FASTUS

*FASTUS is a product brand of OPTEX FA.

OPTEX FA CO., LTD.

Got a tough measurement challenge?
Contact Ramco Innovations today for
amazing application support!

C-MOS Laser Displacement Sensor

CD2H Series

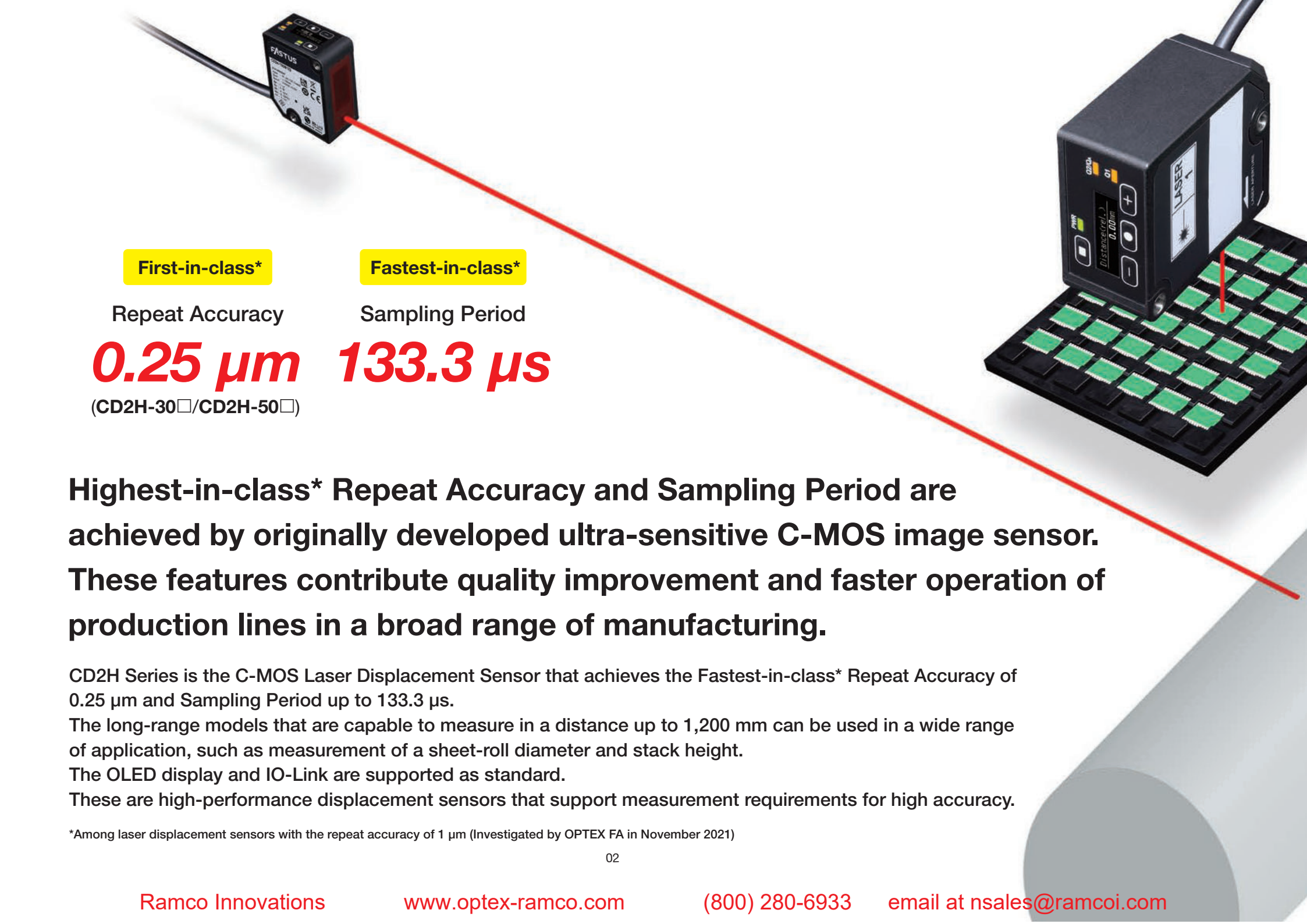
Best-in-Class All-in-One, Middle-Range Laser Displacement Sensors

NEW Six new RS-485 models

Long-distance Measurement in a long distance up to 1,200 mm

First in industry Received light waveform can be displayed on OLED Display.

Ramco Innovations www.optex-ramco.com (800) 280-6933 email at nsales@ramcoi.com



First-in-class*

Repeat Accuracy

0.25 µm

(CD2H-30□/CD2H-50□)

Fastest-in-class*

Sampling Period

133.3 µs

Highest-in-class* Repeat Accuracy and Sampling Period are achieved by originally developed ultra-sensitive C-MOS image sensor. These features contribute quality improvement and faster operation of production lines in a broad range of manufacturing.

CD2H Series is the C-MOS Laser Displacement Sensor that achieves the Fastest-in-class* Repeat Accuracy of 0.25 µm and Sampling Period up to 133.3 µs.
The long-range models that are capable to measure in a distance up to 1,200 mm can be used in a wide range of application, such as measurement of a sheet-roll diameter and stack height.
The OLED display and IO-Link are supported as standard.
These are high-performance displacement sensors that support measurement requirements for high accuracy.

