# SLU4 Slot Sensor

## Instruction Manual

230091

# Contents

# 1 Product Description

*Ultrasonic Label Sensors for Detection of Clear Labels*

- Ultrasonic label sensor for reliable detection of clear and opaque labels
- Rugged anodized aluminum housing with removable stainless steel gap plate
- Fast, highly accurate and precise label detection
- OLED Alphanumeric display for easy configuration and monitoring

⚠️ **WARNING:**
- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

## 1.1 Models

| Model | Supply Voltage | Output Type | Connection |
|---|---|---|---|
| SLU4-PN-2M | 12 V DC to 30 V DC | Bipolar NPN/PNP | 1.8 m (6 ft) unterminated 5-wire PVC cable |
| SLU4-PN-Q8 | | | Integral 5-pin M12 male quick-disconnect connector |
| SLU4-PN-Q7 | | | Integral 4-pin M8 male quick-disconnect connector |
| SLU4-BM-Q7 | | Selectable NPN or PNP | |

## 1.2 Features and Indicators
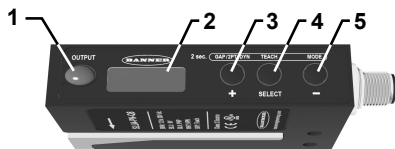


1. Output indicator
2. Display
3. (GAP/2PT/DYN)(+)
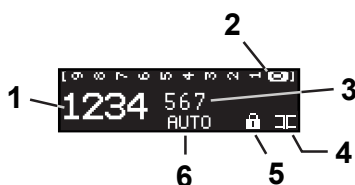4. (TEACH)(SELECT)
5. (MODE)(-)

### 1.2 Output Indicator

- Amber LED illuminates when outputs are ON
- Flashes when short circuit or overload detected

### 1.2.1 Display

Use the display to view menu options and other information.

*Figure 1. Display in Run Mode*



1. Signal strength
2. Contrast indicator (0 to 9)
3. Threshold number
4. Output in gap or on label
5. Button lock or unlock
6. Auto adjust on/off (AUTO)

## 1.2.2 Buttons

Use the sensor buttons to program the sensor.

**(GAP/2PT/DYN)(+)**

- Press and hold for 2 seconds to access and select different TEACH methods
- Press to increase the contrast threshold value
- Scroll through settings in the menu
- Manually adjust the threshold number while in Run mode

**(TEACH)(SELECT)**

- Press and hold for 2 seconds to initiate the TEACH process
- Select settings in MENU options

**(MODE)(-)**

- Press and hold for 2 seconds to access the menu
- Scroll through settings in the menu
- Manually adjust the threshold number while in Run mode

# 2 Installation

## 2.1 Mount the Sensor

Mount the SLU4 directly and securely using the clearance holes on the side of the sensor (bolts not included).

To lessen the effects of web flutter, position the bottom fork of the sensor slightly above the path of the web so that the web can glide over the bottom of the fork with slight tension.

## 2.2 Wiring



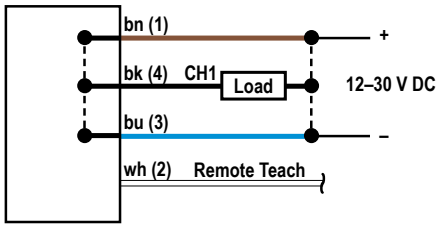*Figure 2. M8 Models—bimodal with remote input*



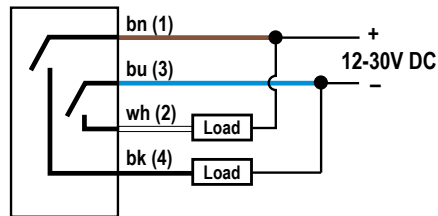*Figure 3. M8 model, bipolar*



*Figure 4. M8 Male Connector*

1. Brown
2. White
3. Black
4. Blue

The black wire is selectable NPN or PNP via the menu. This selection causes the remote input to be active low or active high.



