Displacement sensor

FASTUS

CD22 Series

CD22-15□□   CD22M-15□□
CD22-35□□   CD22M-15□□
CD22-100□□ CD22M-100□□

Instruction manual

- Thank you for purchasing CD22 series. We hope you are satisfied with its performance.
- Please read this manual carefully and keep it for future reference.

⚠ Indicates a possible hazard that may result in death, serious injury, WARNINGS or serious property damage if the product is used without observing the stated instructions.
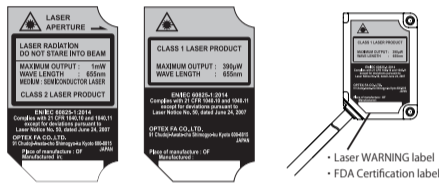
⚠ Warning Mandatory Requirements

● The light source of this product applies the visible light semiconductor laser. Do not allow the laser beam to enter an eye, either directly or reflected from reflective object. If the laser beam enters an eye, it may cause blindness.
● This product is not an explosion proof construction. Do not use the product under flammable , explosive gas or liquid environment.
● Do not disassemble or modify the product since it is not designed to automatically stop the laser emission when open. Disassembling or modifying at customer's end it may cause personal injury, fire or electric shock.
● Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ Warning Safety Precautions

● It is dangerous to wire or attach/remove the connector while the power is on. Make sure to turn off the power before operation.
● Installing in the following place may result in malfunction:
　1. A dusty or steamy place
　2. A place generating corrosive gas
　3. A place directly receiving scattering water or oil.
　4. A place suffered from heavy vibration or impact.
● The product is not designed for outdoor use.
● Do not use the sensor in a transient state at power on (Approx. 15min. Warm up period)
● Do not wire with the high voltage cable or the power lines. Failure to do this will cause malfunction by induction or damage.
● Do not use the product in water.
● Operate within the rated range.
● Wipe off dirt on the emitting/receiving parts to maintain correct detection. Also, avoid direct impact on the product.
● Don't bend the cable when the temperature of the cable or atmosphere is below freezing.

Precautions for using laser

● Regulations in the USA
When exporting laser devices to the USA, the USA laser control, FDA (Food and Drug Administration) is applied. This product has been already reported to CDRH (Center for Devices and Radiological Health). For details, contact our customer service.

- Laser WARNING label
- FDA Certification label

Laser diode
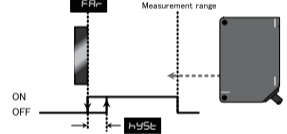Wave length:655nm, Max output:10mW,//9 degree type.

Bundled goods in the box

Please confirm following goods bundled in the box.

- CD22-□-□□□□
- This instruction manual
- Screws M3 × 15…2
- Laser label [reserve]

Connection diagram

■ NPN type

M12 type	M8 type	
Brown	Brown	+V DC 12~24V ±10%
Black	(None)	Control output*
Gray	Black	External input
White	White	Analog output
Blue	Blue	0 V / Analog GND

* : M8 connector type doesn't have

■ PNP type

M12 type	M8 type	
Brown	Brown	+V DC 12~24V ±10%
Black	(None)	Control output*
Gray	Black	External input
White	White	Analog output
Blue	Blue	0V / Analog GND

* : M8 connector type doesn't have

■ Pins configuration
(sensor side)

- M12 type
- M8 type

Dimensions

■ M12 type
[mm]

M12 5pin Connector

■ M8 type

M8 4pin Connector

Functions of components

Control panel

Cable (minimum bending radius : 10mm)
* Don't bend the cable of the outlet part up to 30mm from the case.

Holes for installation (M3 × 2)
* Tightening torque must be 0.5N・m Max.

● Lens (Emitter/Receiver)

● Control panel

OUT : ON when output is ON
ZERO : ON when zero reset

MANUAL : ON when "Setup mode" or "Extension mode"

LASER : ON when laser is emitted

Specifications

● Part number legend

C D 2 2 □ - □□ □ □

- Laser Class ● Nul : Class 1   ● 2 : Class 2
- Connector ● M12 : M12   ● C : M8 connector
- Output ● V : Voltage 0-10V   ● A : Current 4-20mA   ● -485 : RS-485
- Measurement center distance (mm)
- Case ● Nul : Aluminum   ● M : SUS316L