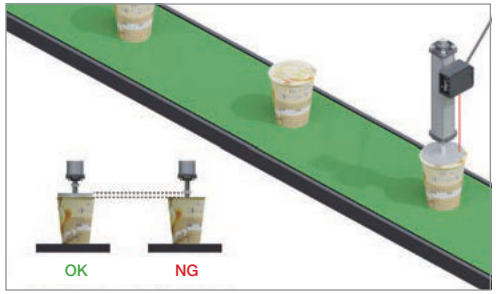
*Among laser displacement sensors with the repeat accuracy of 1 µm (Investigated by OPTEX FA in November 2021)

Application

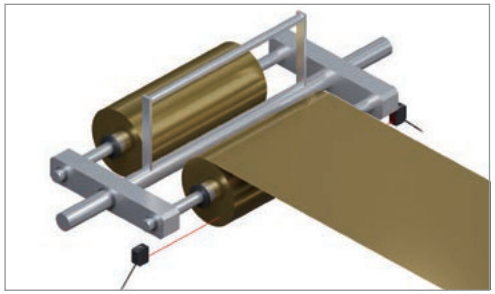
Height Measurement of Mounted Components

Presence Detection of Electronics Components

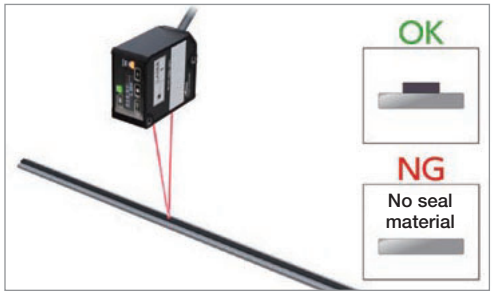
Sealing Inspection of Cupped Foods



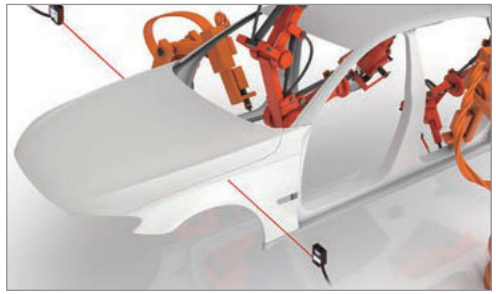
Wind-off Measurement of Secondary Battery Film



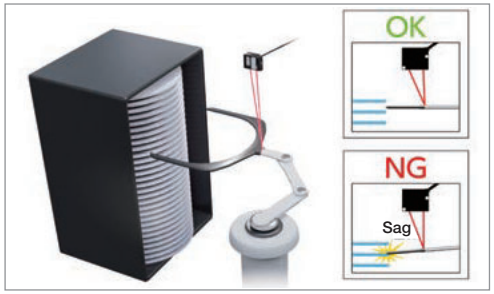
Detecting Seal Material on Pressed Products



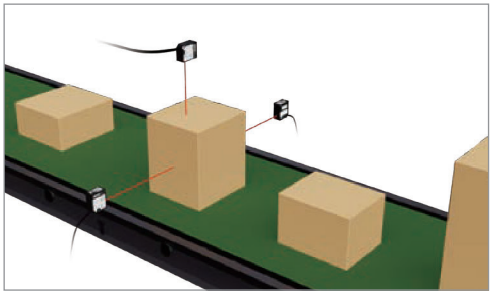
Measurement of Automobile Body Position



Transfer Robot Arm Sag Measurement



Carton Size Measurement

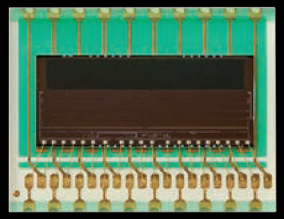


Stacked Bearing Height Measurement

Reasons for first-in-class performance

Equipped with the ATMOS image sensor

The Best-in-class preformation is achieved by the ultra-sensitive ATMOS image sensor that was originally developed for the most advanced displacement sensor, CDX Series.
ATMOS: Auto Tuning C-MOS

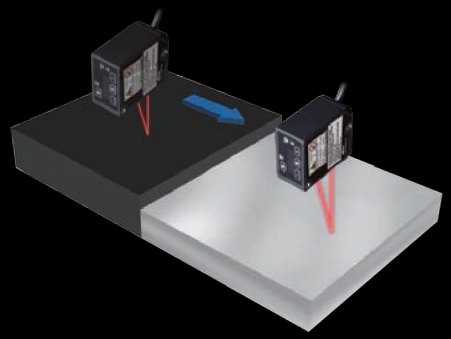


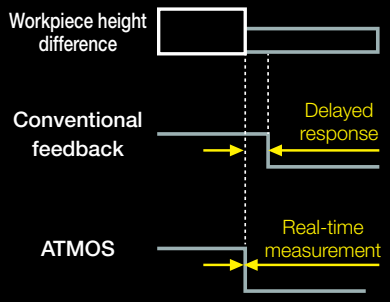
Only in the industry

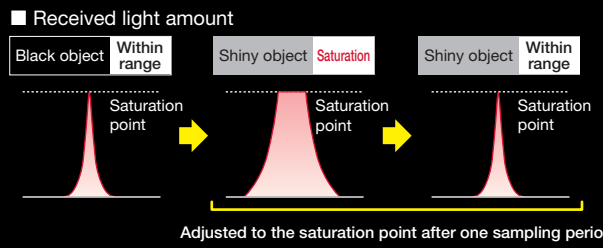
Feedback-free high-speed shutter

The unique algorithm realizes measurement without feedback process. Real-time measurement is realized, as momentary errors of measurement and delay in response are eliminated.

