

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 with type 4 coding
 - 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) 600 N, F_{zh} 450 N
 - Plastic and Diecast: $F_{1\max}$ (typical) 900 N, F_{zh} 675 N
 - Heavy Duty
 - Stainless Steel: $F_{1\max}$ (typical) 950 N, F_{zh} 700 N
 - Plastic and Diecast: $F_{1\max}$ (typical) 1500 N, F_{zh} 1150 N
- 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

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Ordering Information

Switches

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

Spare Actuators

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

Note: 1. The quick disconnect cable has an identical cable pinning as the **Cable Wiring** on page 4
 2. Y92E-M12PURSH8S M-L disconnect cables are also compatible with D40ML.

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	10 VDC 1 mA
	Dielectric Withstand	250 VAC
	Insulation Resistance	100 MΩ
	Shock Resistance	11 ms 30G
	Vibration Resistance	10 to 55 Hz, 1 mm amplitude
	Switching Distance	S _{ao} 1 mm Close; S _{ar} 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	200 mm/m to 1000 mm/s
	Body Material	D40ML-P_: Plastic D40ML-M_: Diecast Metal D40ML-SS_: 316 Stainless Steel Actuator Seal: Silicone Encapsulation: High Temperature Epoxy
	Operating Temperature Range	-25 to 40°C
	Ambient Operating Humidity	up to 90% at 25 ~ 40°C
	Enclosure Protection	IP67 (Plastic or Diecast Metal) IP69K (Stainless steel versions with flying leads)
	Cable Type	PVC 8 core, 6 mm outer diameter
	Mounting Bolts	2 × M5 Tightening torque 1.0 Nm
	Mounting Position	Any
	Power Supply	24 VDC ±10% (selv / pelv)
	Power Consumption	Unlocked: 50 mA max. Locked: - Medium Duty 325 mA max. - Heavy Duty 500 mA max.
	Holding Force	Medium Duty - Stainless Steel: F _{1max} (typical) 600 N, F _{zh} ^{*1} 450 N - Plastic and Diecast: F _{1max} (typical) 900 N, F _{zh} 675 N Heavy Duty - Stainless Steel: F _{1max} (typical) 950 N, F _{zh} 700 N - Plastic and Diecast: F _{1max} (typical) 1500 N, F _{zh} 1150 N
	Max. Switched Current (Outputs)	200 mA (min. internal resistance 8.5 Ohms)
	Auxiliary Signal	+24 VDC (Door Open)
Characteristic Data according to EN ISO13849-1		PLe: If both channels are used in combination with a SIL3/PLe control device Category: Cat. 4 MTTFd: 1100a Diagnostic Coverage DC: 99% (high) Number of operating days per year: d _{op} = 365d Number of operating hours per day: h _{op} = 24h B10d: Not mechanical parts implemented
Characteristic Data according to IEC62061 (used as a sub system)		Safety Integrity Level: SIL3 PFH (1/h): 4.77E-10 Corresponds to 4.8% of SIL3 PFD: 4.18E-05 Corresponds to 4.2% of SIL3 Proof Test Interval T _i : 20a
Information with regard to UL508		Use LVLC or Class 2 supply. Type 1 enclosure.
Risk Time in accordance with EN 60947-5-3		150 ms (switching off delay at removal of actuator)

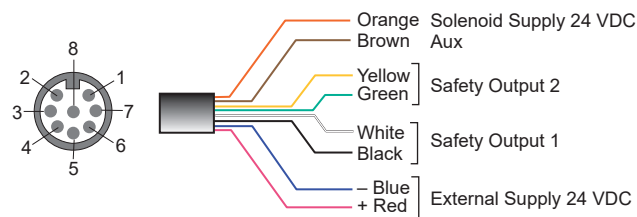
*1 A new test has been introduced with the coefficient 1.3. A device with a specified maximum holding force (F_{zh}) of 500 N needs to hold up a force test (F_{1max}) at 650 N.

