Digital Mark Sensor `Amplifier Built-in`
LX-100 SERIES

Related Information	■ General terms and conditions........... F-17	■ Sensor selection guide ....P.831~
	■ Glossary of terms........................ P.1359~	■ General precautions P.1405

CE Conforming to EMC Directive

UL Recognition

panasonic-electric-works.net/sunx

PNP — PNP output type available

TIMER — Timer

Automatic sensitivity setting

Introduction of the 3 LED mark sensor

Can detect any mark!

Coaxial reflective optics and a sharp 1 × 5 mm 0.039 × 0.197 in spot enable high precision sensing. Stable detection of marks is possible.

3LED Newly developed

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.

High precision coaxial reflective optical system
Panasonic Electric Works SUNX's unique coaxial reflective optics technology ensures very accurate sensing. The unit is made with a scratchproof glass lens.

Total reflection mirror
Half mirror
Glass lens

▲Image schematic
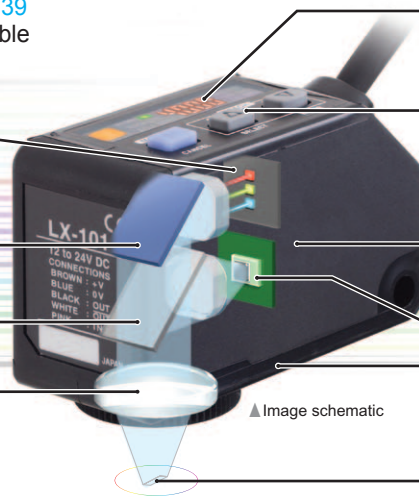
4-digit digital display
The 4-digit digital display enables numerical sensing control and minute settings.

Operation panel
3 large buttons that click into position making operation easy.

Highest in the industry

12-bit A/D converter
A resolution of 1/4,000 is realized to enable high precision mark sensing.

Receiving element

Protection IP67
Washing the machines and production line with water will not affect the sensor thanks to its waterproof construction.
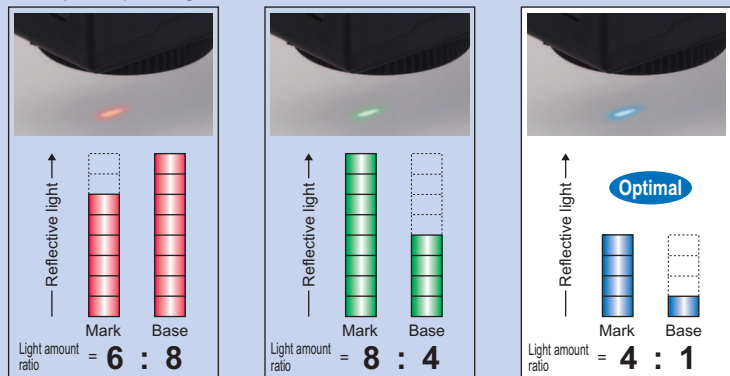
Spot size 1 × 5 mm 0.039 × 0.197 in approx.

Automatic optimal LED selection function

The 3 colors of the R•G•B LEDs are optimally selected according to the color combination. With the **LX-100**'s Mark mode, the built-in "Automatic optimal LED selection function" automatically selects the LED for the largest contrast (S / N ratio) between the mark and base (non-mark area) to ensure optimal sensing. For more stable detection, the sensor makes selection according to the contrast and not according to the reflected light variation between the mark and base (non-mark area).

The example on the right deals with reflected light on packing film.
Great figures are indicated for the blue LED's light amount ratio and, for even more stable sensing, the blue LED effectuates this mark sensing.

