

LS

CD5

CD4

CD33

CD3

CD22

CD1

UQ1

# CD5 series

World's longest sensing distance of 2 meter with fine linearity of  $\pm 0.1\%$  F.S.



- Best-in-class resolution (0.02 $\mu$ m) of CD5L-25
- Best-in-class linearity (0.05% F.S.) of CD5-85
- Multiple calculations, one controller supports 3 heads simultaneously.
- Sensing heads can function without controller (Patent pending). Direct connection to PC is possible via RS-422.

# SENSORHEAD VARIATION

## CD5-30 (Narrow spot)

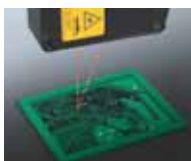
## CD5-W30 (Wide spot)

### Short distance

5 times better resolution than conventional model

Diffuse  
type

Measurement range : 30  $\pm$ 5mm  
Resolution : 0.2  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



Specular  
mode

Measurement range : 26.1  $\pm$ 2.5mm  
Resolution : 0.1  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



## CD5-85 (Narrow spot)

## CD5-W85 (Wide spot)

### Middle distance

Highest level of linearity in this class

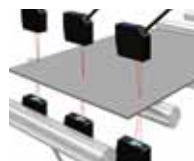
Diffuse  
type

Measurement range : 85  $\pm$ 20mm  
Resolution : 1  $\mu$ m  
Linearity :  $\pm$ 0.05% F.S.



Specular  
mode

Measurement range : 82.3  $\pm$ 10mm  
Resolution : 0.5  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



## CD5-150 (Narrow spot)

## CD5-W150 (Wide spot)

### Semi long distance

Highest level of linearity in this class

Diffuse  
type

Measurement range : 150  $\pm$ 40mm  
Resolution : 2  $\mu$ m  
Linearity :  $\pm$ 0.05% F.S.



## CD5-W350 (Wide spot)

### Long distance

High accuracy & stability by wide spot

Diffuse  
type

Measurement range : 350  $\pm$ 100mm  
Resolution : 5  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



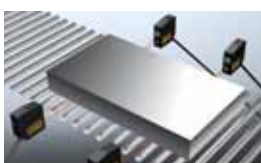
## CD5-W500 (Wide spot)

### Super long distance

Highest level of accuracy for this range

Diffuse  
type

Measurement range : 500  $\pm$ 200mm  
Resolution : 10  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



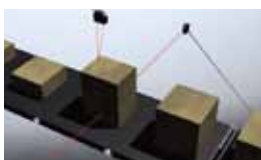
## CD5-W2000 (Wide spot)

### Ultra long distance

This longest range in the industry

Diffuse  
type

Measurement range : 2000  $\pm$ 500mm  
Resolution : 30  $\mu$ m  
Linearity :  $\pm$ 0.1% F.S.



## CD5-L25 (Narrow spot)

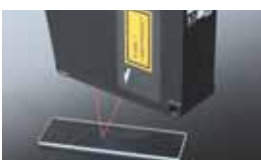
## CD5-LW25 (Wide spot)

### For transparent and specular objects

Measurement of glass thickness is available

Specular  
type

Measurement range : 25  $\pm$ 1mm  
Resolution : 0.02  $\mu$ m  
Linearity :  $\pm$ 0.08% F.S.



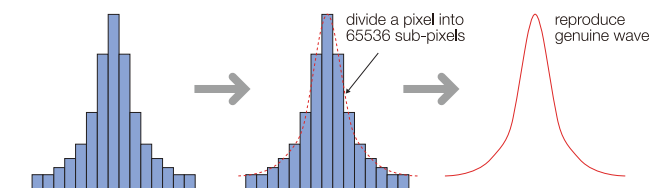
# CD5 SENSOR HEADS

The CD5 series uses OPTEX FA's original design cutting edge technology to achieve high accuracy measurement

## Digital sub-pixel processing

### Accurate profile reproduction

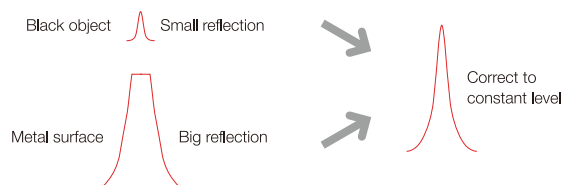
The linearity has been improved to more than twice that of a conventional product by digital sub-pixel processing. This divides one pixel into 65536 sub-pixels.



## High resolution electronic shutter

### Automatic level correction

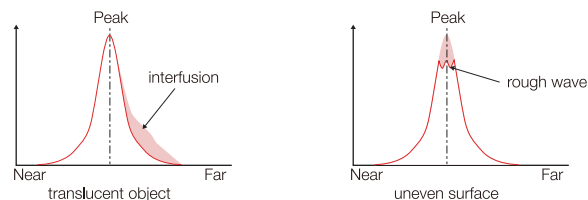
A high resolution electronic shutter that can be controlled to 1/485th of the sampling period helps to insure stable peak level detection even when unstable surface conditions exist.



## For uneven and varied luster object

### Original algorithm

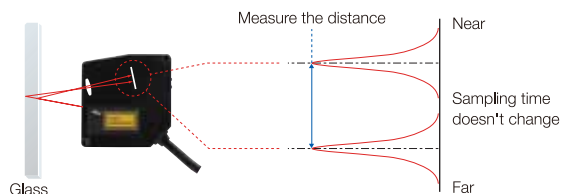
Even if the object is translucent or its surface is uneven, it can detect the position of the true peak thanks to the original Optex designed algorithm.



## Standalone operation - no controller required

### Reliable glass thickness measurement

The Specular type CD5-L25/CD5-LW25 can detect both the surface of glass and measure the thickness without being connected to the controller.



## Control unit UQ1 series to connect sensor head to MITSUBISHI PLC MELSEC-Q series directly

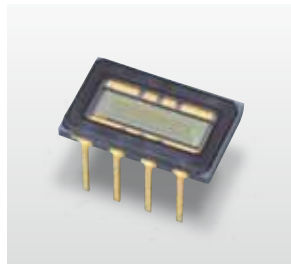
UQ1-01 enables easy connection of CD5 and MITSUBISHI PLC MELSEC-Q series. UQ1 setup the sensor head automatically. You don't have to have big ladder program.

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## High accuracy, high speed, high sensitivity High sensitivity linear image sensor

The CD5 series offers 5 times higher accuracy and 10 times higher speed than a conventional product.



## Low aberration lens "Multi-CLD" lens

Newly developed lens used in the receiver projects a clear image on the image sensor with very little aberration.



Multi-CLD: Multi Combined Low Dispersion

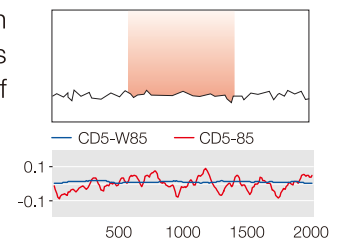
## High speed and high accuracy High speed processing unit

The newly developed processing unit is able to process the measurement data at high speed. It is also able to correct for any distortion and accurately compensates for variations in the readings.



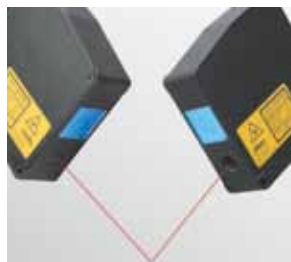
## Highly stable linearity Wide spot type

The wide spot type can measure rough surfaces with a high degree of linearity and stability.



## Cross-talk prevention Preventing cross-talk (world's first)

The newly developed cross-talk prevention function eliminates interference between sensors even when the beams are crossing or are mounted close together.