According to the standard the locking force F_{zh} should be stated for every guard locking switch.

Note: When the product use deviates from these assumptions (different load, operating frequency, etc.) the values must be adjusted accordingly.

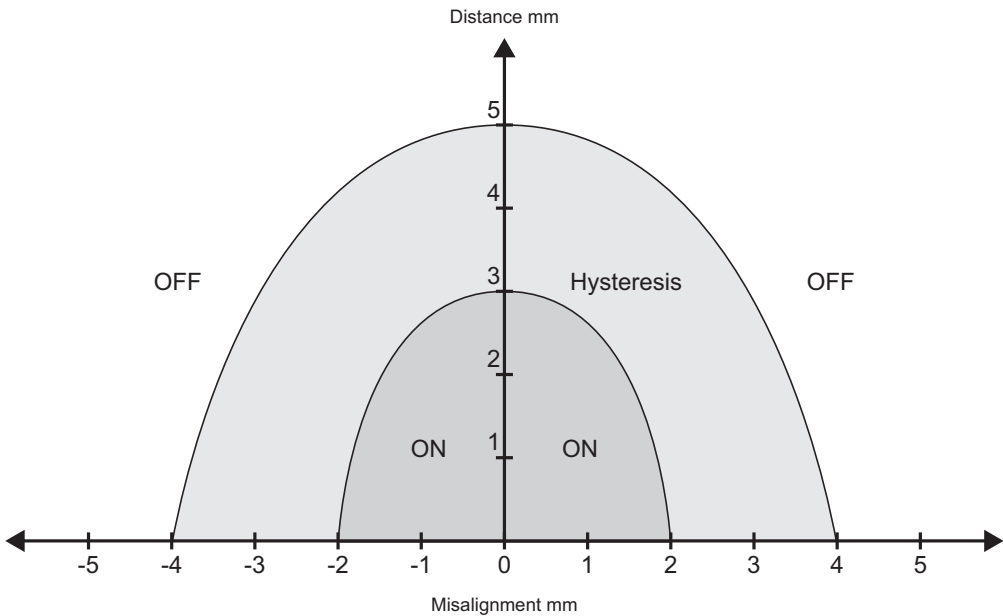
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Cable Wiring



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

Typical Operating Distance (Front Approach)

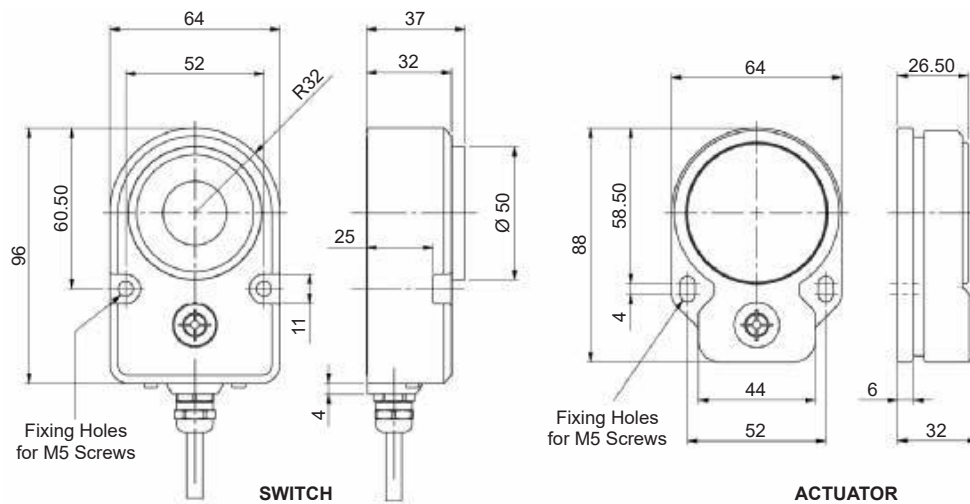


Note: DO NOT use switch and actuator as a guard door stop.