When receiving light level changes suddenly





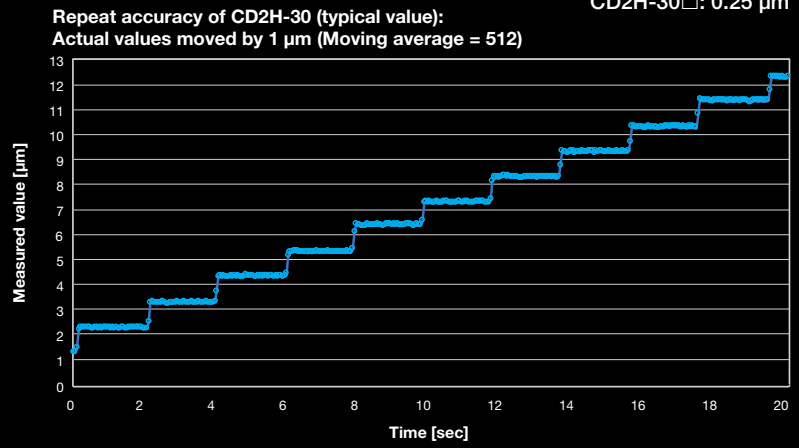


The shutter is closed just before the saturation point to stop receiving light, so that no feedback time is needed.

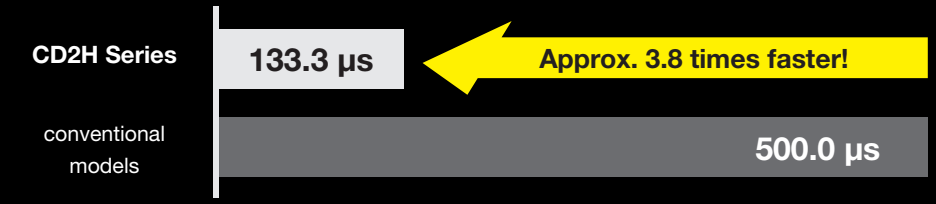
Fastest-in-class* repeat accuracy

Reliable detection is possible even in 1 µm steps.

CD2H-30□: 0.25 µm



Fastest-in-class Sampling Period*



Highest-in-class Linearity*

This is especially effective for measurement in a long distance or wide range.

Long distance 700 mm type: ±0.1% of F.S. (200 to 700 mm) /±0.3% of F.S. (700 to 1200 mm)

*Among laser displacement sensors with the repeat accuracy of 1 µm (Investigated by OPTEX FA in November 2021)

Visualized various data on the display

Easy-to-read OLED display

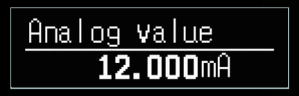
Improved visibility

Improved operability

Menu texts can be displayed in 7 languages.
Display of measurement values can be selected among 3 modes of relative value, analog output value and bar graph.
Maintenance data, such as internal temperature and total operating time can be also displayed for predictive maintenance.

Relative Value
(Distance from a reference point)

Analog value



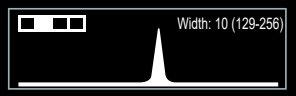
Bar graph display

Waveform of received light can be displayed

First in industry*

Monitoring of waveform helps to check amounts of received light and an installation angle.
The masking function of unwanted ambient light is also available to reduce such interference.

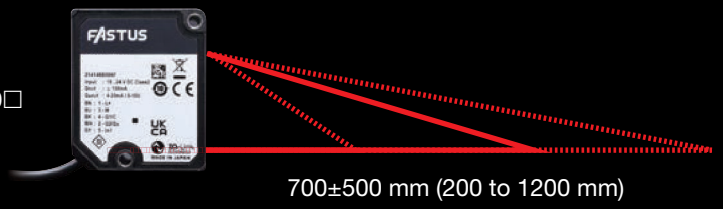
Received light waveforms



*with amplifier built-in displacement sensors
Investigated by OPTEX FA in December 2021.

Wide lineup of measurement ranges

Narrow measurement ranges of displacement sensors have required to adjust installation or model of the sensors to measure the distance to objects.
CD2H-700 with the longest distance of measurement range of 700±500 mm reduces work and time of setup changes.



NEW RS-485 Type

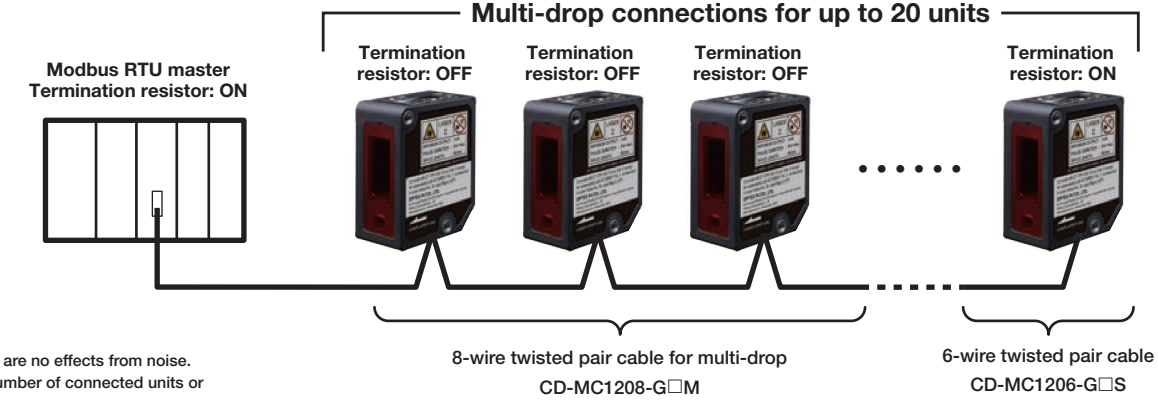
Multi-drop support

Modbus RTU standard

Connection conditions

- Connected units: Maximum 20 units
- Cable length: Maximum total length 70 m
- Baud rate: 1 Mbps or less

*The above connection conditions apply when the OPTEX FA option cable is used and there are no effects from noise. Depending on the cable used and the environment, there is the possibility that the above number of connected units or cable length cannot be fulfilled.



