

FDM M12 CYLINDRICAL PHOTOELECTRIC SENSORS

Installation Manual - 806001380 Rev. A - ENG - Created: 04/06/2024

SUPPLIED MATERIAL

- 2 metallic ring nuts
- Trimmer adjustment accessory ST82 for emitters with sensitivity adjustment

GENERAL DESCRIPTION

- M12 Cylindrical photoelectric sensors - DC Digital sensitivity adjustment by Teach-in button or remote cable

Multifunctional LED with signal level indication

Sensing distance:

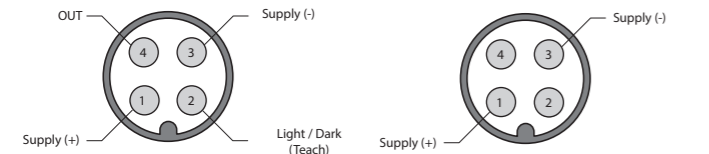
- Diffuse reflection 100, 300 mm, polarized 2,5 m, through-beam 4 m
- Emission, Diffusion reflection, Through-beam: infrared (880 nm).
- Polarized: red (660 nm).

Housing Material: nickel-plated brass

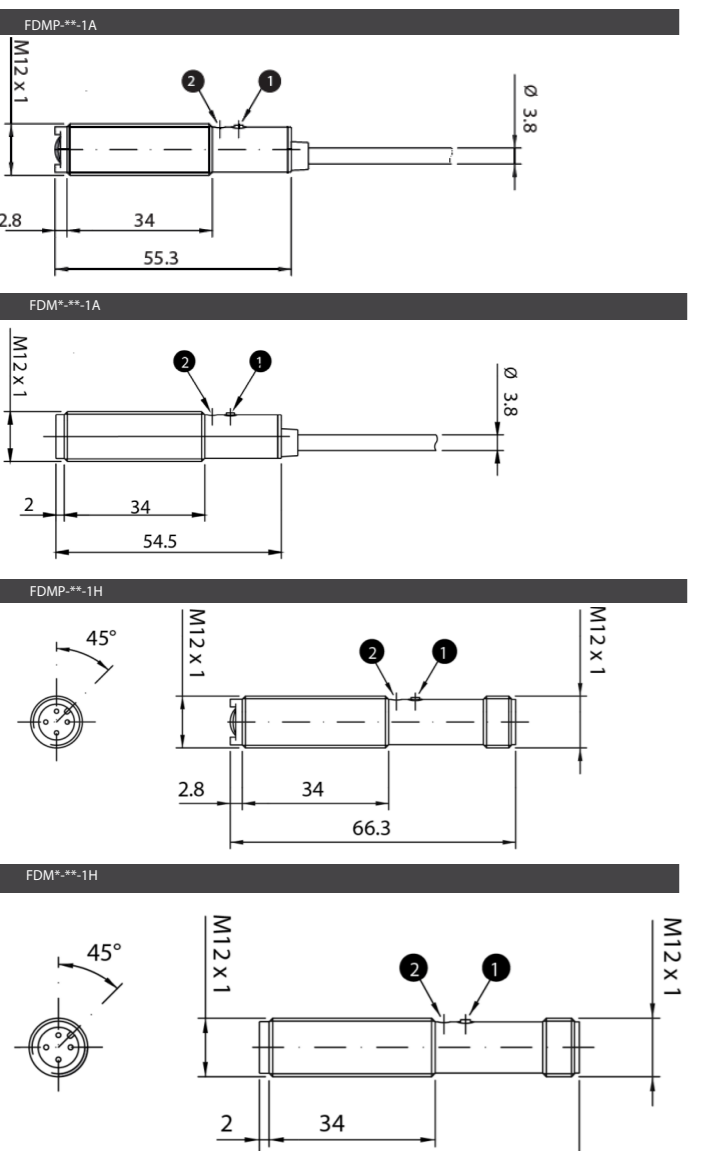
Output: NPN or PNP, 100 mA, with short circuit protections.

PLUG

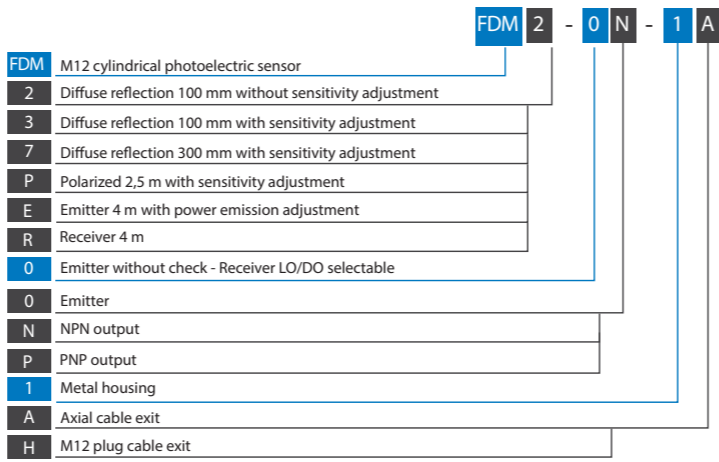
M12 diffuse reflection polarized receiver



