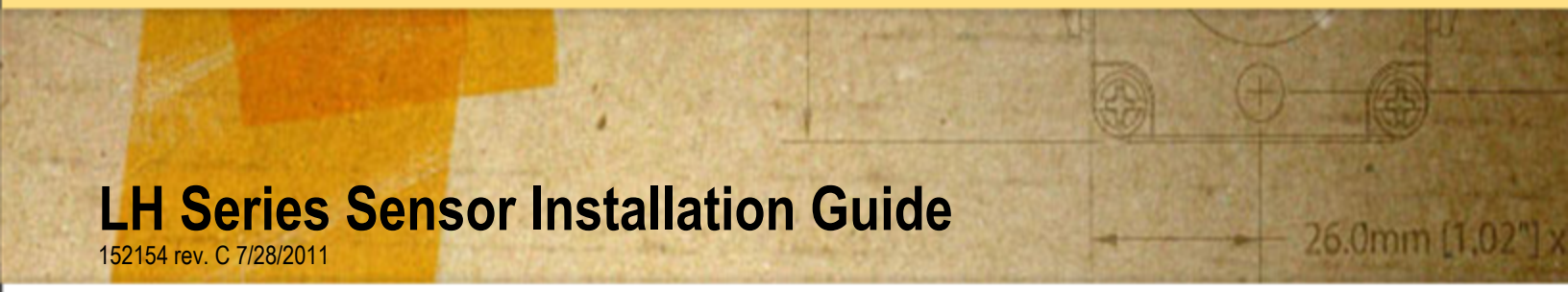
LH Series Sensor Installation Guide

152154 rev. C 7/28/2011



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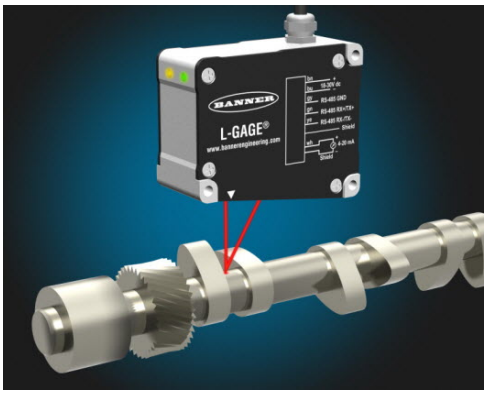
Introduction

Banner's LH Series Laser Displacement Sensor brings a sophisticated and cost-effective solution to precision measurement applications. Featuring a narrow effective beam, excellent resolution, and user configurable outputs, the LH Series sensor solves a variety of measurement applications with an all-in-one design. The LH Series Sensor can serve as a displacement measurement sensor or can perform thickness delta measurements when two sensors are configured to work together. The LH Series Configurator is a software tool for setting up a network of sensors, configuring sensors, and acquiring measurements using serial communication over RS-485. Measurements from multiple sensors can be simultaneously acquired using the LH Network protocol.



Installation Overview

This Installation Guide provides an overview of the LH Series Laser Displacement Sensor and describes how to install and prepare for configuring the sensor.

Features

- Provides precise displacement measurements or thickness delta measurements (thickness delta measurements requires two sensors)
- Self-contained Class 2 modulated visible laser gauging sensor
- Needs no separate controller
- Narrow effective beam is excellent for precision gauging applications
- Automatic run mode dynamically adjusts laser power and measurement rate based on target conditions or measurement rate can be locked by user
- 4-20 mA analog output that can be easily scaled over a specified measurement window
- Digital output provides the measurement value on the RS-485 bus
- Sensor can be easily configured using LH Series Configurator software

Components

Each LH Series Laser Displacement Sensor Kit includes the following:

- 1 LH Series High-Performance Laser Displacement Sensor
- 1 CD containing Banner LH Series Configurator (p/n 13597) and LH Series Laser Displacement Sensor Configurator Software Manual (p/n 150307)
- This Installation Guide (p/n 152154)

NOTE: A INTUSB485-LH converter to connect the LH Series Sensor to a PC can be purchased separately.

WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

WARNING: Class 2 Safety Notes

Low-power lasers are by definition incapable of causing eye injury within the duration of the blink, or aversion response of 0.25 seconds. They must also emit only visible wavelengths (400-700 nm). Therefore, an ocular hazard can only exist if an individual overcomes their natural aversion to bright light and stares directly into the laser beam. The product requirements for these lasers are to have a [hazard] label and to have an indicator light to indicate laser emission.

The two operational safety rules are:

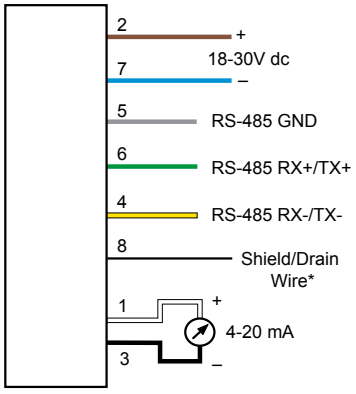
- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range

WARNING: Beam Paths:

The beam emitted by a class 2 laser product should be terminated at the end of its useful path. Open laser beam paths should be located above or below eye level where practical.

LH Series Installation and Setup

Cable/Connector Wiring



Pin	Color	Description
1	White	4-20 mA output source
2	Brown	Power supply 18-30V dc
3	Shield (bundled with white wire inside blue foil wrap)	4-20 mA output return
4	Yellow	RS-485 RX- / TX-
5	Grey	Ground of RS-485 bus
6	Green	RS-485 RX+ / TX+
7	Blue	Ground
8	Shield	Shield/drain wire*

* The shield/drain wire is connected internally to the sensor housing and should be connected as follows:

1. If the sensor housing is mounted so that it is in continuity with both the machine frame and earth ground, connect the shield/drain wire (also) to earth ground.
2. If the sensor housing is mounted so that it is insulated from the machine frame, connect the shield/drain wire to -V dc (together with the blue wire).
3. If the sensor is mounted so that it is in continuity with the machine frame, but not with earth ground, do not connect the shield/drain wire (i.e. cut off the shield/drain wire).

