Displacement Sensor

CD SERIES

Laser type
LED type

OPTEX FA

·CD1-30□□ ·CD1-100□□
·CD1-130□□ ·CD1-250□□
·CD1-50□□ ·CD2-25□□

INSTRUCTION MANUAL

- Confirm if the item meets your needs.
- Before the use, you should first thoroughly read this manual and operate correctly as mentioned.
- You should keep this manual at hand for proper use.

1 Specifications

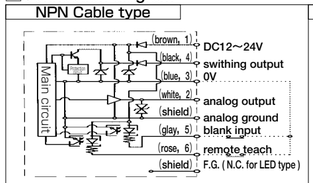
		Laser type					LED type
Type	Cable type	CD1-30(N,P)(E)	CD1-100(N,P)(E)	CD1-130(N,P)(E)	CD1-250(N,P)(E)	CD1-50(N,P)(E)	CD2-25(N,P)(E)
	Connector type	CD1-30C(N,P)(E)	CD1-100C(N,P)(E)	CD1-130C(N,P)(E)	CD1-250C(N,P)(E)	CD1-50C(N,P)(E)	CD2-25C(N,P)(E)
Measuring range / Offset range		30±4㎜	100±35㎜	130±50㎜	250±150㎜	50±10㎜	25±5㎜
Light source		Class 2 Red laser diode (wave length：650nm Max.3.3mW)					Red LED (650nm)
Light spot diameter		φ0.5㎜/30㎜	1X1.5㎜/100㎜	1X1.5㎜/130㎜	1.5X3㎜/50㎜	φ0.5㎜/50㎜	φ1.5㎜/25㎜
Supply voltage		DC12～24V（−5%、＋10%）					
Current consumption (Including analog output value)		max.120mA／12VDC max. 75mA／24VDC					max.200mA／12VDC max.120mA／24VDC
Response time		100ms/10ms/1ms switch-selectable					
Resolution 1		Refer to 3)					
Linearity 2)		±2%FS		±3.5%FS	±5%FS	±2%FS	±1%FS
Temperature drift 1)		±0.02%FS／℃					±0.05%FS／℃
Sensitivity adjustment		SET／FIX／AUTO selectable					BLACK／WHITE／AUTO selectable
Outputs	Analog output	4～20mA					
	Switching output	NPN/PNP open collector, max. 100mA/30VDC Residual voltage max. 1.8V					
Indicators	Distance indicator	（Switching range is set by TEACHING BUTTON） Near：Red Middle：Orange Far：Green Out of range：Blinking red & green Too high/low reflection：Blinking red & 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 lead to +0V PNP：Connect gray lead to +V					
OFF delay timer		0/40ms switch-selectable					
Ambient light（max.）		Sunlight：10000 Lux, Incandescent lamp：3000 Lux					
Operating temperature		-10 to 40℃					
Operating humidity		30 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

FS（Full Scale） is defined as CDI-30:8㎜, CDI-50:20㎜, CDI-100:70㎜, CDI-130:100㎜, CDI-250:300㎜, CDI-25:10 ㎜.
1）Middle of measuring range, Sensitivity; AUTO, Response time；100ms, Object；White alumina ceramic
2）Linearity error：Sensitivity; AUTO, Response time；100ms, object；White alumina ceramic
3) Resolution

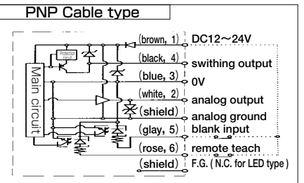
	CD1-30	CD-150	CD1-100	CD1-130	CD1-250	CD2-25
Response time 100ms	1	3	15	20	150	3
Response time 10ms	3	10	50	70	500	10
Response time 1ms	10	30	150	200	1500	30

2 Connection diagram

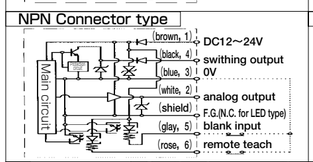
NPN Cable type



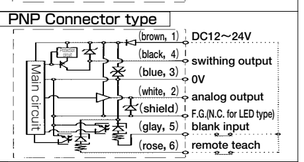
PNP Cable type



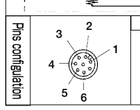
NPN Connector type



PNP Connector type



Pins configuration

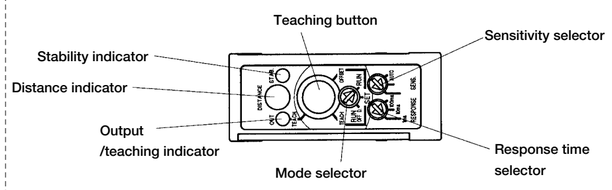


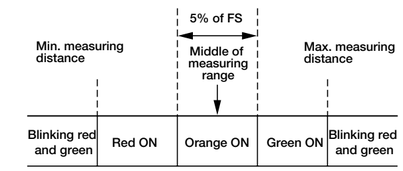
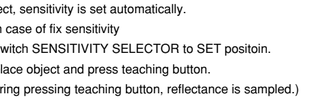
Caution for connection

- The F.G. shield wire of laser type is connected to the housing. (LED type is not connected.)
- Analog ground wire is not equipped for connector type. Therefore connect the analog ground terminal of analog input equipment and the OV terminal of power supply.