Buffering data storage of up to 16,000 measurements

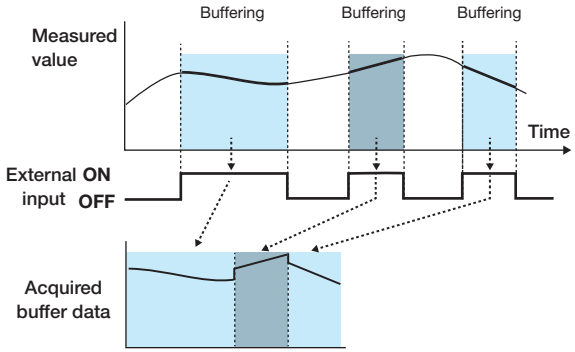
- Level operation: Measured values are buffered at a particular time, or when an event occurs.

  e.g. • Level (Input ON): Buffering occurs during external input.
  • Level (Judgement ON/OFF): Buffering occurs while judgement is ON/OFF.

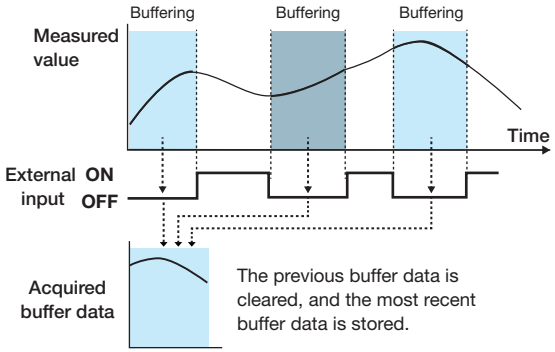
- Replay operation: Measurement values are buffered during external input or until immediately before the judgement changes.

  e.g. • Replay (Input ON): Buffering starts when the power is turned on and stops on the rising edge of an external input.
  • Replay (Judgement ON/OFF): Buffering stops when sensor judgment is switched ON/OFF.

● **Image during level operation**



● **Image during replay operation**



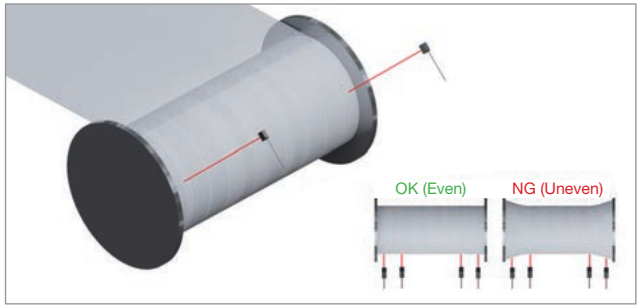
*If the number of data exceeds 16,000, the oldest data will be overwritten. (Common to level and replay operation modes)

Software CD2H_RS485_Navigator for RS-485 type

Software is available to check measurement values, received light waveform and acquire buffering data on a PC by using a commercially available RS-485-USB converter. It can be downloaded free of charge from our website.

Applications (Buffering function)

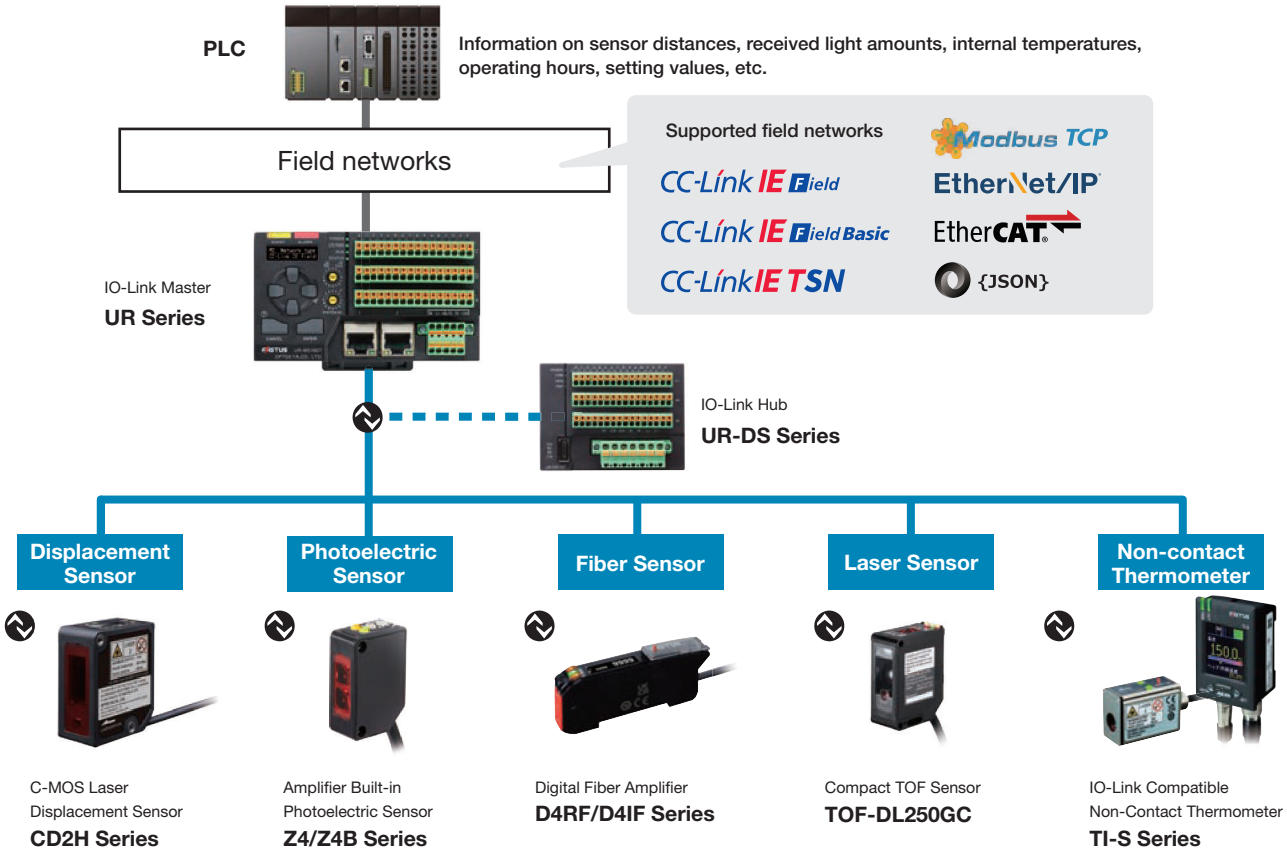
Detection of Uneven Winding



When CD2H judges that the wire is unevenly wound, buffering is stopped and the continuous data immediately before the wire became unevenly wound can be retrieved as buffered data.