● Specifications per measurement range

Part number	Aluminum housing	CD22-15□□	CD22-35□□	CD22-100□□
	SUS housing	CD22M-15□□	CD22M-35□□	CD22M-100□□
Center of measurement range		15mm	35mm	100mm
Measurement range		±5mm	±15mm	±50mm
Light source		Red laser Diode (wave length 655nm)		
		Max. output: 390 μW		Max. output: 1mW [3]
Laser class IEC/JIS		Suffix nul: CLASS 1 / 2: CLASS 2 (Laser Notice No.50)		
Spot size [1]		500 * 700μm	450 * 800μm	600 * 700μm
Linearity [2]		0.1% of F.S.	0.1% of F.S.	0.1% of F.S.
Repeatability [2]		1μm	6μm	20μm
Sampling period		500μs / 1000μs / 2000μs / 4000μs / AUTO		
Temperature drift (typical value)		±0.02% / ℃ of F.S.	±0.02% / ℃ of F.S.	±0.05% / ℃ of F.S.
Indicator		Laser indicator: Green / Zero reset indicator: Red		
		Output indicator: Orange / Mode indicator: Red		
External Input		Laser OFF, Teaching, Sample & Hold, One shot, Zero reset		
Control Output		NPN/PNP max.100mA/DC30V (Residual voltage 1.8 V max.)		
Current consumption		70mA max. including Analog output current		
Protection circuit		Reverse connection protection, Over current protection		
Protection category		IP67 including connection part		
Operating Temp./Humid.		-10 ~ 50℃ / 35 ~ 85% RH without freasing or condensation		
Storage Temp./Humid.		-20 ~ 60℃ / 35 ~ 85%/RH		
Ambient illuminance		Incandescent lamp: 3,000 lx max.		
Vibration resistence		10 ~ 55Hz, Double amplitude 1.5mm, X,Y,Z for 2 hours		
Shock resistence		500m/s² (approx. 50G) X,Y,Z 3 times each		
Material		Case: Aluminum/SUS316L, Front lens: PPSU, Display: PET		
Weight		Aluminum case with M12 connector : Approx. 60g including 300mm cable with connector		
		SUS case with M12 connector type : Approx. 90g including 300mm cable with connector		
		Aluminum case with M8 connector : Approx. 40g		
		SUS case with M8 connector : Approx. 70g		

The specifications are based on the condition unless otherwise designated: Ambient temperature: 23℃ , Supply voltage: 24VDC, Sampling period: 500μs, Averaging: 64, Measuring distance: Center of the range, Testing object: White ceramic
※ 1 Defined with center strength 1/e²(13.5%) at the center. 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.
※ 2 512 averaging time
※ 3 for Laser Class 2 type (Model : CD22-100AM122 / CD22-100VM122 , CD22-100A2 , CD22-100V2)

● Specifications per output

Part number	CD22□-□□V	CD22□-□□A	CD22□-□□-485
Type	Voltage output	Current output	RS-485 type
Analog output range	0 ~ 10V [1]	4 ~ 20mA	—
Maximum load impedance	—	300Ω	—
Output impedance	100Ω	—	—
Power supply		DC12-24V ±10% [1]	

※ 1 Please keep power supply voltage over 12.0V for Voltage output type to get 0-10V analog output correctly.

Setup

● Changing mode

While it's "Teach mode", "Setup mode" or "Extension mode", you can change the mode to "Measurement mode" by pressing "ZERO/RUN" button.
While it's "Setup mode" or "Extension mode", the LED "MANUAL" is lit.

- Measurement mode
- Teaching mode
- Setup mode
- Extension mode

Press at a time for 1 second

● Changing parameters

You can choose and adjust the parameters by pressing "+" and "-" buttons.
The mode can be changed to "Measurement mode" by pressing "ZERO/RUN" button.

Changing parameter   Adjusting parameter

Teach mode

■ 1: Setup mode
nEnu → To Setup mode

■ 2: Teaching mode
nodE → 1Pt : 1 point Teaching
         FGS2 : FGS2
         2Pt : 2 point Teaching

■ 3: FGS2 threshold
FGS2 → tch : Teaching current position

■ 4: Near side threshold
nEAr → tch : Teaching current position

■ 5: 1 point Teaching - Far side threshold
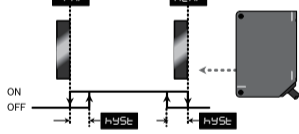FAr → tch : Teaching current postiion

---

Measurement mode

CD22 has 3 measurement mode. The mode is chosen by "Teach mode".
Output can be reversed by setting "Output polarity Act ".
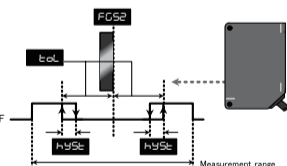Following output shows its ON/OFF status as "Light ON L □□ ".

● 1 point Teaching
Teaching is done at a position. When the measurement distance is closer that position, the output will be ON.

● 2 point Teaching
Teaching is done at 2 positions. While the measurement distance is between those positions, the output will be ON.

● FGS2
Teaching is done at a position. When the measurement distance is closer than the distance set by "Hysteresis tol "from the position that Teaching is done, the output will be ON. It works as FGS sensor.