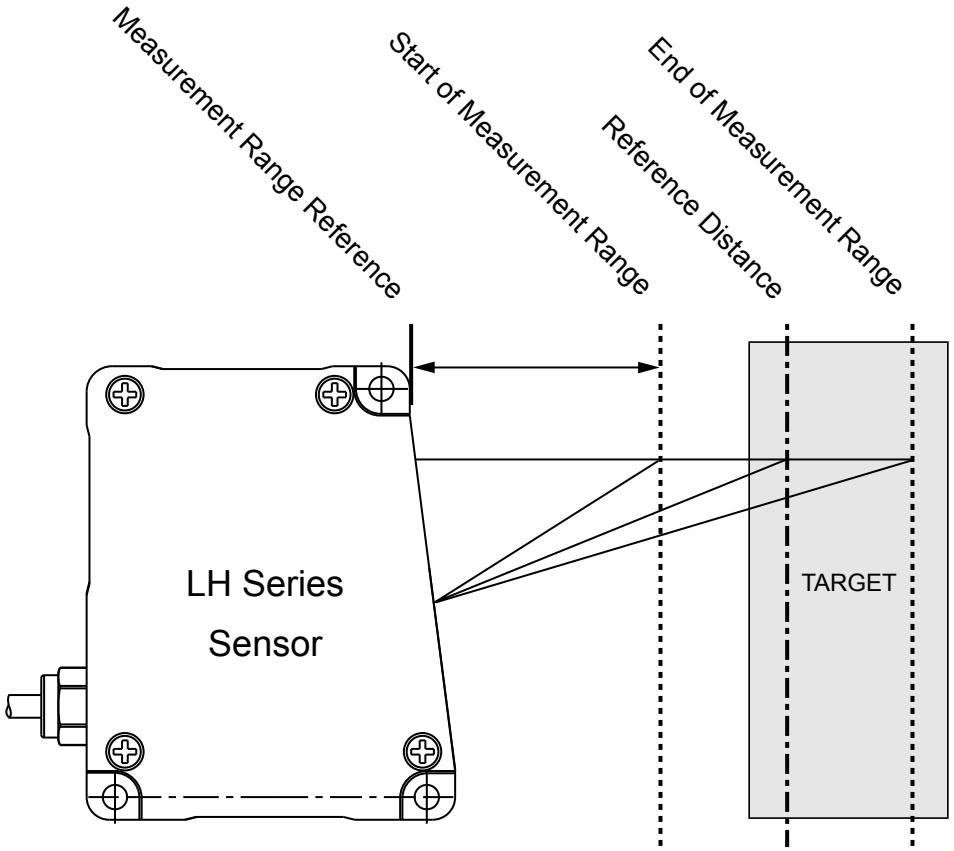
Installation

The LH Series Laser Displacement Sensor is an optical instrument capable of micrometer-level resolutions.

NOTE: Handle the sensor with care when installing and operating. Applications requiring measurement resolution in the micrometer range must take vibration, dust, and thermal expansion effects into consideration. Windows of all sensors must be clean for full functionality. Windows that are soiled by dust, water, oil, etc may cause the sensor to not operate correctly. The windows should be cleaned thoroughly whenever necessary, using a high quality glass cleaner.

Displacement Measurement Installation

1. Adjust the distance between the sensor head and the target so the target is near the middle of the measurement range.
2. The sensor must be aligned to the target so the laser beam strikes the target surface at a right angle.
3. Secure the sensor with 3 bolts of 4 mm diameter.
4. Attach the M12 cord set and complete wiring of the sensor.



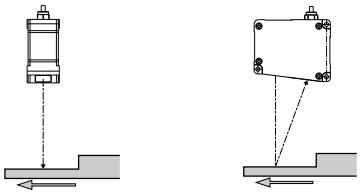
Displacement Measurement Installation Tips

Target motion must be perpendicular to emitter/receiver axis.

Some targets (those with a stepped plane facing the sensor, a boundary line, or rounded targets) pose specific problems for sensing distances. For such applications, see below for suggested mounting orientations.

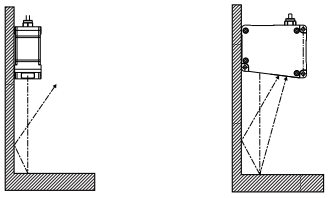
Height-difference

Correct Incorrect



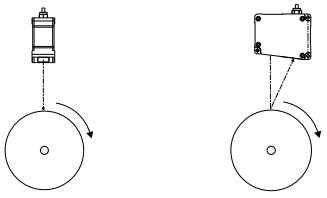
By a Wall

Correct Incorrect



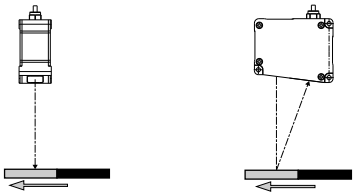
Moving Target

Correct Incorrect



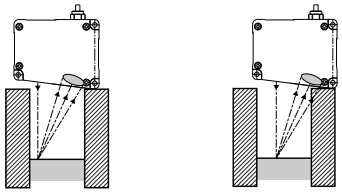
Border of different luster or color

Correct Incorrect



Displacement in a hole

Correct Incorrect



Thickness Delta Measurement Installation

For thickness delta measurement using two sensors, the "master/slave separation" is significant instead of the "middle of range" that is significant when measuring displacement. It is frequently necessary to measure materials whose thickness lies in a particular range. In such cases you should increase the distance apart by the nominal thickness of the material that is being measured.

