FASTUS
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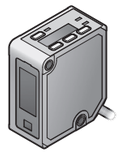
INSTRUCTION MANUAL

0813981

C-MOS Laser Displacement Sensor

CD2H Series



Download the index list, the IO Device Description file, IODD file, and the users manual from the OPTEX FA website.
https://www.optex-fa.com

IO-Link

OPTEX FA CO., LTD.

- Thank you for purchasing this C-MOS Laser Displacement Sensor CD2H Series.
- Before using this product, please read this manual carefully to ensure proper use.
- Read this manual thoroughly, and then keep this manual at hand so that it can be used whenever necessary.

Safety Precautions

Safety precautions for ensuring safe operation of this product are displayed as follows with the following symbols.

Precautions listed here describe important information about safety. Make sure to follow them accordingly.

Safety Symbols

⚠WARNING	Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage.
⚠CAUTION	Indicates that any improper operation or handling may result in minor injury or property damage.

⚠WARNING

	This product cannot be used in applications that directly or indirectly detect human bodies for the purpose of ensuring safety. Do not use this product as a detection device for protecting the human body.
	Do not disassemble, repair, modify, deform under pressure, or attempt to incinerate this product. Doing so may cause injury or fire.
	This product does not have a function that stops the emission of light from the laser during disassembly. Do not disassemble the product.
	Do not use this product in water or in a location where it may be exposed to water. Do not use this product if wet. Doing so may cause a fire or damage the product.
	This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in an explosion or fire.
	Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in an explosion or fire.
	Do not install this product in any of the following locations. Doing so may cause a fire, damage, or a malfunction. 1. Locations where dust, salt, iron powders, or vapor (steam) is present. 2. Locations subjected to corrosive gases or flammable gases. 3. Locations where oil or chemical splashes may occur. 4. Locations where heavy vibrations or impacts may occur. 5. Locations where the ambient temperature exceeds the rated range. 6. Locations subject to rapid temperature changes (or where condensation occurs). 7. Locations with strong electric or magnetic fields. 8. Locations subject to direct light.
	Do not use the product at voltages or with AC power supplies that exceed the rated voltage. Doing so may cause a fire or damage the product.
	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 adequate measures.
	This product is not intended for use with nuclear power, railways, aviation, vehicles, medical equipment, food-handling equipment, or any application where particular safety measures are required. Absolutely do not use this product for any of these fields.
	Do not use this product outdoors. It is specially designed for indoor applications.
	Do not look directly at the laser beam or intentionally shine the laser beam in another person's eyes. Doing so may have adverse affects on the eyes, including temporary blindness.
	What to do in the event of a malfunction such as smoke being emitted from the product If you detect any malfunction including emission of smoke, abnormal smells or sounds, or the body becoming very hot, immediately stop operating the product and turn off the sensor power. Failure to do so may cause a fire. Repairing the product is dangerous and should in no way be performed by the customer. Contact an Optex FA sales representative for repairs.
	What to do if water enters the product If water or any other liquid enters the product or the cable, immediately stop operating the product and turn off the power. Using the product in this condition may cause a fire.