IO-Link communication supported IO-Link

IO-Link is one of technology that connects sensors and actuators to Industrial Ethernet using digital signals to promote smart factories. Measurement values can be obtained as digital values, reducing analog input. This enables noise immunity, cost reduction, and predictive maintenance.



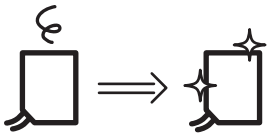
Software CD2H_URES_Navigator for IO-Link/analog output type

Software is available to check measurement values, received light waveform and log measured values on a PC using our IO-Link Master (UR-E□16DT). It can be downloaded free of charge from our website.

Advantage 1

Device information status monitoring leads to predictive maintenance and reduced downtime.

Advantage 2



The storage of device information allows for immediate restoration even if the device is replaced, improving maintainability.

Advantage 3

Converts measured value to digital signals for transmission to PLC, making them resistant to noise and enabling long-distance communication.

Lineup

Reflection mode	Measurement range	Repeat Accuracy	Linearity	Light source Laser class	I/O	Connection	Model
Diffuse	30±5 mm	0.25 µm	±0.1% of F.S.	Red semiconductor laser CLASS 1/Class I	Analog output 2 control outputs External input IO-Link	Cable	CD2H-30A
						Pigtail cable	CD2H-30M12A
					RS-485 Control output External input	Pigtail cable	CD2H-30-485M12A
	50±10 mm	0.25 µm	±0.1% of F.S.		Analog output 2 control outputs External input IO-Link	Cable	CD2H-50A
						Pigtail cable	CD2H-50M12A
					RS-485 Control output External input	Pigtail cable	CD2H-50-485M12A
	130±70 mm	4 µm	±0.1% of F.S.		Analog output 2 control outputs External input IO-Link	Cable	CD2H-130
						Pigtail cable	CD2H-130M12
					RS-485 Control output External input	Pigtail cable	CD2H-130-485M12
	245±175 mm	10 µm	±0.1% of F.S.	Red semiconductor laser CLASS 2/Class II	Analog output 2 control outputs External input IO-Link	Cable	CD2H-2452
						Pigtail cable	CD2H-245M122
					RS-485 Control output External input	Pigtail cable	CD2H-245-485M122
	350±250 mm	20 µm	±0.1% of F.S.		Analog output 2 control outputs External input IO-Link	Cable	CD2H-3502
						Pigtail cable	CD2H-350M122
					RS-485 Control output External input	Pigtail cable	CD2H-350-485M122
	700±500 mm	100 µm	±0.1% of F.S. (200 to 700 mm)		Analog output 2 control outputs External input IO-Link	Cable	CD2H-7002
						Pigtail cable	CD2H-700M122
			±0.3% of F.S. (700 to 1200 mm)		RS-485 Control output External input	Pigtail cable	CD2H-700-485M122

● Purchase of an optional connector cable is necessary for pigtail cables.

Options/Accessories

● Connector cables for IO-Link/analog output

Standard cables

YF2A15-020VB5XLEAX Cable length: 2 m
YF2A15-050VB5XLEAX Cable length: 5 m
YF2A15-100VB5XLEAX Cable length: 10 m
Minimum bending radius:
Cable diameter × 5 (when fixed in place)

Bending resistant cables

DOL-1205-G02M-R Cable length: 2 m
DOL-1205-G05M-R Cable length: 5 m
Minimum bending radius:
Cable diameter × 2 (when fixed in place)
Cable diameter × 6 (when movable)

● Connector cables for RS-485 communication

6-wire twisted pair cables

CD-MC1206-G2S Cable length: 2 m
CD-MC1206-G5S Cable length: 5 m
Minimum bending radius:
Cable diameter × 5 (when fixed in place)
Cable diameter × 8 (when movable)

8-wire twisted pair cables for multi-drop

CD-MC1208-G2M Cable length: 2 m
CD-MC1208-G5M Cable length: 5 m
Minimum bending radius:
Cable diameter × 5 (when fixed in place)
Cable diameter × 8 (when movable)

● Mounting bracket

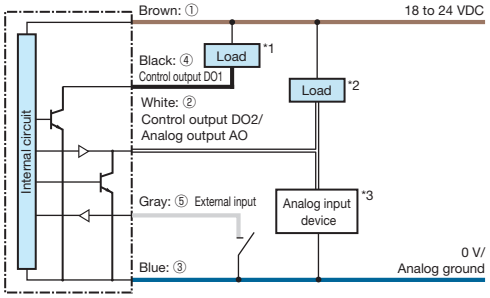
BEF-WN-OD2000-B

Installation image

I/O Circuit Diagrams

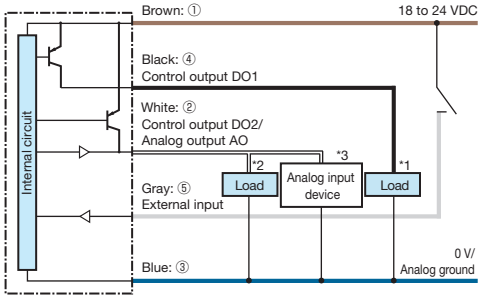
● IO-Link/analog output Type

SIO mode (NPN setting)



