

# CD4 series

CD5

CD4

CD33

CD3

CD1

CD4 Series with linear image sensor and electronic shutter provides accurate measurement.

- Laser displacement sensor features easy setup and operation.
- High accuracy of 0.1  $\mu\text{m}$  resolution and  $\pm 0.1\%$  F.S. linearity. (Specular Type)
- Specular type (CD4L-25) optics that are ideal for glass sensing.



# SENSORHEAD VARIATION

CD5

CD4

CD33

CD3

CD1

## 〈For general use〉

Regular type

**CD4-30** (IEC Class 2 「FDA CLASS II」 Type)  
**CD4-30-3R** (High power Class 3R Type)

### Short distance

Tire inspection

Measurement range : 30 ±5mm  
 Resolution : 1 μm  
 Linearity : ±0.1% F.S.



Regular type

**CD4-85** (IEC Class 2 「FDA CLASS II」 Type)  
**CD4-85-3R** (High power Class 3R Type)

### Middle distance

Checking clear package of IC mounted on PCB

Measurement range : 85 ±20mm  
 Resolution : 3 μm  
 Linearity : ±0.1% F.S.



Regular type

**CD4-350** (IEC Class 2 「FDA CLASS II」 Type)  
**CD4-350-3R** (High power Class 3R Type)

### Long distance

Monitoring the die cast

Measurement range : 350 ±100mm  
 Resolution : 40 μm  
 Linearity : ±0.1% F.S.



## 〈For glass material〉

Specular type

**CD4L-25** (IEC Class 1 「FDA CLASS II」 Type)

### Specular type

Monitoring warping sagging of glass plate

Measurement range : 25 ±1mm  
 Resolution : 0.1 μm  
 Linearity : ±0.1% F.S.



# CD4 SENSOR HEADS

CD4 Series laser displacement sensor with linear image sensor and electronic shutter provides accurate measurement.

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## Measuring range

### <General use>

**CD4-30**  
**CD4-30-3R** Short range : 30 ±5mm



### <Glass material>

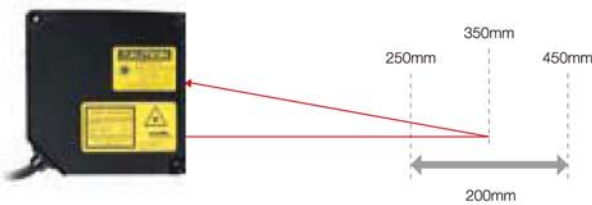
**CD4L-25** Specular type : 25 ±1mm  
The optical path is designed to project the correct angle for the detection of specular reflections from transparent objects.



**CD4-85**  
**CD4-85-3R** Middle range : 85 ±20mm



**CD4-350**  
**CD4-350-3R** Long range : 350 ±100mm



## Class 2 (IEC/JIS) CLASS II (FDA) laser product

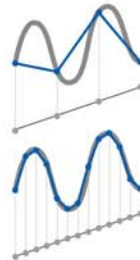
CD4-30    CD4-85    CD4-350

High power type (models with "-3R") has class 3 laser



## High speed sampling rate

The CD4 Displacement sensor has a 100μsec. sampling rate and high density linear image detector.



Conventional displacement sensor with slow response.

CD4 Series sensors, high speed sampling rate improves overall accuracy.

## Class 3R - High power types

CD4-30-3R    CD4-85-3R    CD4-350-3R

For matte black objects or any application that requires a higher power laser, there are models of the CD4 series available which use a Class 3R light source.



## IP67 Environmental rating

The sensing heads of the CD4 series have an IP67 rating for use in applications where they may be exposed to water.