⚠CAUTION

- Make sure to turn the power off before wiring the cable or connecting/disconnecting the connector. Performing work while the product is energized may damage it or cause electric shock.
- Do not wire with high voltage cables or power lines. Doing so may cause malfunction or damage by induction.
- Do not excessively twist or apply stress to the cable or place items on it. When connecting or disconnecting the connector, make sure to hold it by the connector portion. Do not pull on the cable.
- Do not drop the product or subject the product to strong impacts. Doing so may damage the product.
- Follow the instructions in this manual or the specified instruction manual when wiring the product or the dedicated controller for the correct wiring method. Incorrect wiring can damage the product or the controller, or cause a malfunction.
- Do not bend the cable when below the freezing point. Doing so may cause the cable to break.
- Install this product as far away as possible from high-voltage equipment, power equipment, equipment that generates large switching surges, inverter motors, welders, or any equipment that can be a source of noise.
- Do not touch the product, the cable, or the connector with wet hands. Doing so may damage the product or cause electric shock.
- Use the dedicated connector cable for connecting the product. Use of anything other than the dedicated cable may cause a malfunction or damage the product.
- Tighten the sensor head mounting screws (included screws or the like) with a tightening torque of no more than 0.8 N·m. Excessive tightening torque may damage the sensor head.
- Use the product and dedicated controller within the rated ranges.
- Install this product and dedicated controller securely. Failure to ensure secure installation may result in the products falling and becoming damaged.
- During operation, this product becomes very hot. Do not touch it for long time.
  Doing so may cause a low-temperature burn.
- The ϕ0.7 mm hole on the side of the sensor (The side opposite the laser warning label. See "2. Dimensions.") is a watertight ventilation hole. To maintain the degree of protection, do not cover this hole or insert a sharp object into it.

Precautions for Laser Use

- This product emits a Class 1 or Class 2 visible laser beam that is compliant with JIS C6802 / IEC 60825-1 laser product safety standards. Labels for applicable standards are affixed to the product.

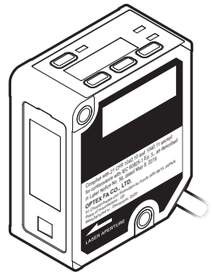
Laser Class 1

Symbol	Meaning
	Laser emission
LASER 1	Class 1 laser product
LASER APERTURE	Laser aperture

Laser Class 2

Symbol	Meaning
	Laser emission
LASER 2	Class 2 laser product
	Do not look directly at the beam
LASER APERTURE	Laser aperture

Laser warning label position



Type of laser used in this product

Type	Red semiconductor laser
Wavelength	655 nm
Maximum output	0.39 mW/1 mW
Pulse duration	Variable within 0.5 µs to 5 ms
Repetition	Variable within 200 Hz to 7.5 kHz

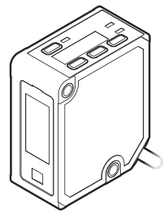
NOTICE

- After carefully considering the intended use, required specifications, and usage conditions, install and use the product within the specified ranges.
- All specifications may be changed without notice.
- When using this product, it is the responsibility of the customer to ensure necessary safety designs in hardware, software, and systems in order to prevent any threat to life, physical health, and property due to product malfunction or failure.
- Do not use this product for the development of weapons of mass destruction, for military use, or for any other military application. Moreover, if this product is to be exported, comply with all applicable export laws and regulations, including the "Foreign Exchange and Foreign Trade Act" and the "Export Administration Regulations," and carry out the necessary procedures pursuant to the provisions therein.
- Before using this product, fully examine the applicable environmental laws and regulations, and operate the product in conformity to such laws and regulations. Optex FA does not assume any responsibility for damages or losses occurring as a result of noncompliance with applicable laws and regulations.
- If this product will be exported to the United States, approval must first be obtained from the FDA (Food and Drug Administration), the laser regulating body of the United States.
- A report for this product has been submitted to the CDRH (Center for Devices and Radiological Health).
- If installing this product in your own equipment, ensure that the product is properly handled according to the laws and regulations of the relevant country or region.

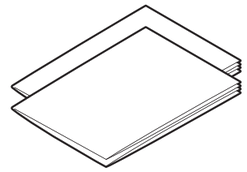
1. Included Items and Option

Included Items

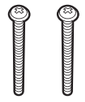
Sensor ×1



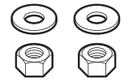
Instruction manual:
English x 1, Japanese x 1



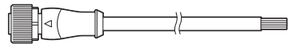
M4×35 mm
mounting screws ×2



Washers, M4 nuts ×2 sets



Optional cables (required for the pigtail cable type)



M12 5-pin connector cables
(straight, open-end):
- YF2A15-020VB5XLEAX: 2 m
- YF2A15-050VB5XLEAX: 5 m
- YF2A15-100VB5XLEAX: 10 m