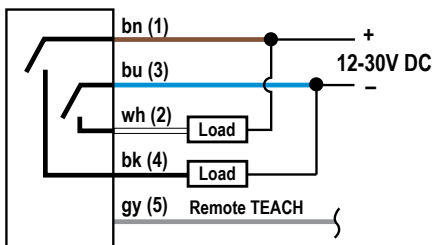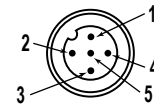*Figure 5. M12 and cabled models—bipolar with remote input*



*Figure 6. M12 Male Connector*

1. Brown
2. White
3. Blue
4. Black
5. Gray

# 3 Sensor Setup

Use the following images and instructions to program the sensor for use.

The default TEACH mode is Gap TEACH. In this mode, the sensor is looking for a gap between the labels.

## 3.1 Sensor Menu

Access the menu from run mode by pressing and holding **MODE** for 2 seconds.

Use **+** and **–** buttons to navigate through the menu. Press **SELECT** to select a menu option and access the submenus. Use **+** and **–** to navigate through the submenus. Press **SELECT** to select a submenu option and return to the top menu or press and hold **SELECT** for longer than 2 seconds to select a submenu option and return immediately to run mode.

To exit Setup mode and return to Run mode, navigate to End and press **SELECT.**

*Figure 7. Menu Map*
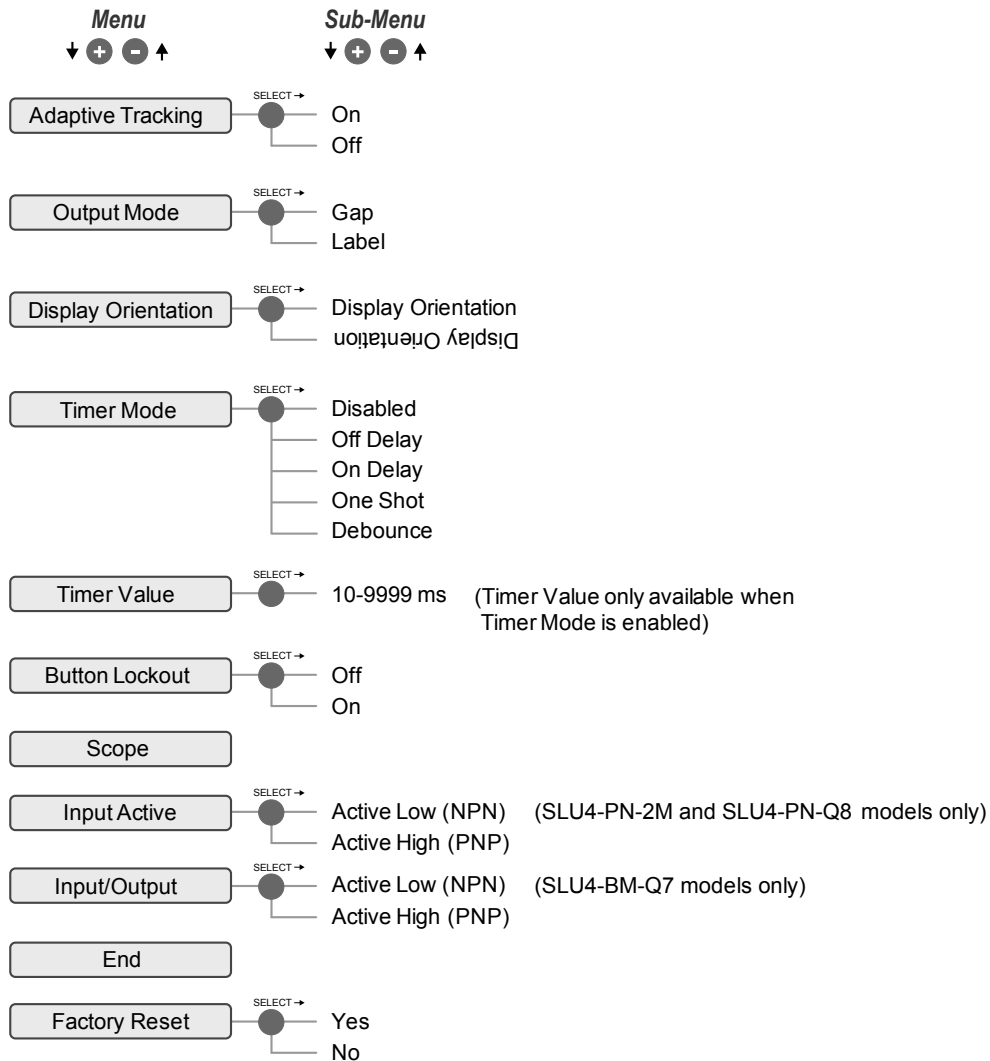


The following are menu options:

**Adaptive Tracking**

Evaluates signal levels and makes automatic adjustments to keep the sensor in optimum response levels.

**Output Mode**

Change from GAP ( ⌐⌐ ) to LABEL ( |▢| ). GAP means the output will be on when the label is not present under the transducer. LABEL means the output will be on when the label is under the transducer.

|▢| = Outputs on the Label

⌐⌐ = Outputs in the Gap

**Display Orientation**

Toggles the orientation of the display.

**Timer Mode**

Selects the output timing delay to be set:

Off Delay—Outputs stay on for set time after duration of input.

On Delay—Outputs turn on when input exceeds set time.

One Shot—Outputs turn on for set time when triggered by input.

Debounce—Output changes immediately when a change in detect state occurs. Then, a timer prevents the output from switching again until the timer expires. This behavior occurs on both the leading and trailing edges of the object.

*Figure 8. Output Timing Delays*
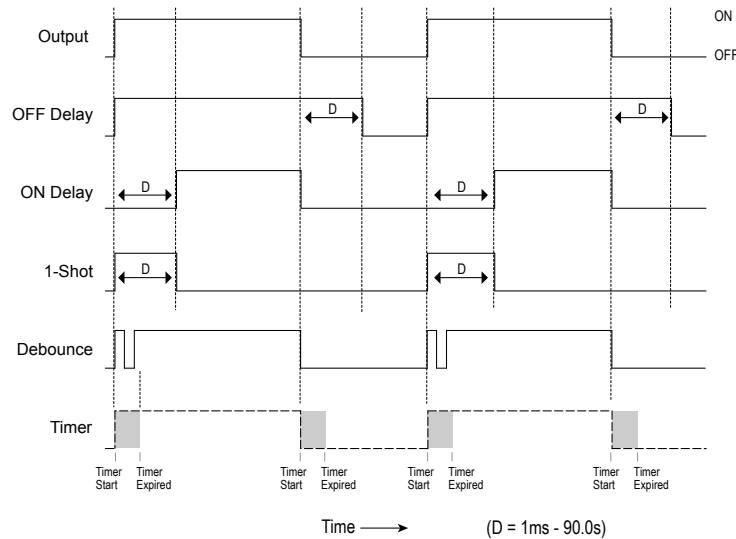
**Timer Value**

Sets the delay timer. This menu item is available only if a Timer Mode has been selected. The range is 1 ms to 9999 ms.

**Button Lockout**

Locks the sensor for tamper-free operation.

The sensor can be taught if it is locked. To unlock the sensor, toggle from Lock (🔒) to Unlock (no symbol).

**Scope**

Allows the operator to visually inspect the current setup for repeatability. The sensor scope also reveals any nominal setup issues or sensitivities to label or gap thickness changes. To shorten the time between signals, press **+**. To lengthen the time between signals, press **–**.

**Input Active (SLU4-PN-2M and SLU4-PN-Q8 models only)**

Sets the remote input to either Active High or Active Low to dictate the type of signal needed to program the sensor remotely. For more details, see Remote Input on page 9.

**Input/Output (SLU4-BM-Q7 model only)**

Sets the output to either NPN or PNP. Also sets the remote input to either Active High or Active Low to dictate the type of signal needed to program the sensor remotely. For more details, see Remote Input on page 9.

**End**

Returns to run mode.

**Factory Reset**

Resets the sensor to factory defaults.

# 3.2 TEACH Procedures

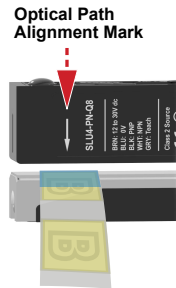To change between TEACH modes, press and hold the **GAP/2PT/DYN** button for 2 seconds.