## Class 1 (IEC/JIS) CLASS II (FDA) laser product

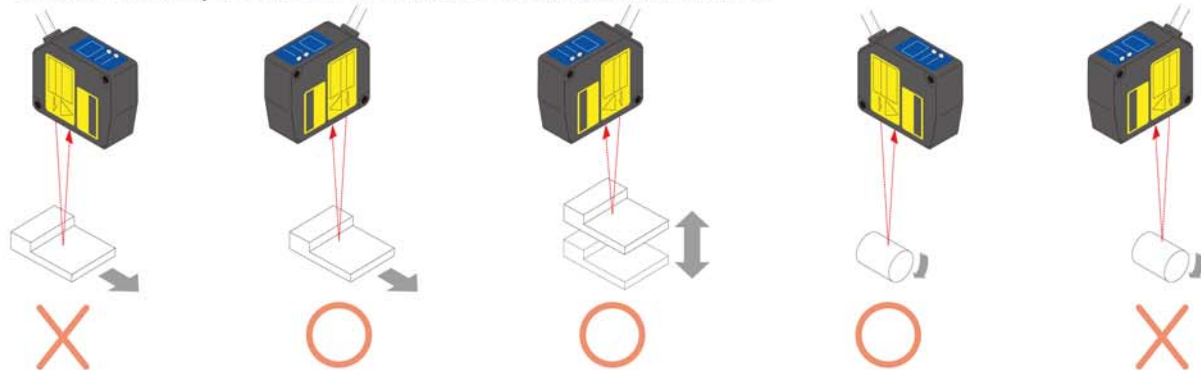
CD4L-25

CD4L-25 is registered to CDRH. (Center of devices and radiological health)



## Hint of installation for best accuracy

To obtain accuracy the sensor head must be oriented as shown below.



# CD4 CONTROLLERS

The CD4 controller is easy to operate with simple pushbutton setup and an LCD display to verify / change the settings.

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## LCD Display

The CD4A-N(or P) controller has a built-in color display that indicates multiple data values on the same screen.

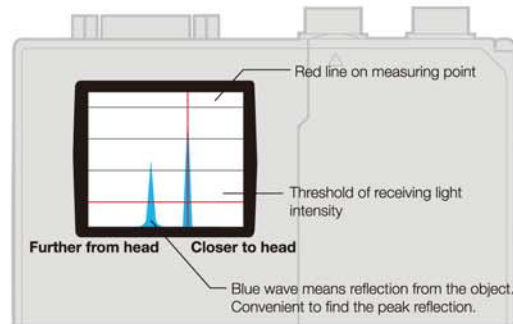
Distance values from both heads, calculated value, output status, bank number, etc. are displayed on the normal run screen.



## Light intensity monitor (For CD4L-25 only)

For stable measurement and improved accuracy the light intensity needs to be adjusted to the optimum setting.

With the built-in monitor the status of the level can be verified.



## Ten formulas of calculation

A	Sensor head A
B	Sensor head B
A+B	Adding of A and B
A-B	Gap between A and B
-A-B	Reverse of A+B
K-A-B	K = distance between sensors. Good for measuring thickness.
K+A+B	K = Offset value
K+A-B	K = Offset value
K+A	Offset the sensor A. K = Offset value
K+B	Offset the sensor B. K = Offset value

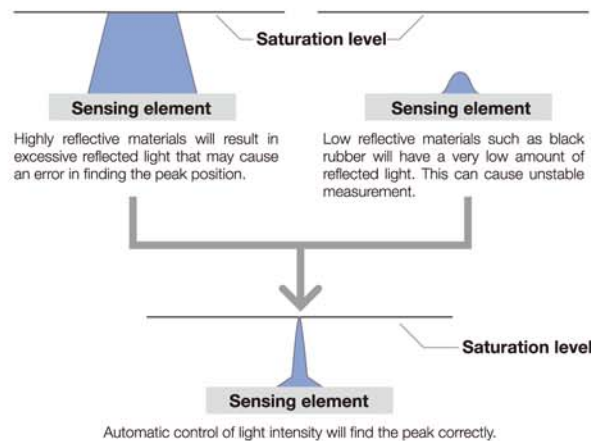
## 8 Banks selections

Bank No.	Bank 2 input	Bank 1 input	Bank 0 input
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

## Electronic shutter

The microcomputer in the CD4 controller will automatically control the shutter speed depending upon the reflectance of the target.

This will select the best light intensity level for accurate measurement and will help to minimize the error (AUTO Sensitivity Mode).



## RS-232C Communications

By connecting the CD4 controller to a PC, the following operations can be performed from the PC via RS232.