Minimum bending radius:
26 mm (stationary position)

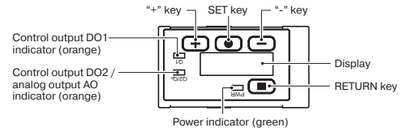
M12 5-pin connector cables
(straight, open-end, bending resistant):
- DOL-1205-G02M-R: 2 m
- DOL-1205-G05M-R: 5 m

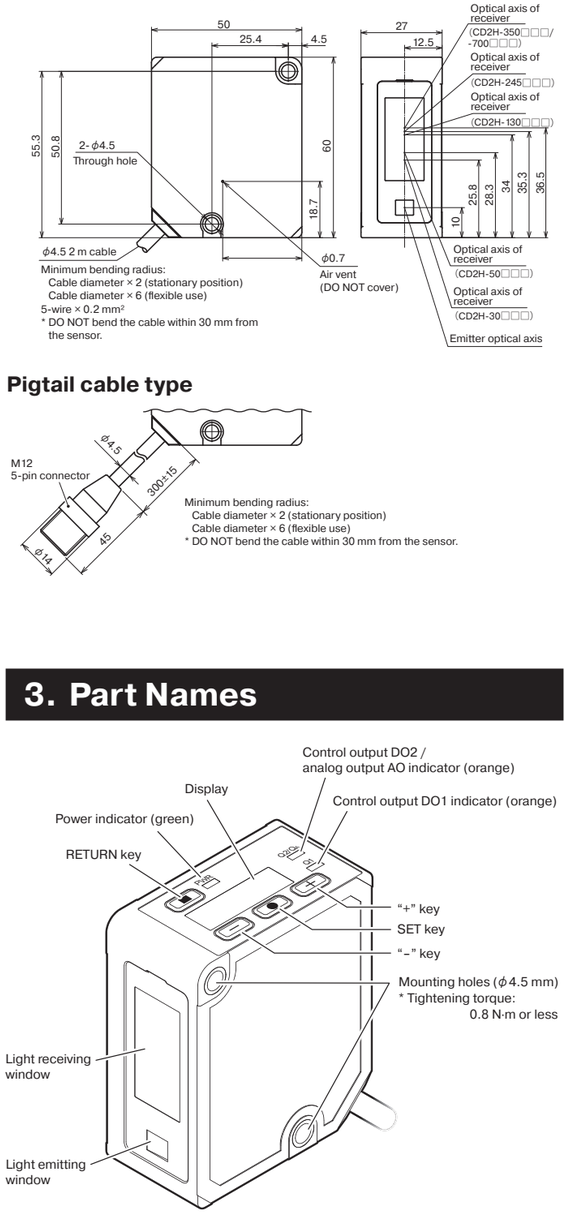
Minimum bending radius:
10 mm (stationary position)
30 mm (flexible use)

2. Dimensions

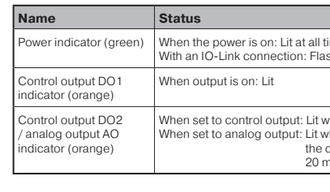
Cable type

(Unit: mm)