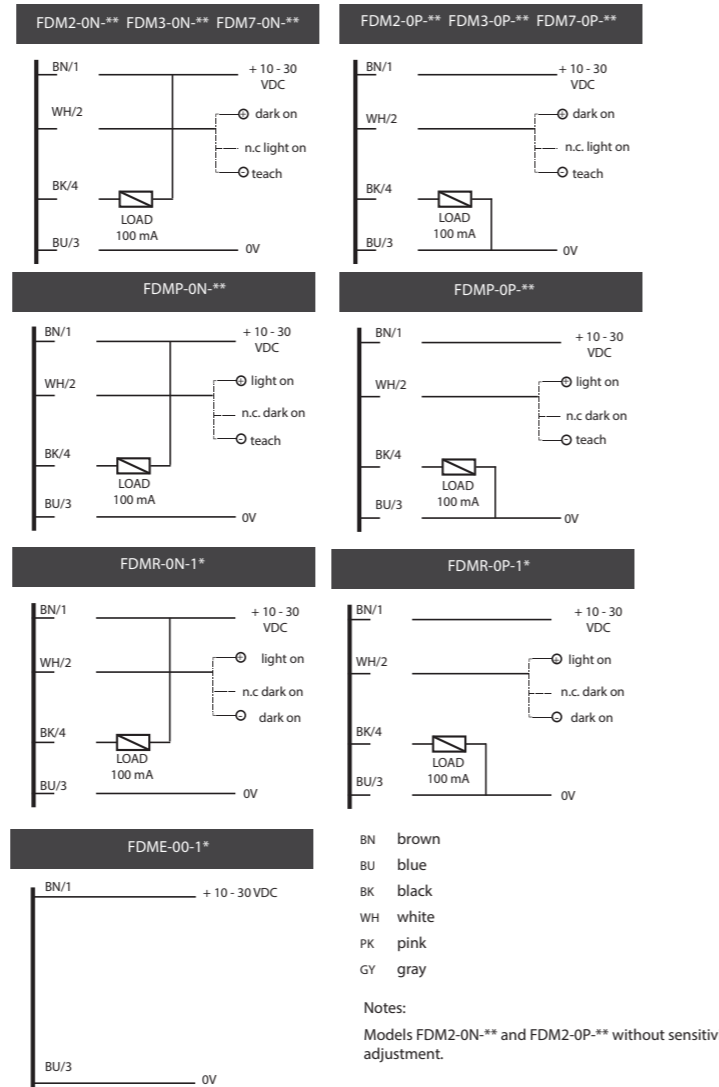
DIMENSIONS



CODE STRUCTURE



ELECTRICAL DIAGRAMS OF THE CONNECTIONS



- BN brown
- BU blue
- BK black
- WH white
- PK pink
- GY gray

Notes:
Models FDM2-0N-** and FDM2-0P-** without sensitivity adjustment.

TECHNICAL SPECIFICATIONS

Models	diffuse reflection		polarized	through-beam	
	FDM2-0*-1*	FDM3-0*-1*	FDM7-0*-1*	FDMR-0*-1*	FDME-0*-1*
nominal sensing distance	100 mm ⁽¹⁾	300 mm ⁽²⁾	2,5 m ⁽³⁾	4 m	
emission	infrared (880 nm)		red (660 nm)	infrared (880 nm)	
tolerance	+ 10 % / - 5 %				
hysteresis	+ 10 %				
repeatability	5%				
operating voltage	10...30 Vcc				
ripple	≤ 10 %				
no-load current	≤ 30 mA				
load current	100 mA				
leakage current	≤ 150µA				
output voltage drop	2 V max. IL = 100 mA				
output type	NPN or PNP - LO / DO selectable				
switching frequency	1 kHz		250 Hz		
response time	500 µs		2 ms		
power on delay	150 ms				
power supply protections	polarity reversal, transient				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
output protection	short circuit (autoreset)				
temperature range	- 25°C...+ 70°C				
temperature drift	10 % Sr				
protection degree	IP67 (EN60529) ⁽⁴⁾				
check input	15000 lux (incandescent lamp)		5000 lux (incandescent lamp)		
external light interference	>1000lux fluorescent lamp		>3000lux fluorescent lamp		
LEDs	yellow				
sensitivity adjustment	-	Teach		-	Trimmer
housing material	nickel-plated brass				
optic material	PMMA				
tightening torque	10 Nm				
weight (approximate)	30 g connector / 75 g cable				

INSTALLATION

- To aid fastening the following optional brackets are available: ST12-A, ST12C, ST04
- Do not use the sensor where it may be exposed to dust, water, steam, etc. which could affect detection
- Do not use alcohol or chemical products to clean lens
- Do not allow a strong light such as sun light to radiate directly on the sensor
- On the models with plug cable exit the ring nuts must be tightened firmly to avoid impairing the sensor's protection degree IP67.