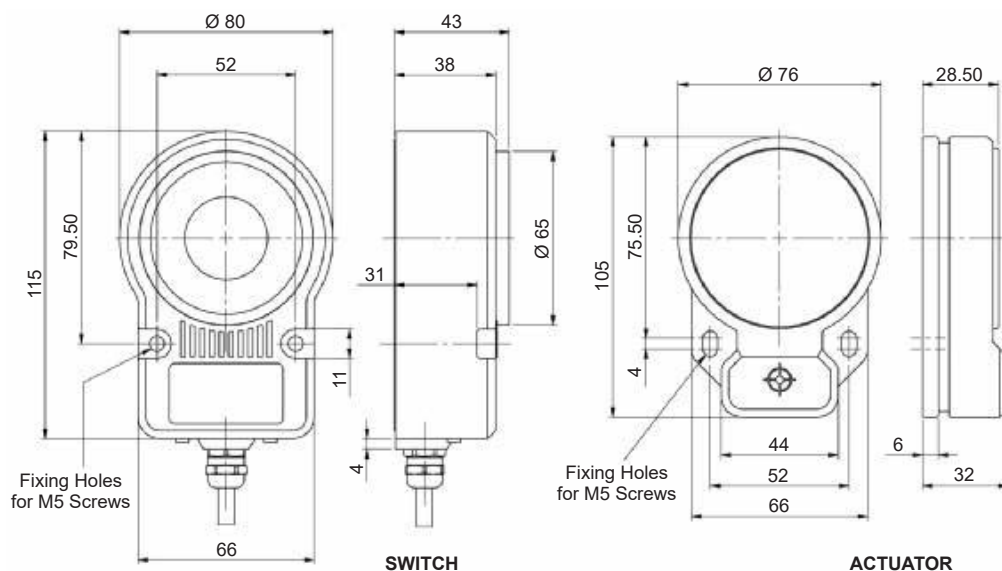


Dimensions

D40ML Medium Duty Switch



D40ML Heavy Duty Switch



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 30 mm.
- 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.

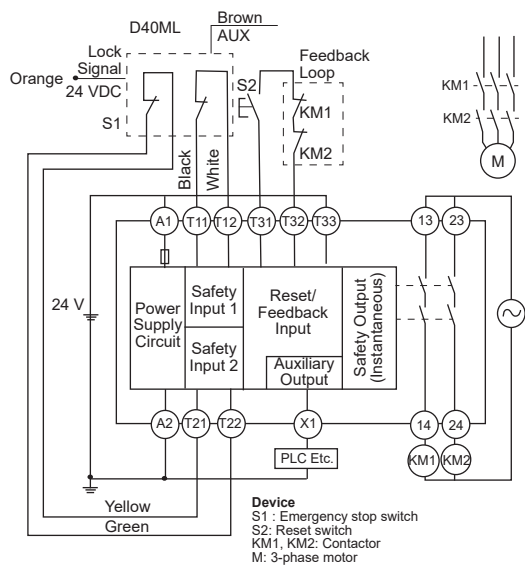
NOTE: The safety outputs will only close when the actuator is in place and the lock magnet is energized. Forcing open of the lock will cause the safety outputs to open.

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.

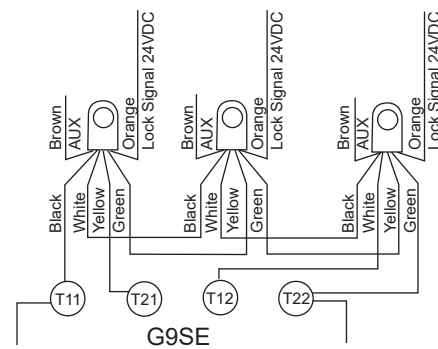
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Wiring Options

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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OMRON Corporation Industrial Automation Company

Contact: www.industrial.omron.eu

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31) 2356-81-300/Fax: (31) 2356-81-388

OMRON ELECTRONICS LLC

2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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