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OMRON

Mark and Colour Sensors

Fast adaption and reliable operation

» Reliable mark detection even in changing environmental conditions

» Fast and easy adaption to new materials and designs

» Different performance levels to match your machine concepts

realizing

361°

MARK SENSORS

Choose the performance you need

In packaging machines to ensure the correct positioning of packaging material before filling or closing operations, characteristic registration marks or design elements have to be detected. At OMRON we closely work together with leading packaging machine makers to evaluate the requirements for sensors from commonly used packaging material as well as most critical designs or materials. In addition the performance requirements vary according to the overall machine value concept.

- Reliable mark detection even in changing environmental conditions during machine operation
- Fast and easy setup up after packaging material exchange
- Performance levels fitting the machine value concept:

LITE Line	Best choice in value for money
PRO Line	Best in reliability, flexibility, stability
PRO^plus Line	Best performance for dedicated applications

Standard print mark detection	**Challenging designs or colour marks**	**Complex shape and position detection and synchronized quality inspection.**
For print marks most commonly used in the packaging and printing industry, the contrast sensors with white LED have an optimised light intensity and RGB ratio evaluation algorithm ensuring a stable and fast detection.	Objects with complex designs or where the contrast between print mark and background is low, require sensors that allow an easy adaption to the specific requirements of the particular task.	For positioning and machine synchronisation tasks e.g. requiring the recognition of words or symbols, the shape, position detection functionalities of the vision sensors and systems can be set up to provide solutions for the most complex and challenging tasks. The vision systems can also detect the registration mark and perform position and quality inspections at the same time.
• Compact housing concept for high flexibility in machine design • Fast response time of 50 µs	• Amplifiers with digital value displays and advanced signal evaluation functions for application optimised settings • Wide range of sensing heads fitting the application and distance requirements	
LITE	PRO	PRO^plus

E3ZM-V	**E3X-DAC-S**	**FQ2**	**Xpectia lite**
Autoteach and white LED	White LED, RGB ratio comparison and extended functionality	Simply guided and crystal clear	Performance in touch with simplicity
see page 4	**see page 5**	**Refer to QUALITY CONTROL & INSPECTION GUIDE**	

COLOUR SENSORS

Choose the performance you need

For the verification of correctly coloured bottle caps or for sorting and classification tasks, the OMRON colour sensors provide a wide performance range from:

LITE Line	Easy one or multi colour detection at excellent value for money
PRO Line	Colour detection with the flexibility of a vision sensor yet easy to set up and use
PRO^{plus} Line	Highest colour detection and processing performance with the flexibility and power of a vision system

Application performance level	Output			Tolerance
	Colour detected – digital output	RGB value out (via ethernet)	HSV value out (via ethernet)	
PRO^{plus} Highest performance image processing	**Xpectia lite** Refer to QUALITY CONTROL & INSPECTION GUIDE			Full real colour & image processing flexibility
PRO Complex colour, shape and position verification (combinations), remotely programmable Adjustable inspection area	**FQ2-CLR-V32** page 8 **FQ2-CLR-V1** page 8			Teachable, auto or manually adjustable tolerance range
LITE Multi Colour Memory Single Colour	**E3X-DACLRX4** page 7 **E3X-DACLRX1** page 7			Teachable or auto tolerance range

3

Registration mark sensor in compact stainless steel housing

The registration mark detection sensor in a compact stainless steel housing provides reliable detection of all common registration marks in food packaging applications.

- White LED for stable detection of differently coloured or black print marks
- SUS 316L stainless steel housing
- Easy-to-use teach-in button or remote teach
- Fast response time of 50 µs

Ordering information

Sensor type	Sensing distance	Connection method				Order code[1]	
						NPN output	PNP output
Mark sensor	12±2 mm	–	–	2 m	–	E3ZM-V61 2M	E3ZM-V81 2M
		■	–	–	–	E3ZM-V66	E3ZM-V86

[1] The output configuration (ON or OFF when mark is detected) is teachable. Common operation is output is ON when mark is detected.