Analog Output

Analog Current or Analog Voltage type outputs Analog output according to the measurement distance.
The distance range for Analog output is set in Teaching mode or Setup mode.
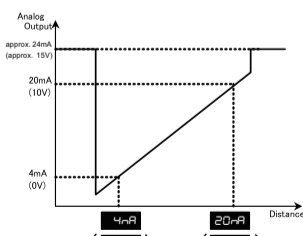
● Default value of each Analog output type

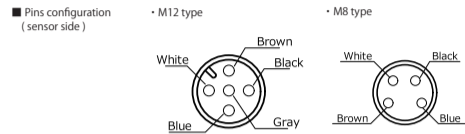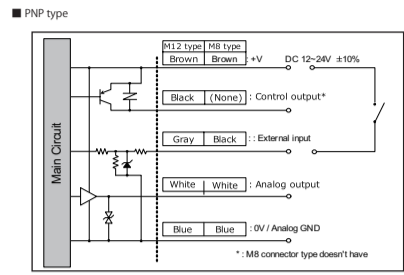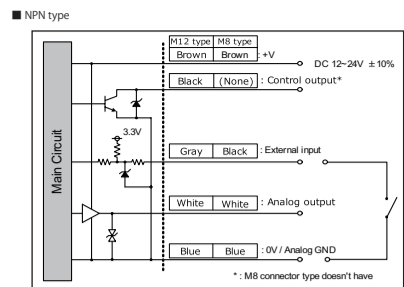| Current (Voltage)	CD22□-15□□	CD22□-35□□	CD22□-100□□
4nA (0V)	- 5.000	- 15.000	- 50.00
20nA (10V)	5.000	15.000	50.00

External Input

Multiple function can be set at external input. When it's set as "Teaching" or "Zero reset", The function varies by input period as follows.
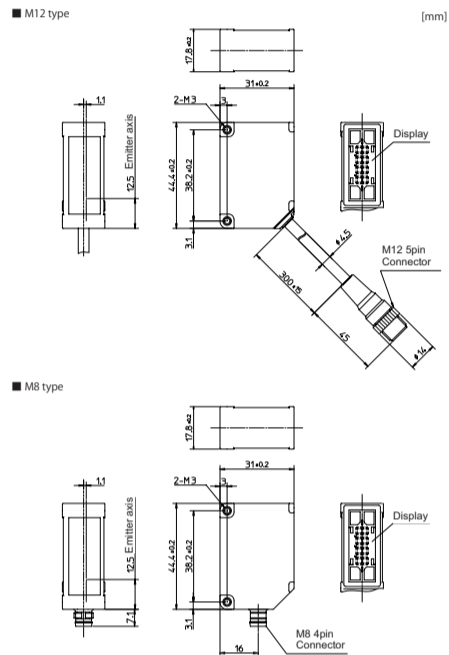
■ Teaching

input period (sec.)	What to teach (Teaching current position)
0 to 0.5 sec.	Do nothing
0.5 to 1.5 sec.	Current output type : 4mA/ Voltage output type : 0V
1.5 to 2.5 sec.	Current output type : 20mA/ Voltage output type 10V
2.5 to 3.5 sec.	Near side threshold
3.5 to 4.5 sec.	Far side threshold
over 4.5 sec.	FGS2 threshold

■ Zero reset

input (sampling)	Function
0 to 1,999	Zero reset
over 2,000	Release Zero reset

Setup mode

Setup mode is chosen by pressing "SET" button from "Menu". (* means default value)

■ 1: Analog output setup (varies by type)

● Voltage type
- 10U 10V → 0.123 Set the value
- 0U 0V → 0.123 Set the value

● Current type
- 20nA 20mA → 0.123 Set the value
- 4nA 4mA → 0.123 Set the value

● RS-485 type - no setup stage

■ 2: Near side threshold
nEAr → 0.123 Set the value

Default: CD22□-15□□ -1.000
CD22□-35□□ -03.00
CD22□-100□□ -10.00

■ 3: 1 point Teaching - Far side threshold
FAr → 0.123 Set the value

Default: CD22□-15□□ 1.000
CD22□-35□□ 03.00
CD22□-100□□ 10.00

■ 4: FGS2 threshold
FGS2 → 0.123 Set the value

Default: CD22□-15□□ 0.000
CD22□-35□□ 00.00
CD22□-100□□ 00.00

■ 5: Teaching mode
nodE → 1Pt : 1 point Teaching
         FGS2 : FGS2
         2Pt : 2 point Teaching *

■ 6: FGS2 hysteresis
tol → 0.123 Set the value

Default: CD22□-15□□ 1.000
CD22□-35□□ 03.00
CD22□-100□□ 00.00

■ 7: External input function
inP →
- oFF : MF OFF : Disable exernal input *
- LSr : Laser OFF : Kill laser power when input is ON
- tch : Teaching : Set current value as threshold
- S h : Sample hold : Keep the level when input is ON
- onE : One shot : Active when input is ON
- 2Ero : Zero reset : Set current position as "0"

■ 8: Sampling period
SAnP →
- 500 : 500μs (2kHz) *
- 1000 : 1000 μs (1kHz)
- 2000 : 2000 μs (500Hz)
- 4000 : 4000μs (250Hz)
- Auto : AUTO (Sensor will optimize automatically)

■ 9: Output polarity
Act →
- L on : Light ON: ON when exceeds the threshold *
- d on : Dark ON: ON when less than the threshold

■ 10: NPN/PNP selection
n_P →
- nPn : Set input/output as NPN *
- PnP : Set input/output as PNP

This parameter won't be change by reset

■ 11: Averaging number
AUG →
- 1 : Once
- 8 : 8 times
- 64 : 64 times *
- 512 : 512 times

■ 12: Alarm setting
AL-n →
- cLnP : Clamp : display "9999" *
- hold : Hold : keep previous value

■ 12-2: Alarm - Hold and Clamp
hdct → 0000 Set sampling number to Hold

When Alarm is set as hold , measurement data will be as follows for Alarm

● "Hold and Clamp" is active
Keep the previous data for the period and clamp to "9999" after that.