The factory defaults for a thickness delta measurement are as follows:

Model	Default Nominal Thickness	Ideal Master/Slave Separation
LH30	5 mm	65 mm
LH80	20 mm	180 mm
LH150	50 mm	350 mm

The ideal master/slave separation can be calculated by the following formula:

Ideal Separation = 2 * Reference Distance + Nominal Thickness

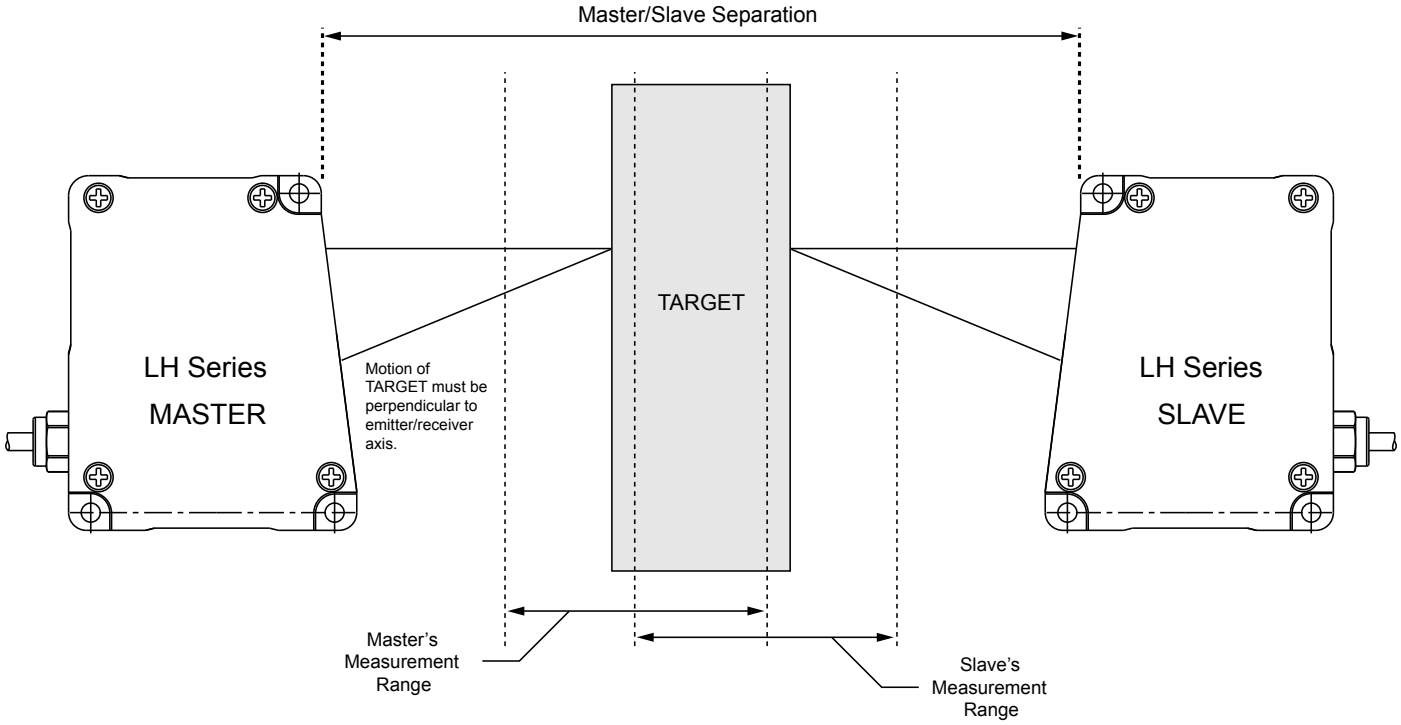
For example: LH30 with 14mm nominal thickness would be calculated as follows: Ideal Separation = 2 * 30 + 14 = 74 mm

(see *Performance Specifications* on page 14 for Reference Distance)

If the ideal master/slave separation cannot be achieved due to application restrictions, the thickness delta measurement can still be configured to work properly by adjusting the Thickness Delta Offset parameter via the Banner LH Series Configurator software.

Thickness Delta Measurement Installation Steps:

1. Adjust the separation distance between the Master and Slave sensors as required by the application.
2. The Master and Slave sensors must be aligned to the target so the laser beam strikes the target surface at a right angle.
3. Secure both sensors with 3 bolts of 4 mm diameter.
4. Attach the M12 cord set and complete wiring of both sensors.



Handling and Storage

The LH Series Laser Displacement Sensor is an optical instrument capable of micometer-level resolutions.

CAUTION: The sensors are delivered in shock-resistant packaging. Always handle/transport the sensors carefully to avoid rough handling. The sensors must be stored in a dry place and should not be subjected to extreme temperature fluctuations.

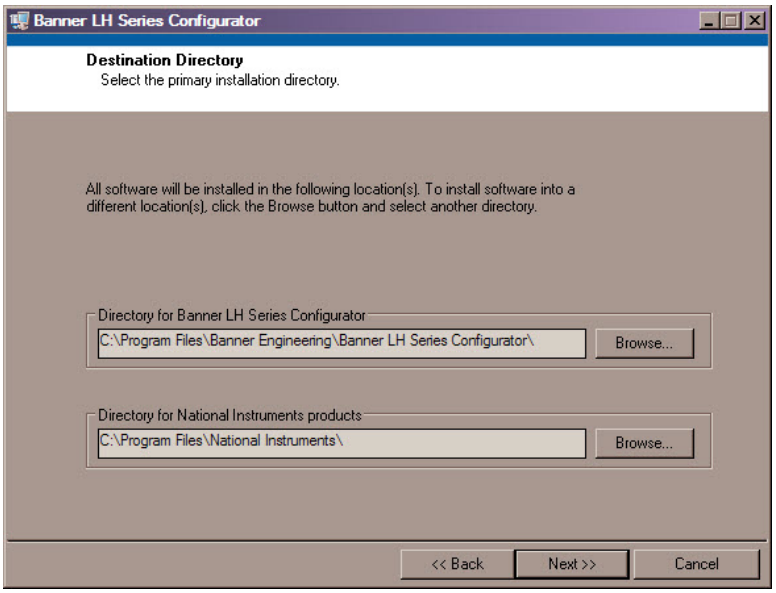
LH Series Configurator Software

The LH Series Configurator CD (P/N 13597) includes the LH Series Configurator software and the LH Series Laser Displacement Sensor Configurator Software Manual (P/N 150307).