Use the **+/-** buttons to navigate through the menu. When the desired TEACH mode is on the screen, press the **SELECT** button to confirm.

## 3.2.1 Gap TEACH

The sensor sets a threshold based on the gap between two labels.

1. Place the label web so that it is centered on the arrow.

*Figure 9. Align Label to Arrow*



2. Position the gap between the labels in the center of the sensor using the alignment line as shown.
   When viewing from the top of the sensor, use the output LED to center the gap between the labels.
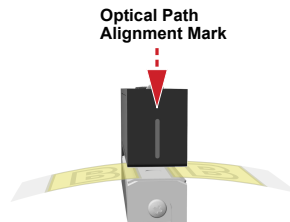
*Figure 10. Align Gap to Line*
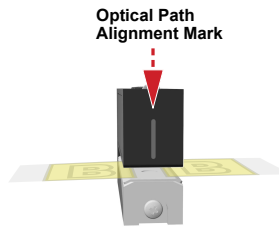


> **Note:** For a simpler TEACH, remove one label to create a larger gap.

3. Place label webbing so that it slides along the bottom of the sensor gap plate.

*Figure 11. Gentle Tension*



   This ensures a more consistent setup and performance.
4. Press and hold the **TEACH** button for 2 seconds.
   The display shows "Gap Set", then returns to Run mode.

The + and - buttons can be used to manually fine tune the sensor to the application.

## 3.2.2 Two-Point TEACH

The sensor sets a threshold based on the gap and label of the web.

1. Position the gap between the alignment markers on the sensor.

> **Note:** For a simpler TEACH, remove one label to create a larger gap.

2. Press and hold the **TEACH** button for 2 seconds.
   The display shows "Tap to Begin Gap Set".
3. Press the **TEACH** button.
   The display shows "Gap Set" then "Tap to Begin Label Set".
4. Position the label under the alignment marker on the sensor.

5. Press the **TEACH** button.
   The display shows "Label Set", then returns to Run mode.

## 3.2.3 Dynamic TEACH

The sensor sets a threshold during machine run conditions.

1. Position the labels under the alignment markers on the sensor and set the labels in motion.
2. Press and hold the **TEACH** button for 2 seconds.
   The display shows "Dynamic Set: Tap Teach to End".
3. Press the **TEACH** button.
   The sensor returns to Run mode.

## 3.3 Remote Input

Use the remote input to program the sensor remotely.

The remote input provides limited programming options. The remote input is either Active High (PNP) or Active Low (NPN) depending on the Input Active setting. For Active High (PNP), connect the white wire to 24 V DC with a remote switch connected between the wire and 24 V DC. For Active Low, connect the white wire to ground (0 V DC) with a remote switch connected between the wire and ground. Pulse the remote input according to the diagram and the instructions provided in this manual.

The length of the individual programming pulses is equal to the value **T: 0.04 seconds ≤ T ≤ 0.4 seconds**.

Remote Input Signals

**Note:** Waveforms shown correspond to PNP input mode.

*Figure 12. Gap Set*



Pulse once, 40 ms to 400 ms.

*Figure 13. Label Set*



Pulse twice, 40 ms to 400 ms, with 40 ms to 400 ms idle time between pulses.

*Figure 14. Dynamic Set*



Hold the remote input on for more than 750 ms, while pulling the labels and gaps through the sensor, then release the remote input line. The sensor returns to Run mode.

