Panasonic

● SPECIFICATIONS

| Type		Cable type	Connector type
Model	NPN output	LX-111	LX-111-Z
Item	PNP output	LX-111-P	LX-111-P-Z
Sensing range		10±3 mm	
Spot size		1×5 mm (at a setting distance of 10 mm)	
Supply voltage		12 to 24 V DC ± 10% / Ripple P-P 10% or less	
Power consumption		850 mW or less (Power voltage 24V, current consumption 35 mA or less)	
Mode switching input		<NPN output type> Mark mode ·Low…0 to +2 V (Source current 0.5mA or less) ·Input impedance: approx. 10 kΩ Color mode High…+5 V to +V or open	<PNP output type> Color mode ·High…+5 V to +V (Sink current 3mA or less) ·Input impedance: approx. 10 kΩ Mark mode Low…0 to + 0.6V or open
Output		<NPN output type> NPN open-collector transistor ·Maximum sink current: 50 mA ·Applied voltage: 30 V DC or less (between output and 0 V) ·Residual voltage: 1.5 V or less (at 50 mA sink current) (Note 1)	<PNP output type> PNP open-collector transistor ·Maximum source current: 50 mA ·Applied voltage: 30 V DC or less (between output and + V) ·Residual voltage: 1.5 V or less (at 50 mA source current) (Note 1)
	Output operation	Mark mode: Light ON during light receiving, Color mode: Light ON in consistency	
	Short-circuit protection	Incorporated (Auto reset type)	
Response time		Mark mode: 45 µs or less, Color mode: 150 µs or less	
Operation indicator		Orange LED (light ON when output is ON)	
Protection		IP 67 (IEC)	
Ambient temperature		-10 to + 55 °C (No condensation or icing), Storage: -20 to + 70 °C	
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH	
Emitting element		Red / green / blue LED (Peak emitting wavelength: 640 nm / 525 nm / 470 nm)	
Material		Enclosure: PBT, Operation key: Silicone rubber, Operation panel, Lens: PC (Poly Carbonate)	
Cable		0.2 mm² 4-core cabtyre cable (standard length: 2 m)	(Note 2)
Cable extension		Total length can be extended up to 100 m with cable of 0.3 mm² or more.	
Weight		Net weight: approx. 110 g Packing weight: approx. 120 g	Net weight: approx. 50g Packing weight: approx. 55g

(Note 1): The ambient temperature is + 23 °C where the detection conditions are not specified precisely.
(Note 2): Mating cable is not provided with the connector type. Please order it separately.
CN-24B-C2 (Straight type, 4-core, Cable length: 2 m), CN-24BL-C2 (Elbow type, 4-core, Cable length: 2 m)
CN-24B-C5 (Straight type, 4-core, Cable length: 5m), CN-24BL-C5 (Elbow type, 4-core, Cable length: 5m)
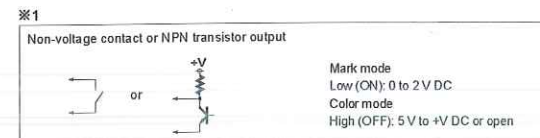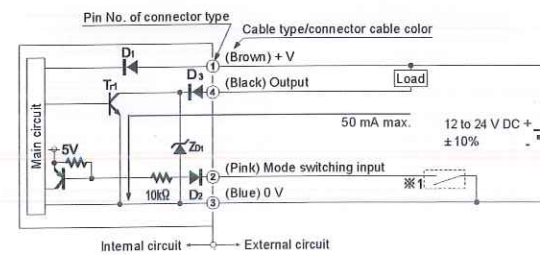
● DIMENSIONS (Unit: mm)