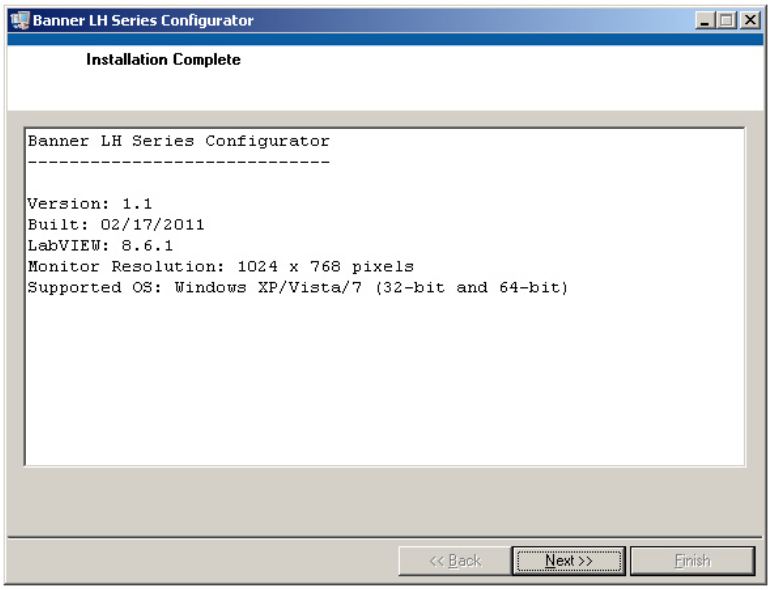
Software Installation

The LH Series Configurator software is compatible with Windows XP, Windows Vista, and Windows 7 (32-bit and 64-bit). To install the LH Series Configurator software:

1. Start up the computer on which the LH Series Configurator software is to be installed.
2. Close all active programs.
3. Insert the LH Series CD into the CD ROM drive of the personal computer. If you have auto-start enabled, the CD should automatically start. If it doesn't start --
    a. Double-click on the **My Computer** icon on the desktop.
    b. Double-click on the **CD Drive** in the list that appears.
    c. Double-click on the **setup.exe** file.
4. When the Install screen appears, click the Install button.
5. Select the destination directory for the LH Series Configurator software or just click the Next button to accept the defaults.

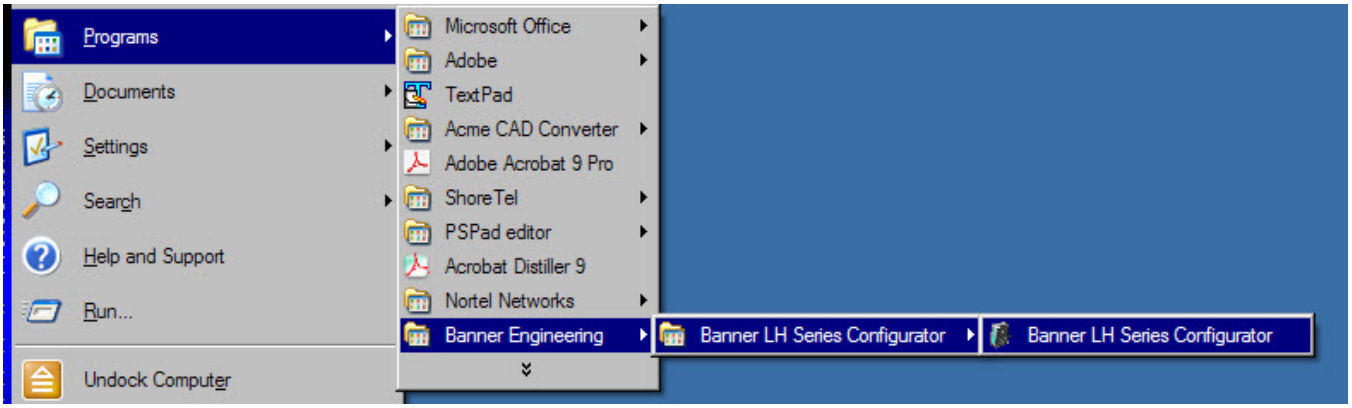


6. When the installation completes, click the Finish button.



Starting Up the LH Series Configurator

To start up the software, double-click the Banner LH Series Configurator icon on the desktop, or launch the Banner LH Series Configurator from the the Start menu.



When the software starts, it displays the Main screen which is described in the section that follows.

LH Series Configurator Main Screen

1. **Menu Bar**

Main Menu	Menu Option	Description
File	***Return to Main Screen***	Returns the user to the Main Screen.
	Load Last LH Network Setup	The LH Series Configurator software is automatically saving the network setup in the background while the user is setting up the LH Network. This menu option provides a way for a user to quickly load the saved network setup after an interruption. Note that, if something has changed on the network since the last time the LH Series Configurator software was used, you will need to re-scan the network.
	Open LH Network Setup File	Provides a way to load a previously saved LH Network Setup File. Note that, if something has changed on the network since the last time the LH Series Configurator software was used, you will need to re-scan the network.
	Save LH Network Setup File	Saves an LH Network Setup File.
	Exit	Used to exit the LH Series Configurator software.

Main Menu	Menu Option	Description
Tools	***LH Assistant***	An alternative way to access the LH Assistant setup wizards and utility tools.
	Show Comm Traffic	Used for monitoring communications traffic.
Help	***Show Help***	Launches the Main Help contents.
	About Banner LH Series Configurator	Displays software version information.

2. **LH Assistant**

   The LH Assistant button launches the LH Assistant, which includes wizards to guide the user step-by-step through setting up a single displacement sensor, a master/slave pair of sensors for a thickness delta measurement, or a network of sensors. The LH Assistant also includes two utilities, one for resetting a sensor back to factory defaults and the other for manually assigning a sensor to an existing network.

3. **LH Configurator**

   The LH Configurator button connects to the LH Network and launches the LH Network and Measurements screen. Typically, a user will launch the LH Network and Measurements screen after a network is configured for the purpose of acquiring measurement data from the network, refining sensor configurations, and diagnosing problems.

4. **COM Port**

   The COM Port selector displays the current COM Port that the PC is using to communicate with the LH Network. There is an option to Refresh (that is, scan) for all available COM Ports on the PC.

Tip: If using an INTUSB485-LH converter:

1. Refresh the COM Port list with the converter disconnected.
2. Connect the converter to an available USB port.
3. Refresh the COM Port list again. The converter will be the new COM Port in the list.

