OPTEX FA

Operating Instructions

Displacement sensor CD series

Laser type LED type

- Thank you for purchasing. Check that the specifications agree with yours.
- Please read this manual through before using the sensor, and retain it for future reference.

1 Specifications

		Laser Type					LED Type
Type	Cable Type	CD1-30(N,P)	CD1-100(N,P)	CD1-130(N,P)	CD1-250(N,P)	CD1-50(N,P)	CD2-25(N,P)
	Connector Type	CD1-30C(N,P)	CD1-100C(N,P)	CD1-130C(N,P)	CD1-250C(N,P)	CD1-50C(N,P)	CD2-25C(N,P)
Measuring Range Offset Range		30 +/- 4 mm	100 +/- 35 mm	130 +/- 50 mm	250 +/- 150 mm	50 +/- 10 mm	25 +/- 5 mm
Light Source		Class 2 Red Laser diode (wavelength : 650 nm Max. 3.3 mw)				Class 2 Red Laser diode (650 nm Max. 2.5 mW)	Red LED (650 nm)
Light Spot Diameter		∮0.1mm@30mm	0.5 x 1.2mm @ 100mm	0.5 x 1.5mm @ 130mm	0.5 x 2mm @ 250mm	∮0.5mm@50mm	∮1.5mm@25mm
Supply Voltage		12 ~ 24 VDC (-5% +10%)					
Current Consumption (Including analog output value)		max. 120 mA / 12 VDC max. 75 mA / 24 VDC				max. 200 mA / 12 VDC max. 120 mA / 24 VDC	
Response Time		100 ms / 10 ms / 1 ms switch selectable					
Resolution 1		Refer to 3)					
Linearity 2)		+/- 2% F.S.		+/- 3.5% F.S.	+/- 5% F.S.	+/- 1% F.S.	
Temperature Drift 1)		+/- 0.02% F.S. / °C					+/- 0.05%F.S. / °C
Sensitivity Adjustment		SET / FIX / AUTO selectable				BLACK / WHITE / AUTO selectable	
Outputs	Analog Output	4 ~ 20 mA					
	Switching Output	NPN / PNP open collector, 100 mA max. @ 30 VDC Residual voltage max. 1.8 V					
Indicators	Distance Indicator	The switching range is set by the TEACHING BUTTON Near : Red Middle : Orange Far : Green Out of range : Flashing Too High / Low reflection : Flashing Red and Green					
	Stability Indicator	Stable : Green Unstable : OFF Too High / Low reflection : Red					
	Output / Teaching Indicator	Running : Orange (ON status) Teaching OK : Green Teaching error : Red					
Blanking Input		NPN : Connect gray wire to 0V					
		PNP : Connect gray wire to +V					
OFF Delay Timer		0 or 40 ms switch selectable					
Ambient Light (max.)		Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux					
Operating Temperature		-10 to +40 °C					
Operating Humidity		35 to 95 % RH					
Housing Material		Zinc die-cast					PBT
Protection Category		IP67					
Weight	Cable Type	approx. 130g (without cable)					approx. 40g (without cable)
	Connector type	approx. 140g					approx. 50g

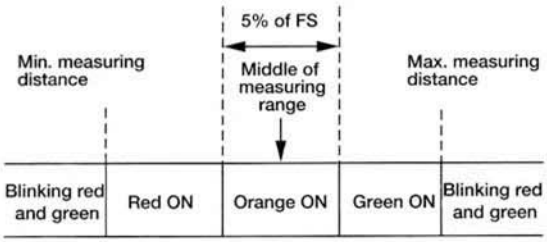
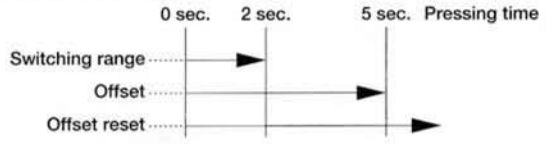
F.S. (Full scale) is defined as CD1-30: 8 mm, CD1-50: 20 mm, CD1-100: 70 mm, CD1-130: 100 mm, CD1-250: 300 mm, CD2-25: 10 mm

1) Middle of measuring range, Sensitivity: AUTO, Response Time: 100 ms, Target: White alumina ceramic