Specifications

Item	NPN	E3ZM-V6_
	PNP	E3ZM-V8_
Light source (wave length)		White LED (450 to 700 nm)
Power supply voltage		10 to 30 VDC ±10%, ripple (p-p) 10% max.
Protective circuits		Reversed power supply polarity protection, output short-circuit protection, Reversed output polarity protection, and mutual interference prevention
Ambient temperature	Operating	-25°C to 55°C
	Storage	-40°C to 70°C (with no icing or condensation)
Response time		50 µs
Degree of protection		IEC: IP67, DIN 40050-9: IP69K
Material	Case	SUS316L
	Lens	PMMA (polymethylmethacrylate)
	Display	PES (polyether sulfone)
	Sensitivity adjustment and operation switch	PEEK (polyether ether ketone)
	Seals	Fluoro rubber
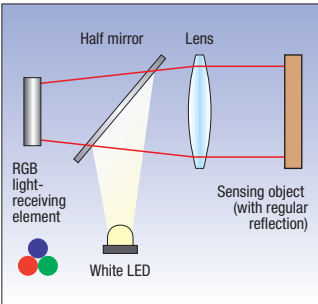
Coaxial optical system with white LED

Remote teaching
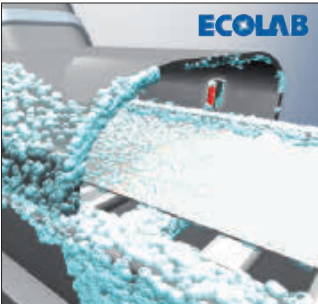
Detergent resistant

Reliable detection of standard or semi-transparent marks at normal or high speed

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E3X-DAC-S high functionality mark detection sensor

The E3X-DAC-S provides reliable mark detection for standard as well as challenging applications. The separate sensing head setup allows the easy adaption to the mounting requirements even when space is crucial. The remote amplifier provides easy teaching for standard applications but also on demand full control over the detection performance for most challenging applications.

Ordering information

Pre-wired

Item	Functions	Order code (for pre-wired types with 2 m cable length)	
		NPN output	PNP output
Standard models	Timer, response speed change	E3X-DAC11-S	E3X-DAC41-S
Advanced models	Same as standard models + simultaneous determination (2 colours) AND/OR output, remote setting	E3X-DAC21-S	E3X-DAC51-S

Connector versions

Item	Functions	Order code	
		NPN output	PNP output
Standard models (fiber amplifier connector) [1]	Timer, response speed change	E3X-DAC6-S	E3X-DAC8-S

[1] Order connector separately

Specifications

Item		Standard models E3X-DAC1, E3X-DAC4 E3X-DAC6, E3X-DAC8	Advanced models E3X-DAC2, E3X-DAC5
Light source (wave length)		White LED (420 to 700 nm)	
Number of registered marks		1	2 (simultaneous determination)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Protective circuits		Power supply reverse polarity protection, output short circuit protection, output reverse polarity protection, mutual interference prevention	
Ambient temperature	Operating	-25° to 55°C	
	Storage	-30° to 70°C (with no icing or condensation)	
Response time	Super-high-speed mode Standard mode	Operation or reset: 60 µs Operation or reset: 1 ms	Operation or reset: 120 µs Operation or reset: 2 ms
Sensitivity setting		Teaching (one-point teaching or teaching with/without workpiece) or manual adjustment	
Functions	Detection mode[1]	Automode (automatic selection of C-mode or I-mode) C-mode (RGB ratio) I-mode (light intensity) Mark mode (Intensity and ratio of RGB values)	
	Operating mode	ON for match (ON for same colour as registered colour) or ON for mismatch (ON for different colour from registered colour)	
	Timer function	Timer type: OFF delay, ON delay, or one-short Timer time: 1 ms to 5 s (variable)	
	Control outputs	–	Output for each channel, AND output, and OR output
	Remote control	–	One-point teaching, teaching with/without workpiece, zero reset, and light emission OFF
Degree of protection		IEC60529 IP50 (with protective cover attached)	

[1] For more detailed information on the detection modes see page 9

Recommended fiber heads

Sensor type	Size	Recommended operating distance (mm)	Comment	Order code
	M6	5	Standard mark detection	E32-CC200 2M
	29x25.5x11.2 mm	40-50	Long distance - plastic	E32-L15 2M
	23x20x9 mm	25-30	Long distance - metal	E32-A09 2M
	M3	10	High precision mark detection (dia 1mm spot)	E32-EC31 2M + E39-EF51

Fiber amplifier connectors

Shape	Type	Comment	Order code
	Fiber amplifier connector	2 m PVC cable	E3X-CN21
		30 cm PVC cable with M12 plug connector (4 pin)	E3X-CN21-M1J 0.3M
		30 cm PVC cable with M8 plug connector (4 pin)	E3X-CN21-M3J-2 0.3M

Easy to operate detection of challenging or coloured registration marks.