Sensor Specifications and Dimensions

General Specifications

Supply Voltage and Current

18 to 30V dc (10% maximum ripple); 250 mA max @ 24V dc (exclusive of load)

Supply Protection Circuitry

Protected against reverse polarity and transient over voltages

Delay at Power-up

1.25 seconds

Sensing Beam

670 nm (1mW) visible red IEC and CDRH Class 2 laser

Measuring Frequency

Dynamically adjusted from 300 to 4000 Hz depending on target conditions, or locked via LH Series Configurator software.

Ambient Light

≤ 3000 Lux

Output Configuration and Rating

Analog current output:4 to 20 mA (current sourcing)

Analog output rating: 1 kΩ max @ 24V dc, max load resistance = [(Vcc - 4.5)/0.02]Ω

Output Response Time

User adjustable output filtering via LH Series Configurator software

1.25ms Analog Output Hold upon loss of target

Temperature Effect

0.01% of full scale range/°C

Adjustments

None on sensor; Configuration through LH Series Configurator software

Indicators

See *Indicators* on page 14

Application Notes

Allow 30-minute warm-up

Construction

Housing: Aluminum

Cover plate: Aluminum

Lens: Glass

Cable: PVC and nickel-plated brass

Environmental Rating

IP67

Connections

150 mm (6") M12 8-pin Euro-style pigtail quick-disconnect. Mating QD cables are purchased separately

Serial Communication Interface

RS-485, optically isolated, up to 230 KBaud

Serial Communication Protocol

LH Network

Operating Conditions

Operating Temperature: –10° to +45° C (+14° to 113° F)

Storage Temperature: -10° to 80° C (+14° to 176° F)

Maximum relative humidity: 85% at +45° C, non-condensing

Vibration and Mechanical Shock

Vibration: IEC60947-5-2, 10-55 Hz, 0.5 mm P-P, 3 axis

Shock: IEC60947-5-2, 30G, 11 milliseconds, half sine wave, 3 axis

Maximum mounting bolt tightening torque: 1 Nm

Factory Default Settings

Measurement Mode: Displacement

Sensor Address: Unset (Address 0)

Baud Rate: 115200

Analog Output: 4-20 mA, positive slope, full scale range

Certifications

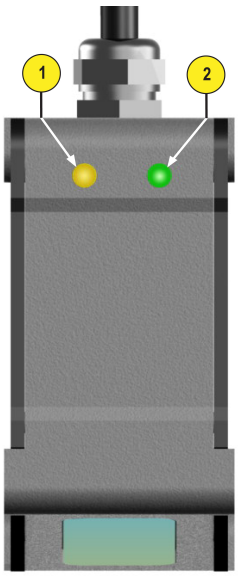
CE

Performance Specifications

Specification	Model		
	LH30IX485QP	LH80IX485QP	LH150IX485QP
Measurement Range (mm)	25 to 35	60 to 100	100 to 200
Measurement Span (mm)	10	40	100
Start of Measurement Range (mm)	25	60	100
Reference Distance (mm)	30	80	150
End of Measurement Range (mm)	35	100	200
Maximum Thickness Delta Measurement (mm)[1]	10	40	100
Default Ideal Separation for Thickness Delta Measurement (mm)	65	180	350
Spot Diameter at Reference Distance (micron)	50	125	225
Linearity[2] (0.1% of full scale range) (micron)	10	40	100
Resolution[2, 3] (micron)	1	4	10

1. Thickness Delta is the change in thickness (i.e. 100-110mm is 10mm of thickness delta)
2. Measured at 20°C, using a standard white ceramic target
3. Resolution measured with the Output Filter value set to 64

Indicators



1. Amber Signal LED
2. Green Power LED

Green Power LED

The Green Power LED indicates the operating status of the sensor.

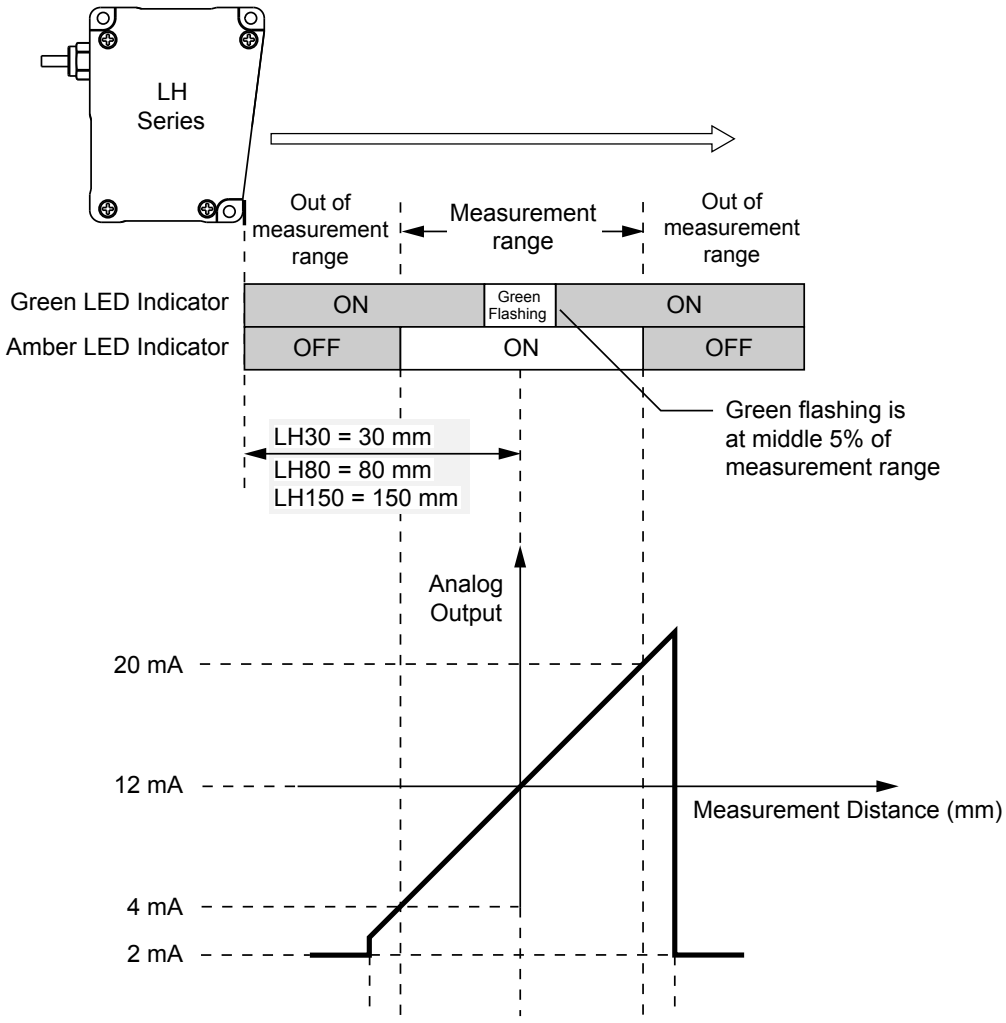
Power LED Status	Indicates
OFF	Power is OFF
Flashing	Target detected in middle 5% of measurement range
ON Solid	Sensor is operating normally (power is ON, Laser enabled)