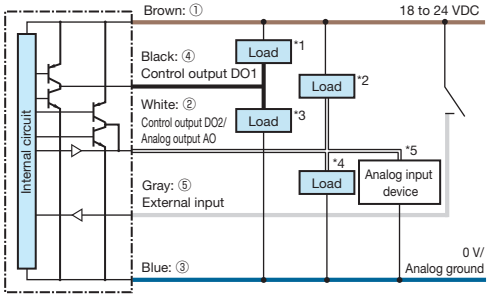
*1. When used as control output DO1
*2. When used as control output DO2
*3. When used as control output AO

SIO mode (PNP setting)



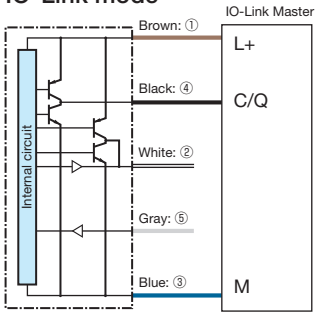
*1. When used as control output DO1
*2. When used as control output DO2
*3. When used as control output AO

SIO mode (Push-pull setting)



*1. When used as control output DO1 with NPN connection
*2. When used as control output DO2 with NPN connection
*3. When used as control output DO1 with PNP connection
*4. When used as control output DO2 with PNP connection
*5. When used as analog output AO

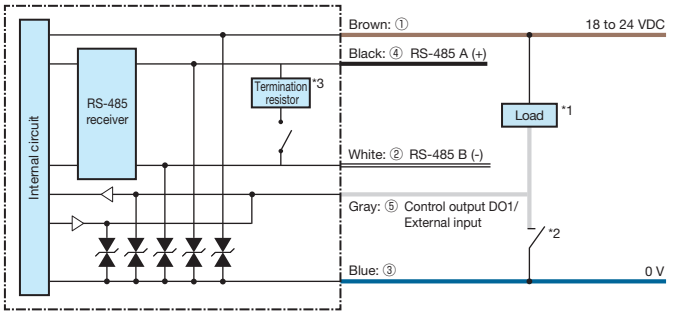
IO-Link mode*1



*1. When using NPN settings for an IO-Link connection, use OPTEX FA's IO-Link Master UR Series or IO-Link Master with sink support.

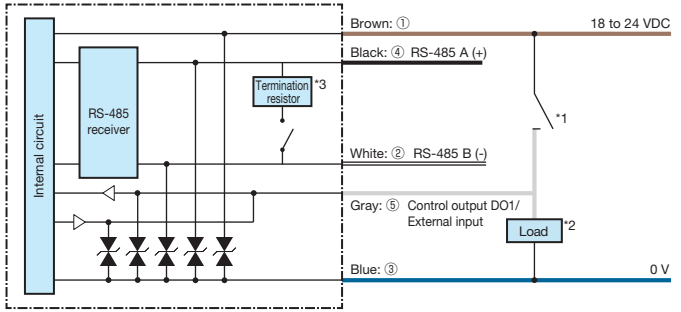
● RS-485 Type

NPN setting (when load is connected by NPN with the push-pull setting)



*1. When used as control output DO1
*2. When used as external input
*3. Default setting for the termination resistor is ON. When multi-drop connections are made, turn the termination resistor OFF at all units except the unit which is connected at the end.

PNP setting (when load is connected by PNP with the push-pull setting)

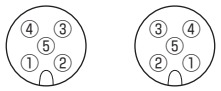


*1. When used as external input
*2. When used as control output DO1
*3. Default setting for the termination resistor is ON. When multi-drop connections are made, turn the termination resistor OFF at all units except the unit which is connected at the end.

■ Connector type

<Pin assignments>

Sensor side / Connector cable side



① 18 to 24 VDC
② Control output DO2/Analog output AO
③ 0 V/Analog ground
④ Control output DO1/IO-Link
⑤ External input

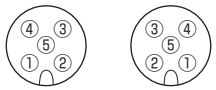
Connecting
- ① to ⑤ are connector pin No.
- Lead wires that are not in use should be wrapped individually with insulating tape, and do not connect it to any other terminal.

Notes
- When using a switching regulator for the power supply, be sure to ground the frame ground terminal.
- Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 3 s).

■ Connector type

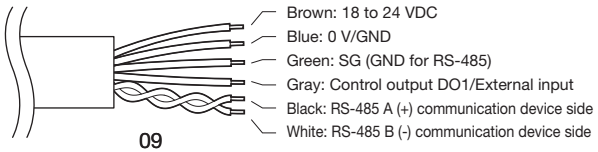
<Pin assignments>

Sensor side / Connector cable side



① 18 to 24 VDC
② RS-485 B (-)
③ 0 V
④ RS-485 A (+)
⑤ Control output DO1/
External input

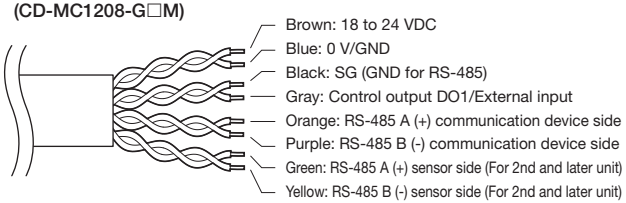
■ 6-wire twisted pair cable (CD-MC1206-G□S)



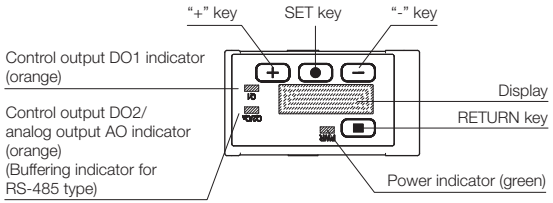
Connecting
- ① to ⑤ are connector pin No.
- Lead wires that are not in use should be wrapped individually with insulating tape, and do not connect it to any other terminal.