● "Hold and Clamp" is not active (when it's set "0000")
Keep the previous data while it's Alarm status.

■ 13: Reset (Initializing)
rESt →
- YES : Initialize the parameters to default setting
- no : Do nothing

■ 14: Display setting
di SP →
- on : Activate the display while "Key lock" *
- oFF : Desable the display while "Key lock"

Extension mode

Extension mode is chosen by pressing "+" and "-" buttons at a time for 1 second.
Parameters in Extension mode must be set correctly otherwise it might not work correctly.
Please use with default setting when changing parameters is not needed. (* * * means default setting)

■ 1: Hysteresis
hySt → 0.123 Set the value

Default: CD22□-15□□ 0.050
CD22□-35□□ 00.15
CD22□-100□□ 00.50

■ 2: Measurement point
ntoP →
Choose measurement point when it receives multiple reflection from the object.
- nAH : MAX : Maximum distance *
- Pt5 : Pt5 : 5th point from sensor side
- Pt4 : Pt4 : 4th point from sensor side
- Pt3 : Pt3 : 3rd point from sensor side
- Pt2 : Pt2 : 2nd point from sensor side
- Pt1 : Pt1 : Closest point from sensor side

■ 3: Treshold
thrE →
Set threshold level to recognize as measurement point.
- bASE : Base : Set threshold to lowest level *
- P400 : P400 : Set threshold to upper level
- P200 : P200 : Set threshold to middle level
- P100 : P100 : Set threshold to lower level

■ 4: Time out
tout →
This is only for communication type. Set Time out period.
- oFF : Disable Time out *
- 100n : Time out in 100ms
- SAnP : Time out in sampling period

■ 5: External input filter
nct →
Set filtering number for external input. The unit is sampling times.
- 1 : Once *
- 256 : 256 times

■ 6: Zero shift
2Ero → 0.123 Set the value

■ 7: Sensitivity
SEnS →
Set Sensitivity of the sensor.
- Auto : Auto : Adjust automatically *
- n..6 : 6 : Maximum sensitivity
- n..1 : 1 : Minimum sensitivity

Miscellaneous function

■ Zero reset function

● Set Zero reset
While it's measurement mode, press ZERO/RUN for 2 seconds. Then, 0.000 will be shown. The position of decimal point varies by sensor type.
When setting Zero reset, the red indicator LED "ZERO" will be ON.

● Release zero reset
While it's measurement mode, press ZERO/RUN for 4 seconds to release Zero reset.

■ Key lock function

● Activate Key lock
While it's measurement mode, press + - at a time for 1 second. Then, Loc will be shown. While Loc is shown, any access except "Releasing Key lock" will be neglected.

● Release Key lock
While Key lock is activated, it will be released by pressing + - at a time for 3 seconds. Then, uLoc will be shown. After this process, every access will be accepted.

⚠ Attention: Not to be Used for Personnel Protection.
Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death. These sensors do not include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
Please consult our distributors about safety products which meet OSHA, ANSI and IEC standards for personnel protection.

ⓘ ⑩ → http://www.optex-fa.com/rohs_cn/

● 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.
Manufactured and sold by :

OPTEX FA CO.,LTD.

91 Chudoji Awata-cho Shimogyo-ku Kyoto 600-8815 Japan
TEL: +81-(0)75-325-1314
FAX: +81-(0)75-325-2936
Website : http://www.optex-fa.com

Displacement sensor

FASTUS

CD22 Series

CD22-15-485□□   CD22M-15-485□□
CD22-35-485□□   CD22M-35-485□□
CD22-100-485□□   CD22M-100-485□□

Instruction manual

- Thank you for purchasing CD22 series. We hope you are satisfied with its performance.
- Please read this manual carefully and keep it for future reference.

⚠ Indicates a possible hazard that may result in death, serious injury, WARNINGS or serious property damage if the product is used without observing the stated instructions.

⚠ Warning   Mandatory Requirements

- The light source of this product applies the visible light semiconductor laser. Do not allow the laser beam to enter an eye, either directly or reflected from reflective object. If the laser beam enters an eye, it may cause blindness.
- This product is not an explosion proof construction. Do not use the product under flammable , explosive gas or liquid environment.
- Do not disassemble or modify the product since it is not designed to automatically stop the laser emission when open. Disassembling or modifying at customer's end it may cause personal injury, fire or electric shock.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ Warning   Safety Precautions

- It is dangerous to wire or attach/remove the connector while the power is on. Make sure to turn off the power before operation.
- Installing in the following places may result in malfunction:
  1. A dusty or steamy place
  2. A place generating corrosive gas
  3. A place directly receiving scattering water or oil.
  4. A place suffered from heavy vibration or impact.
- The product is not designed for outdoor use.
- Do not use the sensor in a transient state at power on (Approx. 15min. Warm up period)
- Do not wire with the high voltage cable or the power lines. Failure to do this will cause malfunction by induction or damage.
- Do not use the product in water.
- Operate within the rated range.
- Wipe off dirt on the emitting/receiving parts to maintain correct detection. Also, avoid direct impact on the product.
- Don't bend the cable when the temperature of the cable or atmosphere is below freezing.