Detection of challenging registration marks e.g. with texts or graphics.

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Easy-Teach Colour Detection Sensor

The E3X-DACLR provides reliable and easy to set up one-touch colour verification. Up to four colours can be identified. The separate amplifier allows mounting in easily accessible areas for operators while the small sensor head can be mounted in locations even when space is limited.

- Easy to set up one-touch colour verification for 1 to 4 colours
- Model for remote teaching
- Small sensor head for easy mounting even when space is tight
- White LED and multi detection modes for reliable operation even for challenging applications

Ordering information

Type	Output	Tolerance adjustment	Connection method	Order code PNP[1]
Single colour detection	Digital colour detected out	– Object teaching (good sample) with auto-tolerance	M8 4-pin pigtail (with 30 cm PVC cable)[2]	E3X-DACLRX1P-M3J 0.3M
1 to 4 colour detection	Digital colour detected out (with bank switching)	– 2-point teaching (good and bad sample)	2 m PVC cable	E3X-DACLRX4P 2M

[1] NPN models are available. Contact your Omron representative.
[2] Models with 2 m PVC cable or M12 pigtail connector are available. Contact your Omron representative.

Specifications (amplifier and sensing head)

Item		Single colour detection	1 to 4 colour detection
Light source (wave length)		White LED (420 to 700 nm)	
Number of registered marks		1	1 to 4 (2 banks switchable by external input with 2 colours each)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Protective circuits		Power supply reverse polarity protection, output short circuit protection, output reverse polarity protection, mutual interference prevention	
Ambient temperature	Operating	-25° to 55°C (amplifier) -40° to 70°C (sensing head)	
	Storage	-30° to 70°C (amplifier); (without icing or condensation) -40° to 70°C (sensing head)	
Response time	Super-high-speed mode Standard mode	Operation or reset: 60 µs Operation or reset: 1 ms	Operation or reset: 120 µs Operation or reset: 2 ms
Functions	Operating mode	ON for match (ON for same colour as registered colour) or ON for mismatch (ON for different colour from registered colour)	
	Timer function	Timer type: OFF delay, ON delay, or one-short Timer time: 1 ms to 5 s (variable)	
	Remote control	–	One-point teaching, teaching with/without workpiece, zero reset, and light emission OFF
Degree of protection		IEC60529 IP50 (with protective cover attached)	

Vision Colour Sensor with teachable inspection area and RGB value processing

The vision colour sensor FQ2-CLR provides real colour identification functionality in combination with the flexibility and functionality of a vision sensor. The teachable inspection area provides an easy and flexible set up. The colour processing and evaluation can be carried out by the FQ2-CLR directly or the RGB values are available via Ethernet to other devices.

- Teachable inspection area
- Models with single colour detection or up to 32 colour and image processing tasks
- RGB values via Ethernet

Ordering information

Type	Output	Tolerance adjustment	Connection method	Order code PNP[1]
Single colour	Digital colour detected out and/or RGB value out (via ethernet)	– Object teaching (good sample) with auto-tolerance	3 m PVC cable or	FQ2-CLR-V1P 3M[3]
1 to 32 colour and image processing tasks		– 2-point teaching (good and bad sample)	3 m Ethernet cable[2]	FQ2-CLR-V32P 3M