Amber Signal LED

The Amber Signal LED indicates that a valid target is detected within the measurement range.

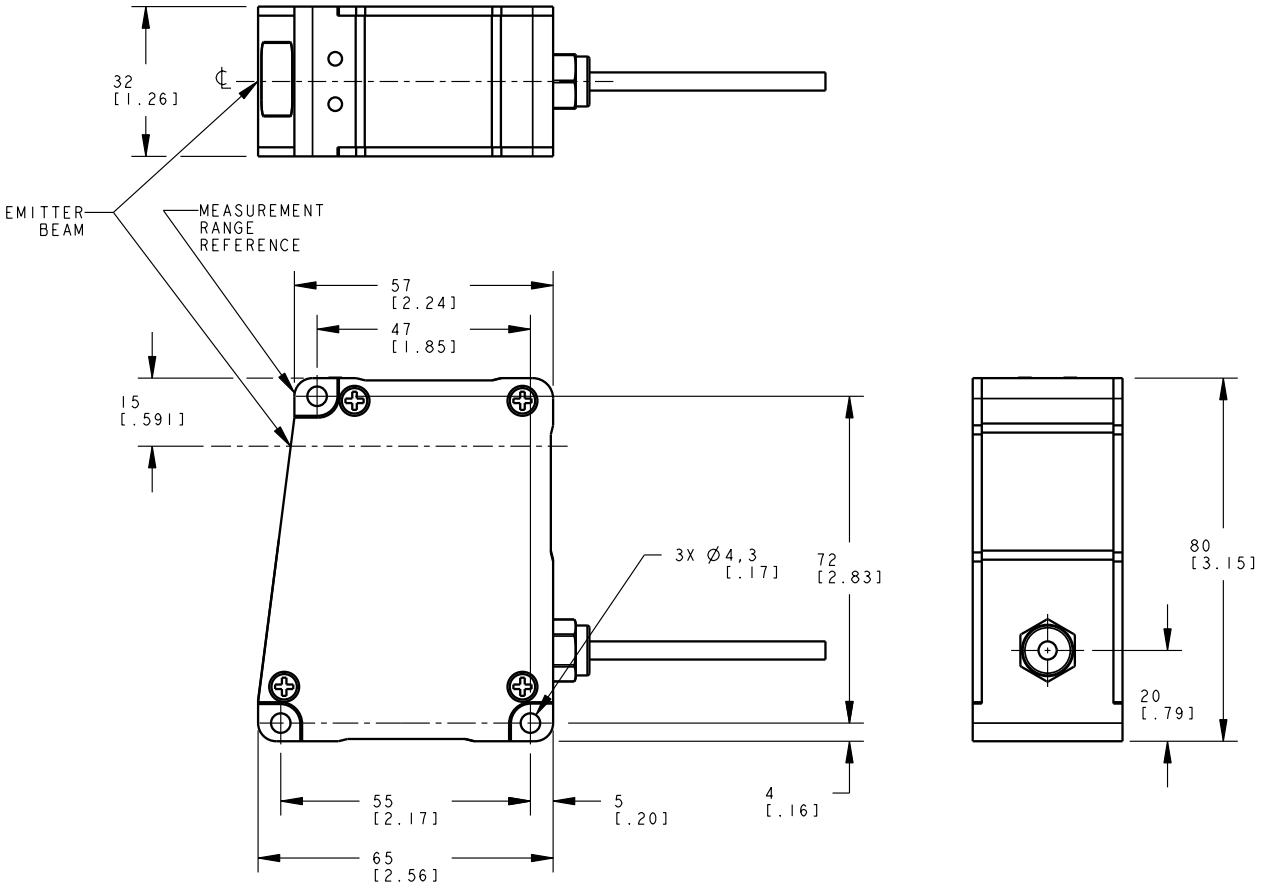
Signal LED Status	Indicates
OFF	No signal is received, or the target is outside the measurement range of the sensor
ON Solid	A valid target is within the measurement range of the sensor

LED Indicators and Outputs



	Start	Reference	End
LH30	25 mm	30 mm	35 mm
LH80	60 mm	80 mm	100 mm
LH150	100 mm	150 mm	200 mm
LH30 Spot Size Ø (micron)	110	50	110
LH80 Spot Size Ø (micron)	200	125	200
LH150 Spot Size Ø (micron)	350	225	350
RS-485 Digital Output	62768	32768	2768