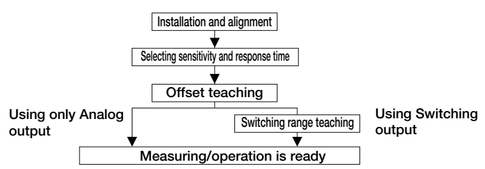
1) Connect the lead wires correctly. The analog output wire must not be in contact with any other wire. Do not turn on any power while wiring.
2) The blue wire（0V） and shield wire（analog GND） are internally connected.
Use the blue wire（0V） for the power supply and use the shield wire（analog GND） for analog output.

3 Functions of components



Sensitivity selector	○CD1-25 3 positions: WHITE/BLACK/AUTO ●Select sensitivity according to the object reflectance. For white objects：WHITE For black objects：BLACK For intermediate colors：AUTO For multi colors：AUTO ●At AUTO position：Depending on the reflectance of object, sensitivity is set on WHITE or BLACK, automatically. ●At WHITE position, resolution is the highest. ○CD1-30, 50, 100, 130, 250 ・Usually you can use at AUTO position. Depending on the reflectance of object, sensitivity is set automatically. ・In case of fix sensitivity ①Switch SENSITIVITY SELECTOR to SET positoin. ②Place object and press teaching button. (During pressing teaching button, reflectance is sampled.) ③Release button and switch SENSITIVITY SELECTOR to FIX position. Setting is completed.
Response time Selector	3 positions: 100ms/10ms/1ms ●Select response time bascd on desired speed and resolution. ●Longer response time provides higher resolution.
Mode selector	3 positions: SET/RUN/RUN OFF DELAY ●SET: Offset and switching range is adjusted. ●RUN: Sensor is active. ●RUN OFF DELAY: Sensor is active with 40ms off delay.
Distance indicator	This LED indicates the distance from sensor to object. 
Stability indicator	This LED indicates the level of received light intensity. Green：Stable measuring OFF：Unstable measuring If the SENSITIVITY SELECTOR is WHITE at OFF, By setting the SELECTOR to BLACK or AUTO, stable measurement is obtained. Red: Measurement is impossible due to too high/low level of received light intensity, caused by miss setting of the SENSITIVITY SELECTOR.
Output/teaching indicator	Switching to RUN：Output indicator Orange：Switching output is ON status OFF：Switching output is OFF status Switching to SET：Teaching indicator 1) Switching range teaching Green ON once：First teaching is OK. Green On Twice：Second teaching 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 status is OK.
Teaching button	Teaching for switching range, offset and offset reset Depending on the pressing time, 3 teaching modes （switching range/offset/offset reset to default status） can be selected. 

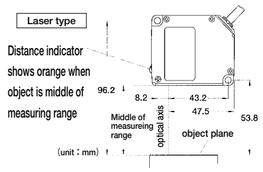
4 Starting operation



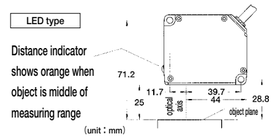
●Installation

Install the sensor and adjust the light spot onto the measuring point so that the distance indicator turns ON (orange) at the middle of measuring range.

Laser type



LED type



Note：○ Adjust the sensor position so that the optical plane of the sensor is parallel with the plane of the object to be detected to obtain reliable measurement.
○ In the laser type sensor, an invisible laser circle resides around the visible light spot. If there is any matter around the spot that is glossier than the measuring object it may lead to incorrect measurement.

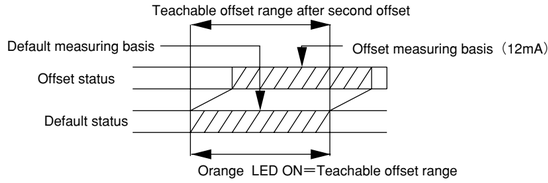
●Offset teaching

○CD1-30, 50, 100, 130, 250
Analog output can be offset to 12mA at any position within measuring range
○CD1-25
Analog output can be offset to 12mA at any position within the range of distance indicator is ON (orange) under following conditions:
1) Within the measuring range
2) Default status（Default range: Distance indicator is ON (orange) =Analog output is at 12+/-0.8mA)）

Procedure

① Switch MODE SELECTOR to SET position.
② Place an object at middle of measuring range（default measuring basis：12mA） → Teaching indicator blinks green 3 times, and press TEACHING BUTTON 2 to 5 seconds.
③Switch MODE SELECTOR to RUN or RUN OFF DELAY position.→Offset teaching is now complete.

Note：By repeating offset teaching, the teachable offset range may differ from the range of orange status of the distance indicator. (In case of OD-25)



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

《Offset reset to default status》
It is possible to reset the default offset status.