[1] NPN models are available. Contact your Omron representative.
[2] I/O and Ethernet cables are included. Other cable lengths can be provided on request. Contact your Omron representative.
[3] Programming device 'Touch Finder FQ2-D31' is not included. Order separately incl. AC power supply and battery or use PC Tool to program FQ2-CLR.
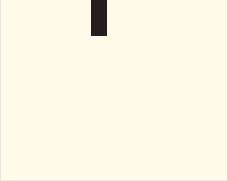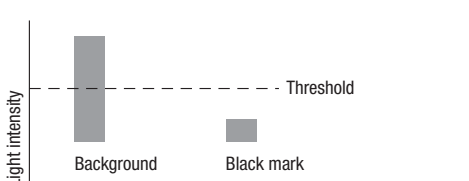
Programming device
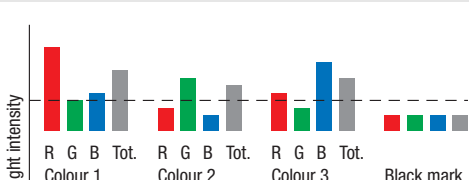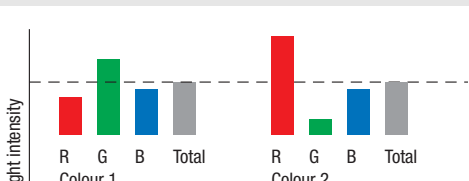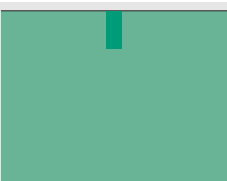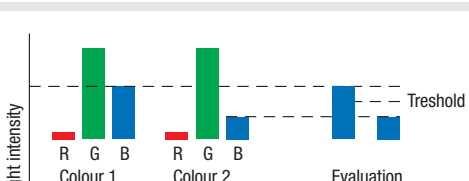
	Type		Order code
	Touch Finder (included in FQ2-CLR-V32P)[1]		FQ2-D31
		AC power supply (plug type c) for FQ2-D31	FQ-AC4
		Rechargeable battery for FQ2-D31	FQ-BAT1

[1] The FQ2-CLR can be programmed either with the Touch Finder or via a PC using the FQ2 PC Tool. After programming the FQ2-CLR, the programming device can be disconnected. Only one programming device is required for programming multiple FQ2-CLR. Contact your OMRON representative for FQ2-CLR-V32P version without included Touch Finder.

Specifications

Item		FQ2-CLR-V□
Field of view		13 x 8.2 to 53 x 33 mm
Installation distance		56 to 215 mm
Ambient temperature	Operating	0° to 50°C
	Storage	-25° to 65°C (without icing or condensation)
Degree of protection		IEC 60529 IP67

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Contrast and colour sensing
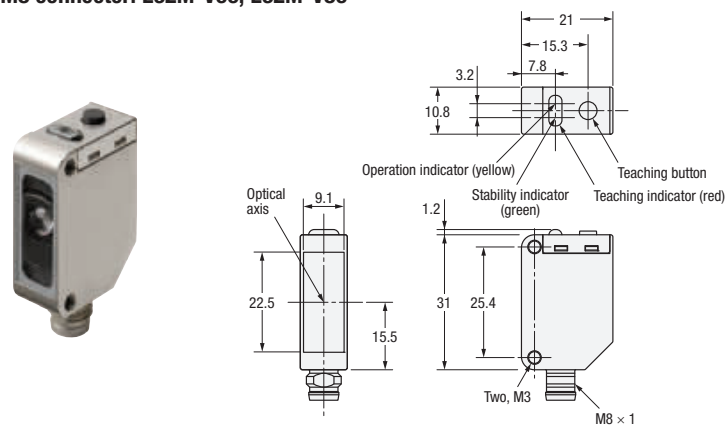
Item		Explanatory diagram		Meaning
Contrast sensing	Black marks on monochrome backgrounds			Contrast/mark sensors evaluate the intensity/amount of the returned light and are able to distinguish between two levels e.g. a black print mark and the background by setting the threshold in the middle between the two intensity levels.
	Black marks with multi-coloured backgrounds (Register mark mode)			For a stable detection of black marks on multi-coloured backgrounds, a higher detection stability can be achieved when the threshold is set closer to the black mark light intensity.
Colour/colour mark detection	RGB ratio comparison (C-mode)			Colours with similar black/white contrast values may be difficult to differentiate by standard contrast sensors. Sensors evaluating the difference in the colour spectrum by comparing RGB (red, green, blue) ratios, allow a differentiation of colours (full colour sensors).
	Colour intensity comparison (I-mode)			For colours with similar RGB values, evaluating not the full RGB ratio but only the colour with the highest value difference, provides a higher detection stability.

