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

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.

- Compact housing concept for high flexibility in machine design
- Fast response time of 50 µs

LITE

Challenging designs or colour marks

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.

- 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

PRO

Complex shape and position detection and synchronized quality inspection.

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.

PRO^{plus}

E3ZM-V

Autoteach and white LED

see page 4

E3X-DAC-S

White LED, RGB ratio comparison and extended functionality

see page 5

FQ2

Simply guided and crystal clear

Xpectia lite

Performance in touch with simplicity

Refer to QUALITY CONTROL & INSPECTION GUIDE

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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: Colour detected – digital output	Output: RGB value out (via ethernet)	Output: HSV value out (via ethernet)	Tolerance
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

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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

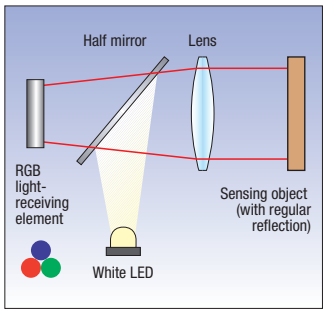
Ordering information

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.

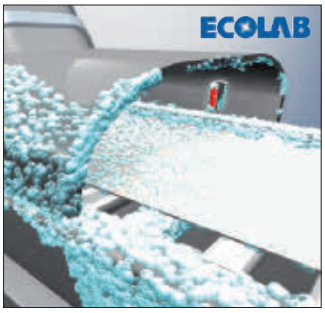
Specifications

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

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

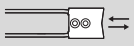
*1 Order connector separately

Specifications

Item		Standard models	Advanced models
		E3X-DAC1, E3X-DAC4 E3X-DAC6, E3X-DAC8	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	Operation or reset: 60 µs	Operation or reset: 120 µs
	Standard mode	Operation or reset: 1 ms	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.

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 – 2-point teaching (good and bad sample)	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 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 – 2-point teaching (good and bad sample)	3 m PVC cable or 3 m Ethernet cable[*2]	FQ2-CLR-V1P 3M[*3]
1 to 32 colour and image processing tasks				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

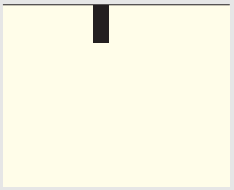
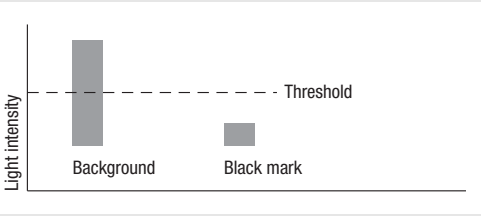
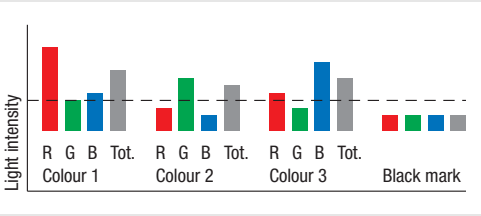
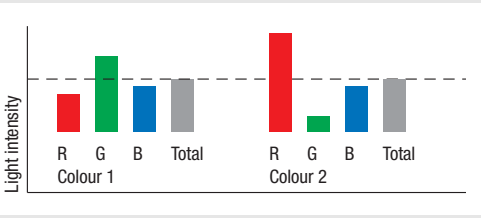
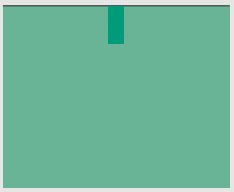
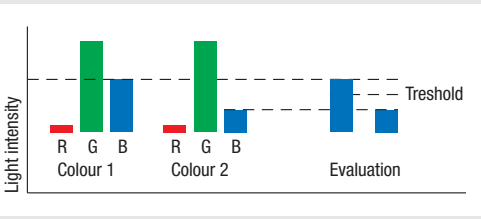
Type		Order code
	Touch Finder (included in FQ2-CLR-V32P)[*1]	FQ2-D31
	AC power supply (plug type c) for FQ2-D31	FQ-AC4
	Rechargeable battery for FQ2-D31	FQ-BAT1

