

# 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

# D40ML Series

## Ordering Information

### Switches

Case Material	Holding Force F <sub>1max</sub> (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

<b>Codes and Standards</b>		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
<b>Safety Classification and Reliability Data</b>	<b>Minimum Switched Current</b>	10 VDC 1 mA
	<b>Dielectric Withstand</b>	250 VAC
	<b>Insulation Resistance</b>	100 MΩ
	<b>Shock Resistance</b>	11 ms 30G
	<b>Vibration Resistance</b>	10 to 55 Hz, 1 mm amplitude
	<b>Switching Distance</b>	S <sub>ao</sub> 1 mm Close; S <sub>ar</sub> 10 mm Open
	<b>Misalignment</b>	Between switch and actuator, 2 mm in any direction
	<b>Switching Frequency</b>	1.0 Hz maximum
	<b>Response Time (On → Off)</b>	10 ms max.
	<b>Operating Time (Off → On)</b>	150 ms
	<b>Approach Speed</b>	200 mm/m to 1000 mm/s
	<b>Body Material</b>	D40ML-P_: Plastic D40ML-M_: Diecast Metal D40ML-SS_: 316 Stainless Steel Actuator Seal: Silicone Encapsulation: High Temperature Epoxy
	<b>Operating Temperature Range</b>	-25 to 40°C
	<b>Ambient Operating Humidity</b>	up to 90% at 25 ~ 40°C
	<b>Enclosure Protection</b>	IP67 (Plastic or Diecast Metal) IP69K (Stainless steel versions with flying leads)
	<b>Cable Type</b>	PVC 8 core, 6 mm outer diameter
	<b>Mounting Bolts</b>	2 × M5 Tightening torque 1.0 Nm
	<b>Mounting Position</b>	Any
	<b>Power Supply</b>	24 VDC ±10% (selv / pelv)
	<b>Power Consumption</b>	Unlocked: 50 mA max. Locked: - Medium Duty 325 mA max. - Heavy Duty 500 mA max.
<b>Holding Force</b>	Medium Duty - Stainless Steel: F <sub>1max</sub> (typical) 600 N, F <sub>zh</sub> <sup>*1</sup> 450 N - Plastic and Diecast: F <sub>1max</sub> (typical) 900 N, F <sub>zh</sub> 675 N Heavy Duty - Stainless Steel: F <sub>1max</sub> (typical) 950 N, F <sub>zh</sub> 700 N - Plastic and Diecast: F <sub>1max</sub> (typical) 1500 N, F <sub>zh</sub> 1150 N	
<b>Max. Switched Current (Outputs)</b>	200 mA (min. internal resistance 8.5 Ohms)	
<b>Auxiliary Signal</b>	+24 VDC (Door Open)	
<b>Characteristic Data according to EN ISO13849-1</b>	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 <sub>op</sub> = 365d Number of operating hours per day: h <sub>op</sub> = 24h B10d: Not mechanical parts implemented	
<b>Characteristic Data according to IEC62061 (used as a sub system)</b>	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 <sub>i</sub> : 20a	
<b>Information with regard to UL508</b>	Use LVLC or Class 2 supply. Type 1 enclosure.	
<b>Risk Time in accordance with EN 60947-5-3</b>	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<sub>zh</sub>) of 500 N needs to hold up a force test (F<sub>1max</sub>) at 650 N.

According to the standard the locking force F<sub>zh</sub> 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.