① Switch MODE SELECTOR to SET position.
②Press teaching button more than 5 seconds. → Keep pressing even if teaching indicator blinks green 3 times after 2seconds（If error status：Blink 1 time to red）. Pressing after 5 seconds, teaching indicator blinks green 3 times, again.
③ Set MODE SELECTOR switch to RUN or RUN OFF DELAY position. → Reset to default status is now complete.

Note：○Offset reset to default status is not subject to the presence of measuring object.

●Analog output

Analog signal can be output based on measuring distance.

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

Note：○In case of out of range or sensitivity error, the signal is held on 24mA.Depends on measuring object, the signal is not held on 24mA even if out of range.

●Switching range teaching（NPN/PNP open collector）

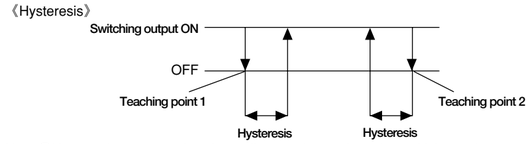
Switching range can be defined 2 points within the measuring range.

① Switch MODE SELECTOR to SET position.
② Place object at the point of switching range, and press teaching button at most 2 seconds. → Teaching indicator blinks to green 1 time.
③Place the object at another point of switching range, and press teaching button at most 2 seconds,again. → Teaching indicator blinks to green 2 time. Switching range teaching is now complete.

Note：○It is necessary to select the suitable positions of sensitivity and response time. Selecting after switching range teaching may cause malfunctions.

《Switching range reset》
In case of error（OUTPUT/TEACHING indicator blinks red once）, or in case of re-teaching, it is possible to reset to previous status by selecting
MODE SELCTOR to RUN or RUN OFF DELAY position.

《Hysteresis》



Note:○Hysteresis range varies depending on the setting of sensitivity and response time（See above table）.Switching range must be more than 2 times that of hysteresis range.

●Remote teaching input

Instead of pressing teaching button, switching range teaching, offset teaching and offset reset to default status can be done by using external switching pulse on REMOTE INPUT lead（pink） to connect 0V（NPN） or +V（PNP）.

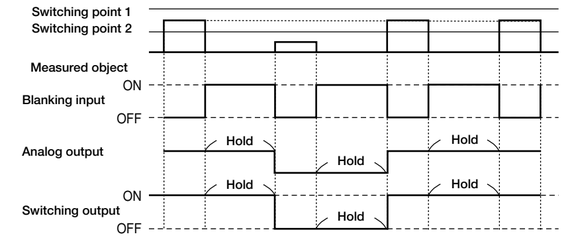
Note：○Remote teaching can be done by switching MODE SELECTOR to RUN or RUN OFF DELAY position.
○According to the duration of teaching pulse, switching range /offset/offset reset to default status is selectable.
○Teaching status is indicated by teaching indicator as well as pressing the button. When teaching through remote input is completed, sensor is automatically switched to RUN/RUN OFFDELAY status.
○In switching range teaching, first teaching pulse makes sensor SET status. Second teaching pulse must be added within 30 seconds. If the second pulse is not added within 30 seconds, SET status by the first pulse is canceled, and the senseor is automatically switched to RUN/RUN OFFDELAY status.

《Reset》
Sensor is automatically reset if any error occurs during switching range / offset teaching.

●Blanking input

An input to trigger sensor via external synchronization pulse. While the pulse is added, status of switching output and value of analog output can be held.

Note：○NPN models：Connect BLANKING INPUT lead（gray） to 0V
○PNP models：Connect BLANKING INPUT lead（gray） to +V



5 Warnings and cautions

Warnings

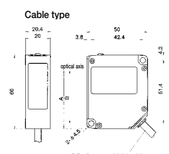
●Laser beam
○Laser models emit visible laser beam which complied with IEC825 Class 2. A warning and description label is attached to the side of the housing.
○DO NOT stare into the beam, or reflect the beam with a mirror.
○DO NOT disassemble the unit. Sensor are not equipped with auto-laser-off function.

Cautions

●DO NOT allow dust, oil, water, etc. to accumulate on the sensor face.
It degrades the sensor function, If pollution, just wipe clean using a dry cloth.
●When a switching regulator is to be used with a power supply, make sure to ground the frame ground terminal.
●DO NOT use the sensor in a transient state at power on（Approx. 15min. warm-up time）.
●DO NOT run the sensor cable near a high-voltage lines, or power lines or put them together in the same raceway. This warning should be strictly observed to prevent malfunctions caused by inductive interference.
●Sensors equipped on machinary are under FDA of American Laser reguration. CD1 series have already been registered with CDRH（Center for Devices and Rediological Health）.

⚠ **Must not use this item as safety equipment for the purpose of human body protection.**

Cable type

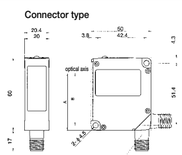


Optical axis

	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.
- For more information, questions and comments regarding products, please contact us below.

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