Pigtail cable type

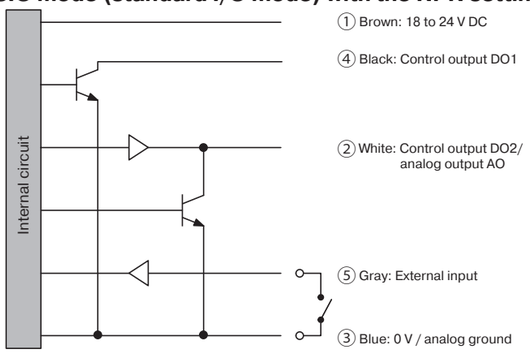


3. Part Names

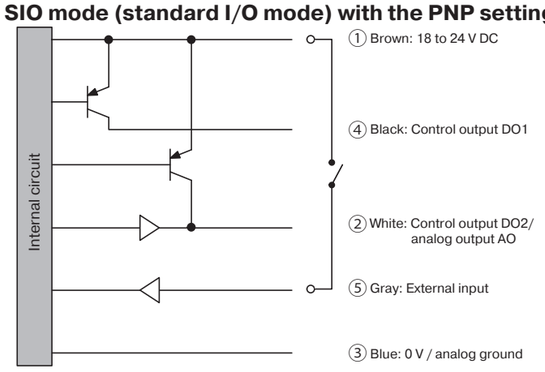
Name	Status
Power indicator (green)	When the power is on: Lit at all times With an IO-Link connection: Flashing
Control output DO1 indicator (orange)	When output is on: Lit
Control output DO2 / analog output AO indicator (orange)	When set to control output: Lit when output is on When set to analog output: Lit when the measured object is present between the distance set to 4 mA (0 V) and that set to 20 mA (10 V)

4. I/O Circuit Diagrams

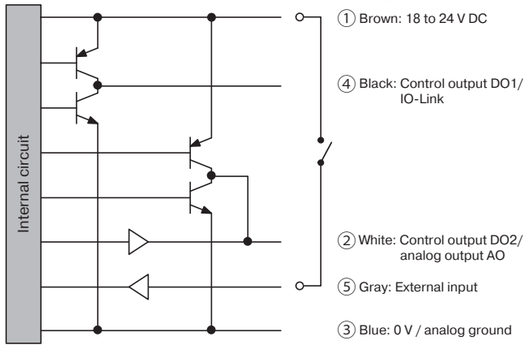
SIO mode (standard I/O mode) with the NPN setting



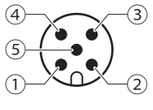
SIO mode (standard I/O mode) with the PNP setting



IO-Link mode or the Push-pull setting



M12 connector pin assignments



① 18 to 24 V DC ± 10%
② Control output DO2 / analog output AO
③ 0V / analog ground
④ Control output DO1/IO-Link
⑤ External input

5. Specifications

Measurement specifications

Model	Cable	CD2H-30A	CD2H-50A	CD2H-130	CD2H-2452	CD2H-3502	CD2H-7002
	Pigtail cable	CD2H-30M12A	CD2H-50M12A	CD2H-130M12	CD2H-245M122	CD2H-350M122	CD2H-700M122
Center of measurement range		30 mm	50 mm	130 mm	245 mm	350 mm	700 mm
Measurement range		±5 mm	±10 mm	±70 mm	±175 mm	±250 mm	±500 mm
Light source	Medium	Red semiconductor laser					
	Wavelength	655 nm					
	Maximum output	0.39 mW			1 mW		
Laser class	JIS/IEC/FDA*1	CLASS 1			CLASS 2		
Spot size*2		ϕ50 µm	ϕ70 µm	ϕ0.3 mm	ϕ0.5 mm	ϕ0.6 mm	ϕ1.0 mm
Linearity		±0.1% of FS	±0.1% of FS	±0.1% of FS	±0.1% of FS	±0.1% of FS	±0.1% of FS (200 to 700 mm)/ ±0.3% of FS (700 to 1200 mm)
Resolution*3		0.25 µm	0.25 µm	4 µm	10 µm	20 µm	100 µm
Repeat accuracy*4		0.25 µm	0.25 µm	4 µm	10 µm	20 µm	100 µm
Sampling period*5		133.3 µs/150 µs/200 µs/300 µs/500 µs/1 ms/2 ms/5 ms/Auto					
Temperature drift*6		±0.06% of FS/°C					
Weight		Cable type: Approx. 140 g Pigtail cable type: Approx. 90 g					