# 4 Specifications

**Supply Voltage and Current**
12 V DC to 30 V DC
Polarity Protected

**Note:** For use in Class 2 circuits

95 mA at 12 V DC, 45 mA at 30 V DC

**Digital Outputs**
(1) NPN and (1) PNP open collector output 150mA maximum; <2 V residual voltage
On SLU4-BM-Q7, NPN & PNP are user-selectable
Protected against output short-circuit

**Remote TEACH Input**
Momentary sinking or sourcing input;1.2 mA maximum; software selectable

**Hysteresis**
Dynamic, adjusted by TEACH

**Response Time**
200 µs

**Repeatability**
125 µs

**Threshold Set**
1-Point, 2-Point, or Dynamic TEACH; manually or remotely

**Threshold Adjust**
Manual or AUTO adjust

**Output Timers**
On Delay, Off Delay, One Shot, or Debounce

**Slot Width**
4 mm

**Indicators**
Display: Includes contrast indicator, numerical display, set point and trigger point, and all sensor options and modes
Amber LED output indicator: Illuminates when the sensor's output transistors are ON

**Note:** Note: If output LED flashes on power up, a short circuit condition exists.

**Construction**
Chemical resistant, high impact aluminum housing
Conforms to heavy industry grade CE requirements

**Connection**
Integral 5-pin M12 male quick-disconnect connector, Integral 4-pin M8 male quick-disconnect connector, or 1.8 m (6 ft) unterminated 5-wire PVC cable, depending on model

**Environmental Rating**
NEMA 4X, NEMA 6P, and IP65

**Ambient Temperature**
+4 °C to +50 °C (+39 °F to +122 °F)
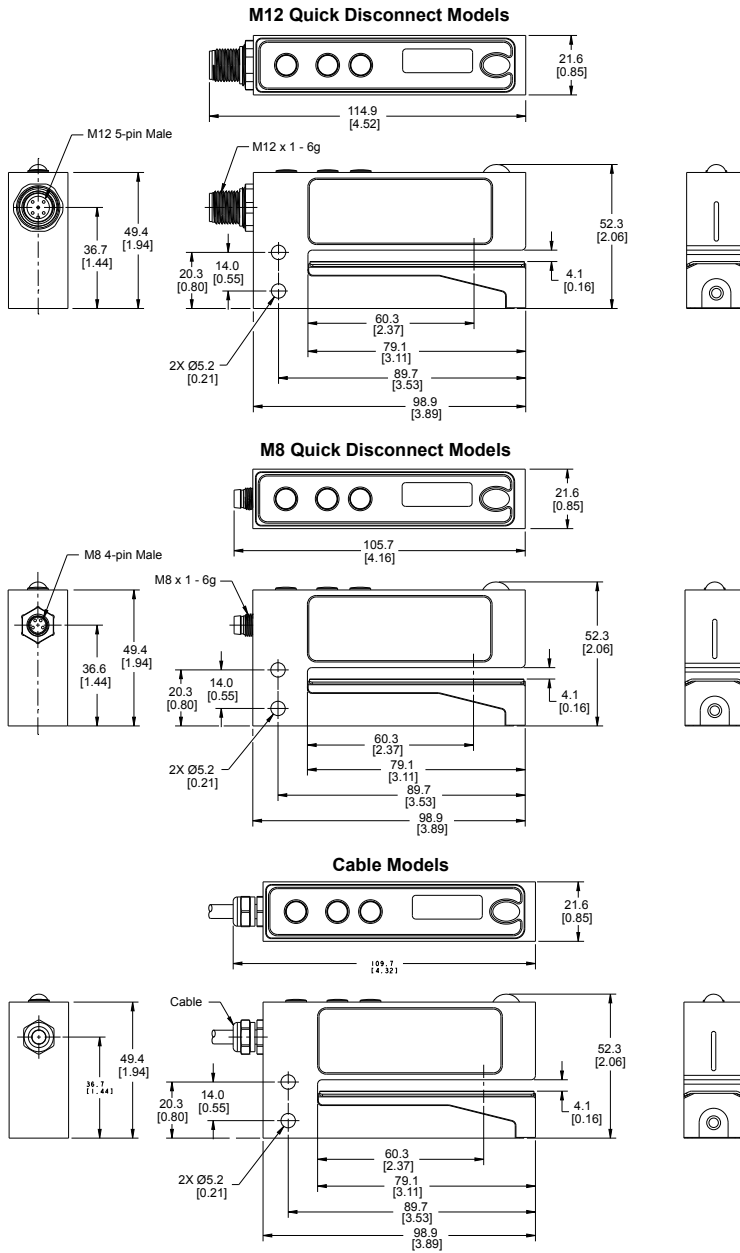
**Certifications**
RoHS compliant

