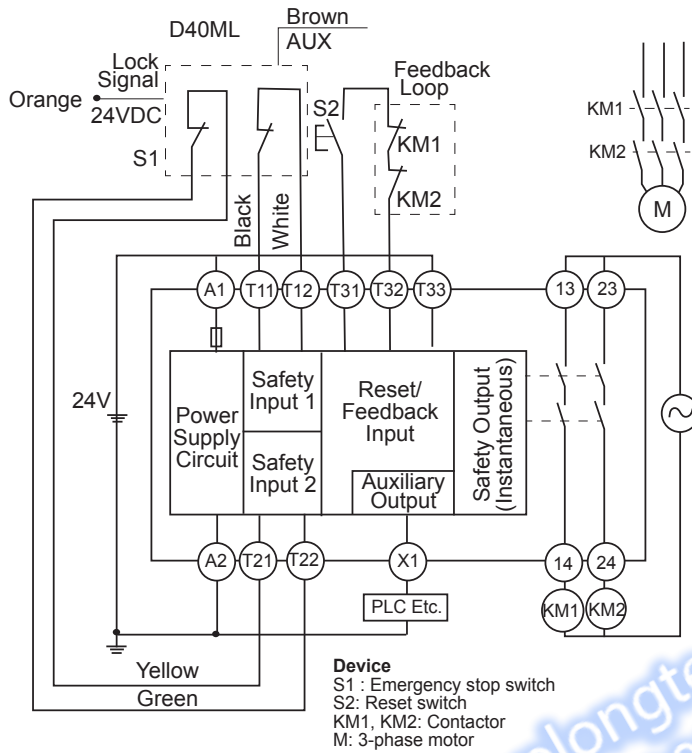
**Maintenance/Safety Checks:** Monthly: Check alignment of actuator and look for signs of mechanical damage to the switch casing or cables. The safety functions and mechanics must be tested regularly. For applications where infrequent guard access is foreseeable, the system must have a manual function test to detect a possible accumulation of faults. At least once per month for PLe Cat3/4 or once per year for PLd Cat3 (ISO13849-1). Where possible it is recommended that the control system of the machine demands and monitors these tests, and stops or prevents the machine from starting if the test is not done. (ISO14119). Check that the machine stops and cannot be re-started when each switch is open.

**NOTE:** The safety outputs will only close when the actuator is in place and the lock magnet is energized. Forcing open of the lock will cause the safety outputs to open.

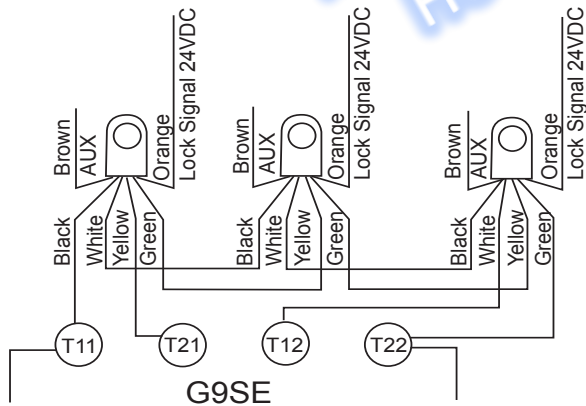
**IMPORTANT:** The guard holding has no interlock function. The Risk Assessment for the particular application should include the risk of spare actuators. Spare actuators should not be readily available and must be securely controlled. Record any RFID codes as required by factory rules or with reference to any risk assessment for the particular application and user location.

## Wiring Options

### D40ML to G9SE-201 (up to Safety PLe acc. EN ISO 13849-1)



### D40ML to G9SE-201 - Series Connections (up to Safety PLd acc. EN ISO 13849-1, maximum 20 switches)



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