Common specifications

Supply voltage		18 to 24 V DC (±10%, including ripple)
Current consumption*7		80 mA (at 18 V DC), 70 mA (at 24 V DC)
IO-Link	Specifications	Ver.1.1
	Baud rate	COM3 (230.4 kbps)
	Number of process input data bytes	6 bytes
	Minimum cycle time	0.7 ms
Control output (DO1/DO2*8)	No. of outputs	2 (DO1 can be switched to IO-Link.)
	Type	NPN/PNP open collector or Push-Pull (selectable by setting), max. 100 mA / 24 V DC, residual voltage 1.8 V or less
Analog output AO*8	Current	4 to 20 mA, load impedance: 300 Ω or less
	Voltage	0 to 10 V, output impedance: 100 Ω or less
External input*9		Switchable between Off, Multi operations, Hold, Zero point teach and Laser off
Display		0.9-inch OLED display Menu languages: English, German, Spanish, Japanese, Simplified Chinese, Traditional Chinese, Korean
Indicators		Power indicator (green), IO-Link communication indicator (flashing green)/ output indicators (orange × 2)
Connection type		Cable: ø4.5 mm 2 m cable, Pigtail cable: ø4.5 300 mm cable with M12 5-pin connector Minimum bending radius: Cable diameter × 2 (stationary position), cable diameter × 6 (flexible use)
Protection circuit		Reverse connection protection, overcurrent protection
Environmental resistance	Degree of protection	IP67 (including M12 connector of pigtail cable type)
	Ambient temperature/humidity	-10 to +50°C/35 to 85%RH (without freezing or condensation)
	Storage temperature/humidity	-20 to +60°C/35 to 85%RH (without freezing or condensation)
	Ambient illuminance	Incandescent light: 10000 lx Max. Fluorescent light: 10000 lx Max.
	Vibration resistance	10 to 55 Hz Double amplitude 1.5 mm, 2 hours in each X, Y, Z direction
	Shock resistance	500 m/s² (Approx. 50 G) 3 times in each X, Y, Z direction
Applicable regulations	EMC	EMC Directive (2014/30/EU)
	Environment	RoHS Directive (2011/65/EU), China RoHS (MIIT Order No.32)
	Safety	FDA Regulations (21 CFR 1040.10 and 1040.11)*10
Applicable standards		EN 60947-5-2, IEC 60825-1
NRTL certification		UL Recognized Components Proximity Switch Certified for US and Canada.
Company standards		Noise resistance: Feilen Level 3 cleared
Warm-up time		Approx. 30 minutes
Material		Housing: PBT, Front window: PMMA

Measurement Condition

The measurement conditions are as follows unless otherwise designated:
Ambient temperature: 25°C (room temperature); supply voltage: 24 V DC; sampling period: 200 µs; moving average performed: 128; median filter: 31; center of measurement range, standard measured object (white ceramic). Furthermore, the sensor is fixed in place with an aluminum bracket when measurements are performed.

*1: In accordance with the FDA provisions of Laser Notice No. 56, the laser is classified per the IEC 60825-1:2014 standard.
*2: Defined with center strength $1/e^2$ (13.5%) at the center of the measurement range. There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object close to the detection area.
*3: The smallest determinable step when changing the distance between the sensor and the target one step at a time (at moving average of 512)
*4: Peak to peak value of measurement in stationary state (at moving average of 512)
*5: Set to 200 µs by default.
*6: Typical example when the object (white ceramic) is measured while the object and the sensor are fixed in place with aluminum brackets. This object is placed at the center of the measurement range.
*7: Value when DO2 is set to analog output (current) and measurement is not possible (outputting a current of 21 mA).
*8: Set to analog current output by default.
*9: Set to laser off by default.
*10: Excluding differences per Laser Notice No. 56.

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*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.

- Support for the China RoHS directive
  For details on the support for the China RoHS (the Administrative Measure on the Control of Pollution Caused by Electronic Information Products), see the following website.
  https://www.optex-fa.com/rohs_cn/
- Specifications are subject to change without notice
- For more information, questions and comments regarding product, please contact us at the information below.

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