Dimensions

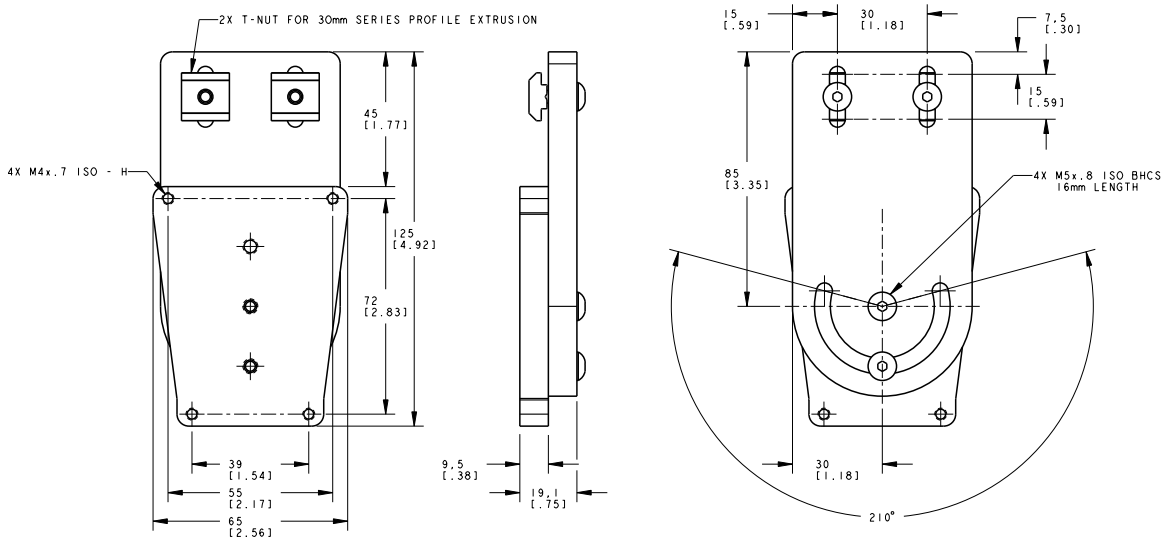

32
[1.26]
EMITTER BEAM
MEASUREMENT RANGE REFERENCE
57
[2.24]
47
[1.85]
15
[.591]
3X Ø4,3
[.17]
72
[2.83]
80
[3.15]
20
[.79]
55
[2.17]
5
[.20]
4
[.16]
65
[2.56]