Sampling period will be 6 times longer

## Water resistance IP67

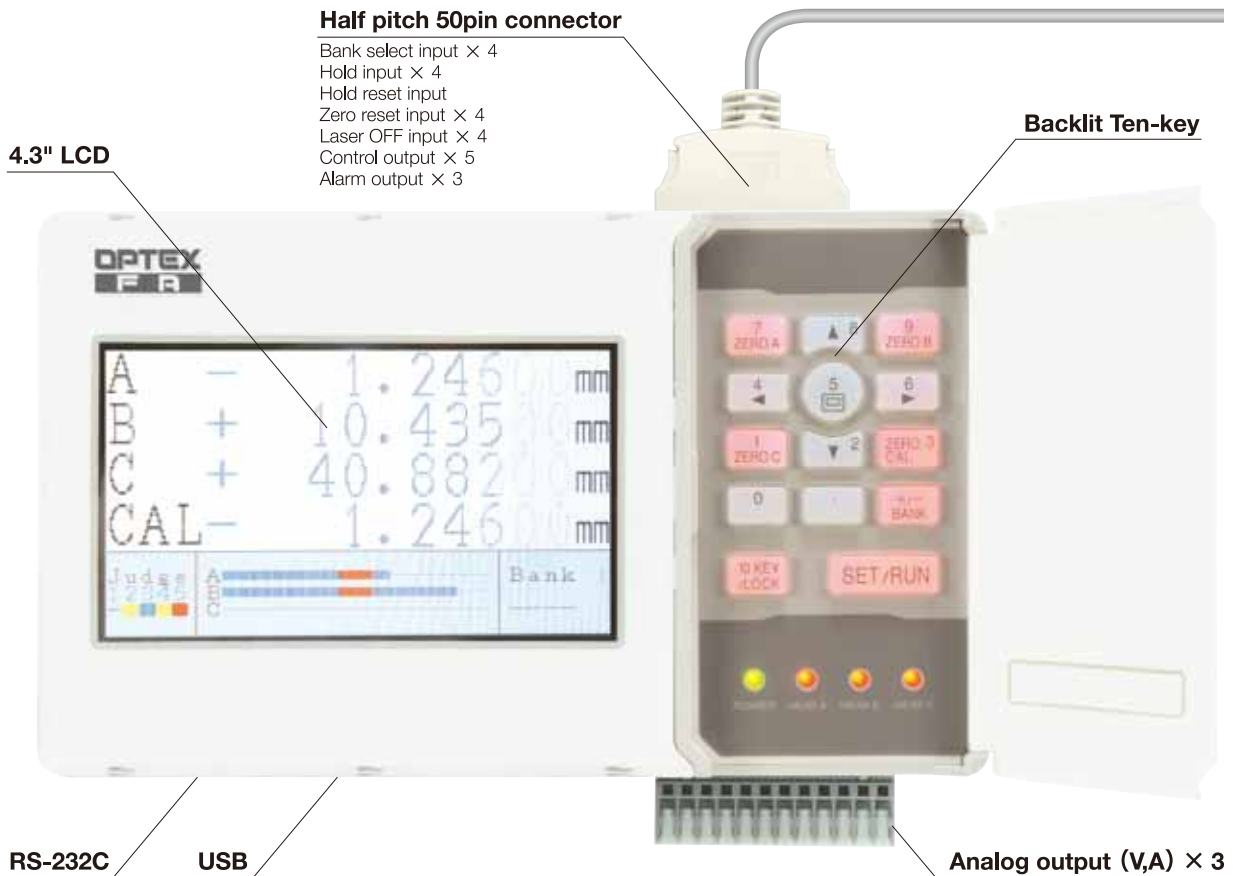
The CD5 series has an IP67 rating not only at the sensor body but also on the extension cable connector. Additional countermeasures to protect the cable from water are not required.



Note: Water droplets on the optical part may cause faulty readings and problems with the measurement.

# CD5 CONTROLLERS

Multiple interface for PC, PLC, etc.



## Multi measurement with one controller 3 heads multi calculation (world's first)

Up to three sensor heads can be connected to one controller unit. Calculation with result from three heads is available that can be used to solve various applications

- Levelness
- Contortion
- Warpage
- Level difference
- Thickness
- Shifting



## Easy SETUP

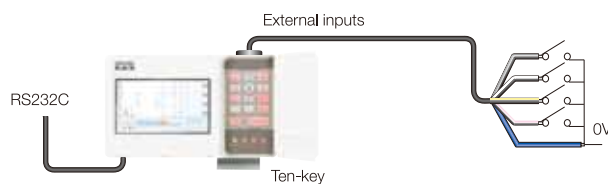
### Backlit Ten-key and display guide

Setup of basic sensor parameter and calibration are easily done by Backlit ten-key and display. Backlit ten-key panel shows which keys are active.



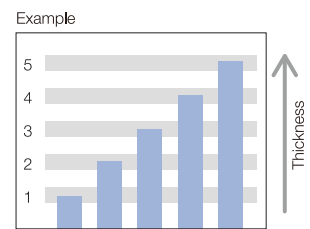
## Multiple SETUP is available 16 Banks for SETUP

You can setup 16 sets of measurement parameter for 16 application. Bank is changed by Ten-key, external inputs and RS-232C communication.



## Effective for sorting 5 Outputs have individual threshold

5 Outputs that have individual threshold, upper and lower limit, is available. This is effective for sorting application.



## Wave monitoring without PC or external monitor Wave monitoring function

You can monitor the wave form and verify if the sensor head and object position are correct by using the wave monitoring function.



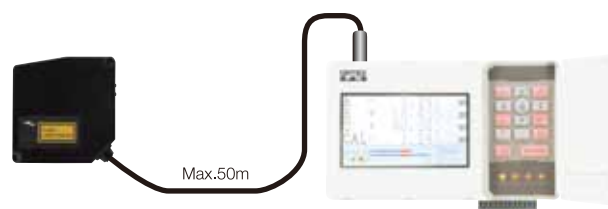
## Easy SETUP Backlit Ten-key

Backlit Ten-key display panel shows which keys are active.



## From remote place Up to 50m

Controller can be located up to a maximum distance of 50m from the sensor head. By interconnecting the cable DSL-1212-G05M.



## Controllable from PC remotely USB and RS-232C

Controller has USB and RS-232C port so that you can control sensor heads effectively and flexibly.