- Writing and reading out the setting value
- Reading out the measurement value
- Reading out the control output status
- Operating the control input
- Data buffer function

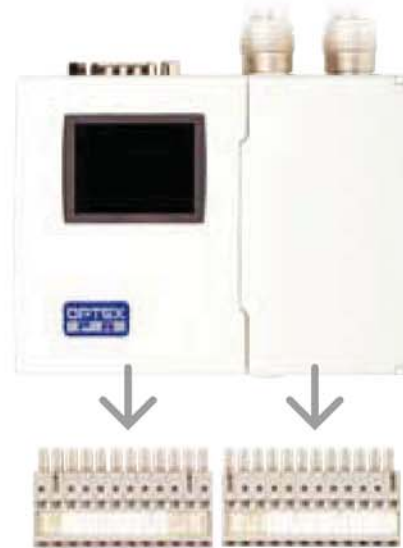
Communication method	RS-232C
Transmission type	Asynchronous
Baud rate	9600/ <u>19200</u> / <u>38400</u> / <u>115200</u> bps
Transmission code	ASCII
Data length	7/8 bit
Stop bit length	1 bit
Parity check	Nil/Even number/Odd number
Data classification	STX·ETX

The underlined values are the factory default settings.

Adjust the communication settings of the PC and the CD4 using the values in the above table. The settings of the CD4 controller can be accessed in screen number 14 (RS232C).

## Low / High pass filters

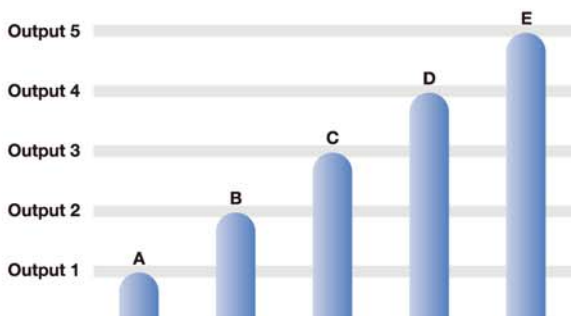
High / Low pass filters are built into the CD4 controller. A low pass filter will help to reduce any sudden changes in the measurement while the high pass filter will eliminate slow gradual changes.



Easy disconnection of QD type.

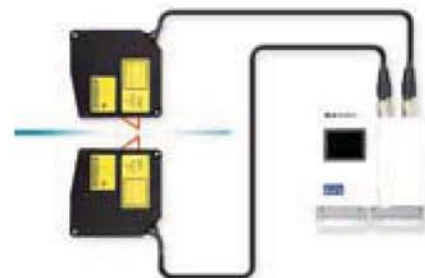
## 5 Independent outputs are available

This is convenient for sorting items according to size. Each of the 5 comparator outputs can be set independently, all outputs have a high and low threshold limit.



## Two sensing heads can be controlled

Therefore it computes for the purpose of measuring thickness, width, etc. Independent measurement from each head is possible as well. Any combination of measurement heads (30, 85, 350) can be used together.