[*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

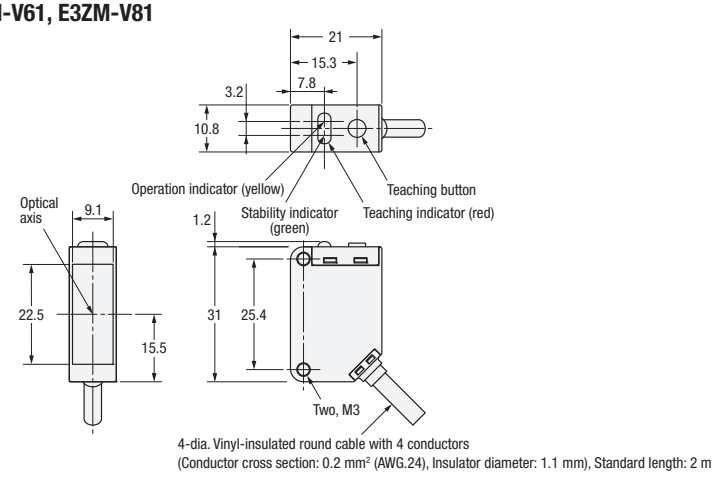
Contrast and colour sensing

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.

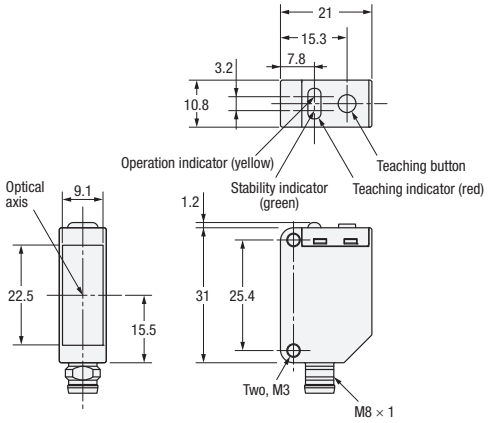
Product dimensions

Mark sensor (Diffuse reflective)