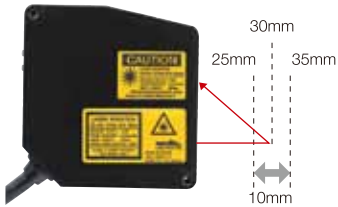
# SYSTEM PART NUMBERS

## Sensorhead

CD5-30

Short range :  $30 \pm 5\text{mm}$ 

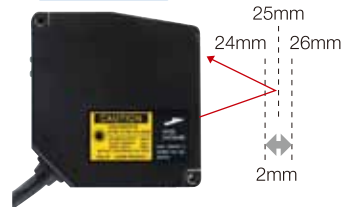
CD5-W30



CD5-L25

Specular type :  $25 \pm 1\text{mm}$ 

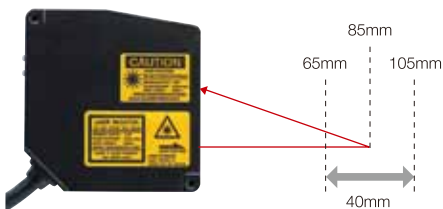
CD5-LW25



CD5-85

Middle range :  $85 \pm 20\text{mm}$ 

CD5-W85



CD5-30

Specular mode :  $26.1 \pm 2.5\text{mm}$ 

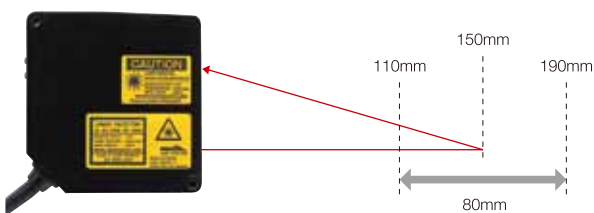
CD5-W30



CD5-150

Middle range :  $150 \pm 40\text{mm}$ 

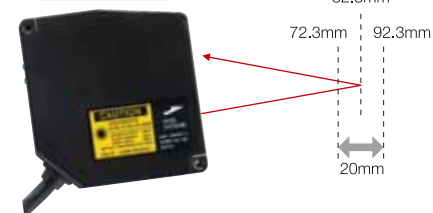
CD5-W150



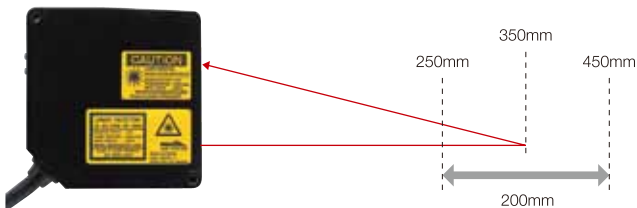
CD5-85

Specular mode :  $82.3 \pm 10\text{mm}$ 

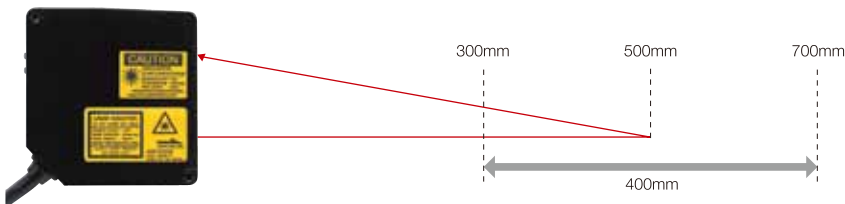
CD5-W85



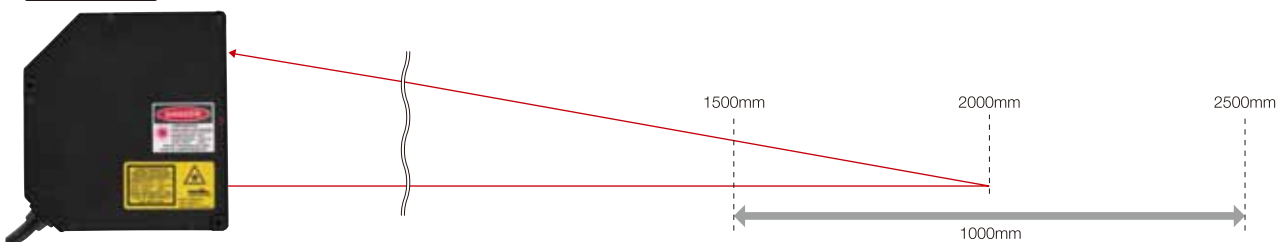
CD5-W350

Long range :  $350 \pm 100\text{mm}$ 

CD5-W500

Super long range :  $500 \pm 200\text{mm}$ 

CD5-W2000

Ultra long range :  $2000 \pm 500\text{mm}$ 

## Controller



**Model No. : CD5A-N (NPN), CD5A-P (PNP)**

Type : CD5 controller

Description : Controller unit for CD5 system with 4.3" TFT LCD and Backlit Ten-key

Interface : Analog output NPN input/output, RS-232C, USB

## Option

### Cable for sensor head and controller

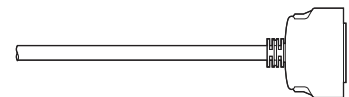
**DSL-1212-G02M** : 2m  
Cable for sensor head to connect controller that can be connected in serial up to 50m

**DSL-1212-G05M** : 5m  
Cable for sensor head to connect controller that can be connected in serial up to 50m



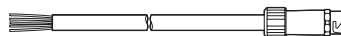
### I/O Connector cable

**IO-EXP-AOD5** : 3m  
IEEE1284 half pitch 50pin

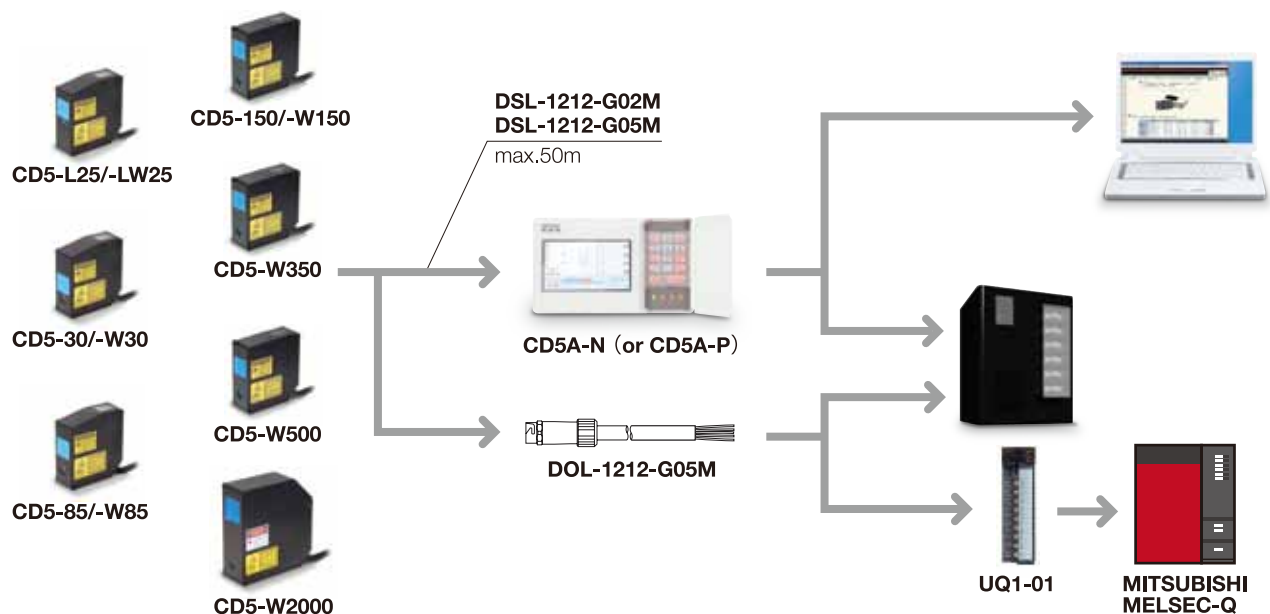


### Cable for sensor head

**DOL-1212-G05M** : 5m  
Cable for sensor head when use without controller



## System configuration example

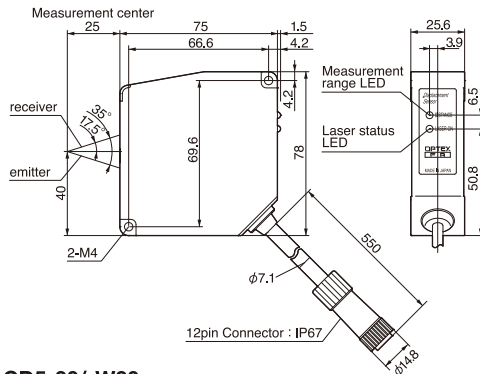




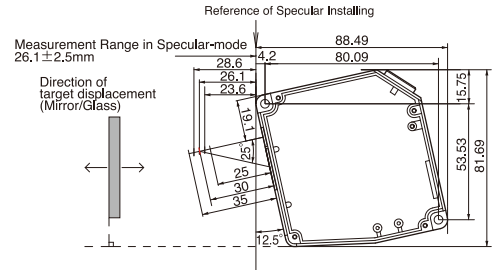
## Dimensions

### Sensor head

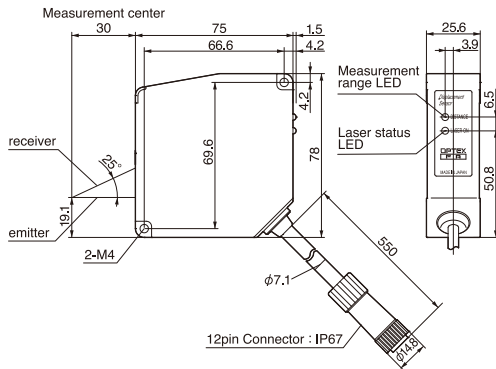
Model No. : CD5-L25/-LW25 (Specular type)