# DIMENSIONS

CD5

CD4

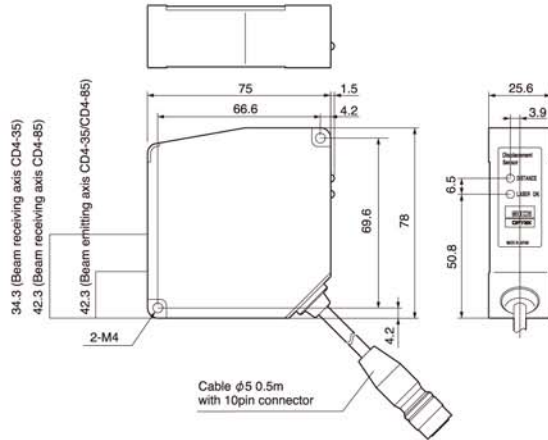
CD33

CD3

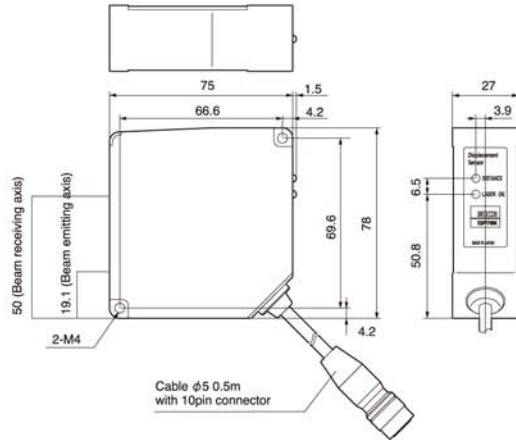
CD1

## CD4 series sensor head

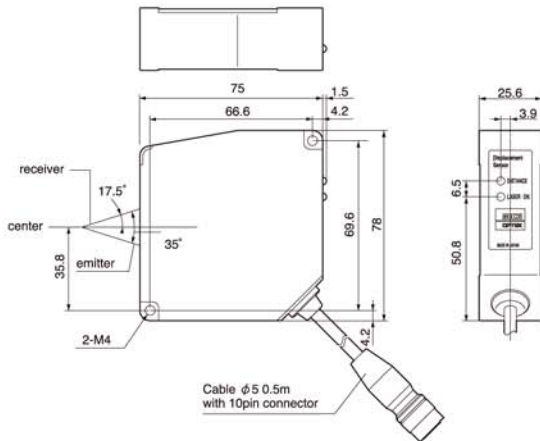
Model No. : CD4-30/-30-3R/-85/-85-3R



Model No. : CD4-350/-350-3R



## CD4L-25 Sensor head



## Cable

Model No. : CD4CN-S-ROBOT

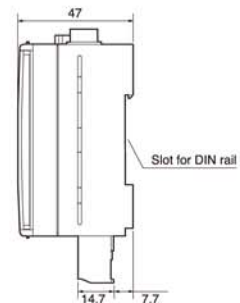
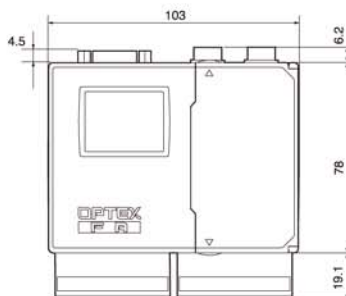
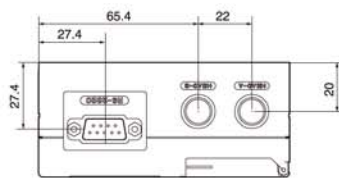
: Extension 2m cable to connect the sensor head

Model No. : CD4CN-5S-ROBOT

: Extension 5m cable to connect the sensor head



## Controller



(mm)

# SPECIFICATIONS

## CD4 series

Model	IEC Class 1 (FDA CLASS II) Type High power Class 3R Type	CD4-30 CD4-30-3R	CD4-85 CD4-85-3R	CD4-350 CD4-350-3R
<b>Measurement range</b>		30 ±5mm	85 ±20mm	350 ±100mm
<b>Light source</b>	(Regular type) (High power type)	Class 2 (IEC/JIS) CLASS II (FDA) Class 3R (IEC/JIS) CLASS III a (FDA)	Red laser diode , 650nm, max 1m W Red laser diode, 650nm, max 5mW	
<b>Spot size</b> (*1)		30×100μm	70×290μm	300×700μm
<b>Linearity</b> (*2)		±0.1% F.S.		
<b>Resolution</b> (*3)		1μm	3μm	40μm
<b>Supply voltage</b>		Supplied by CD4A-N/P controller		
<b>Temp drift</b>		±0.01% F.S. / °C		
<b>Laser emission indicator</b>		Green = Laser emission		
<b>Measurement indicator</b>		Red = In range, closer than center 5% of measurement range (0 to 45%) Orange = Within +/- 5% of the center of the measuring range Green = In range, farther than center 5% of measurement range (55 to 100%) Red/Green alternating = Out of measuring range		
<b>Protection category</b>		IP67		
<b>Operation temp / humidity</b>		-10 to 45 °C (14 to 113 °F), 35 to 85% RH		
<b>Storage temp / humidity</b>		-20 to 60 °C (-4 to 140 °F), 35 to 85% RH		
<b>Environmental illuminance</b>		Incandescent lamp = Max 3,000 lux		
<b>Vibration resistance</b>		10 to 55 Hz double amplitude 1.5mm for XYZ		
<b>Shock resistance</b>		50G (500m/s <sup>2</sup> )		
<b>Cable</b>		50cm (19.7 inch) cable		
<b>Cable extension</b>		CD4CN-S-ROBOT (2m, 78 inch), CD4CN-5S-ROBOT (5m, 197 inch)		
<b>Material</b>		Aluminum diecast		

\*1 Defined with center strength 1/e<sup>2</sup> (13.5%). There may be leak light other than the spot size. The sensor may be affected when there is a highly reflective object close to the detection area.