Mark sensor (Diffuse reflective)
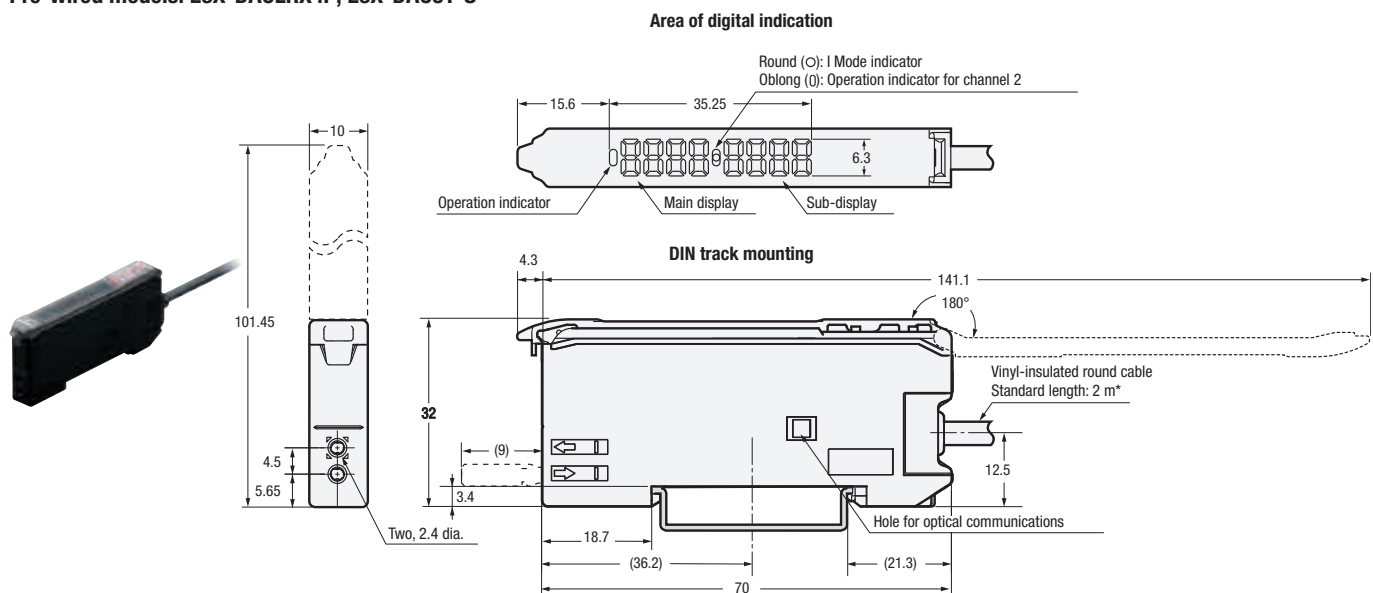
Pre-wired models: E3ZM-V61, E3ZM-V81

Optical axis

9.1

22.5

15.5

21
15.3
7.8
3.2
10.8

1.2

31 25.4

Operation indicator (yellow)
Teaching button
Stability indicator (green)
Teaching indicator (red)

Two, M3

4-dia. Vinyl-insulated round cable with 4 conductors
(Conductor cross section: 0.2 mm² (AWG.24), Insulator diameter: 1.1 mm), Standard length: 2 m
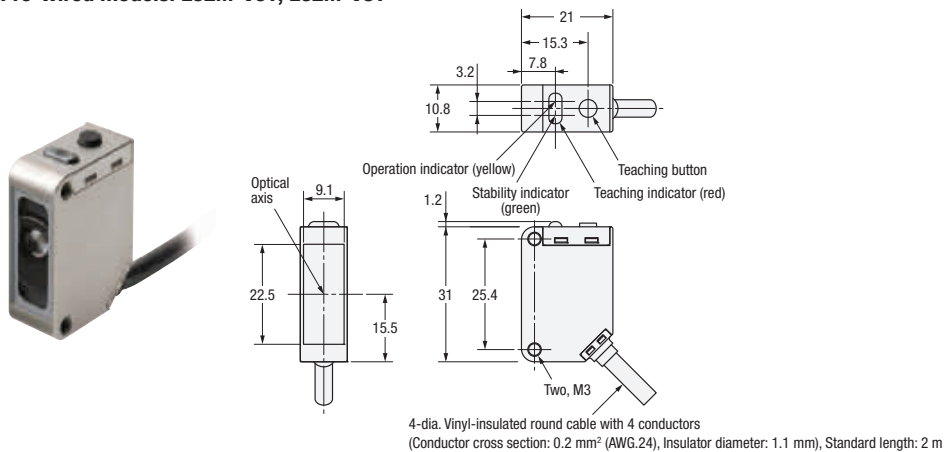
M8 connector: E3ZM-V66, E3ZM-V86

Optical axis

9.1

22.5

15.5

21
15.3
7.8
3.2
10.8

1.2

31 25.4

Operation indicator (yellow)
Teaching button
Stability indicator (green)
Teaching indicator (red)

Two, M3

M8 × 1

Amplifier unit

Pre-wired models: E3X-DACLRX4P, E3X-DAC51-S

Area of digital indication

Round (○): I Mode indicator
Oblong (◍): Operation indicator for channel 2

15.6 35.25 6.3

Operation indicator
Main display
Sub-display

DIN track mounting

10

101.45

4.5
5.65

Two, 2.4 dia.

