

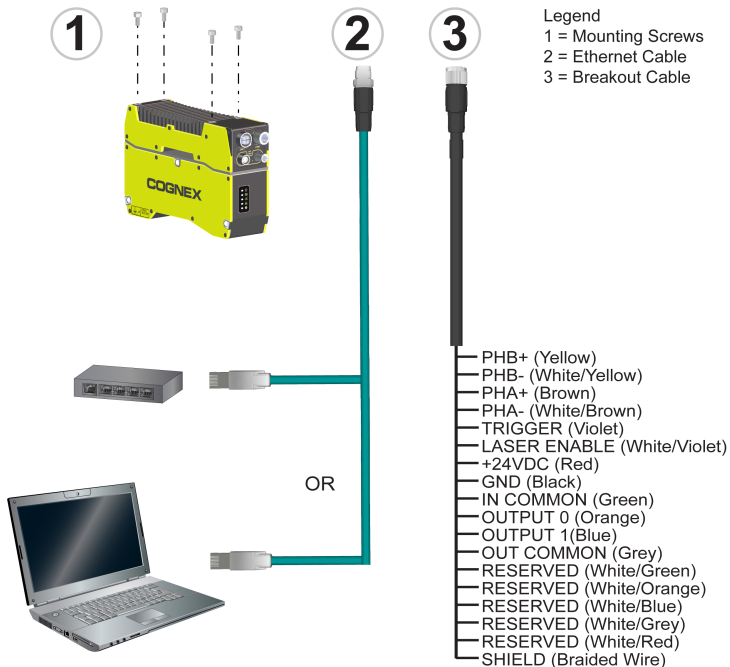
COGNEX

In-Sight[®] 3D-L4000 Series Displacement Sensor Manual




2021 January 13
Revision: 1.0.0.62

In-Sight 3D-L4000 Series



Installation

Read this section to learn how the displacement sensor connects to its standard components and accessories. For a list of options and accessories, contact your Cognex sales representative.

 **Note:** Cables are sold separately.



CAUTION: All cable connectors are keyed to fit the connectors on the displacement sensor. Do not force the connections or damage may occur.

Mount the Displacement Sensor: Top Housing

1. Align the holes on the mounting surface with the mounting holes on the displacement sensor.
2. Insert the M4 screws into the top mounting holes and tighten. The maximum torque is 2.00Nm (17.70in-lb). The maximum insertion depth of the M4 screws should not exceed 8mm. This does not include the thickness of the mounting material used.

Connect the Ethernet Cable

CAUTION: The Ethernet cable shield must be grounded at the far end.



Whatever this cable is plugged into (typically a switch or router) should have a grounded Ethernet connector. A digital voltmeter should be used to validate the grounding. If the far end device is not grounded, a ground wire should be added in compliance with local electrical codes.

1. Connect the Ethernet cable's M12 connector to the displacement sensor ENET connector.
2. Connect the Ethernet cable's RJ-45 connector to a switch/router or PC, as applicable.

Displacement Sensor Specifications

Specification	3D-L4050	3D-L4100	3D-L4300
Operating Temperature	0°C to 35°C (32°F to 95°F) without heat sink 35°C to 45°C (95°F to 113°F) with heat sink		
Storage Temperature	-20°C to 70°C (-4°F to 158°F)		
Humidity	20% to 80%, non-condensing (Operating and Storage)		
Protection	IP65 with all cables properly attached and M/S TRIG connectors capped.		
Shock	15 G's, 6 milliseconds half sinusoidal		
Vibration	10 to 57, double amplitude 1.5 mm X,Y,Z, 3 hours in each direction		

Camera Specifications

This section provides information about the components of the camera in the 3D-L4300 displacement sensor.

The main components of the camera are the lens and the image sensor.

Image Sensor Properties

The sensor used is the Sony IMX421LLJ-C monochrome CMOS sensor.

Parameter	Value
Width	1936 pixels
Height	1464 pixels
Pixel pitch	4.5x4.5 μ m
Active area width	8.7 mm
Active area height	6.0 mm
Package type	LGA226
Package size	20.0x16.8 mm

The table below summarizes data points per profile characteristics regarding the displacement sensortypes.

