Thank you very much for purchasing Panasonic products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

WARNING

Never use this product as a sensing device for personnel protection.

In case of using sensing devices for personnel protection, use products which meet standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

1 SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Cable type</th>
<th>Connector type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>Type</td>
<td>Cable type</td>
<td>Connector type</td>
</tr>
<tr>
<td>NPN/ PNP</td>
<td>Output 1</td>
<td>LX-101</td>
<td>LX-101-Z</td>
</tr>
<tr>
<td>NPN/ PNP</td>
<td>Output 2</td>
<td>LX-101-P</td>
<td>LX-101-P-Z</td>
</tr>
</tbody>
</table>

- **Sensing distance**: 10 ± 3mm
- **Supply voltage**: 12 to 24V DC ±10%, Ripple P-P-10% or less
- **Current consumption**: Normal mode: 75mA or less (Current consumption 30mA at 24V supply voltage) (Elbow type, 4-core, Cable length: 5m)
- **Source current**: 0.5mA or less
- **Sink current**: 3mA or less
- **Driving voltage**: 30V DC or less
- **Ambient temperature**: -10°C to +55°C (No dew condensation or icing allowed), Storage: -20°C to +70°C
- **Operation indicator**: 'RUN': Green LED, 'TEACH', 'ADJ', 'COLOR
- **Response time**: Mark mode: 45 μs or less, Color mode: 150 μs or less
- **Operation indicator**: Orange LED (lights up when output 1 is ON)
- **Digital display**: 4 digits red LED display
- **Ambient humidity**: 35 to 85% RH, Storage: 35 to 85% RH
- **Emitting element**: 0.2mm2, 5-core cable type, 2m long
- **Weight**: 120g approx., 55g approx.

- **Teaching input**: <NPN output type> Low (ON): 0 to 2V DC, Source current 0.5mA or less
  - Input impedance: 10kΩ approx. (at 50mA [Note 1] sink current)
- **Output operation**: Inverted operation of the output 1
- **Output protection**: Incorporated

- **Power consumption**: Normal mode: 750mW or less (Current consumption 30mA or less at 24V supply voltage)
- **Digital display**: 4 digits red LED display
- **Sensitivity setting**: Mark mode: 2-level teaching / Full-auto teaching, Color mode: 4-level teaching
- **Fire safety adjustment function**: Incorporated
- **Timer function**: Incorporated
- **Protection**: IP67 (IEC)
- **Ambient temperature**: -10°C to +55°C (No dew condensation or icing allowed), Storage: -20°C to +70°C
- **Ambient humidity**: 35 to 85% RH, Storage: 35 to 85% RH
- **Emitting element**: Red / green / blue LED
- **Material**: Enclosure: PBT, Display: Polycarbonate, Operation buttons: Silicone rubber, Lens: Glass
- **Cable**: 0.2mm2, 5-core cable type, 2m long
- **Weight**: 120g approx., 55g approx.

Notes:
1) The connector type LX-101-Z is 100mA.
2) The connecting cable is not supplied as an accessory for the connector type LX-101-Z.

2 CAUTIONS

- This product has been developed / produced for industrial use only.
- Make sure to carry out wiring in the power supply off condition.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the sensor may get burnt or damaged.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Take care that short-circuit of the load or wrong wiring may burn or damage the sensor.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency light device or sunlight etc., as it may affect the sensing performance.
- If the surface of the sensing object has a shine, mount the sensor inclining approx. 10 to 15 degrees against the sensing object.
- Do not touch the lens of the sensor by hand directly. If the lens becomes dirty, wipe it off with a soft cloth gently.
- When the inside lens is steamed up, unscrew the lens to get rid of the condensation.
- Make sure that stress by forcible bend or pulling with 76N or more, force is not applied to the sensor cable joint.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

3 MOUNTING

- Care must be taken regarding the sensor mounting direction with respect to the object’s direction of movement.
- The tightening torque should be 0.8N·m or less.