\*2 256 times in average (using the special amplifier), object: White ceramic. The value is subject to objects.

\*3 The typical value in the conditions of 256 times in average (using the special amplifier), object: White ceramic, distance range: Middle. The value is subject to objects.

## CD4L-25

Model	CD4L-25
<b>Measurement range</b>	25 ±1mm
<b>Light source</b>	Class 1 (IEC/JIS) CLASS II (FDA) Laser, 650nm, max 390 micro W
<b>Spot size</b> (*1)	25×35 μm
<b>Linearity</b> (*2)	± 0.1% F.S.
<b>Resolution</b> (*3)	0.1 μm
<b>Supply voltage</b>	Supplied by CD4A-LN/LP controller
<b>Temp drift</b>	±0.01% F.S. / °C
<b>Laser emission indicator</b>	Green = Laser emission
<b>Measurement indicator</b>	Red = In range, closer than center 5% of measurement range (0 to 45%) Orange = Within +/- 5% of the center of the measuring range Green = In range, farther than center 5% of measurement range (55 to 100%) Red/Green alternating = Out of measuring range
<b>Protection category</b>	IP67
<b>Operation temp / humidity</b>	-10 to 45 °C (14 to 113 °F), 35 to 85% RH
<b>Storage temp / humidity</b>	-20 to 60 °C (-4 to 140 °F), 35 to 85% RH
<b>Environmental illuminance</b>	Incandescent lamp = Max 3,000 lux
<b>Vibration resistance</b>	10 to 55 Hz double amplitude 1.5mm for XYZ
<b>Shock resistance</b>	50G (500m/S <sup>2</sup> )
<b>Cable</b>	50cm (19.7 inch) cable
<b>Cable extension</b>	CD4CN-S-ROBOT (2m, 78 inch), CD4CN-5S-ROBOT (5m, 197 inch)
<b>Material</b>	Aluminum diecast

\*1 Defined with center strength 1/e<sup>2</sup> (13.5%). There may be leak light other than the spot size. The sensor may be affected when there is a highly reflective object close to the detection area.

\*2 256 times in average (using the special amplifier), object: White ceramic. The value is subject to objects.

\*3 The typical value in the conditions of 256 times in average (using the special amplifier), object: White ceramic, distance range: Middle. The value is subject to objects.

CD5

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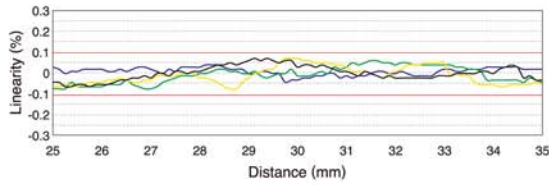
## Controller

Model	CD4A-N / -LN (NPN output type)	CD4A-P / -LP (PNP output type)
Number of heads	Max.2 pcs	
Sampling period	100 $\mu$ s	
Supply voltage	12 to 24V, DC $\pm$ 10%	
Power consumption	270mA/24V (When connected with 2 sensor heads. Including analog current output)	
Temp drift	$\pm$ 0.01% F.S./ $^{\circ}$ C	
Analog output	ANG (V) [A] [B]	Voltage output $\pm$ 5V / F.S. (Output impedance 100 $\Omega$ , resolution 1mV)
	ANG (mA) [A] [B]	Current output 4 to 20mA / F.S. (Load impedance 300 $\Omega$ , resolution 1.5 $\mu$ A)
Alarm output	ALM A,ALM B	NPN open collector
		PNP open collector
Control output	JDGE 1 to 5	Max. 100mA / DC 24V (residual voltage Max. 1.8V)
		Turns ON when the sensor head fails in measurement.
		PNP open collector
Bank input	BANK 0 to 2	NPN open collector
		Max. 100mA / DC 24V (residual voltage Max. 1.8V)
		HI / LO setting and Hysteresis setting are available for each output.
Hold input	HOLD A, HOLD B, HOLD RST	ON when connected to GND
		ON when connected to 12 to 24V
Zero reset input	ZERO A, ZERO B	ON when connected to GND
		ON when connected to 12 to 24V
Optional features	Average sampling times, Filter mode (Cut-off frequency), Calculation, Hold setting, Output during alarm, Output control (Hysteresis), Analog output, Sensor head sensitivity control, Timer function, Memory function, Memory bank function, Auto zero reset	
Display type	LCD display	
Protection category	IP20	
Operation temp / humidity	-10 to +45 $^{\circ}$ C (Non-condensing) / 35 to 85% RH	
Storage temp / humidity	-20 to +60 $^{\circ}$ C / 35 to 85% RH	
Vibration resistance	10 to 55Hz, Double amplitude 1.5mm, 2h for XYZ axis	
Shock resistance	20G (196m/s $^2$ )	
Material	Chassis: Polycarbonate, Connection terminals: Nylon 66	
Weight	240g (including connection terminals)	