Data points/profile		IS3D-L4050	IS3D-L4100	IS3D-L4300
X resolution (μm)	Top	30.2	41.7	54.2
	Bottom	49.5	99.0	260.4
Z resolution (μm)	Top	2.5	4.4	6.9
	Bottom	6.9	25.9	147.5
Z repeatability ¹ (μm)	Top	0.5	1	2
	Bottom	0.5	1	2
Z linearity ²		0.06% of full scale (F.S.)	0.04% of full scale (F.S.)	0.05% of full scale (F.S.)
Temperature characteristics		0.01% of F.S./°C		

Lens Specifications

The table below summarizes lens specifications.

Parameter	Value
Lens aperture	$f/\# \geq 2.8$
Geometric distortion	$< 2\%$
Vignetting	$< 10\%$
Blur	RSS Blur + Diffraction = 1pixel
Ambient light rejection of the bandpass filter	$< 20 \text{ nm}$
Stray light rejection and veiling glare	$< 1\%$ in 10 milliseconds

Cleaning and maintenance

This chapter gives an overview about the cleaning and maintenance of the displacement sensor.

¹ Z repeatability is measured an average of 100 times over a pointcloud using a 4x4 mm area, at the middle of the measurement range

² Z linearity is the max. deviation of 250 position measurements on the measurement range, where a measurement is the average of 2 profiles using the standard Cognex target.

Clean the housing

To clean the outside of the displacement sensor housing, use a small amount of mild detergent cleaner or isopropyl alcohol on a cleaning cloth. Do not pour the cleaner on the displacement sensor housing.



CAUTION: Do not attempt to clean any In-Sight product with harsh or corrosive solvents, including lye, methyl ethyl ketone (MEK) or gasoline.

Sensor maintenance

The windows to the displacement sensor and laser must be kept clean and free of defects to ensure proper operation. Any scratches, dust or dirt will impact the accuracy of acquired images.



CAUTION: Use care not to damage the anti-reflective coating on the windows.

Cognex makes the following recommendations for cleaning the laser and displacement sensor windows:

- Unplug the unit so the laser cannot be enabled.
- Use lint-free tissue or an optical grade cotton swab ("Q-tip").
- Use reagent-grade isopropyl alcohol.
- Use minimal pressure.
- Use several tissues or swabs.
- Start at the center of each window and spiral out to the edges.
- Rotate the tissue or swab during cleaning so dirt is not dragged across the surface.

Laser Models

The following sensors contain a class 2M laser:

Model	Class 2M Laser
3D-L4050 3D-L4100 3D-L4300	√

Laser Compliance



WARNING: Laser light, do not stare into beam: Class 2M laser product.
Failure to follow these instructions may cause serious injury.

Cognex places the following labels on every 3D-L4000 series displacement sensor:



Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019

Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019.



WARNING: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Specification	3D-L4050	3D-L4100	3D-L4300
Wavelength	450 nm +/- 10 nm		
½ Angle Beam Divergence	W0 1.54	W0 0.93	W0 0.80
Pulse Duration	Varies to DC		
Maximum Power	<5mW accessible power		

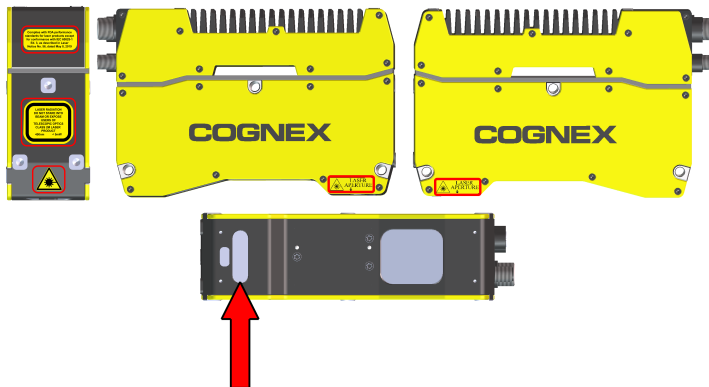
Laser Safety Warnings

- Do not stare into the beam.
- Do not view directly with optical instruments (magnifiers).
- Do not place optical components (mirrors) into the beam.
- Design test fixtures in such a way that unintentional viewing of the beam is prevented.
- Switch off the laser when not in use.
- Avoid the use of highly reflective materials. If you cannot, try to angle the part so unintentional viewing of the reflection is prevented.
- Terminate (block) unused beams.
- Keep the laser plane horizontal or pointing downwards.
- Report any issues that may have an impact on laser safety to your supervisor or Laser Safety Officer.
- There is no scheduled maintenance necessary to keep the product in compliance.
- Under no circumstances should you operate the sensor if it is defective or the seal damaged. Cognex Corporation cannot be held responsible for any harm caused by operating a faulty unit.
- Under no circumstances should you modify in any way the sensor or its housing.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- When moving the unit from a very hot environment to a cold environment please allow the unit to equalize in a room temperature environment for 2 hours between temperature extremes.