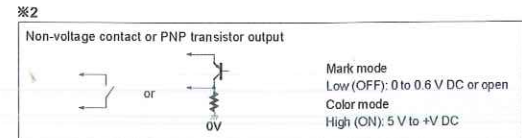### Cable type / LX-111☐
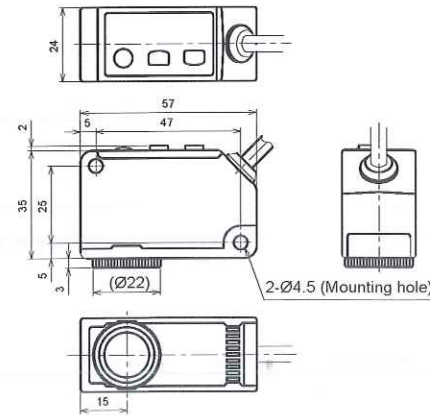
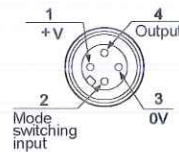### Connector type / LX-111☐-Z
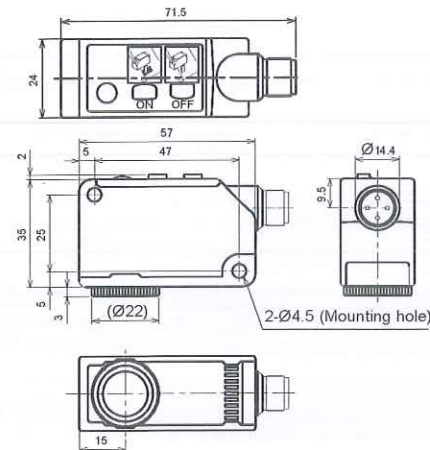
● I/O CIRCUIT DIAGRAMS

NPN output type

PNP output type

Layout of connector pin for connector type LX-111☐-Z

1 +V	4 Output
2 Mode switching input	3 0V

※1
Non-voltage contact or NPN transistor output
Mark mode
Low (ON): 0 to 2 V DC
Color mode
High (OFF): 5 V to +V DC or open

※2
Non-voltage contact or PNP transistor output
Mark mode
Low (OFF): 0 to 0.6 V DC or open
Color mode
High (ON): 5 V to +V DC
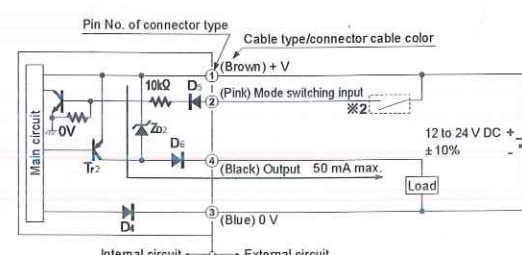
Symbols ··· D1, D2, D3, D4, D5, D6 : Reverse supply polarity protection diode
ZD1, ZD2 : Surge absorption zener diode

Tr1 : NPN output transistor
Tr2 : PNP output transistor

Mark Sensor for Sensing the Rainbow

No.CE-LX111 May, 2013   Specifications are subject to change without notice.

2013.05 | panasonic.net/id/pidsz/global

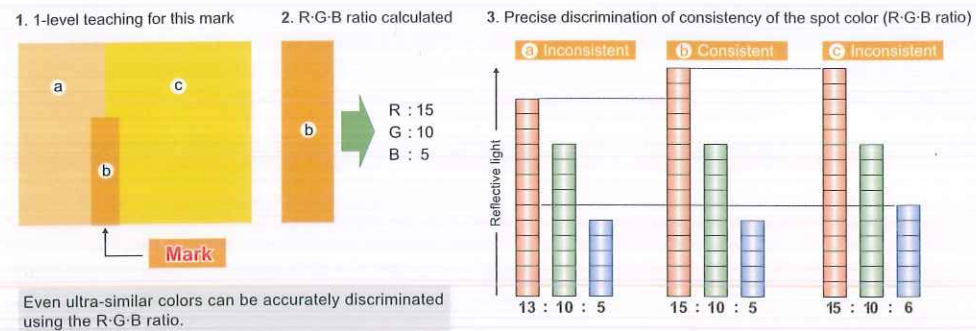# High - Speed and Ultra - Simple Mark Detection with Two Modes

High Precision

Color mode `High precision discrimination`

Utilizing 3-color (R·G·B) LEDs simultaneously, this mode realizes high precision mark color discrimination by the R·G·B reflective light ratio. This mode also enables effective detection of films with patterns around the mark.