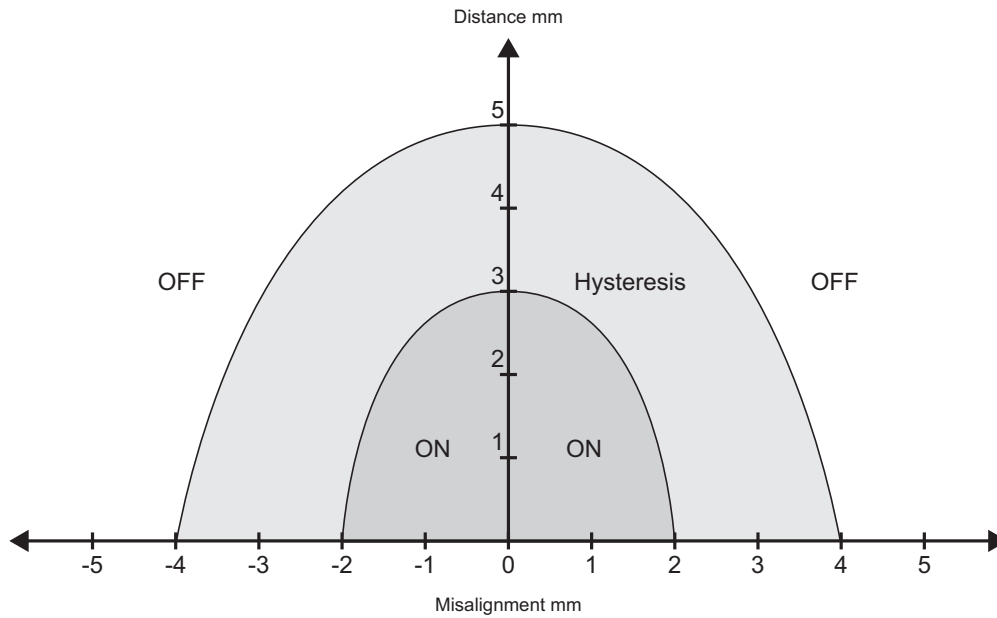
# D40ML Series

## Cable Wiring



Quick Connect (CC) M12 8-way male plug	Conductor Colors	Function	Power Rating
8	Orange	Apply Lock (24 VDC $\pm$ 10%)	500 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	200 mA Max
1	White	Safety Output 1	200 mA Max
7	Black	Safety Output 1	200 mA Max
3	Blue	0 VDC	50 mA Max
2	Red	+24 VDC $\pm$ 10%	