Precautions for using laser

● Regulations in the USA
When exporting laser devices to the USA, the USA laser control,FDA (Food and Drug Administration) is applied. This product has been already reported to CDRH (Center for Devices and Radiological Health). For details, contact our customer service.

· Laser WARNING label
· FDA Certification label

Laser diode
Wave length:655nm, Max output:10mW,//9 degree type.

Included items

Before using this product, confirm that the following items are contained in the package.

· CD22-□□□□
· This instruction manual
· Screws M3 x 15 2 pieces
· Laser label

Pins configuration and cable color

Pins configuration of the connector and cable color are as follows.

Pin No.	Color	Description
1	Brown	DC12-24V ± 10%
3	Blue	0V
5	Gray	(N.C.)
4	Black	RS-485(A)
2	White	RS-485(B)

● Pins configuration (sensor side)
M12 type / M8 type

Dimensions

● M12 type [mm]

● M8 type

Functions of components

Control panel
Cable (minimum bending radius :10mm)
- Don't bend the cable of the outlet part up to 30mm from the case.

Holes for installation (M3 × 2)
- Tightening torque must be 0.5N·m Max.

Lens (Emitter/Receiver)

● Control panel

OUT : ON when output is ON
ZERO : ON when zero reset

MANUAL : ON when "Setup mode" or "Extension mode"
LASER : ON when laser is emitted

Specifications

● Part number legend

CD22□_□□□

- Laser Class: Nul : Class 1 / 2 : Class 2
- Connector: M12 : M12 / C : M8 connector
- Output: V : Voltage 0-10V / C : Current 4-20mA / -485 : RS-485
- Measurement center distance (mm)
- Case: Nul : Aluminum / M : SUS316L

● Specifications per measurement range

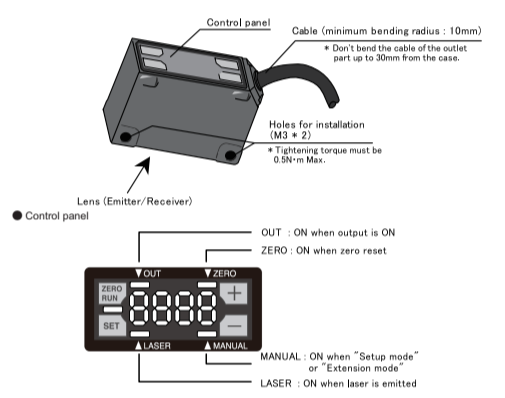| Part number (Aluminum housing)	CD22-15-485□□	CD22-35-485□□	CD22-100-485□□
(SUS housing)	CD22M-15-485□□	CD22M-35-485□□	CD22M-100-485□□
Center of measurement range	15mm	35mm	100mm
Measurement range	±5mm	±15mm	±50mm
Light source	Red laser Diode (wave length 655nm)		
	Max. output: 390 μW		
			Max. output:1mW ※³
Laser class (IEC/JIS)	Suffix nul: CLASS 1 / 2: CLASS 2 (Laser Notice No.50)		
Spot size	500 * 700μm	450 * 800μm	600 * 700μm
Linearity	0.1% of F.S.	0.1% of F.S.	0.1% of F.S.
Repeatability ※²	1μm	6μm	20μm
Sampling period	500μs / 1000μs / 2000μs / 4000μs / AUTO		
Temperature drift (typical value)	±0.02% / ℃ of F.S.	±0.02% / ℃ of F.S.	±0.05% / ℃ of F.S.
Indicator	Laser indicator: Green / Zero reset indicator: Red		
	Output indicator: Orange / Mode indicator: Red		
Communication I/F	RS-485 Half Duplex (Multi-drop I/F is not supported)		
Power supply	12-24VDC ± 10%		
Current consumption	70mA max.		
Protection circuit	Reverse connection protection, Over current protection		
Protection category	IP67 including connection part		
Operating Temp./Humid.	-10 ~ 50℃ / 35 ~ 85% RH without freasing or condensation		
Storage Temp./Humid.	-20 ~ 60℃ / 35 ~ 85%/RH		
Ambient illuminance	Incandescent lamp: 3,000 lx max.		
Vibration resistance	10 ~ 55Hz, Double amplitude 1.5mm, X,Y,Z for 2 hours		
Shock resistance	500mm/s² （ approx. 50G）X,Y,Z 3 times each		
Material	Case: Aluminum/SUS316L, Front lens: PPSU, Display: PET		
Weight	Aluminum case with M12 connector : Approx. 60g including 300mm cable with connector / SUS case with M12 connector type : Approx. 90g including 300mm cable with connector / Aluminium case with M8 connector : Approx. 40g / SUS case with M8 connector : Approx. 70g		

The specifications are based on the condition unless otherwise designated: Ambient temperature: 23℃ , Supply voltage: 24VDC, Sampling period: 500μs, Averaging: 64, Measuring distance: Center of the range, Testing object: White ceramic
※ 1 Defined at center strength 1/e²(13.5%) at the center. 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.
※ 2 512 averaging time
※ 3 Laser Class 2 type (Model: CD22-100-485M122 ,CD22-100-485C2)

Setup

● Changing mode
While it's "Teach mode", "Setup mode" or "Extension mode", you can change the mode to "Measurement mode" by pressing "ZERO/RUN" button.
While it's "Setup mode" or "Extension mode", the LED "MANUAL" is lit.