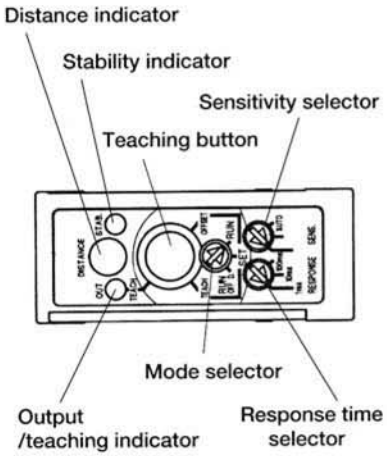
2) Linearity error : Sensitivity: AUTO, Response Time: 100 ms, Target: White alumina ceramic

3) Resolution

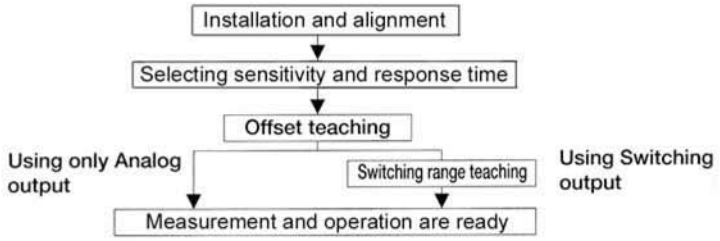
	CD1-30	CD-150	CD1-100	CD1-130	CD1-250	CD2-25
Response time 100ms	1	3	15	20	150	3
Response time 10ms	3	10	50	70	500	10
Response time 1ms	10	30	150	200	1500	30

Sensitivity Selector	● CD1-25 and CD1-50 3 position: WHITE / BLACK / AUTO ● Select the sensitivity based on the target reflectivity. For white objects : WHITE, For black objects : BLACK For intermediate colors : AUTO, For multiple colors : AUTO ● In AUTO position : Depending upon the reflectance of the target, the sensitivity will automatically be set to WHITE or BLACK. ● On the WHITE setting the resolution is the highest. ● CD1-30, CD1-100, CD1-130 and CD1-250 ● Usually leave this on the AUTO setting. Depending upon the reflectance of the object the sensitivity is automatically set. ● In case of manually setting the sensitivity 1) Switch the SENSITIVITY SELECTOR to the SET position. 2) Place the target and press the teaching button. (The reflectance will be sampled while the button is pressed) 3) Release the button and change the SENSITIVITY SELECTOR to the FIX position. The setting is complete.
Response Time Selector	3 position: 100 ms / 10 ms / 1 ms ● Select the response time based on the desired speed and resolution. ● A longer response time provides a higher resolution.
Mode Selector	3 position: SET / RUN / RUN OFF DLAY ● SET: Offset and switching are adjusted. ● RUN: Sensor is active. ● RUN OFF DLAY: Sensor is active with a 40 ms OFF delay.
Distance Indicator	This LED indicates the distance from the sensor to the target. 
Stability Indicator	This LED indicates the level of received light intensity. Green : Stable measurement OFF : Unstable measurement If the SENSITIVITY SELECTOR is set to WHITE and the indicator is OFF, changing the SELECTOR to BLACK or AUTO should allow stable detection. Red: Measurement is impossible due too high / low level of received light intensity. Caused by incorrect setting of the SENSITIVITY SELECTOR.
Output / Teaching Indicator	Switching to RUN : Output indicator Orange : Switching output is ON OFF : Switching output is OFF Switching to SET : Teaching indicator 1) Switching range teaching Green ON once : First teaching point is OK. Green ON twice : Second teaching point is OK. Red ON once : Teaching error. 2) OFFSET teaching Green ON 3 times : OFFSET teaching is OK. Red ON : OFFSET error. 3) OFFSET reset to default status Green ON 3 times : OFFSET reset to default setting is OK.
Teaching Button	Teaching for the switching range, offset and offset reset. Depending upon how long the button is pressed, 3 different teaching modes can be selected. Switching range / Offset / Offset reset to default. 