Pre-wired models: E3ZM-V61, E3ZM-V81

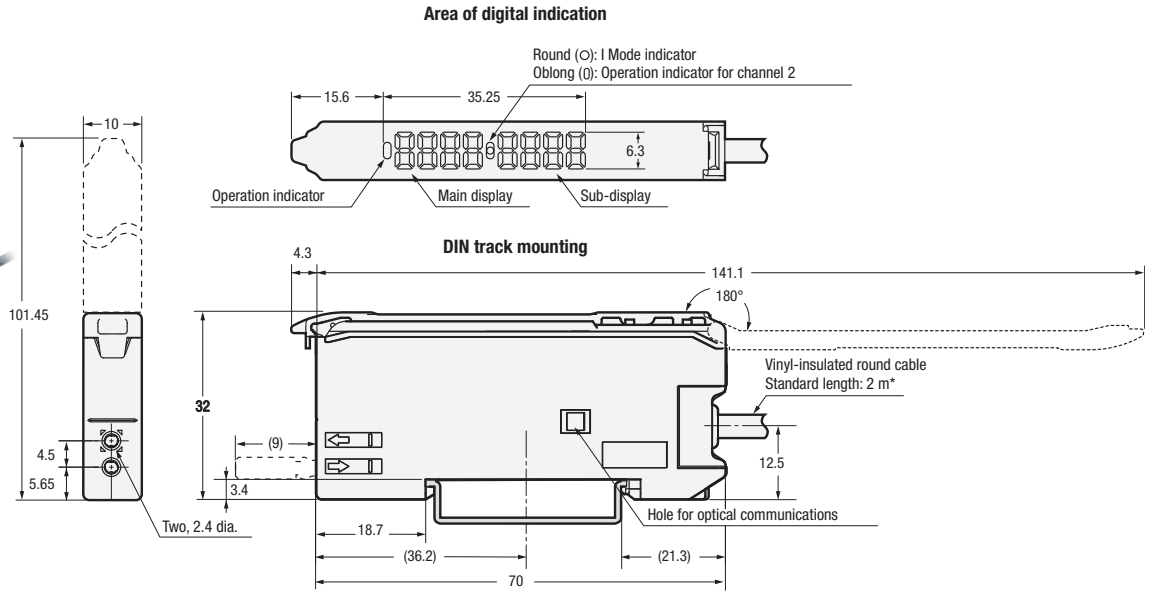


M8 connector: E3ZM-V66, E3ZM-V86



Amplifier unit

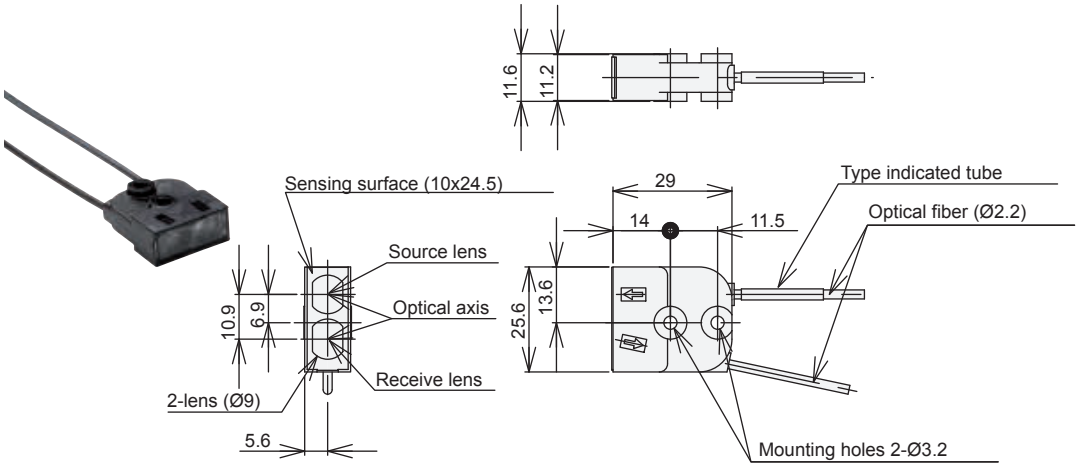
Pre-wired models: E3X-DACLRX4P, E3X-DAC51-S



Product dimensions

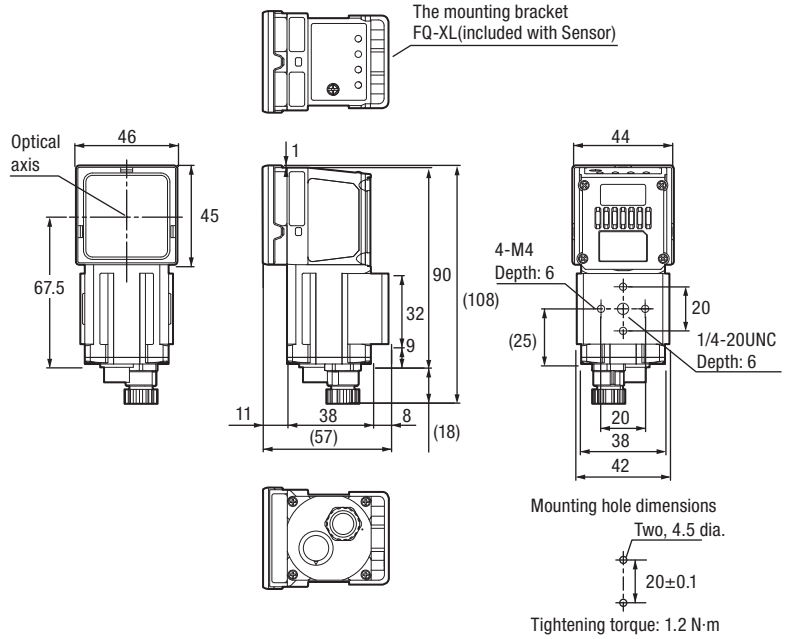
Fiber unit

E32-L15



Sensor unit

FQ2-CLR



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