4 PART DESCRIPTION

- MODE indicator / RUN (Green)
- MODE indicator / TEACH (Yellow)
- MODE indicator / ADJ (Yellow)
- MODE indicator / TIMER (Yellow)
- MODE indicator / PRO (Yellow)

5 I/O CIRCUIT DIAGRAMS

- **NPN output type**
  Terminal No. of Connector: Color code of cable type / cable with connector below:
  - CN-36B-C2 (Straight type, 4-core, Cable length: 5m)
  - CN-36BL-C2 (Elbow type, 4-core, Cable length: 5m)

- **PNP output type**
  Terminal No. of Connector: Color code of cable type / cable with connector below:
  - CN-36B-C5 (Straight type, 4-core, Cable length: 5m)
  - CN-36BL-C5 (Elbow type, 4-core, Cable length: 5m)
**OPERATION PROCEDURE**

Before performing teaching or each detail setting, perform the setting of either mark mode or color mode with mark / color mode setting of Navi mode.

- **Mark mode**
  - At mark mode setting: Sets the threshold value by '2-level teaching' or 'full-auto teaching'.
  - At color mode setting: Allows adjustment of the threshold value.

- **Color mode**
  - At mark mode setting: Sets the threshold value by '2-level teaching' or 'full-auto teaching'.
  - At color mode setting: Allows adjustment of sensing tolerance value.

**MARK / COLOR MODE SETTING**

This product enables to select the applicable mark / color mode depending on the using purpose. Before carrying out teaching or each setting, set the mark / color mode in COLOR of Navi mode. Since the available functions differ depending on the selected mode, take care when setting mode. (The factory setting of this product is mark mode.)

- **Mark mode**: Detects incident light intensity at receiving part.
- **Color mode**: Detects color ratio of the sensing object. This mode can be used when desired to detect a specific color only.

The mode is selected using either 'ON / SELECT key', 'OFF / ENTER key', 'MARK / COLOR MODE SETTING'.

**DIRECT CODE DISPLAY**

When MODE indicator / RUN (green) lights up, the direct code is displayed on the digital display by pressing 'MODE / CANCEL key' for more than 2 seconds. (The direct code is turned off when stop pressing the MODE / CANCEL key.)

The current setting status can be confirmed at a glance with the direct code.

**KEY LOCK FUNCTION**

The key operation is locked by pressing both 'MODE / CANCEL key' 'OFF / ENTER key' for more than 2 seconds simultaneously when MODE indicator / RUN (green) lights up.

In order to release the key lock, press both 'MODE / CANCEL key' and 'OFF / ENTER key' for more than 2 seconds again.

**TEACHING MODE**

The teaching setting can be done when MODE indicator / TEACH (yellow) lights up.

The applicable teaching for mark mode and color mode is differed in the teaching mode as shown below:

- **Mark mode**: Sets either 2-level teaching or full-auto teaching.
- **Color mode**: Sets 1-level teaching

Note: If stable sensing becomes impossible by environmental effect etc., carry out the teaching again.

- **In case of mark mode**
  1. Press 'MODE / CANCEL key' to light up 'MODE indicator / TEACH (yellow)'
  2. Align the beam spot to the base (non-mark area) of the mark to be detected. When 'ON / SELECT key' is pressed at the step 1, press 'OFF / ENTER key', when 'OFF / ENTER key' is pressed at the step 1, press 'ON / SELECT key'.
  3. The threshold value is set at the mid-value between the step 1 and 2.

- **In case of color mode**
  1. Press 'MODE / CANCEL key' to light up 'MODE indicator / TEACH (yellow)'
  2. Align the beam spot to the base (non-mark area) of the mark to be detected. When 'ON / SELECT key' is pressed at the step 1, press 'OFF / ENTER key', when 'OFF / ENTER key' is pressed at the step 1, press 'ON / SELECT key'.
  3. The threshold value is set at the mid-value between the step 1 and 2.
<case of full-auto teaching>

1. Press 'MODE / CANCEL key' to light up MODE indicator / TEACH (yellow). In the state where the sensing objects are moving on the assembly line, align the beam spot to the position where the mark on the object passes through.

2. When setting the output to on for the side with less incident light intensity, press 'ON / SELECT key', and when setting the output to on for the side with more incident light intensity, press 'OFF / ENTER key' for more than 2 seconds. 'ADJ' is displayed, and sampling begins.

3. In case stable sensing is possible: 'ADJ' is displayed on the digital display.

In case stable sensing is impossible: 'Err' is displayed on the digital display.

Note: If the output is gained on the opposite side against the side desired to the step 2, carry out the teaching again. In this case, note that, when carrying out the teaching for this measurement, the press the different key from the one previously pressed.

Besides, since the output 2 (inversion output) is incorporated in the cable type LX-101C, the output can be inverted. Refer to '10 OUTPUT 2 (INVERSION OUTPUT) (OUT) (For LX-101C type only)' for the details.