Example: A packing film

Reflective light →
Light amount ratio = **6 : 8**
Mark   Base

Reflective light →
Light amount ratio = **8 : 4**
Mark   Base

Reflective light →
Optimal
Light amount ratio = **4 : 1**
Mark   Base

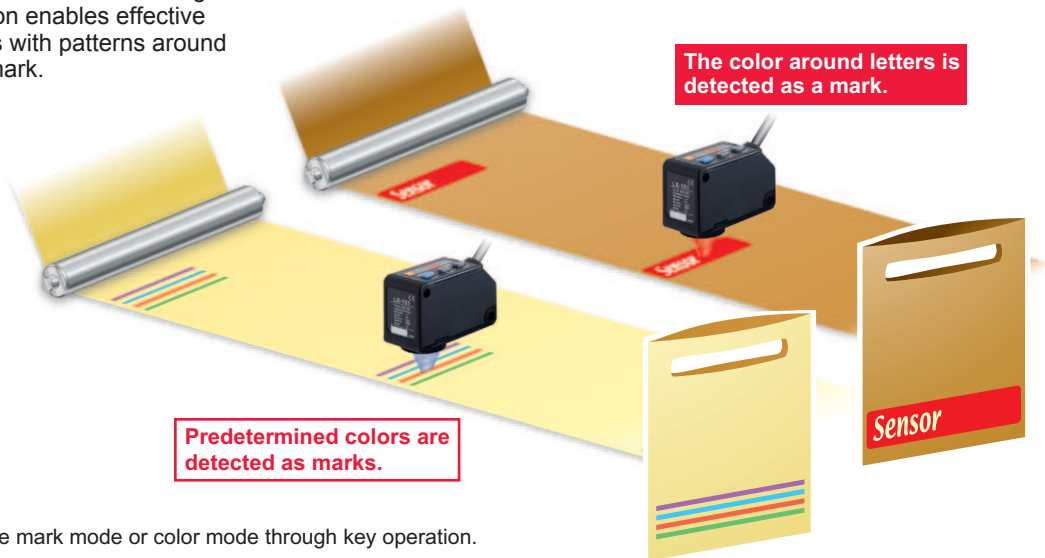## Two detection modes can be selected from to suit the application

Mark mode Ultra high-speed response

This sensing mode automatically selects a single color from the 3 R•G•B LEDs to achieve an ultra quick 45 μs response time. The automatic optimal LED selection function automatically selects the LED that is most suitable for the sensing. This function is perfect for ultra quick sensing.

Automatic selection of the optimal LED

RED

GREEN

BLUE
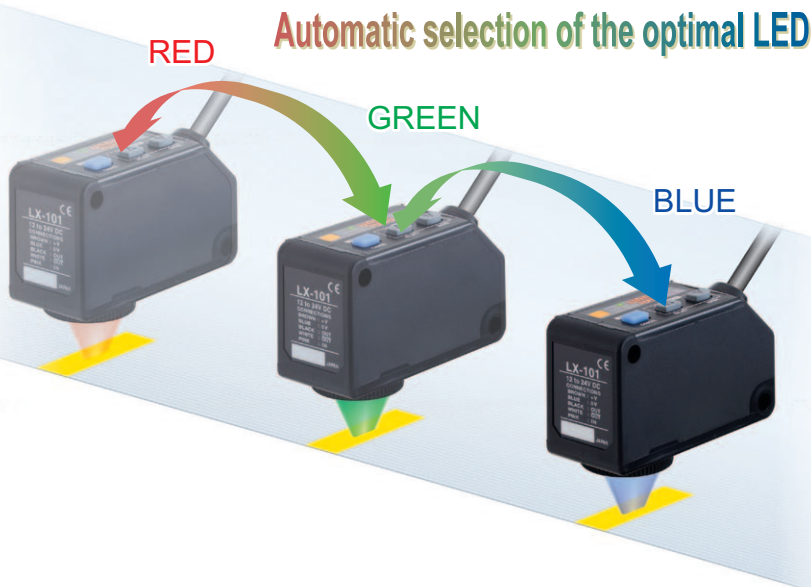
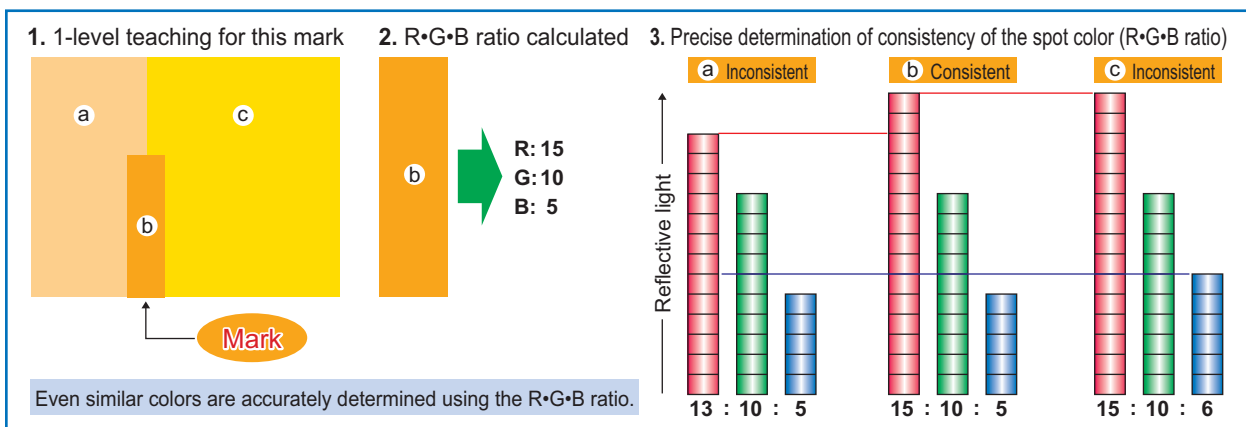### Color mode High precision discrimination

All 3 R•G•B LEDs light up and high precision mark color discrimination occurs using the R•G•B reflective light ratio. This function enables effective detection of films with patterns around the area of the mark.