Accessories

Mounting Brackets

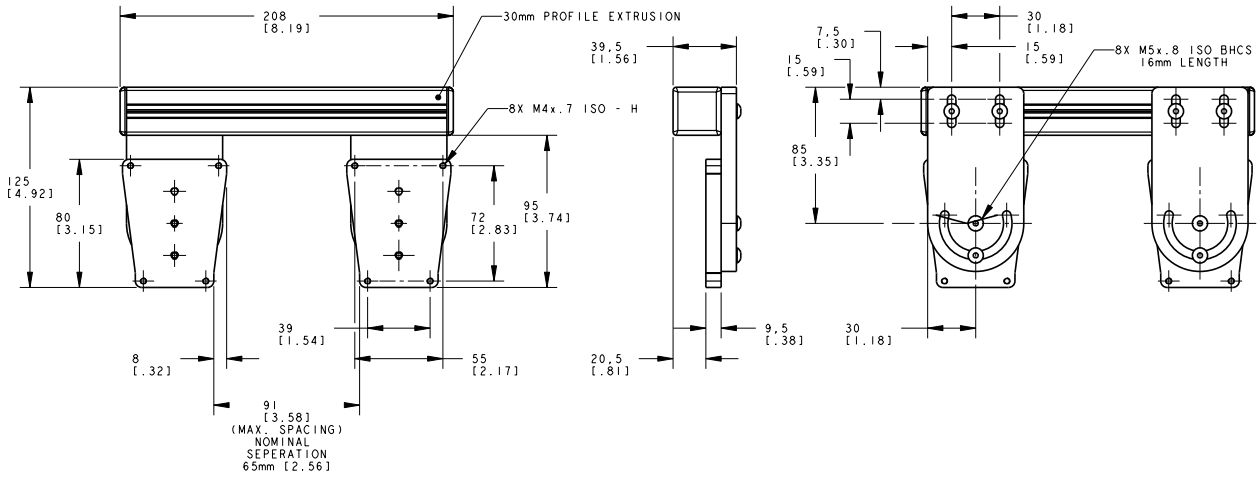
SMBLH1

- Main mounting bracket for LH Series sensor
- Anodized Aluminum



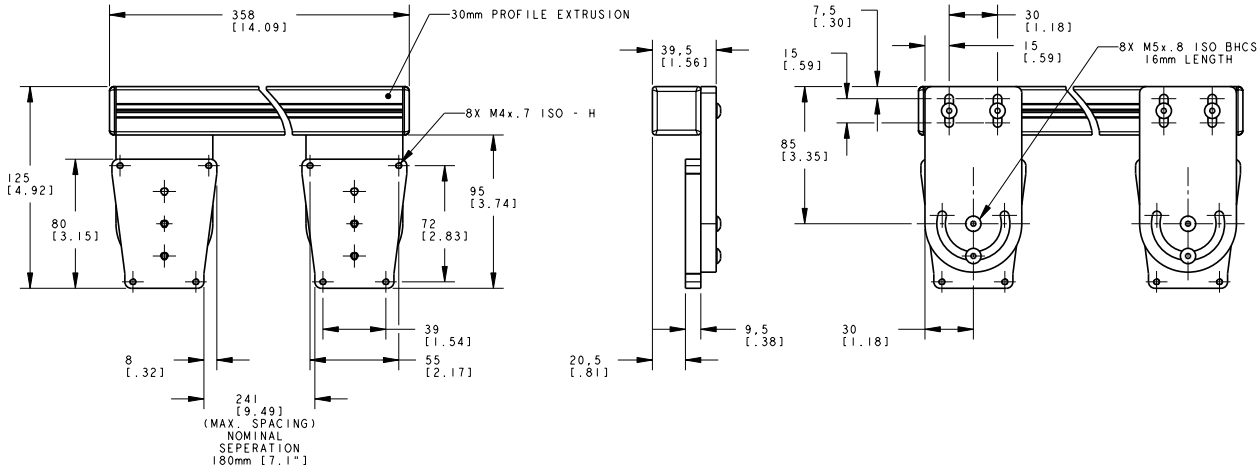
SMBLH30

- Thickness Delta Measurement Extension for LH30 sensors
- Anodized Aluminum



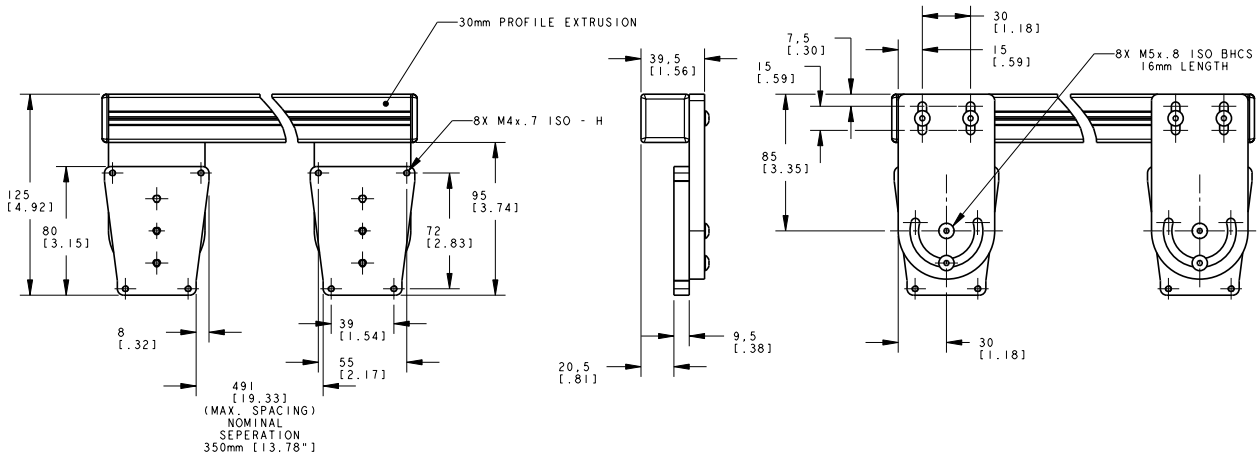
SMBLH80

- Thickness Delta Measurement Extension for LH80 sensors
- Anodized Aluminum



SMBLH150

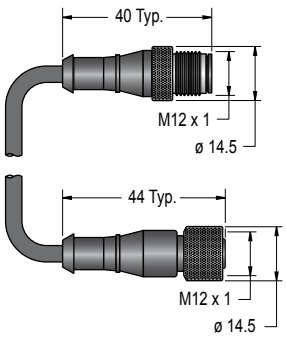
- Thickness Delta Measurement Extension for LH150 sensors
- Anodized Aluminum

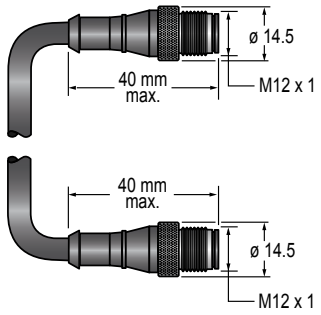


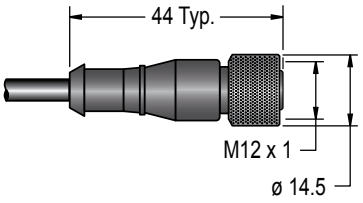
INTUSB485-LH Adapter

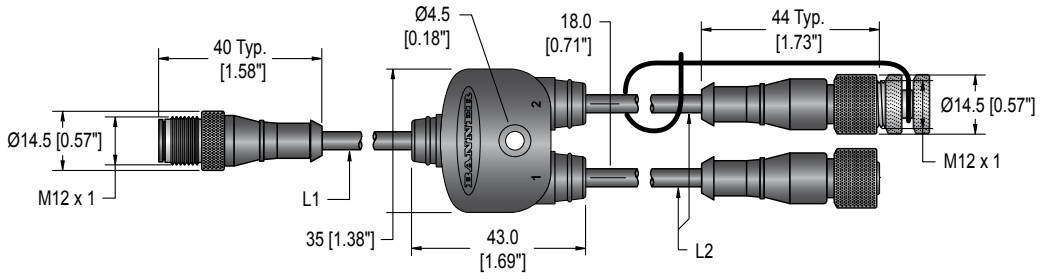
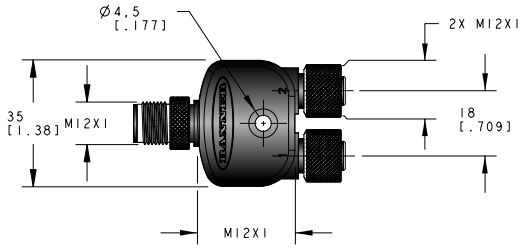
Model	Adapter	Length
INTUSB485-LH	RS-485 to USB	.75 meter

8-Pin Quick Disconnect (QD) Cordsets

8-Pin M12/Euro-Style Cordsets – Double-Ended Male-Female			
Model	**Length**	**Description**	**Dimension**
MQLH-806-MF	2 m (6.5')	8-pin cable, Euro-style, straight, with shield; double-ended Male and Female	
MQLH-815-MF	5 m (15')		
MQLH-830-MF	9 m (30')		

8-Pin M12/Euro-Style Cordsets – Double-Ended Male-Male			
Model	**Length**	**Description**	**Dimension**
MQLH-801-MM	0.3 m (1')	8-pin cable, Euro-style, straight, with shield; double-ended Male and Male	

8-Pin M12/Euro-Style Cables – Female			
Model	**Length**	**Description**	**Dimensions**
MQLH-806-F	2 m (6.5')	8-pin cable, Euro-style, straight, with shield	
MQLH-815-F	5 m (15')		
MQLH-830-F	9 m (30')		

8-Pin M12/Euro-Style Cables – Splitter		
Model	**Length**	**Description**
CSB-M1281M1282-LH	1 m (3') L1 = 305 mm (1') L2 = 610 mm (2')	8-pin cable, Euro-style, straight, with shield. 2-way splitter is useful for connecting a single sensor or a network to the communication adapter.
		
CSB-M1280M1280-LH	0 m (0')	8-pin cable, Euro-style, straight, with shield. 2-way splitter is useful for connecting a single sensor or a network to the communication adapter.
		
CSB3-M1281M1282-LH	1 m (3') L1 = 305 mm (1') L2 = 610 mm (2')	8-pin cable, Euro-style, straight, with shield; 3-way splitter is useful for connecting a thickness master/slave pair of sensors or a network to the communication adapter.