3 Functions of components

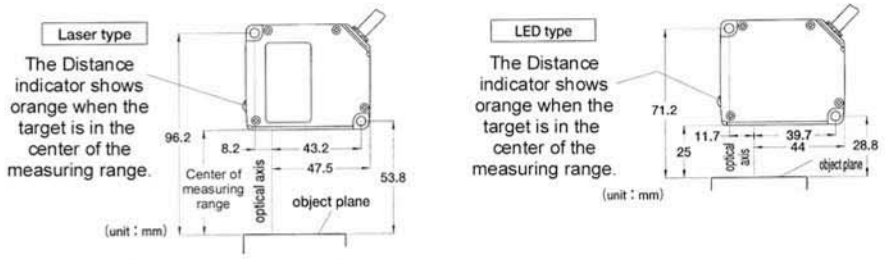


4 Starting operation



● Installation

Install the sensor and adjust the projected light spot at the desired measuring point so that the distance indicator turns ON (orange) indicating the center of the measuring range.



Note: 1) Adjust the sensor position so that the optical plane of the sensor is parallel with the target to be detected to obtain reliable measurement.
2) In the laser type sensors, an invisible laser circle resides around the visible light spot. If there is any material around the spot that is glossier than the target surface it may lead to incorrect measurement.

● Analog output

The analog output is based on the measuring range.

CD1 - 25 : 4 ~ 20 mA / 20 ~ 30 mm
CD1 - 30 : 4 ~ 20 mA / 26 ~ 34 mm
CD1 - 50 : 4 ~ 20 mA / 40 ~ 60 mm
CD1 - 100 : 4 ~ 20 mA / 65 ~ 135 mm
CD1 - 130 : 4 ~ 20 mA / 80 ~ 180 mm
CD1 - 250 : 4 ~ 20 mA / 100 ~ 400 mm

Note : In case of out of range or sensitivity error, the analog signal is held at 24 mA. It is possible that the signal may not be held at 24 mA when out of range in some conditions, it depends upon the measuring object.

● Switching range teaching (NPN/PNP open collector)

The switching range can be set at 2 points within the measuring range.

① Change the MODE SELECTOR to the SET position.
② Place the target at the first detection point, press the teaching button for no more than 2 seconds. → The teaching indicator will blink green 1 time.
③ Place the target at the second detection point, press the teaching button again for no more than 2 seconds. → The teaching indicator will blink green 2 times. Teaching is now complete.

Note : It is required that the Sensitivity and Response time be set prior to teaching. Changing these settings after teaching may cause the performance of the sensor to change.

Resetting the switching range

In case of an error (OUTPUT / TEACHING indicator blinks red once), or when re-teaching the sensor, it is possible to reset back to the previous status by changing the MODE SELECTOR to RUN or RUN OFF DELAY position.

● Offset Teaching

○CD1-30, CD1-100, CD1-130 and CD1-250

The analog output can be offset to 12 mA at any position within the measuring range.

○CD1-50 and CD2-25

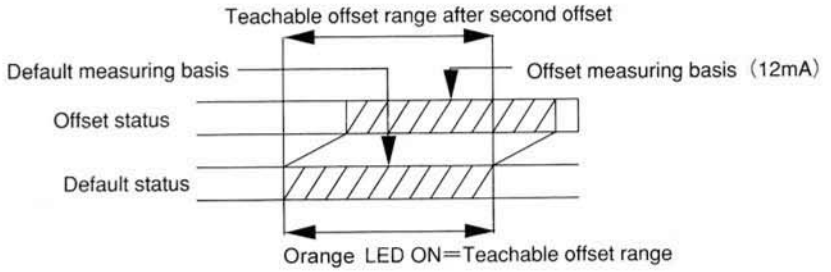
The analog output can be offset to 12 mA at any position within the range that the distance indicator is ON (orange) under the following conditions.

1) Within the measuring range.
2) Default status (Default range: Distance indicator is ON (orange) = Analog output is at 12 +/- 0.8 mA).

Procedure

① Switch the MODE SELECTOR to the SET position.
② Place the target at the middle of the measuring range (default measuring range : 12 mA), the Teaching indicator flashes 3 times, press the TEACHING BUTTON for 2 to 5 seconds.
③ Switch the MODE selector to RUN or RUN OFF DELAY. Offset teaching is complete.