4.3
32

(9)
3.4

18.7
(36.2)
70

141.1
180°

Vinyl-insulated round cable
Standard length: 2 m*

12.5

Hole for optical communications

(21.3)

Product dimensions

Fiber unit

E32-L15

Sensing surface (10x24.5)

Source lens

Optical axis

Receive lens

2-lens (Ø9)

11.6
11.2

29

14

11.5

13.6

25.6

10.9

6.9

5.6

Type indicated tube

Optical fiber (Ø2.2)

Mounting holes 2-Ø3.2

Sensor unit

FQ2-CLR

The mounting bracket
FQ-XL(included with Sensor)

Optical axis

46

45

67.5

1

90

(108)

32

19

11

38

8

(57)

(18)

44

4-M4
Depth: 6

20

(25)

1/4-20UNC
Depth: 6

20

38

42

Mounting hole dimensions

Two, 4.5 dia.

20±0.1

Tightening torque: 1.2 N·m

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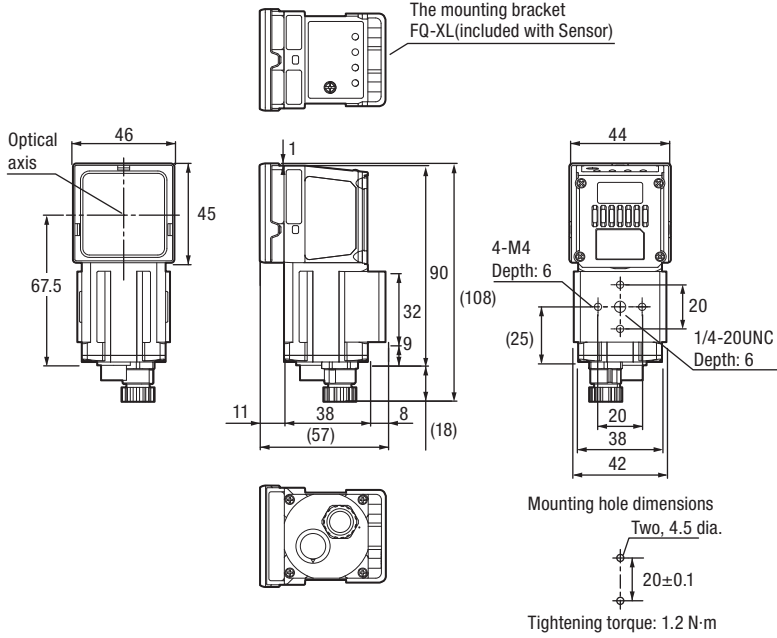
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Photoelectric Sensor, Reflex Long distance square head	172351	E32-A09 2M	Buy on EAN
Photoelectric sensor, SLR coaxial Threaded M6	182805	E32-CC200 2M	Buy on EAN
Photoelectric sensor, metal 4h Brands cc PNP Teach 12mm SLR. Cable 2m	326595	E3ZM-V81 2M	Buy on EAN
Photoelectric sensor, metallic Brands cc 4h 12mm SLR NPN Teach.	332046	E3ZM-V61 2M	Buy on EAN
Photoelectric sensor, metallic Brands cc 4h 12mm SLR NPN Teach. M8	332048	E3ZM-V66	Buy on EAN
Photoelectric sensor, metal 4h Brands cc PNP Teach 12mm SLR. M8	332049	E3ZM-V86	Buy on EAN
Photoelectric sensor, detection marks 3h cc PNP Teach Connection M / E	323872	E3X-DAC8-S	Buy on EAN
Photoelectric Sensor, Reflex 50mm long distance focal point	392260	E32-L15 2M	Buy on EAN
Vision System, Touch Finder AC / DC / Battery	372136	FQ2-D31	Buy on EAN
Vision system, mounting bracket FQ	337797	FQ-XL	Buy on EAN