## Typical Operating Distance (Front Approach)

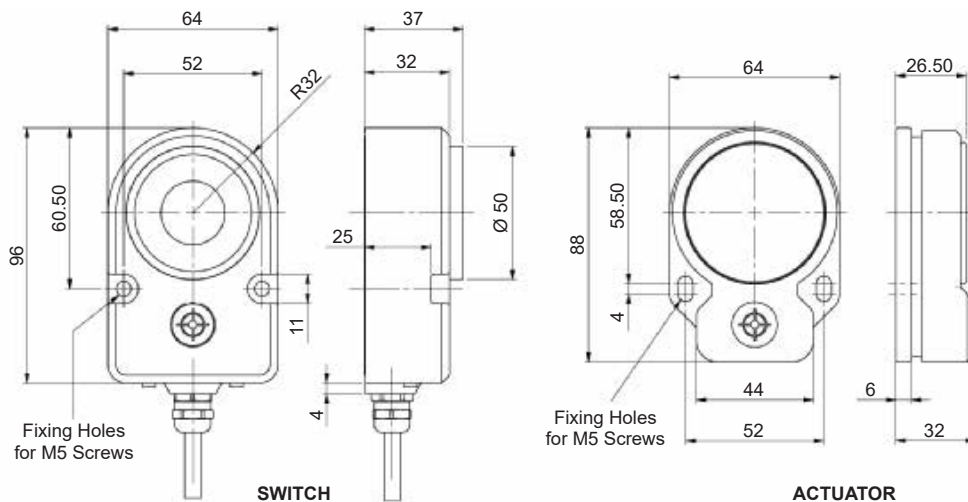


**Note:** DO NOT use switch and actuator as a guard door stop.

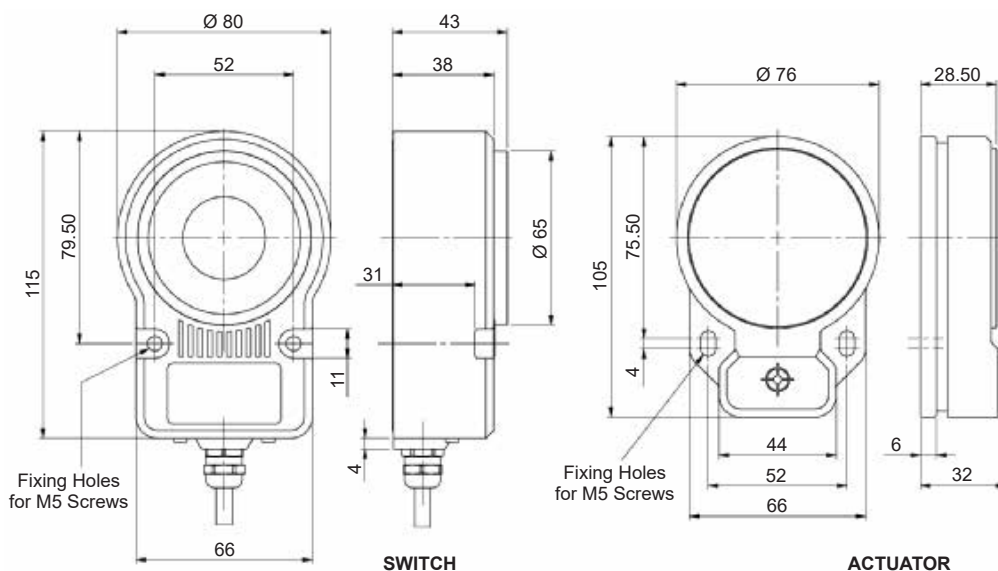


## Dimensions

### 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.

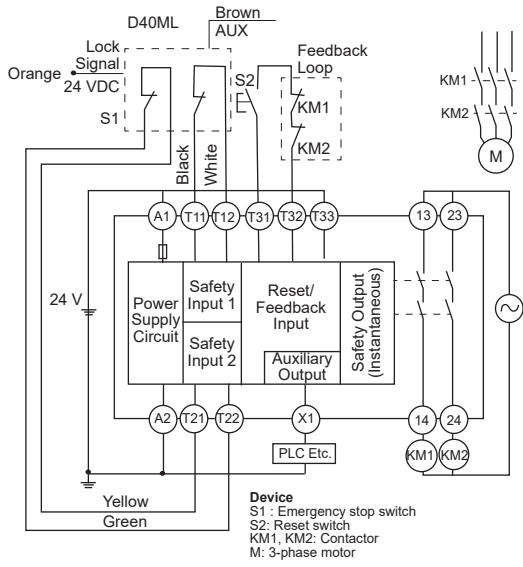
**NOTE:** The safety outputs will only close when the actuator is in place and the lock magnet is energized. Forcing open of the lock will cause the safety outputs to open.

**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.

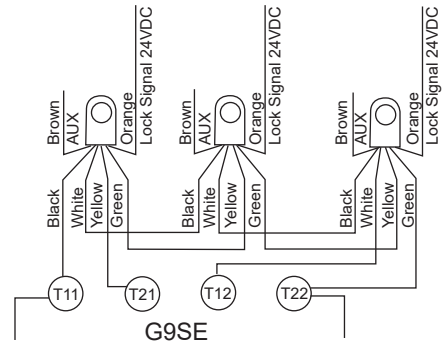
# D40ML Series

## 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)**



# Terms and Conditions Agreement

## **Read and understand this catalog.**

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## **Warranties.**

- (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.
- (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

## **Limitation on Liability; Etc.**

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

## **Suitability of Use.**

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## **Programmable Products.**

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

## **Performance Data.**

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

## **Change in Specifications.**

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

## **Errors and Omissions.**

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

**OMRON Corporation Industrial Automation Company**

**Contact: [www.industrial.omron.eu](http://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

**Authorized Distributor:**

© OMRON Corporation 2013-2016 All Rights Reserved.  
In the interest of product improvement,  
specifications are subject to change without notice.

**Cat. No. F22E-EN-01B**

0120(0613)