Note: By repeated offset teaching, the teachable offset range may differ from the range of where the distance indicator turns to orange. (In case of CD1-50, CD2-25)



Note: In the default status, the sensor has been offset using white alumina ceramic. If it is not necessary to use the offset function you can skip this step.

Resetting Offset to default status

It is possible to reset the offset back to the default state.

① Switch the MODE SELECTOR to the SET position.
② Press the Teaching button for more than 5 seconds. Continue to press the button even if the teaching indicator flashes 3 times after 2 seconds (If error status: the Red will flash once). After 5 seconds the teaching indicator will flash 3 times.
③ Switch the MODE selector to RUN or RUN OFF DELAY. Reset Offset to default is complete.

Note: The Offset reset is not influenced by the presence of a target in the measuring area.

● Remote Teach Input

Instead of pressing the teaching button on the sensor, the switching range, offset and offset reset to default can be done remotely by using the external REMOTE INPUT wire (pink).

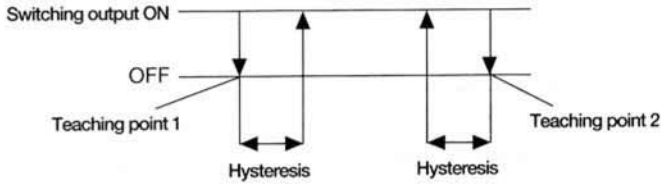
Note: Remote teaching can be done by changing the MODE SELECTOR to RUN or RUN OFF DELAY.
According to the time duration of the teaching pulse, the switching range, offset or offset reset to default status is selected.
The teaching status is indicated by the indicator. When teaching by the remote input is complete, the sensor is automatically returned to the RUN / RUN OFF DELAY status.

○ When remote teaching the switching range, the first pulse changes the sensor to the SET mode. The second teaching pulse must occur within 30 seconds of the first. If this does not occur the SET state will be cleared and the sensor will automatically return to the RUN / RUN OFF DELAY status.

《Reset》

The sensor will automatically reset if an error occurs during switching range / offset teaching.

《Hysteresis》

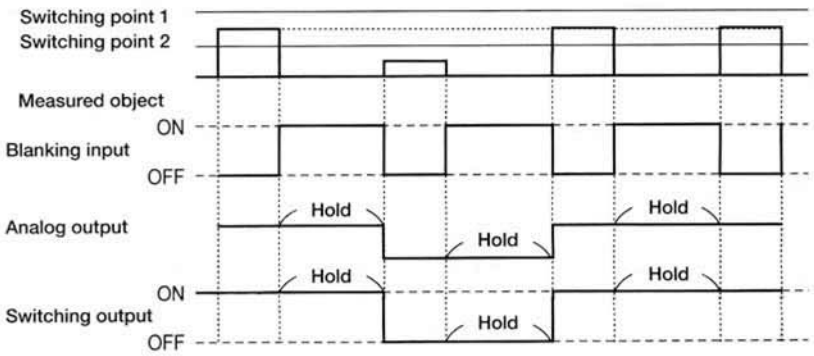


Note: The Hysteresis range will vary depending upon the setting of the Sensitivity and Response time. The switching range must be more than 2 times that of the hysteresis range.