The color around letters is detected as a mark.

Sensor

Sensor

Predetermined colors are detected as marks.

Sensor

* You can select the mark mode or color mode through key operation.

High precision mark color discrimination

The color mode on the **LX-100** series utilizes all 3 R•G•B LEDs to determine the R•G•B ratio of the mark color. The built-in 12-bit A/D converter enables high precision 1/4,000-resolution judgments. The figure below is a graphic description of this process.

1. 1-level teaching for this mark

a

c

b

Mark

2. R•G•B ratio calculated

b

→ **R: 15**
G: 10
B: 5

3. Precise determination 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

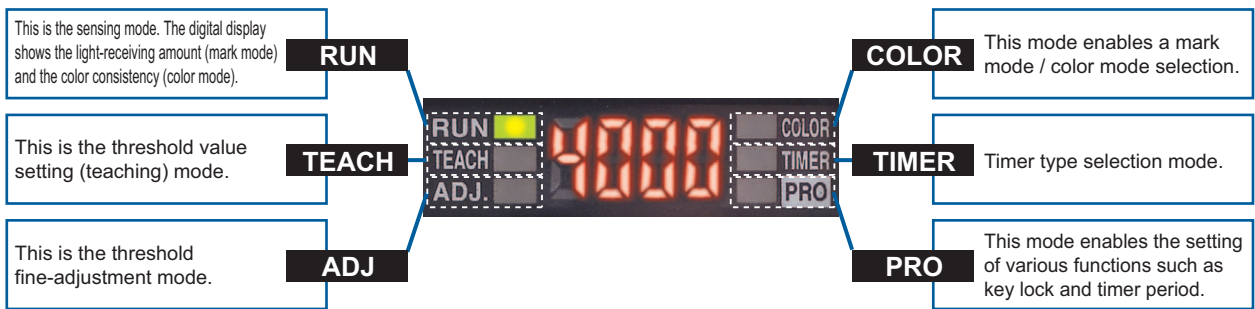Even similar colors are accurately determined using the R•G•B ratio.

Its digital display makes settings easy! Numerical control of the settings is possible

The 4-digit digital display enables easy verification of received light from marks and base (non-mark area). Also, the threshold value can be controlled numerically enabling setting indication easily. Displaying the direct code enables settings verification. This function is handy for remote maintenance.

MODE indicator

Operation indicator

4-digit digital display
(Light-receiving amount and setting values are displayed.)

MODE indicator

MODE key
(PRO mode: CANCEL key)

OFF key
(PRO mode: ENTER key)

ON key
(PRO mode: SELECT key)

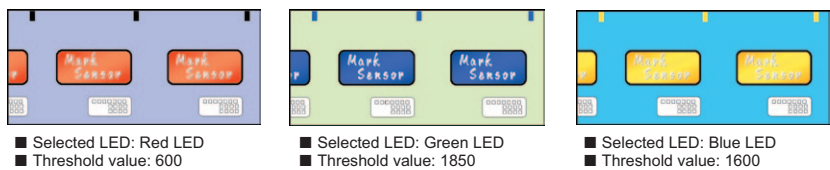## Even beginners can quickly master MODE NAVI operation

The sensor's basic operations are represented by 6 indicators (MODE NAVI). The user can check what mode the sensor is presently in with a quick glance making operation simple.

This is the sensing mode. The digital display shows the light-receiving amount (mark mode) and the color consistency (color mode). **RUN**	**COLOR** This mode enables a mark mode / color mode selection.
This is the threshold value setting (teaching) mode. **TEACH**	**TIMER** Timer type selection mode.
This is the threshold fine-adjustment mode. **ADJ**	**PRO** This mode enables the setting of various functions such as key lock and timer period.

Sensing status digitally controllable

The sensing status, displayed numerically, can be verified at a glance. Also, the sensor settings for each type of packing film can be digitally indicated.

• Example of sensor setting indication

■ Selected LED: Red LED
■ Threshold value: 600

■ Selected LED: Green LED
■ Threshold value: 1850

■ Selected LED: Blue LED
■ Threshold value: 1600

Direct codes enable settings verification at a glance

The settings for the **LX-100** series sensors are displayed using a 4-digit direct code. Direct codes enable easy setting verification and maintenance by phone.