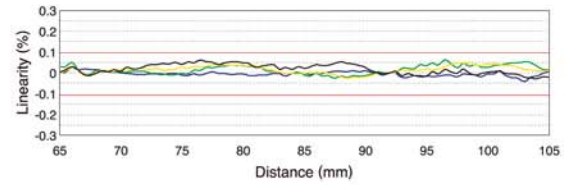
# LINEARITY (Typical example data)

## CD4 series : by material

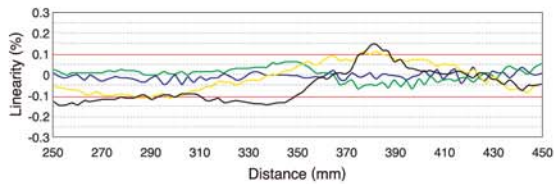
Model No. : CD4-30/CD4-30-3R



Model No. : CD4-85/CD4-85-3R

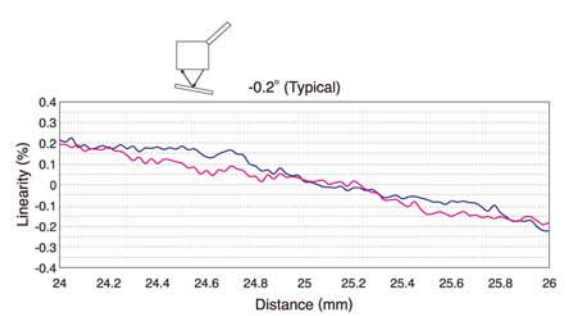
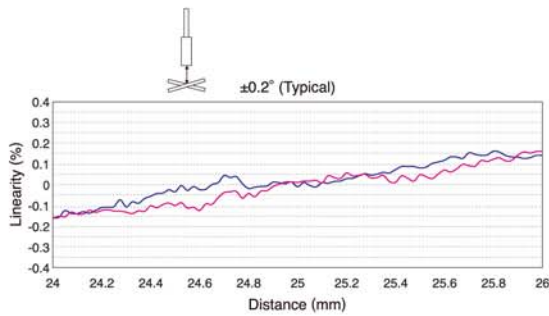
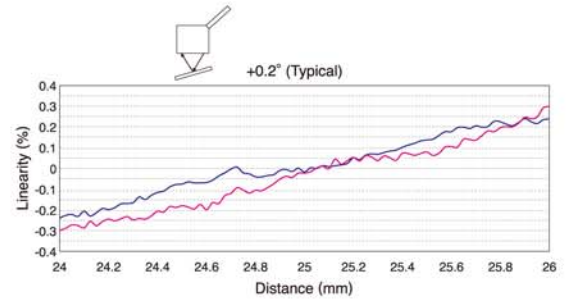
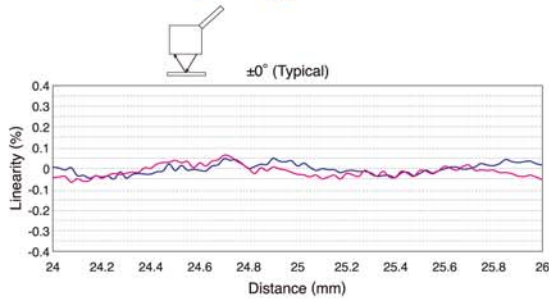


Model No. : CD4-350/CD4-350-3R



- White ceramic
- Aluminum
- Gray ceramic
- Black rubber

## CD4L-25 : by angle



- Mirror(SENS=MIN)
- Glass(SENS=8)