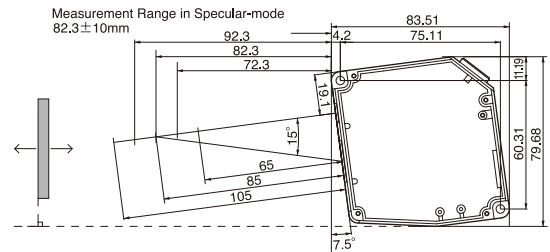
Model No. : CD5-30 / W30 (Specular mode)



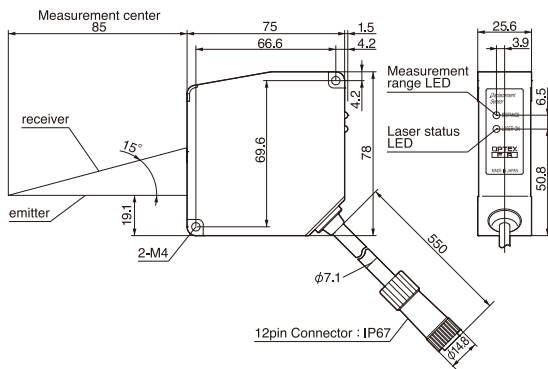
Model No. : CD5-30/-W30



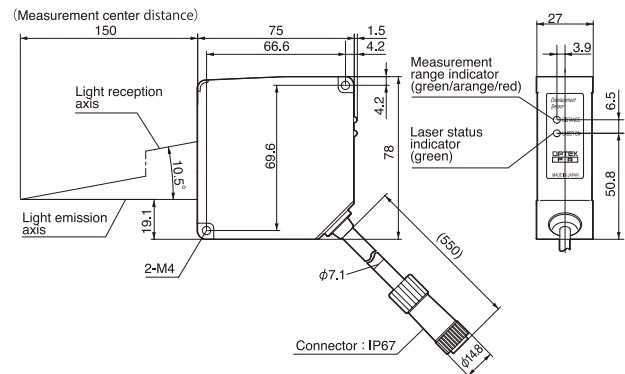
Model No. : CD5-85 / W85 (Specular mode)



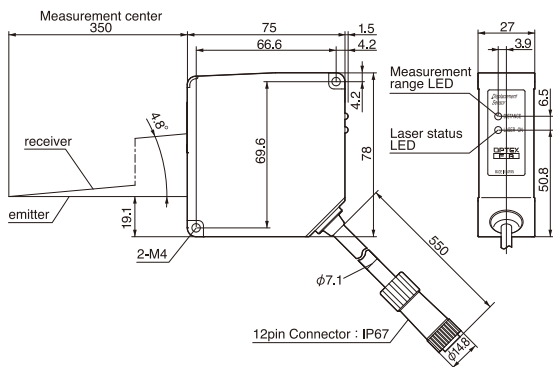
Model No. : CD5-85/-W85



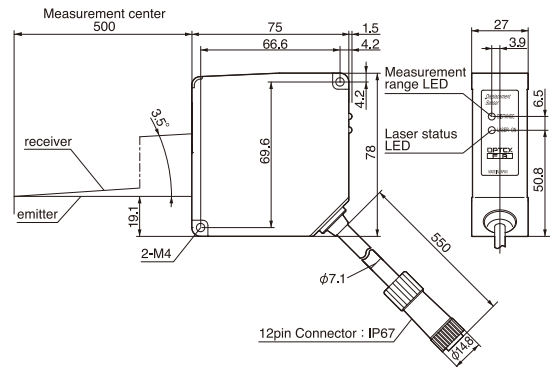
Model No. : CD5-150/CD5-W150



Model No. : CD5-W350

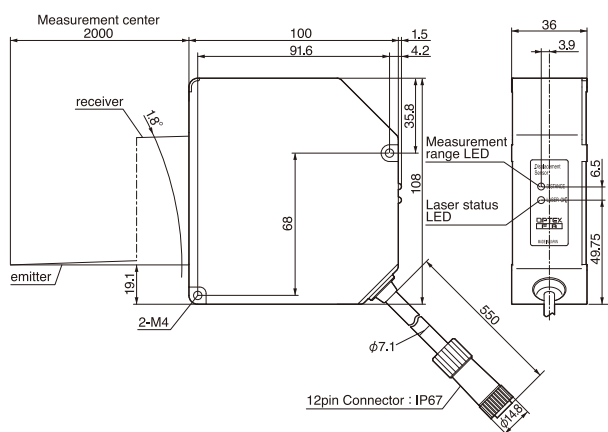


Model No. : CD5-W500



(mm)

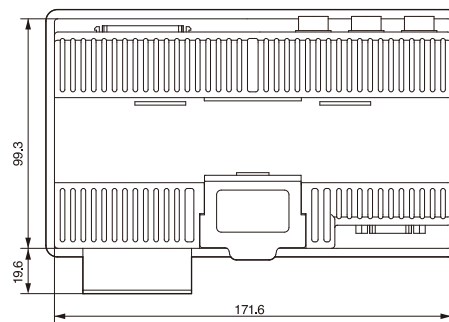
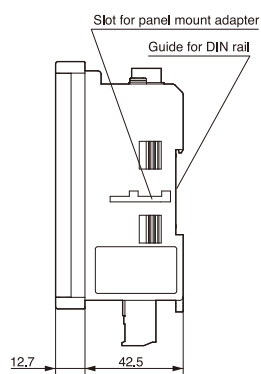
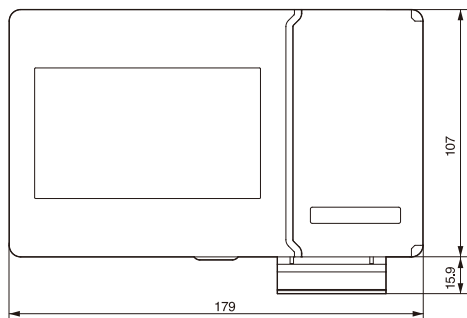
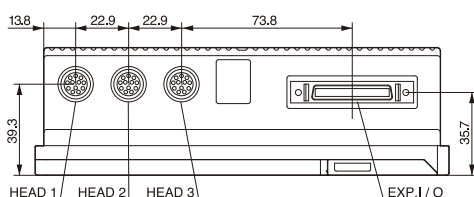
**Model No. : CD5-W2000**



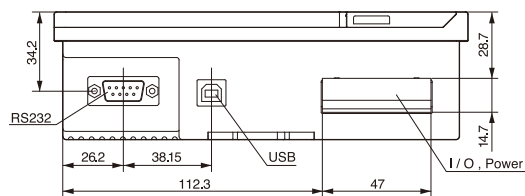
(mm)

## Controller

**Model No. : CD5A-N(-P) common in NPN and PNP types**



(mm)



## Accessories

Control unit UQ1

**Model No.: UQ1-01**

: Control unit for CD5 sensor head to connect to Mitsubishi PLC MELSEC-Q series directly.