Measurement mode
Teaching mode   Press at a time for 2 second
Setup mode
Extension mode

● Changing parameters
You can choose and adjust the parameters by pressing "+" and "-" buttons.
The mode will be changed to "Measurement mode" by pressing "ZERO/RUN" button.

Changing parameter   Adjusting parameter

Teach mode

■ 1: Setup mode
AEnu → To Setup mode

■ 2: Teaching mode
NodE
- 1Pt : 1 point Teaching
- FGS2 : FGS2
- 2Pt : 2 point Teaching
- switching

■ 3: Calibration(Far end of the range)
cALF → tch : Teaching current position

■ 4: Calibration(Near end of range)
cALn → tch : Teaching current position

■ 5:FGS2 threshold
FGS2 → tch : Teaching current position

■ 6:Near side threshold
nEAr → tch : Teaching current position

■ 7:1 point Teaching - Far side threshold
FAr → tch : Teaching current position

Measurement mode

CD22 has 3 measurement mode. The mode is chosen by "Teach mode".
Output can be reversed by setting "Output polarity **Act**".
Following output shows its ON/OFF status on "Light ON **L on** ".

●1 point Teaching
Teaching is done at a position. When the measurement distance is closer than that position, the output will be ON.

●2 point Teaching
Teaching is done at 2 positions. While the measurement distance is between those positions, the output will be ON.

●FGS2
Teaching is done at a position. When the measurement distance is closer than the distance set by "Hys teresis **toL** "from the position that Teaching is done, the output will be ON. It works as FGS sensor.

●Calibration (Far end of the range/ Near end of range)
The sensor can be calibrated by "Calibration" mode at both far and near end of the measurement range. This feature is very useful especially when you can't mount the sensor head parallel to the object surface.

● Example of Calibration of CD22-100
A)Calibration condition at the factory   B)When the sensor is mounted tilted

	measurement result:	measurement result:
Position of the target -50mm (Near end of the range)	-50.00	-49.81 → **cALn** → -50.00
0mm (Reference distance)		
50mm (Far end of the range)	50.00	50.19 → **cALF** → 50.00

Just calibrate the sensor by "Calibration" mode at far end and near end of the measurement range. Then, you will get calibrated result if the sensor head is tilted.

Setup mode

Setup mode is chosen by pressing "SET" button from "Menu". (* means default value)

■ 1: Baud rate
bAud
96	9,600bps *
192	19,200bps
384	38,400bps
576	57,600bps
1152	115,200bps
2304	230,400bps
3125	312,500bps
468b	468.750bps
5000	500,000bps
6250	625,000bps
8333	833,333bps
9375	937,500bps
1250	1,250,000bps

■ 2: Near side threshold
nEAr → Set the value
Default: CD22-15□□ -1.000 / CD22-35□□ -03.00 / CD22-100□□ -10.00

■ 3: 1 point Teaching - Far side threshold
FAr → Set the value
Default: CD22-15□□ 1.000 / CD22-35□□ 03.00 / CD22-100□□ 10.00

■ 4: FGS2 threshold
FGS2 → Set the value
Default: CD22-15□□ 1.000 / CD22-35□□ 00.00 / CD22-100□□ 00.00

■ 5: Teaching mode
NodE
- 1Pt : 1 point Teaching
- FGS2 : FGS2
- 2Pt : 2 point Teaching *

■ 6: FGS2 hysteresis
toL → Set the value
Default: CD22-15□□ 1.000 / CD22-35□□ 03.00 / CD22-100□□ 10.00

■ 7: Sampling period
SANP
- 500 : 500μs (2kHz) *
- 1000 : 1000μs (1kHz)
- 2000 : 2000μs (500Hz)
- 4000 : 4000μs (250Hz)
- Auto : AUTO (Sensor will optimize automatically)

■ 8: Output polarity
Act
- L on : Light ON: ON when exceeds the threshold *
- d on : Dark ON: ON when less than the threshold

■ 9: Averaging number
AUG
- 0 : Once
- 8 : 8 times
- 64 : 64 times *
- 512 : 512 times

■ 10: Alarm setting
ALrN
- ctNP : Clamp : display "9999" *
- hold : Hold : Keep previous value

■ 10-2:Alarm-Hold and Clamp
hdct → 0000

When Alarm is set as **hold** measurement data will be as follows for Alarm

- "Hold and Clamp" is active
  - Keep the previous data for the period and clamp to "9999" after that.
- "Hold and Clamp" is not active
  (When it's set "0000")
  - Keep the previous data while it's Alarm status.