The color around letters is detected as a mark.

Predetermined colors are detected as marks.

Sensor
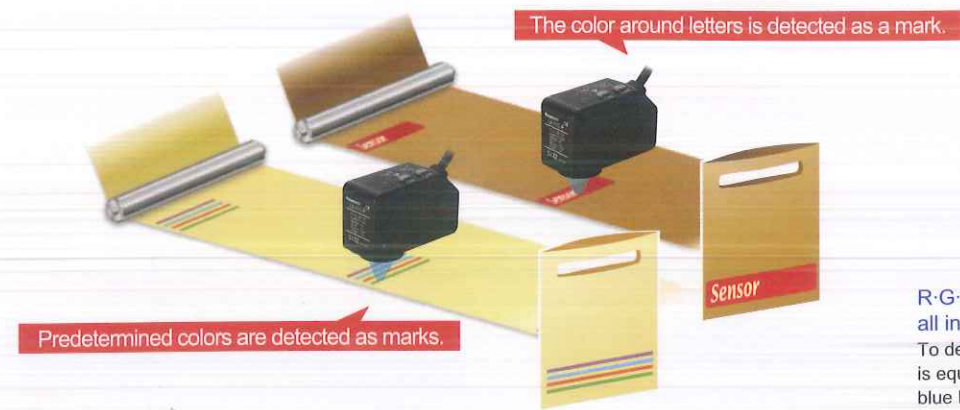
High precision mark color discrimination

The color mode on the LX-111 series utilizes all 3-color (R·G·B) LEDs to discriminate the mark color by the R·G·B ratio, which enables high precision judgments. The graphic figure below shows the above-mentioned process.

1. 1-level teaching for this mark
2. R·G·B ratio calculated

a c
b
Mark

R : 15
G : 10
B : 5

3. Precise discrimination of consistency of the spot color (R·G·B ratio)

| a Inconsistent | b Consistent | c Inconsistent |

Reflective light

13 : 10 : 5   15 : 10 : 5   15 : 10 : 6

Even ultra-similar colors can be accurately discriminated using the R·G·B ratio.

Meeting various requirements of mark detection

Coaxial reflective optical system combined with ultra-slim spot of approximately. 1 mm × 5 mm enables high precision detection.

Newly developed
3 LED

R·G·B light emitting elements all in one
To detect any marking, this unit is equipped with red, green and blue LED light emitting elements all in one.

LX-111

12 To 24V DC
CONNECTIONS
BROWN +V
BLUE -V
BLACK OUT
WHITE OUT
PINK GND

Total reflection mirror
Half reflection mirror
Large-diameter lens

A/D converter
Its high resolution ensures high precision mark detection.

Receiving element

▲ Schematic image

Spot size of approx. 1 mm × 5 mm

High precision coaxial reflective optical system
Besides the unique coaxial reflective optics technology ensuring high precision detection, it also adopts a superior large-diameter scratchproof lens.