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## Specifications

### Controller

Model	CD5A-N (NPN input / output type)	CD5A-P (PNP input / output type)
Number of heads	Max. 3pcs	
Supply voltage	12 - 24VDC $\pm 10\%$	
Power consumption	350mA / 24VDC (When connected with 3 sensor heads. Including analog current output)	
Temp drift	$\pm 0.01\%$ F.S. / $^{\circ}\text{C}$	
Interface	RS232 / USB	
Analog output	Voltage output $\pm 10\text{V}$ / F.S. (Output impedance 100 $\Omega$ )    Current output 4 to 20mA / F.S. (Load impedance max.300 $\Omega$ )	
Alarm output	NPN open collector Max. 100mA / 24V DC (residual voltage max. 1.8V)	PNP open collector Turns ON when the sensor head fails in measurement.
Control output	NPN open collector Max. 100mA / 24V DC (residual voltage max. 1.8V)	PNP open collector HI / LO setting for each line and hysteresis setting are available.
Bank select input	Turns ON when connected to GND 16 banks selectable	Turns ON when connected to 12 - 24VDC
Hold input	Turns ON when connected to GND Measurement value holding (selectable in the menu)	Turns ON when connected to 12 - 24VDC
Zero reset input	Turns ON when connected to GND Zero reset of Head A measurement value / Head B measurement value / Head C measurement value / Calculation value is available.	Turns ON when connected to 12 - 24VDC
Laser off input	Turns ON when connected to GND Laser shutoff of Head A / Head B / Head C is available.	Turns ON when connected to 12 - 24VDC
Optional features	Calculation setting (calculation formula, measurement value increase / decrease direction, value of K, shift), hold settings, filter setting (filter, cut-off frequency), memory bank setting, RS232 setting, memory copying function, measurement value display digit number setting, display brightness setting, key illumination setting	
Display	4.3" TFT LCD	
Protection category	IP20	
Operating temp / humidity	$-10$ to $+50^{\circ}\text{C}$ (No condensation) / 35 to 85% RH	
Storage temp / humidity	$-20$ to $+60^{\circ}\text{C}$ (No condensation) / 35 to 85% RH	
Vibration resistance	10 to 55Hz, Double amplitude 1.5mm, 2h for XYZ axes	
Shock resistance	20G(196m/s <sup>2</sup> ), 3 times for XYZ axes	
Material	Chassis: Polycarbonate, connection terminals : Nylon 66	
Weight	Approx. 550 g (Including connection terminals)	

### Sensor head

Model		CD5-L25		CD5-LW25	CD5-30		CD5-W30		
Optical method		Specular reflection			Diffuse reflection	Specular mode		Diffuse reflection	Specular mode
Measurement dist.		25mm			30mm	26.1mm		30mm	26.1mm
Measurement range		±1mmn			±5mm	±2.5mm		±5mm	±2.5mm
Light source		Red laser diode							
		Wavelength 650nm / Maximum output 390μW			Wavelength 650nm / Maximum output 1mW		Wavelength 658nm / Maximum output 1mW		
Laser class	IEC/JIS FDA	Class 1			Class 2				
		CLASSII							
Spot size (*1)		Appx.25×35μm	Appx.100×700μm		Appx.30×100μm		Appx.260×1,000μm		
Light receiving element		Linear image sensor							
Linearity		±0.08%F.S.							
Resolution (*2)		0.02μm			0.2μm	0.1μm	0.2μm	0.1μm	
Sampling period (*3)		100 / 200 / 400 / 800 / 1600 / 3200μs			Setup to be done through the controller (CD5A series)				
Temperature drift (*4)		±0.01% F.S. / °C	±0.05% F.S. / °C		±0.01% F.S. / °C				
Serial I/F		RS-422 9.6k to 1843.2kbps							
Supply voltage		12 - 24VDC ±10% or from controller (CD5A series)							
Indicator		Laser emission indicator : Green (ON during laser emission) Distance indicator : Orange (Lights around center)    Distance indicator : Green (Lights at the far side) Distance indicator : Red (Lights at the near side)    Distance indicator : Alternative Red / Green (Out of range)							
Protection category		IP67 (Including connecting part)							
Operating temp / humidity		－10 to +50℃ (No condensation) / 35% to 85%RH							
Storage temp / humidity		－20 to +60℃ (No condensation) / 35% to 85%RH							
Ambient illuminance		Max. 3,000lx (Surface illuminance, incandescent lamp)							
Vibration resistance		10 to 55Hz Double amplitude 1.5mm 2 h per XYZ axes							
Shock resistance		50G (500m/S <sup>2</sup> ) X,Y,Z 3times							
Cable extension		Up to 50 m using an optional extension cable (unbundled)							
Material		Sensor head housing : Diecast aluminum    cover of emitting / receiving part : Glass							
Weight		Appx. 250 g (Including cable)							

Model		CD5-85		CD5-W85		CD5-150	CD5-W150
Optical method		Diffuse reflection	Specular mode	Diffuse reflection	Specular mode	Diffuse reflection	
Measurement dist.		85mm	82.3mm	85mm	82.3mm	150mm	
Measurement range		±20mm	±10mm	±20mm	±10mm	±40mm	
Light source		Red Laser Diode					
		Wavelength 650nm / Maximum output 1mW		Wavelength 658nm / Maximum output 1mW		Wavelength 650nm / Maximum output 1mW	Wavelength 658nm / Maximum output 1mW
Laser class	IEC/JIS FDA	Class 2					
		CLASSII					
Spot size (*1) (μm)		Appx.70×29		Appx.260×1200		Appx.180	Appx.330×1,600
Light receiving element		Linear image sensor					
Linearity		±0.05% F.S.	±0.08% F.S.	±0.05% F.S.	±0.08% F.S.	±0.05% F.S.	
Resolution (*2)		1μm	0.5μm	1μm	0.5μm	2μm	
Sampling period (*3)		100 / 200 / 400 / 800 / 1600 / 3200μs Setup to be done through the controller (CD5A series)					
Temperature drift (*4)		±0.01% F.S. / °C					
Serial I/F		RS-422 9.6k to 843.2kbps					
Supply voltage		12 - 24VDC ±10% or from controller (CD5A series)					
Indicator		Laser emission indicator : Green (ON during laser emission)					
		Distance indicator : Orange (Lights around center)		Distance indicator : Green (Lights at the far side)			
		Distance indicator : Red (Lights at the near side)		Distance indicator : Alternative Red / Green (Out of range)			
Protection category		IP67 (Including connecting part)					
Operating temp / humidity		－10 to +50°C (No condensation) / 35% to 85%RH					
Storage temp / humidity		－20 to +60°C (No condensation) / 35% to 85%RH					
Ambient illuminance		Max. 3,000lx (Surface illuminance, Incandescent lamp)					
Vibration resistance		10 to 55Hz Double amplitude 1.5mm 2 h per XYZ axes					
Shock resistance		50G (500m/s <sup>2</sup> ) X,Y,Z 3times					
Cable extension		Up to 50 m using an optional extension cable (unbundled)					
Material		Sensor head housing : Diecast aluminum cover of emitting / receiving part : Glass					
Weight		Appx. 250 g (Including cable)					