What is the direct code?

The direct code is 0004. At present, the sensor is operating with a mark at 2300 and base at 860.

Direct code table (D-Code)

The sensor setting modes can be verified by a 4-digit code (D-Code). The table below shows a list of all available codes.
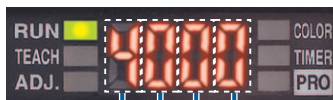
● When in RUN mode, press the MODE key for at least 2 sec. to display the direct code. (Remove your finger from the MODE key and the direct code will disappear.)

1st digit				2nd digit			3rd digit			4th digit	
Display	Sensing mode (light source color)	Operation mode (Note 1)	Sensing (Note 2)	Display	Display mode	ECO mode (Note 4)	Turn mode (Note 5)	Display	Key lock	Timer mode	Display	Timer period
0	Mark mode (green)	L-ON	FINE	0	Standard	OFF	OFF	0	Full lock (All operations disabled)	non	0	1 ms
1			COARSE	1			ON	1		OFF-delay	1	2 ms
2		D-ON	FINE	2		ON	OFF	2		ON-delay	2	5 ms
3			COARSE	3			ON	3	RUN teaching (Teaching only enabled)	non	3	10 ms
4	Mark mode (blue)	L-ON	FINE	4	Percent display (Note 3)	OFF	OFF	4		OFF-delay	4	20 ms
5			COARSE	5			ON	5		ON-delay	5	50 ms
6		D-ON	FINE	6		ON	OFF	6	RUN adjust (Threshold value adjustment only enabled)	non	6	100 ms
7			COARSE	7			ON	7		OFF-delay	7	200 ms
8	Mark mode (red)	L-ON	FINE	8	———			8		ON-delay	8	500 ms
9			COARSE	9	———			9	———		9	———
A		D-ON	FINE	A	———			A	———		A	———
b			COARSE	b	———			b	———		b	———
c	Color mode	Consistent-ON	FINE	c	———			c	———		c	———
d			COARSE	d	———			d	———		d	———
E		Inconsistent-ON	FINE	E	———			E	———		E	———
F			COARSE	F	———			F	———		F	———

Notes: 1) In Mark mode, L-ON / D-ON is automatically set in the sensor. For example, with 2-level teaching, press the ON key at the targeted mark and press the OFF key at the base (non-mark area). When doing so, the operator does not have to consider L-ON / D-ON.
2) Sensing accuracy can be set to either FINE (standard) or COARSE.
3) The percent display is only enabled in mark mode.
4) ECO mode is a function that reduces power consumption by turning off the digital display in the event that no button operations are made for a predetermined time (approx. 10 sec. or more) in RUN mode. Press any button to turn the digital display on again.
5) The turn mode is a function that reverses the digital display making it easily to be viewed in the event that the sensor installation renders the display up-side-down.
* Default setting: D-code = " 0004 ".

Super simple teaching

Press the ON button at the targeted mark.

Here is an example of the most basic setting method "2-level teaching".

Mode selection	Press MODE key and select TEACH mode.

Teaching	❶ Align the spot on the mark and press the ON key. ❷ Align the spot onto the base (non-mark area) and press the OFF key. * The ❶❷ order can be reversed.

Display showing complete settings

Sensing	Teaching complete. The optimal LED is automatically selected and the sensor automatically returns to RUN mode.

Other teaching methods

• Full-auto teaching: In Mark mode, teaching is effective without stopping the sensing object.
• 1-level teaching: In Color mode, the color detected is aligned by the spot and teaching is effective.

External teaching possible

Teaching is possible through external input using an operation panel or touch panel even on hard-to-reach color mark sensors located inside an equipment. Also, models can be interchanged easily.

Mark mode
2-level teaching and full-auto teaching possible

Color mode
1-level teaching possible

Compact design for significant space savings

High precision sensing and multiple functions are all packed in a compact W57 × D24 × H38 mm W2.244 × D0.945 × H1.496 in body.
Cable and plug-in connector types are available depending on the equipment used. These sensors can be easily introduced to existing facilities.

38 mm 1.496 in
24 mm 0.945 in
57 mm 2.244 in

Key lock function

The key lock function enables input operation control that prevents mistaken changes in the sensor settings. Other detailed settings include "RUN adjust", allowing threshold value adjustment only, and "RUN teaching", allowing teaching operation only.
If the sensor is set to "RUN adjust" or "RUN teaching", adjustment and teaching are possible having the sensor remained in RUN mode.