SENSITIVITY ADJUSTMENT

Two types of digital sensitivity adjustment are possible on the diffuse reflection and polarized sensors: standard adjustment and fine adjustment. Fine adjustment is ideal for achieving the greatest sensitivity for the detection of small and semi-transparent objects; if the target objects are opaque or of larger dimensions, or if the background does not affect the reading, standard adjustment should be used as it guarantees that the system can operate in harsh environments. On the through beam sensors sensitivity adjustment is available by means of a trimmer.

Diffuse reflection

Install the unit and select the output state. Position the target object at the sensing distance required, checking that the optical axis is perpendicular to the surface of the object. Assuming the worst possible conditions (object smaller and object or part of object darker than the background), position the object at the furthest possible point from the sensor. Press the Teach-in button or connect pin 2 (white cable) to earth for 2...5 sec. until the yellow signal LED switches back on constantly. The threshold is set at 50% of the detected

The threshold is set at 50% of the detected signal, thus giving the device a standard sensitivity adjustment. Remove the object and check that the yellow LED has switched off. If the yellow LED remains switched on, fine sensitivity adjustment is required.

To carry out the fine adjustment connect pin 2 (white cable) to earth or press the Teach-in button for >8 secs. Until the yellow signal LED starts flashing. The threshold is set below the detected signal of the hysteresis amplitude. Remove the object and check that the yellow LED has switched off.

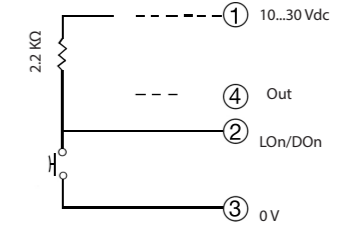
Polarized

Install the retro-reflector so that its surface is perpendicular to the sensor's optical axis. Make sure that the distance between the sensor and the retro-reflector is not greater than that specified for the retro-reflector in use. Provisionally secure the sensor in a stable position and select the output state. To achieve the best alignment, use the following procedure. Press the Teach-in button, or connect pin 2 (white cable) to earth for >8 secs., until the yellow signal LED starts flashing. The threshold is set below the detected signal of the hysteresis amplitude. Adjust the sensor by moving it vertically and horizontally until the LED switches on constantly, or at least until the frequency of the flashes decreases. Repeat the operation until it is no longer possible to vary the frequency at which the yellow LED flashes. Secure the sensor in a stable position and check that the LED switches off when the beam is interrupted by the target object. In this way a correct centring on the retro-reflector in use and a fine adjustment is ideal for the accurate detection of semi-transparent object.

For applications in which the target objects are not transparent, the standard adjustment is recommended (after having carried out the operations described above). This gives the highest possible margin of immunity to the dust or dirt, which can deposit on the optical elements. To carry out a standard adjustment press the Teach-in button or connect pin 2 (white cable) to earth for 2...5 sec., until the yellow signal LED switches back on constantly. The threshold is set at 50% of the detected signal. Check that the LED switches off when the beam is interrupted by the target object. If the yellow LED remains switched on, fine sensitivity adjustment is required.

Teach-in with Dark ON configuration

Should it be necessary to use the teach input with a DARK ON configuration 2.2 KΩ resistor must be added to avoid short circuits in the power supply when the teach mode is active.



Through-beam

Using the recommended brackets, provisionally install the emitter and receiver within the sensing distance. Position the components so that they coincide with the optical axis as much as possible. Check that the sensitivity adjustment trimmer is turned to the furthest clockwise position. Adjust the receiver by moving it vertically and horizontally until the yellow LED on the receiver switches on. Adjust the receiver by moving it vertically and horizontally until the yellow LED switches on constantly. Secure the system properly and proceed with the sensitivity adjustment. Check that, when no object is present, the yellow LED on the receiver is constantly switched on. Turn the sensitivity adjustment trimmer in an anticlockwise direction until the LED switches off. Turn the trimmer in a clockwise direction until the signal LED switches back on constantly. This is the position in which the system can operate in the optimum conditions for detecting both solid parts and spaces with equal precision and with a good safety margin. If the target object does not create problems, the trimmer can be turned clockwise to the furthest position to achieve higher working limits.

Check that the yellow LED on the receiver switches off when the optical beam is interrupted.

CONNECTIONS

1. Make sure that the operating voltage is correctly stabilized with a maximum ripple being within the specified figure as stated in the catalogue.
2. When using a "switching" regulator for the power source be sure to earth both the frame round terminal and the sensor
3. In the event that the noise induced by the power lines is greater than that specified by the EMC directive (interference immunity), detach the sensor cables from the power and high voltage lines and insert the cable in an earthed metal conduit. Furthermore, it is advisable to connect the sensor directly to the supply source and not downstream of other devices
4. To extend to supply and output cables, a cable with a minimum cross-section of 1 mm² must be used. The length of such an extension is limited to a maximum of 100 m (with respect to a minimum voltage and load current of 100 mA)
5. The sensor will become active 150 ms after supply voltage is applied. During this time, the outputs will be OFF.