Model		CD5-W350	CD5-W500	CD5-W2000
Optical method		Diffuse reflection		
Measurement dist.		350mm	500mm	2000mm
Measurement range		±100mm	±200mm	±500mm
Light source		Red Laser Diode		
		Wavelength 658nm / Maximum output 1mW		Wavelength 658nm / Maximum output 5mW
Laser class	IEC/JIS FDA	Class 2		Class 3R
		CLASS II		CLASS IIIa
Spot size (*1) (μm)		Appx.700×2,400	Appx.1,000×3,700	Appx.2,100×7,800
Light receiving element		Linear image sensor		
Linearity		±0.08% F.S.	±0.08% F.S.	±0.1% F.S.
Resolution (*2)		5μm	10μm	30μm
Sampling period (*3)		100 / 200 / 400 / 800 / 1600 / 3200μs Setup to be done through the controller (CD5A series)		
Temperature drift (*4)		±0.01% F.S. / °C		±0.05% F.S. / °C
Serial I/F		RS-422 9.6k to 843.2kbps		
Supply voltage		12 - 24VDC ±10% or from controller (CD5A series)		
Indicator		Laser emission indicator : Green (ON during laser emission)		
		Distance indicator : Orange (Lights around center)		Distance indicator : Green (Lights at the far side)
		Distance indicator : Red (Lights at the near side)	Distance indicator : Alternative Red / Green (Out of range)	
Protection category		IP67 (Including connecting part)		
Operating temp / humidity		－10 to +50°C (No condensation) / 35% to 85%RH		
Storage temp / humidity		－20 to +60°C (No condensation) / 35% to 85%RH		
Ambient illuminance		Max. 3,000lx (Surface illuminance, Incandescent lamp)		
Vibration resistance		10 to 55Hz Double amplitude 1.5mm 2 h per XYZ axes		
Shock resistance		50G (500m/s <sup>2</sup> ) X,Y,Z 3times		
Cable extension		Up to 50 m using an optional extension cable (unbundled)		
Material		Sensor head housing : Diecast aluminum cover of emitting / receiving part : Glass		
Weight		Appx. 250 g (Including cable)		Appx. 450 g (Including cable)

〈Measurement condition〉

Unless otherwise designated, measurement condition is as follows. Using special controller / operating temperature, 23°C (ordinary temperature) / supply voltage, 24 V DC / sampling period : 100μs (CD5-W350 / -W500 : 800μs) 256 times in average / center / standard testing object (specular reflection: evaporated aluminum mirror, diffuse reflection: white ceramic) / digital measured value.

\*1 Defined with center strength 1/e<sup>2</sup> (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 4096 times in average. Other conditions are same as the above condition.

\*3 Default setting of sampling period is as follows.

CD5-□□25~□150 :100μs

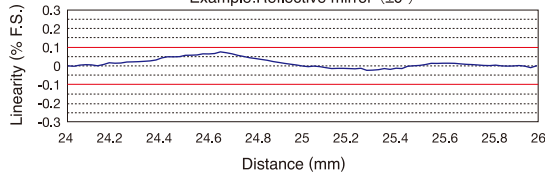
CD5-W350~W2000 :800μs

\*4 The typical value in the above condition.

## Linearity (Typical example data)

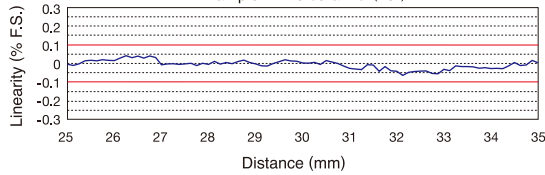
**Model No. : CD5-L25**

Example: Reflective mirror ( $\pm 0^\circ$ )



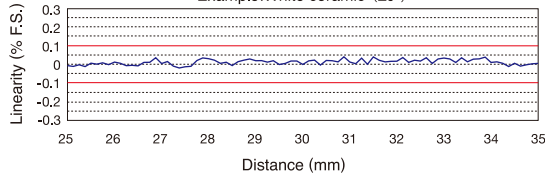
**Model No. : CD5-30**

Example: White ceramic ( $\pm 0^\circ$ )



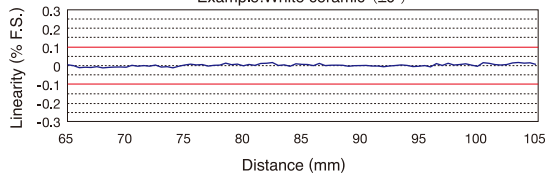
**Model No. : CD5-W30**

Example: White ceramic ( $\pm 0^\circ$ )



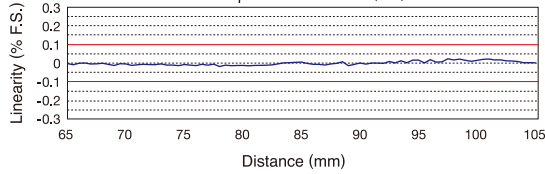
**Model No. : CD5-85**

Example: White ceramic ( $\pm 0^\circ$ )



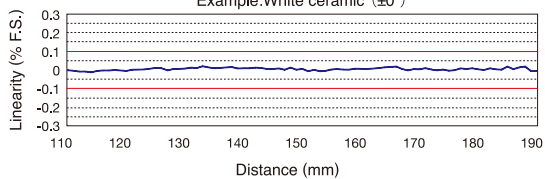
**Model No. : CD5-W85**

Example: White ceramic ( $\pm 0^\circ$ )



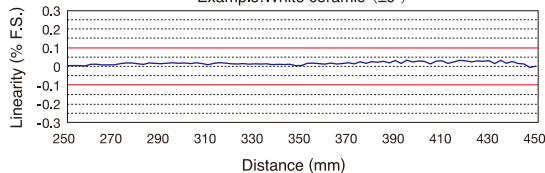
**Model No. : CD5-150**

Example: White ceramic ( $\pm 0^\circ$ )



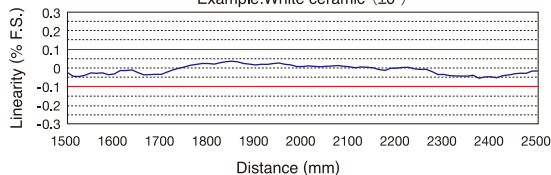
**Model No. : CD5-W350**

Example: White ceramic ( $\pm 0^\circ$ )



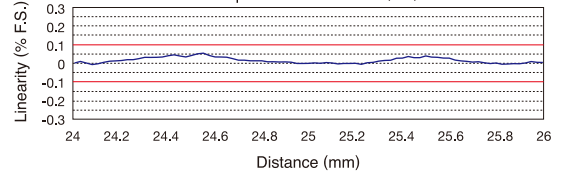
**Model No. : CD5-W2000**

Example: White ceramic ( $\pm 0^\circ$ )



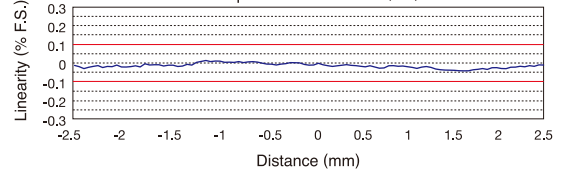
**Model No. : CD5-LW25**

Example: Reflective mirror ( $\pm 0^\circ$ )



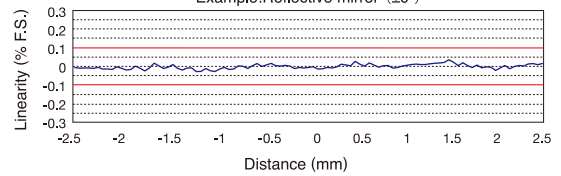
**Model No. : CD5-30 (Specular mode)**

Example: Reflective mirror ( $\pm 0^\circ$ )



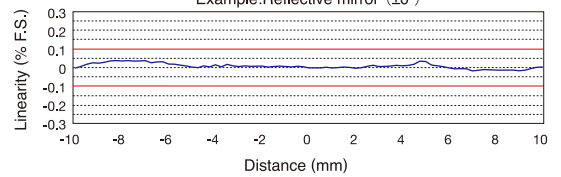
**Model No. : CD5-W30 (Specular mode)**

Example: Reflective mirror ( $\pm 0^\circ$ )



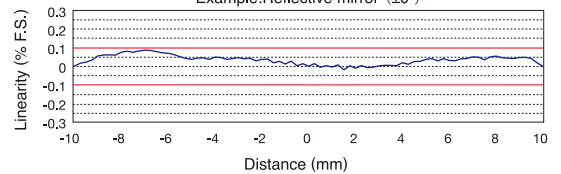
**Model No. : CD5-85 (Specular mode)**

Example: Reflective mirror ( $\pm 0^\circ$ )