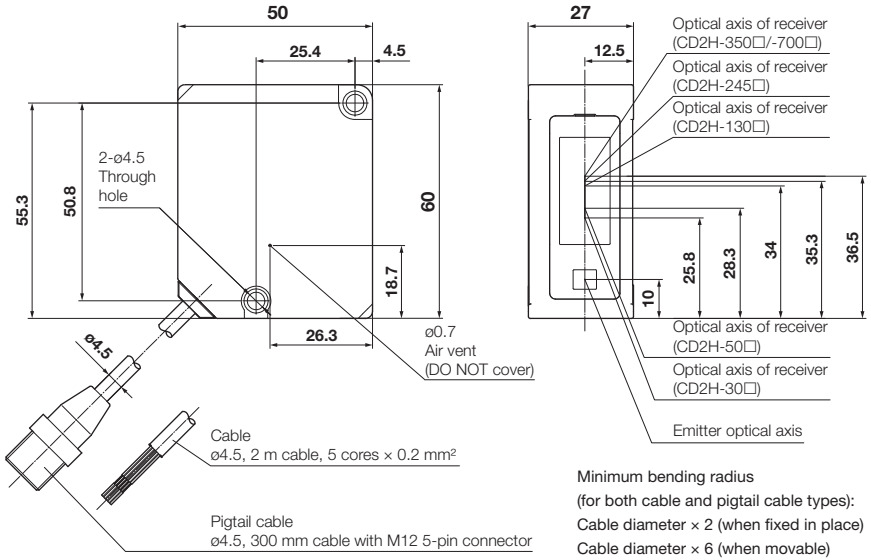
Notes
- When using a switching regulator for the power supply, be sure to ground the frame ground terminal.
- Because wiring sensor wires with high-voltage wires or power supply wires can result in malfunctions due to noise, which can cause damage, make sure to wire separately.
- Avoid using the transient state while the power is on (approx. 3 s).

■ 8-wire twisted pair cable for multi-drop (CD-MC1208-G□M)



Dimensions (Unit: mm)

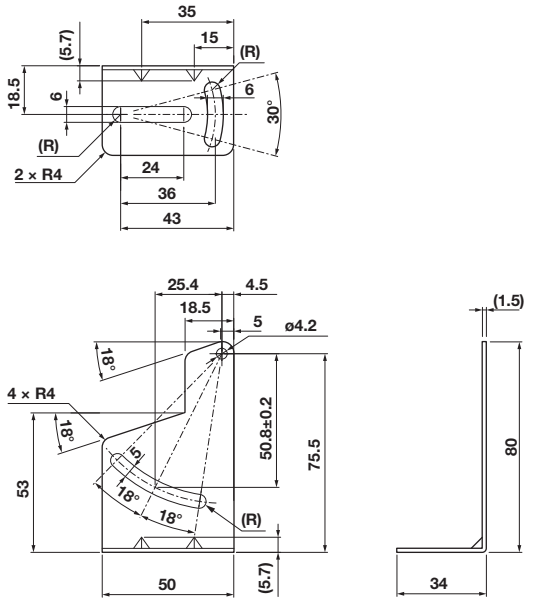




Minimum bending radius
(for both cable and pigtail cable types):
Cable diameter × 2 (when fixed in place)
Cable diameter × 6 (when movable)

● Mounting bracket

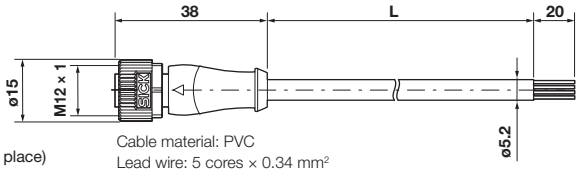
BEF-WN-OD2000-B



● Connector cables for IO-Link/analog output

Standard cables

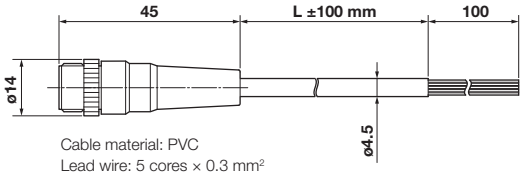
YF2A15-020VB5XLEAX
YF2A15-050VB5XLEAX
YF2A15-100VB5XLEAX
Minimum bending radius:
Cable diameter × 5 (when fixed in place)



Cable material: PVC
Lead wire: 5 cores × 0.34 mm²
L = 2000 mm (YF2A15-020VB5XLEAX)
= 5000 mm (YF2A15-050VB5XLEAX)
= 10000 mm (YF2A15-100VB5XLEAX)

Bending resistant cables

DOL-1205-G02M-R
DOL-1205-G05M-R
Minimum bending radius:
Cable diameter × 2 (when fixed in place)
Cable diameter × 6 (when movable)

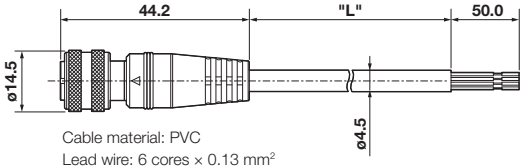


Cable material: PVC
Lead wire: 5 cores × 0.3 mm²
L = 2000 mm (DOL-1205-G02M-R)
= 5000 mm (DOL-1205-G05M-R)