Miscellaneous function

■ Zero reset function

● Set Zero reset
While it's measurement mode, press **ZERO** for 2 seconds.
Then, **0000** will be shown. The position of decimal point varies by sensor type.
When setting Zero reset, the red indicator LED "ZERO" will be ON.

● Release zero reset
While it's measurement mode, press **ZERO** for 4 seconds to release Zero reset.

■ Key lock function

● Activate Key lock
While it's measurement mode, press **+** **-** at a time for 2 second. Then, **Loc** will be shown.
While **Loc** is shown, any access except "Releasing Key lock" will be neglected.

● Release Key lock
While Key lock is activated, it will be released by pressing **+** **-** at a time for 3 seconds. Then, **uLoc** will be shown.
After this process, every access will be accepted.
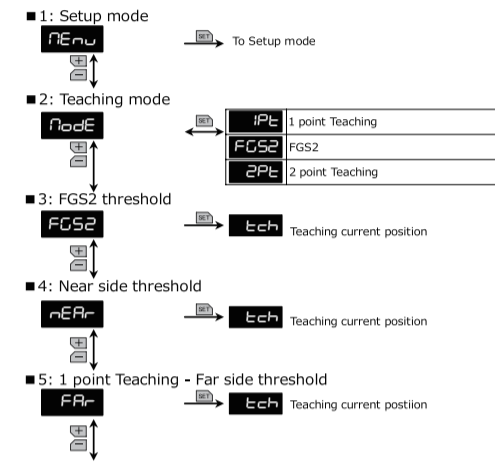

Setup mode (continued)

■ 11: Reset (Initializing)
rESt
- YES : Initialize the parameters to default setting
- no : Do nothing

■ 12: Display setting
di SP
- on : Activate the display while "Key lock" *
- oFF : Desable the display while "Key lock"

Extension mode

Extension mode is chosen by pressing "+" and "-" buttons at a time for 2 second in teach mode top page. Parameters in Extension mode must be set correctly otherwise it might not work correctly.
Please use with default setting when changing parameters is not needed. (" * " means default setting)

■ 1: Hysteresis
hySt → Set the value
Default: CD22-15□□ 0.050 / CD22□-35□□ 0.15 / CD22□-100□□ 0.50

■ 2: Measurement point
NtoP
Choose measurement point when it receives multiple reflection from the object.
- NAH : MAX : Maximum distance *
- Pt5 : Pt5 : 5th point from sensor side
- Pt4 : Pt4 : 4th point from sensor side
- Pt3 : Pt3 : 3rd point from sensor side
- Pt2 : Pt2 : 2nd point from sensor side
- Pt1 : Pt1 : Closest point from sensor side

■ 3: Threshold
thrE
Set threshold level to recognize as measurement point.
- bASE : Base : Set threshold to lowest level *
- P400 : P400 : Set threshold to upper level
- P200 : P200 : Set threshold to middle level
- P100 : P100 : Set threshold to lower level

■ 4: Zero reset value
ZEro → Set the value
Set display value for Zero reset .

■ 5: Sensitivity
SEnS
Set Sensitivity of the sensor.
- Auto : Auto : Adjust automatically *
- n_6 : 6 : Maximum sensitivity
- n_1 : 1 : Minimum sensitivity

Communication

Specifications are as follows.

Communication method	RS-485 Half Duplex (Multi-drop I/F is not supported)
Transmission code	Binary
Data length	8bit
Stop length	1bit
Parity check	Nil
Baud rate (bps)	9.6k/19.2k/38.4k/57.6k/115.2k/230.4k/312k/460k/500k/625k/833k/920k/1.25M
Data classification	STX / ETX

■ Data Format

Transmission data:
| STX | COMMAND | DATA1 | DATA2 | ETX | BCC |

Incoming data:
| STX | ACK | RESPONSE1 | RESPONSE2 | ETX | BCC |

Incoming data (error):
| STX | NAK | ERROR CODE | 00H | ETX | BCC |

STX = 02H , ETX = 03H , ACK = 06H , NAK = 15H , BCC = XOR of values hatched

Basic commands
- C(43H): Individual function commands
- W(57H): Writing the setting
- R(52H): Reading out setting

Error code table
02H	Address is invalid
04H	BCC value is invalid
05H	Invalid command is issued except "C", "W", "R"
06H	Setting value is invalid (out of specifications)
07H	Setting value is invalid (out of range)

■ C(43H) parameter table

Command	Type	DATA1 (upper)	DATA2 (lower)	Description
Reading out Measurement value	Write	B0h	01h	Response in 2 bytes ※¹
	Read	Upper data	Lower data	
Reading out Output status	Write	B0h	02h	
	Read	Output status		bit:0 = 1 (ON) bit:4 = 0 (the status has been read)
Writing the setting	Write	A0h	00h	Write the setting into EEPROM.
	Read	00h	00h	
Teaching FGS2	Write	11h	05h	
	Read	00h	00h	
Teaching near side point	Write	11h	06h	
	Read	00h	00h	
Teaching far side point	Write	11h	07h	
	Read	00h	00h	
Laser ON	Write	A0h	03h	10ms is required until the laser power stable.
	Read	00h	03h	
Laser OFF	Write	A0h	02h	
	Read	00h	00h	
Execute Zero reset	Write	A1h	00h	
	Read	00h	00h	
Release Zero reset	Write	A1h	01h	
	Read	00h	00h	
Execute Key lock	Write	A1h	04h	
	Read	00h	00h	
Release Key lock	Write	A1h	05h	
	Read	00h	00h	
Initializing	Write	40h	00h	Initialize all parameters except communication speed and re-boot. The communication won't worrk while initializing.
	Read	00h	00h	

*1 : Measurement and setting value are described as signed hexadecimal.