High Speed

Mark mode `Ultra high-speed response`

This sensing mode enables an ultra high-speed response time of 45 µs by automatically selecting a single color from the 3-color (R·G·B) LEDs, and automatically selects the optimal LED that is most suitable for the sensing by its automatic optimal LED selection function, which is perfect for ultra quick sensing.
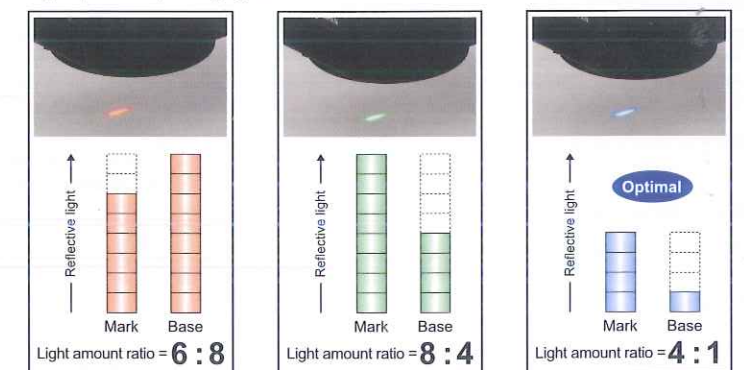
RED
GREEN
BLUE
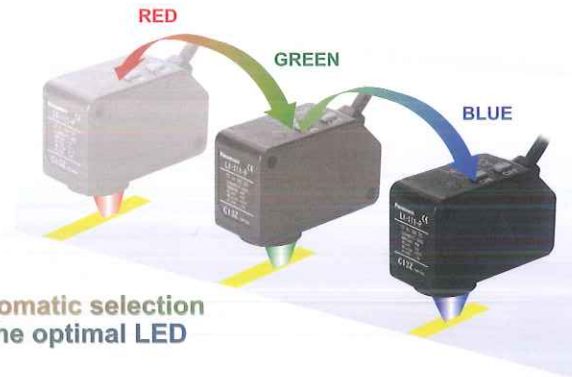
Automatic selection of the optimal LED

Automatic optimal LED selection function

This function selects the optimal color from the 3-color (R·G·B) LEDs. Incorporating the "Automatic optimal LED selection function", the mark mode on LX-111 series enables optimal sensing by automatically selecting the LED coming with the largest contrast between the mark and the base (S/N ratio). As this mode automatically selects the LED according to the contrast of reflection of the mark and base instead of the difference between their reflected light amounts, a more stable sensing is ensured.

For the packaging film below, the blue LED will be used to detect the mark for its optimal light amount ratio to ensure a more stable sensing.

Eg. A piece of packaging film

Reflective light	Reflective light	Reflective light (Optimal)
Mark Base	Mark Base	Mark Base
Light amount ratio = **6 : 8**	Light amount ratio = **8 : 4**	Light amount ratio = **4 : 1**

Easy Setting

The setting can be completed easily just by pressing the ON key with the light source aligned to the color to be detected.

1 Press the ON key with the light source aligned to the mark to be detected

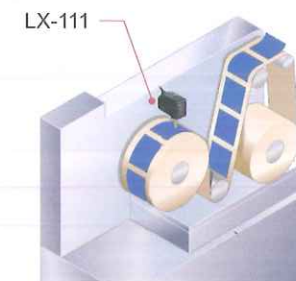2 Press the OFF key with the light source moved away from the set color

Aligned to the mark

Aligned to the base

Operation indicator ON key OFF key
ON   OFF
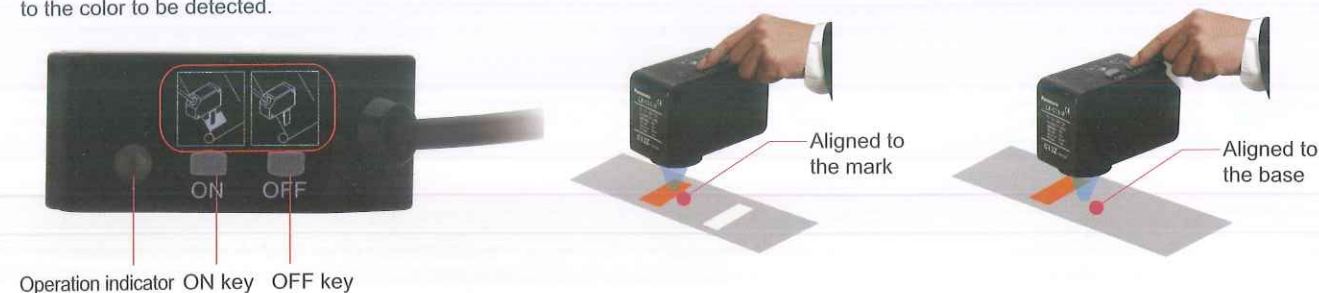
Environment-resistant IP67 Protection Construction

The sensor will not be affected by the water during washing the machines and production line.

Application

Detection of mark on packaging machine tapes

LX-111

Detection of tapes stuck on copper foils

Copper foil

Tape