● Connector cables for RS-485 communication

6-wire twisted pair cables

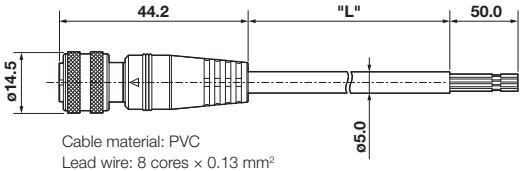
CD-MC1206-G2S
CD-MC1206-G5S
Minimum bending radius:
Cable diameter × 5 (when fixed in place)
Cable diameter × 8 (when movable)



Cable material: PVC
Lead wire: 6 cores × 0.13 mm²
L = 2000 (CD-MC1206-G2S)
= 5000 (CD-MC1206-G5S)

8-wire twisted pair cables for multi-drop

CD-MC1208-G2M
CD-MC1208-G5M
Minimum bending radius:
Cable diameter × 5 (when fixed in place)
Cable diameter × 8 (when movable)



Cable material: PVC
Lead wire: 8 cores × 0.13 mm²
L = 2000 (CD-MC1208-G2M)
= 5000 (CD-MC1208-G5M)

Model Specifications

● IO-Link/analog output Type

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 I			CLASS 2/Class II		
Spot size*2		ø50 µm	ø70 µm	ø0.3 mm	ø0.5 mm	ø0.6 mm	ø1.0 mm
Linearity		±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S. (200 to 700 mm) ± 0.3% of F.S. (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 characteristics*6		±0.06% of FS/°C					
Weight		Cable models: Approx. 140 g Connector models: Approx. 90 g					
IO-Link	Specifications	Rev. 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*7)	No. of outputs	2 (DO1 can be switched to IO-Link.)					
	Polarity	NPN/PNP, open collector or Push-Pull (selectable by setting) Max. 100 mA/24 VDC, residual voltage 1.8 V or less					
Analog output QA*7	Current	4 to 20 mA, load impedance: 300 Ω or less					
	Voltage	0 to 10 V, output impedance: 100 Ω or less					
External input*8		Switchable between Off, Multi operations, Hold, Zero point teach, and Laser off					
Connection		Cable: ø4.5 mm, 2 m cable Pigtail cable: ø4.5 mm, 300 mm cable with M12 5-pin connector Minimum bending radius: Cable diameter × 2 (when fixed in place), cable diameter × 6 (when movable)					

<Measurement conditions> The measurement conditions are as follows unless otherwise designated:
Ambient temperature: 25°C (room temperature); supply voltage: 24 VDC; 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: Set to analog current output by default.
*8: Set to laser off by default.

● RS-485 Type

Model		CD2H-30-485M12A	CD2H-50-485M12A	CD2H-130-485M12	CD2H-245-485M122	CD2H-350-485M122	CD2H-700-485M122
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 I			CLASS 2/Class II		
Spot size*2		ø50 µm	ø70 µm	ø0.3 mm	ø0.5 mm	ø0.6 mm	ø1.0 mm
Linearity		±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S.	±0.1% of F.S. (200 to 700 mm) ± 0.3% of F.S. (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 characteristics*6		±0.06% of F.S./°C					
Weight		Connector models: Approx. 90 g					
Communication specifications	Data transmission	RS-485 half-duplex communication, start-stop synchronization					
	Protocol	Modbus RTU					
	Baud rate	9600 bps/19200 bps/38400 bps/57600 bps/115.2 Kbps/230.4 Kbps/1 Mbps/2 Mbps/4 Mbps					
	Data length	8 bit					
	Parity	Even/Odd/None					
	Stop bit	1bit, 2bit					
Control output (DO1)	No. of outputs	1 (switchable to external input.)					
	Polarity	NPN/PNP, open collector or Push-Pull (selectable by setting) Max. 100 mA/24 VDC, residual voltage 1.8 V or less					
External input*7		Teach 1/Teach 2/Offset/Offset clear/Laser off/Input hold/Buffering/Buffer clear/Rise: Teach 1, Fall:Teach 2/Rise Teach 2, Fall: Teach 1					
Connection		Pigtail cable: ø4.5 mm, 300 mm cable with M12 5-pin connector Minimum bending radius: Cable diameter × 2 (when fixed in place), cable diameter × 6 (when movable)					

<Measurement conditions> The measurement conditions are as follows unless otherwise designated:
Ambient temperature: 25°C (room temperature); supply voltage: 24 VDC; 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: Set to laser off by default.

Common specifications

Supply voltage		18 to 24 VDC (±10%*1, including ripple)
Current consumption*2		80 mA (at 18 VDC), 70 mA (at 24 VDC)
Display		0.9-inch OLED display Menu languages: English, German, Spanish, Japanese, Simplified Chinese, Traditional Chinese, Korean
Indicators		Power indicator (green), Output indicators (orange x 2), IO-Link communication indicator (flashing green)
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) UK EMC (Electromagnetic Compatibility Regulations 2016)
	Environment	RoHS Directive (2011/65/EU), UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012), China RoHS (MIIT Order No.32)
	Safety	FDA Regulations (21 CFR 1040.10 and 1040.11)*3
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

*1: When used as an IO-Link device, do not use it at less than 18 VDC.
*2: For IO-Link/analog output type, value when DO2 is set to analog output (current) and measurement is not possible (outputting a current of 21 mA).
*3: Excluding differences per Laser Notice No. 56.

● Precautions for Laser Use

This product emits a Class 1 or Class 2 visible laser beam that is compliant with JIS C 6802/IEC 60825-1/FDA laser safety standards.
Labels for applicable standards are affixed to the product.

Type	Red semiconductor laser
Wavelength	655 nm
Maximum output	0.39 mW (CLASS 1) 1 mW (CLASS 2)

● Exports to the United States

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 this product will be exported to the United States, please stick or replace the attached label on 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

● Specifications are subject to change without prior notice.

78087-01-006-2501

The information in this catalog is correct as of January 2025.