Model	CD22□-15-485-□	CD22□-35-485-□	CD22□-100-485-□
Range	±5mm	±15mm	±50mm
Unit	1μm	1μm	10μm
Data (Hex)	EC78h / 1388h	FA24h / 05DCh	EC78h / 1388h
Data (Decimal)	-5000 / +5000	-1500 / +1500	-5000 / +5000

■ Writing Data
Writing is done as following procedure.

1. Read out setting
Execute Command "R" (Reading out setting) on the target parameter.
Set "Address" at "DATA1" and "DATA2".

2. Write setting
Execute Command "W" (Writing the setting) on the target parameter.
Writing data is done to the address set at "1. Read setting".

Example: Setting "Sampling period" to "AUTO"
1. Read out "Sampling period"
Transmission command: STX (02h) R (52h) 40h 06h ETX (03h) BCC (14h)
Incoming data: STX (02h) ACK (06h) 00h 03h ETX (03h) BCC (06h)
2. Write the setting
Transmission command: STX (02h) W (57h) 00h 04h ETX (03h) BCC (53h)
Incoming data: STX (02h) ACK (06h) 00h 00h ETX (03h) BCC (06h)

* Incoming data of command "W" (Writing the setting) will be "00h" and "00h".

■ Setting parameter table

Setting	Address/Parameter	DATA1 (upper)	DATA2 (lower)	Description
Model type	Address	01h	00h	Return center value of measurement range (only for checking model type)
	Parameter	00h	0Fh	15mm type
		00h	23h	30mm type
		00h	64h	100mm type
Measurement mode	Address	40h	04h	
	Parameter	00h	00h	2 point Teaching
		00h	01h	1 point Teaching
		00h	02h	FGS2 Teaching
Near side threshold	Address	41h	00h	
	Parameter	Upper data	Lower data	
Far side threshold	Address	41h	02h	
	Parameter	Upper data	Lower data	
FGS2 threshold	Address	41h	04h	
	Parameter	Upper data	Lower data	
FGS2 hysteresis	Address	41h	06h	
	Parameter	Upper data	Lower data	
Output polarity	Address	40h	08h	
	Parameter	00h	00h	Light ON: ON when exceeds the threshold
		00h	01h	Dark ON: ON when less than the threshold
Sampling period	Address	40h	06h	
	Parameter	00h	00h	500μs
		00h	01h	1,000μs
		00h	02h	2,000μs
		00h	03h	4,000μs
		00h	04h	AUTO
Averaging number	Address	40h	0Ah	
	Parameter	00h	00h	Once
		00h	01h	8 times
		00h	02h	64 times
		00h	03h	512 times
Alarm setting	Address	40h	0Ch	
	Parameter	00h	00h	Clamp
		00h	01h	Hold
Alarm - Hold and Clamp	Address	41h	08h	
	Parameter	Upper data	Lower data	
Display setting	Address	40h	0Eh	
	Parameter	00h	00h	ON
		00h	01h	OFF
Hysteresis	Address	41h	10h	
	Parameter	Upper data	Lower data	
Measurement point	Address	00h	10h	
	Parameter	00h	00h	MAX. : Maximum distance
		00h	01h	Pt1 : Closest point from sensor side
		00h	02h	Pt2 : 2nd point from sensor side
		00h	03h	Pt3 : 3rd point from sensor side
		00h	04h	Pt4 : 4th point from sensor side
		00h	05h	Pt5 : 5th point from sensor side
Threshold	Address	40h	12h	
	Parameter	00h	00h	Base : Lowest level
		00h	01h	Level 100 : lower level
		00h	02h	Level 200 : middle level
		00h	03h	Level 400 : upper level
Zero reset value	Address	41h	12h	
	Parameter	Upper data	Lower data	
Sensitivity	Address	40h	14h	
	Parameter	00h	00h	AUTO
		00h	01h	1 : Minimum sensitivity
		00h	02h	2
		00h	03h	3
		00h	04h	4
		00h	05h	5
		00h	06h	6 : Maximum sensitivity

* Execute the command "R" (Read out) before executing command "W" (Write).

⚠ Attention: Not to be Used for Personnel Protection.
Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death. These sensors do not include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized senso r output condition. Please consult our distributors about safety products which meet OSHA, ANSI and IEC standards for personnel protection.

→ http://www.optex-fa.com/rohs_cn/

- 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.

Manufactured and sold by :

OPTEX FA CO.,LTD.

91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 Japan
TEL : +81-(0)75-325-1314
FAX : +81-(0)75-325-2921
Website : http://www.optex-fa.com