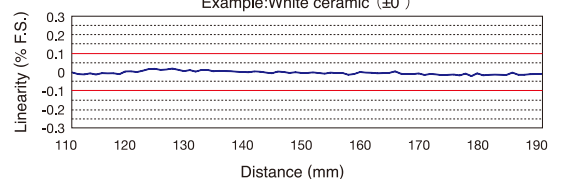
**Model No. : CD5-85 (Specular mode)**

Example: Reflective mirror ( $\pm 0^\circ$ )



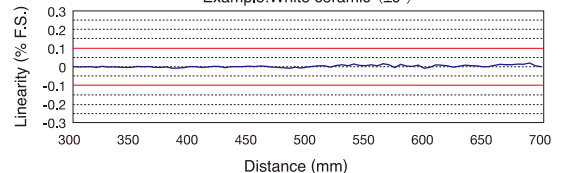
**Model No. : CD5-W150**

Example: White ceramic ( $\pm 0^\circ$ )



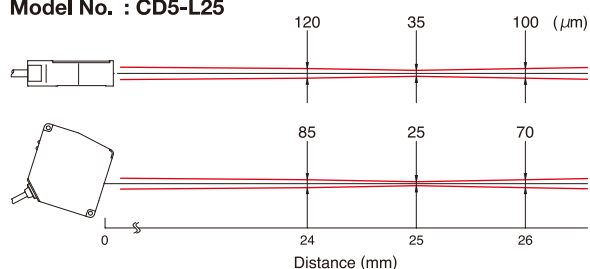
**Model No. : CD5-W500**

Example: White ceramic ( $\pm 0^\circ$ )

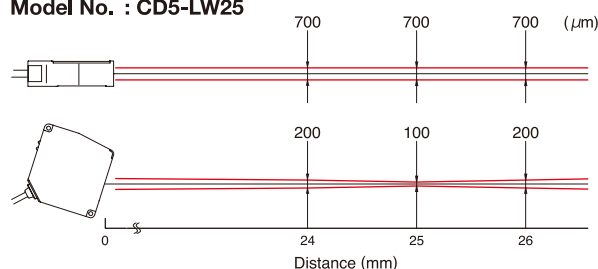


# Spot size

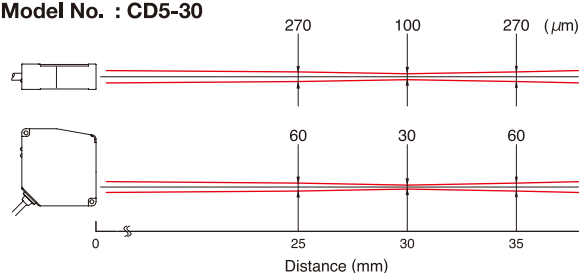
Model No. : CD5-L25



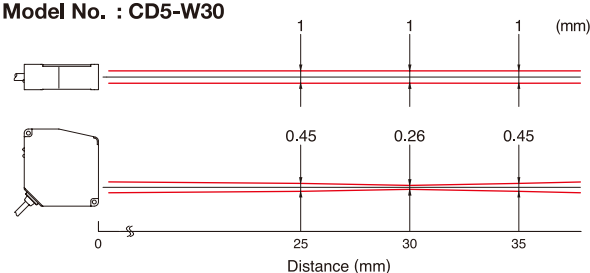
Model No. : CD5-LW25



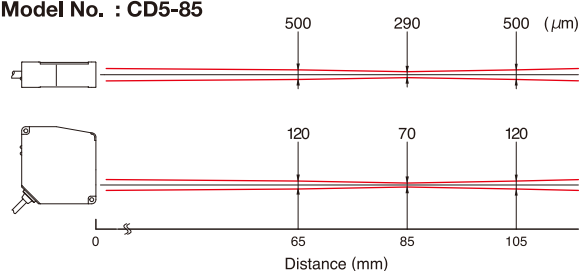
Model No. : CD5-30



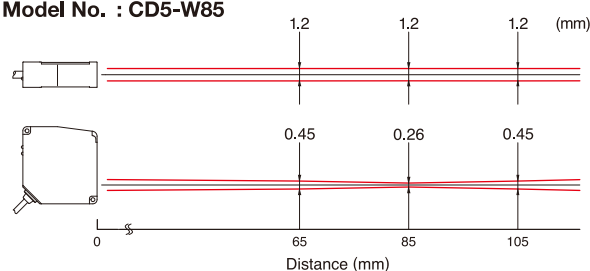
Model No. : CD5-W30



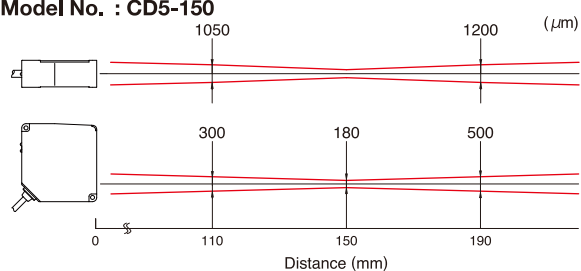
Model No. : CD5-85



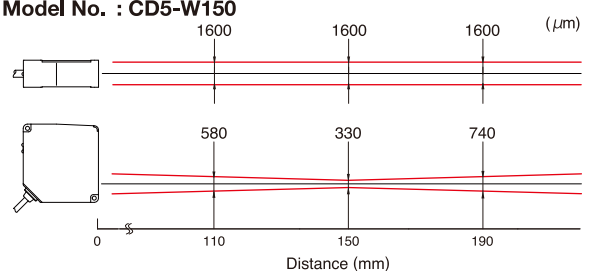
Model No. : CD5-W85



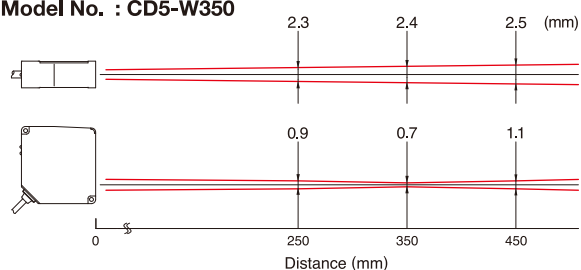
Model No. : CD5-150



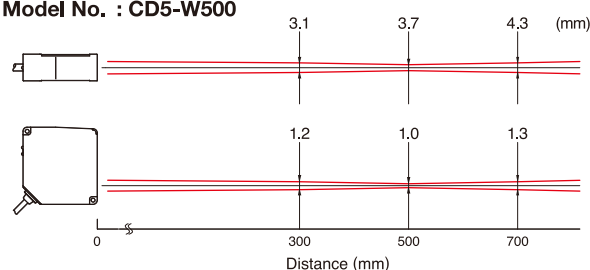
Model No. : CD5-W150



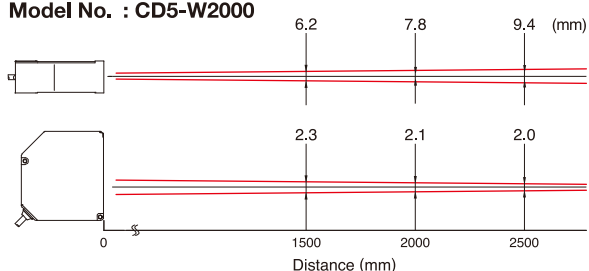
Model No. : CD5-W350



Model No. : CD5-W500



Model No. : CD5-W2000

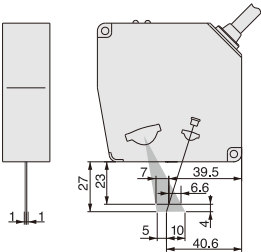




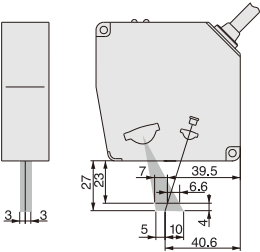
- LS
- CD5
- CD4
- CD33
- CD3
- CD22
- CD1
- UQ1