Label Locations





WARNING: Laser light, do not stare into beam: Class 2M laser product.
Failure to follow these instructions may cause serious injury.



WARNING: Avoid exposure - laser radiation is emitted from this aperture.

Regulations and Conformity

i Note: For the most current CE declaration and regulatory conformity information, see the Cognex support site: cognex.com/support.

Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
	3D-L4050: Regulatory Model 50203 3D-L4100: Regulatory Model 50203 3D-L4300: Regulatory Model 50203 This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take immediate measures. This equipment complies with the essential requirements of the EU Directive 2014/30/EU. Declarations are available from your local representative.
EU RoHS	Compliant to the most recent applicable directive.
FCC	FCC Part 15, Class A This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Laser Safety Certification	IEC 60825-1 US FDA CDRH Filing
Korea 	3D-L4050: Regulatory Model 50203: R-R-CGX-50203 3D-L4100: Regulatory Model 50203: R-R-CGX-50203 3D-L4300: Regulatory Model 50203: R-R-CGX-50203 This device is certified for office use only and if used at home, there can be frequency interference problems.

TÜV	3D-L4050: Regulatory Model 50203 3D-L4100: Regulatory Model 50203 3D-L4300: Regulatory Model 50203
	NRTL: TÜV SÜD AM SCC/NRTL OSHA Scheme for UL/CAN 61010-1.
	CB report available upon request. TÜV SÜD AM, IEC/EN 61010-1.

China RoHS



Part Name 部件名称	Hazardous Substances 有害物质					
	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexavalent Chromium (Cr (VI)) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴二苯醚
Regulatory Model 50203	X	O	O	O	O	O
<p>This table is prepared in accordance with the provisions of SJ/T 11364. 这个标签是根据SJ/T 11364的规定准备的。</p> <p>O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB / T26572 - 2011. 表示本部件所有均质材料中含有的有害物质低于GB / T26572 - 2011的限量要求。</p> <p>X: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB / T26572 - 2011. 表示用于本部件的至少一种均质材料中所含的有害物质超过GB / T26572 - 2011的限制要求。</p>						

For European Community Users

Cognex complies with Directive 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE).

This product has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment, if not properly disposed.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems for product disposal. Those systems will reuse or recycle most of the materials of the product you are disposing in a sound way.



The crossed out wheeled bin symbol informs you that the product should not be disposed of along with municipal waste and invites you to use the appropriate separate take-back systems for product disposal.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You may also contact your supplier for more information on the environmental performance of this product.

Precautions

To reduce the risk of injury or equipment damage, observe the following precautions when you install the Cognex product:

- The displacement sensor requires a UL or NRTL listed power supply with a 24VDC output that meets the following rating requirements:
 - At least 1A continuous current.
 - A maximum short circuit current of less than 4A.
 - A maximum power of less than 50VA and marked as a Limited Power Source (LPS) or National Electrical Code (NEC) Class 2.

Any other voltage creates a risk of fire or shock and can damage the components. Applicable national and local wiring standards and rules must be followed.

- This product is intended for industrial use in automated manufacturing or similar applications.
- The safety of any system incorporating this product is the responsibility of the assembler of the system.
- Do not install Cognex products where they are exposed to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- Route cables and wires away from high-current wiring or high-voltage power sources to reduce the risk of damage or malfunction from the following causes: over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply.

- This product does not contain user-serviceable parts. Do not make electrical or mechanical modifications to product components. Unauthorized modifications can void your warranty.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Include service loops with cable connections.
- Ensure that the cable bend radius begins at least six inches from the connector. Cable shielding can be degraded or cables can be damaged or wear out faster if a service loop or bend radius is tighter than 10X the cable diameter.
- The displacement sensor's M/S connectors are not supported.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purposes only and can change without notice.

Product Service

- Bring any performance issues to the attention of your Cognex sales representative.
- The sensor can only be serviced by a trained Cognex representative. Return the unit to Cognex for any service or repairs.
- Do not operate the sensor if the enclosure appears damaged.

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