<case of color mode>

1. Press 'MODE / CANCEL key' to light up MODE indicator / TEACH (yellow).

2. Align the beam spot to the mark to be detected.

3. In case stable sensing is possible: 'ADJ' is displayed on the digital display.

In case stable sensing is impossible: 'Err' is displayed on the digital display.

11 ADJUST MODE

- The following settings can be done when MODE indicator / ADJ (yellow) lights up.

  **In case of mark mode**: Fine adjustment of threshold value

  - The threshold value is fine adjustable using 'ON / SELECT key' or 'OFF / ENTER key'.

  **In case of color mode**: Set judging tolerance

  - The judging tolerance setting is the function that can change the judging tolerance with respect to the taught reference color.
  - Even if the tolerance is changed, the information of the reference color taught earlier does not change.
  - The judging tolerance value increases with 'ON / SELECT key', and decreases with 'OFF / ENTER key'.

Notes: 1) Press 'MODE / CANCEL key' to confirm.

  2) The numerical value indicated in the digital display should be used as a reference.

12 TIMER OPERATION SETTING MODE

- The setting for whether the timer is used or not cannot be done when MODE indicator / TIMER (yellow) lights up.

- The initial value of each timer function is 20ms.

- Refer to '10 PRO MODE' for the setting delay timer, OFF-delay timer and ON-delay timer

Note: Press 'MODE / CANCEL key' to confirm.

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</tr>
<tr>
<td>Timer setting</td>
<td>t-2D</td>
<td>Sets timer setting period by 9-steps.</td>
</tr>
<tr>
<td>Key lock setting</td>
<td>Full</td>
<td>Selects key lock function.</td>
</tr>
<tr>
<td>Display setting</td>
<td>Srd</td>
<td>Selects display method of digital display.</td>
</tr>
<tr>
<td>Eco setting</td>
<td>off</td>
<td>Sets ON / OFF of eco mode.</td>
</tr>
<tr>
<td>Display inverting mode setting</td>
<td>off</td>
<td>Changes display direction of digital display.</td>
</tr>
<tr>
<td>Reset setting</td>
<td>no</td>
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</table>
This product incorporates the external teaching function. Take care that the teaching methods for mark mode and color mode differ in the external teaching function.

### In case of mark mode

#### <2-level teaching>

1. Align the beam spot to the mark to be detected in ‘RUN mode’.
2. Input the external signal for 20ms or more in step 1 state. (Do not input the external signal more than 2 sec. continuously.)
3. Align the beam spot to the base (non-mark area), and input the external signal for 20ms or more.

(Timing chart)

- Input external signal
- Aligning beam spot to mark
- Space 20ms or more
- Aligning beam spot to base (non-mark area)
- ON
- OFF

#### <Full-auto teaching>

1. Put the object on the assembly line at ‘RUN mode’ state.
2. When the external signal is input for 2 sec. or more, sampling begins. When sampling finishes, the digital display flashes. If ‘HRD’ is displayed, slow down the line speed, and carry out the teaching again.

(Timing chart)

- 2sec. or more: Start sampling
- ON
- OFF

Note: When the full-auto teaching is used, the output operation is set to ‘DARK-ON’.

### In case of color mode

#### <1-level teaching>

1. Align the beam spot to the mark to be detected in ‘RUN mode’.
2. Input the external signal for 20ms or more in step 1 state.

(Timing chart)

- 20ms or more: ON
- OFF

### OUTPUT 2 (INVERSION OUTPUT) (OUT) (For LX-101□ type only)

The LX-101□ cable type incorporates the output 2 (inversion output) (OUT). For teaching, this function is convenient for inverting logic of LIGHT-ON / DARK-ON (mark-mode), and coincidence-ON / incocidence-ON (color mode). When the output 2 is used, conned the output wire (output 2) to +V side (0V side for PNP output type). When the output 2 is not used, be sure to insulate it.

### ERROR DISPLAY

Take measurement for the error as shown below:

<table>
<thead>
<tr>
<th>Display</th>
<th>Error content</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er-1</td>
<td>Shorten the load and flows overcurrent.</td>
<td>Turn off the power supply and check the load.</td>
</tr>
</tbody>
</table>

### DIMENSIONS (Unit: mm)

- Cable type / LX-101□

### INTENDED PRODUCTS FOR CE MARKING

The models listed under ‘SPECIFICATIONS’ come with CE Marking. As for all other models, please contact our office.

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