Interference area

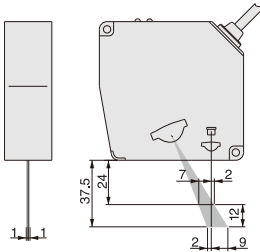
Model No. : CD5-L25



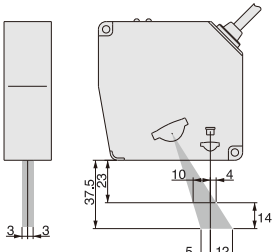
Model No. : CD5-LW25



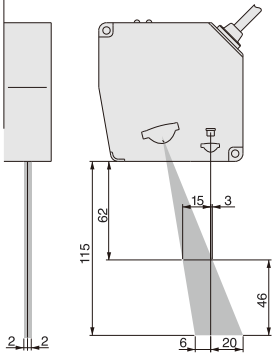
Model No. : CD5-30



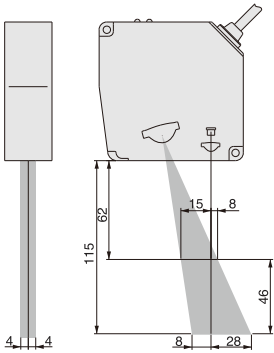
Model No. : CD5-W30



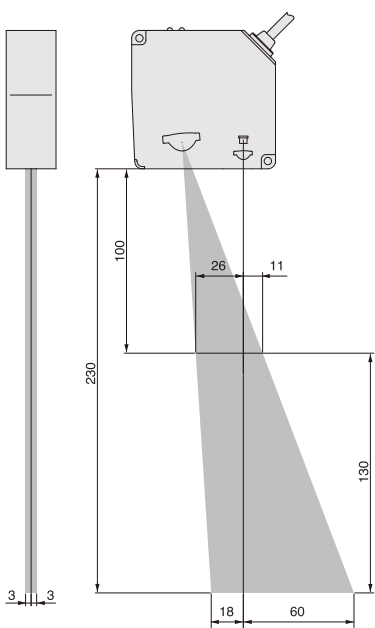
Model No. : CD5-85



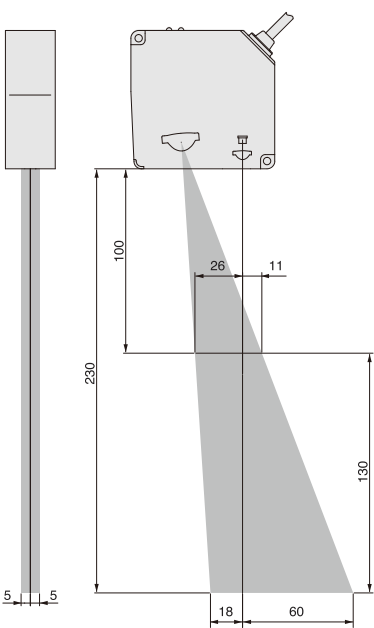
Model No. : CD5-W85

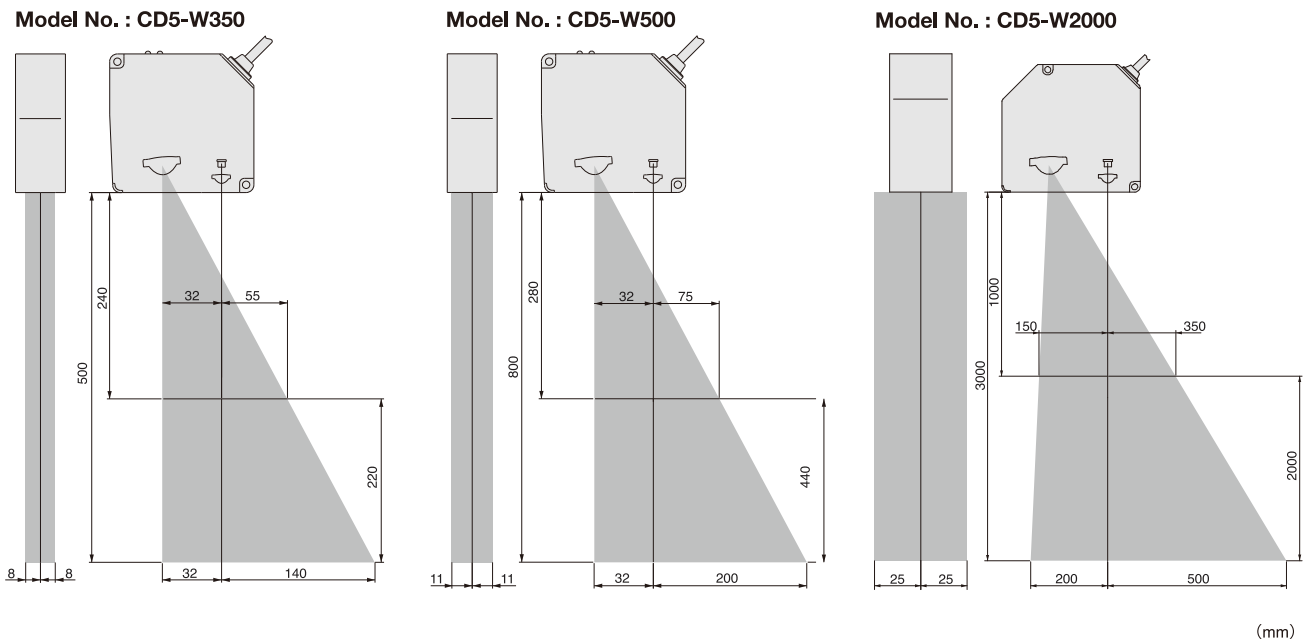


Model No. : CD5-150



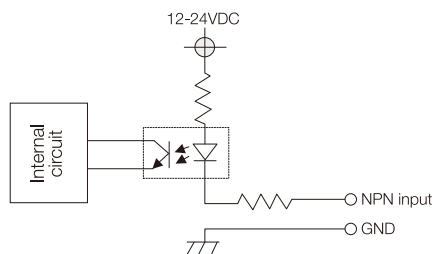
Model No. : CD5-W150



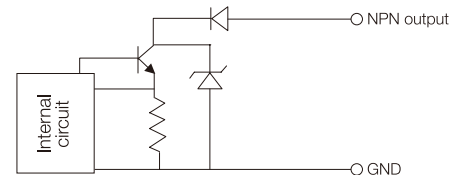


## Input / Output diagrams

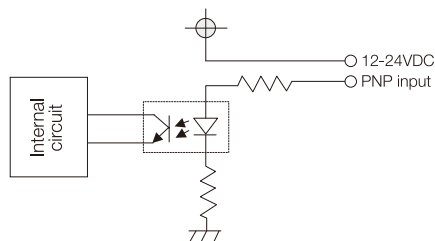
**NPN model**  
Bank input  
Hold input  
Zero reset input  
Laser off input



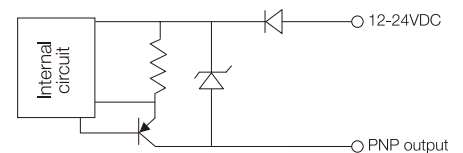
**NPN model**  
Control output  
Alarm output



**PNP model**  
Bank input  
Hold input  
Zero reset input  
Laser off input



**PNP model**  
Control output  
Alarm output



**Analog output**