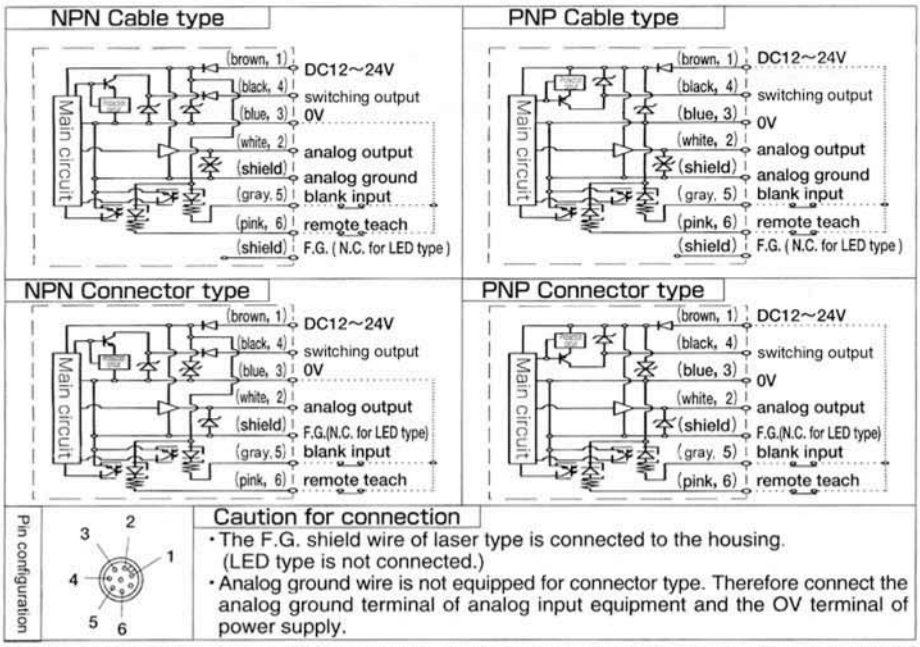
● Blanking Input

This input is used to hold the analog and digital outputs in the current state. The outputs will be held for the duration of the input signal.

Note : NPN models, connect the BLANKING INPUT wire (gray) to 0 V
PNP models, connect the BLANKING INPUT wire (gray) to + V



Connection diagram



1) Connect the lead wires correctly. The analog output wire must not be in contact with any other wire. Do not turn on any power while wiring.

2) The blue wire (0V) and shield wire (analog GND) are internally connected.
Use the blue wire (0V) for the power supply and use the shield wire (analog GND) for analog output.

Warnings and precautions

Warnings

- Laser beam
  - ○ Models with a laser light source emit a visible laser beam with IEC825 Class 2 rating. A warning label and description are attached to the side of the sensor.
  - ○ DO NOT stare into the beam, or reflect the beam with a mirror.
  - ○ DO NOT disassemble the unit. The sensor is not equipped with an auto-laser-off function.

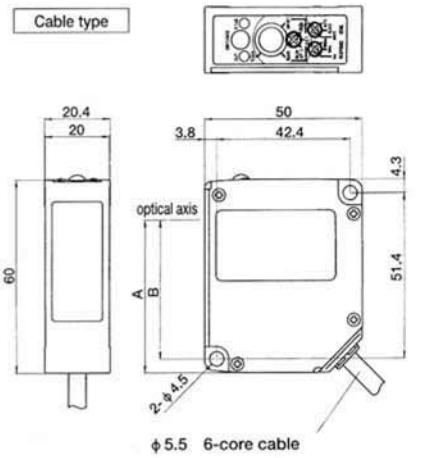
Precautions

- DO NOT allow dust, oil, water, etc. to accumulate on the face of the sensor. It degrades the sensor performance, if necessary wipe clean with a dry cloth.
- When a switching regulator is to be used as the power supply, make sure to ground the frame ground terminal.
- DO NOT use the sensor in a transient state at power on (approx. 15 min. warm-up time).
- DO NOT run the sensor cable near to high-voltage or power lines, do not put them together in the same raceway. This warning should be strictly observed to prevent malfunctions caused by inductive interference.

THIS PRODUCT IS NOT DESIGNED TO BE USED AS A SAFETY DEVICE TO PROTECT THE HUMAN BODY.

Dimension drawing

Cable type

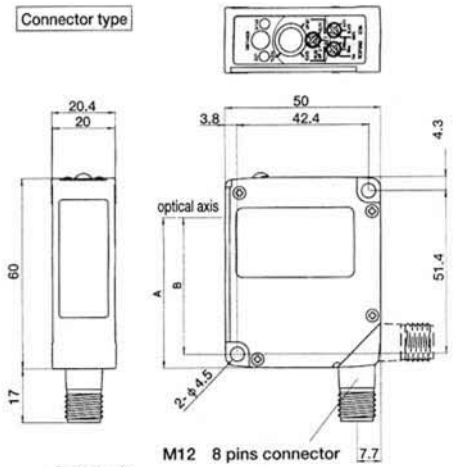


Optical axis

	A	B
Laser type	47.5	43.2
LED type	44	39.7

(unit:mm)

Connector type



Optical axis

	A	B
Laser type	47.5	43.2
LED type	44	39.7

(unit:mm)

- Specifications and equipment are subject to change without any obligations on the part of manufacture.

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- For more information, please contact us below.

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