**Banner Engineering Europe**
Park Lane, Culliganlaan 2F bus 3, 1831 Diegem, BELGIUM

**Turck Banner LTD** Blenheim House, Blenheim Court, Wickford, Essex SS11 8YT, Great Britain
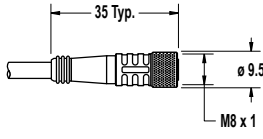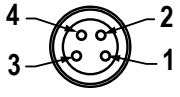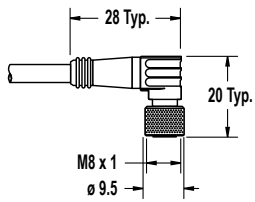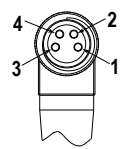
# 4.1 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

**M12 Quick Disconnect Models**

21.6
[0.85]

114.9
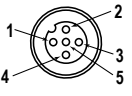[4.52]

M12 5-pin Male

M12 x 1 - 6g

49.4
[1.94]

36.7
[1.44]

52.3
[2.06]

20.3
[0.80]

14.0
[0.55]

4.1
[0.16]

2X Ø5.2
[0.21]

60.3
[2.37]

79.1
[3.11]

89.7
[3.53]

98.9
[3.89]

**M8 Quick Disconnect Models**

21.6
[0.85]

105.7
[4.16]

M8 4-pin Male

M8 x 1 - 6g

49.4
[1.94]

36.6
[1.44]

52.3
[2.06]

20.3
[0.80]

14.0
[0.55]

4.1
[0.16]

2X Ø5.2
[0.21]

60.3
[2.37]

79.1
[3.11]

89.7
[3.53]

98.9
[3.89]

**Cable Models**

21.6
[0.85]

109.7
[4.32]

Cable

49.4
[1.94]

36.7
[1.44]

52.3
[2.06]

20.3
[0.80]

14.0
[0.55]

4.1
[0.16]

2X Ø5.2
[0.21]

60.3
[2.37]

79.1
[3.11]

89.7
[3.53]

98.9
[3.89]

# 5 Accessories

## 5.1 Cordsets

| 4-Pin Threaded M8 Cordsets—Single Ended | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Style** | **Dimensions** | **Pinout (Female)** |
| **PKG4M-2** | 2.04 m (6.68 ft) | Straight |  |  1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black |
| **PKG4M-5** | 5 m (16.4 ft) | | | |
| **PKG4M-9** | 9.04 m (29.6 ft) | | | |
| **PKW4M-2** | 2 m (6.56 ft) | Right Angle |  |  |
| **PKW4M-5** | 5 m (16.4 ft) | | | |
| **PKW4M-9** | 9 m (29.5 ft) | | | |

| 5-Pin Threaded M12 Cordsets—Single Ended | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Style** | **Dimensions** | **Pinout (Female)** |
| **MQDC1-501.5** | 0.5 m (1.5 ft) | Straight |  |  1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black<br>5 = Gray |
| **MQDC1-503** | 0.9 m (2.9 ft) | | | |
| **MQDC1-506** | 2 m (6.5 ft) | | | |
| **MQDC1-515** | 5 m (16.4 ft) | | | |
| **MQDC1-530** | 9 m (29.5 ft) | | | |
| **MQDC1-560** | 18 m (59 ft) | | | |
| **MQDC1-506RA** | 2 m (6.5 ft) | Right-Angle |  | |
| **MQDC1-515RA** | 5 m (16.4 ft) | | | |
| **MQDC1-530RA** | 9 m (29.5 ft) | | | |
| **MQDC1-560RA** | 19 m (62.3 ft) | | | |

# 6 Product Support

## 6.1 Cleaning and Maintenance

Clean the sensor when soiled and use with care.

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow the window clear using filtered, compressed air, then clean as necessary using only water and a lint-free cloth.

## 6.2 Contact Us

Banner Engineering Corp. headquarters is located at:

9714 Tenth Avenue North
Minneapolis, MN 55441, USA
Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

## 6.3 Banner Engineering Corp. Limited Warranty

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