CD5

CD4

CD33

CD3

CD1

# SPOT SIZE

CD5

**CD4**

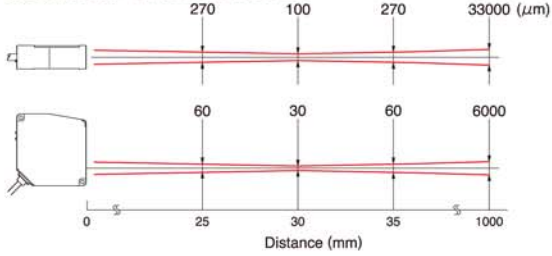
CD33

CD3

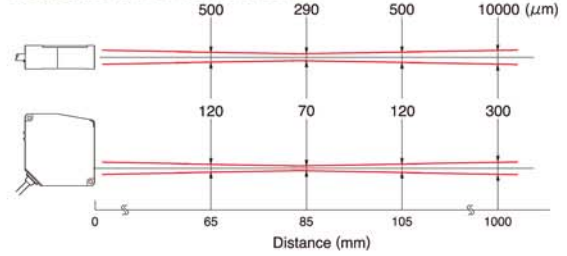
CD1

## CD4 series

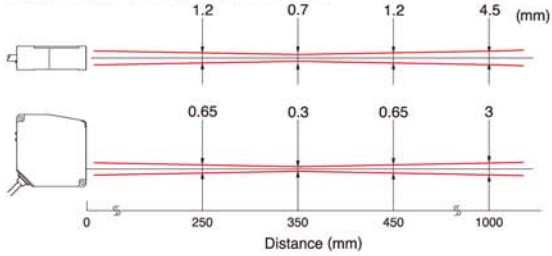
Model No. : CD4-30/CD4-30-3R



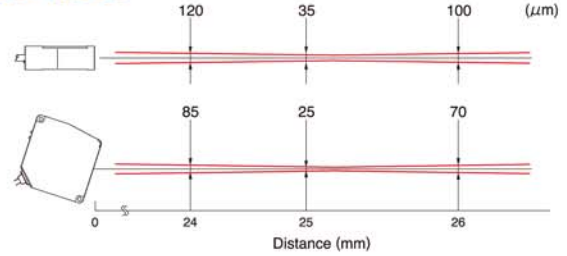
Model No. : CD4-85/CD4-85-3R



Model No. : CD4-350/CD4-350-3R



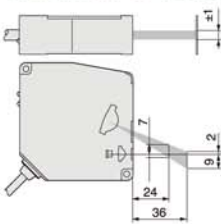
## CD4L-25



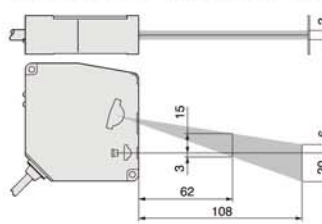
# INTERFERENCE AREA

## CD4 series

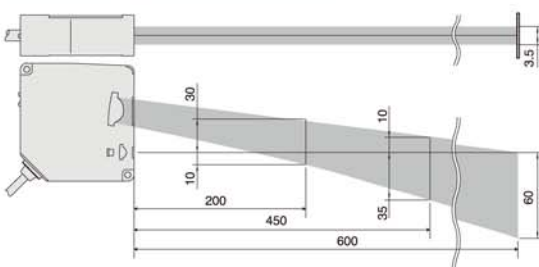
Model No. : CD4-30/CD4-30-3R



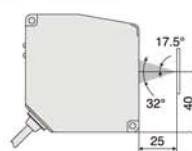
Model No. : CD4-85/CD4-85-3R



Model No. : CD4-350/CD4-350-3R



## CD4L-25



(mm)

# INPUT / OUTPUT DIAGRAMS

CD5

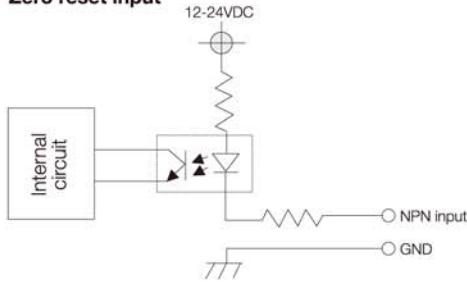
**CD4**

CD33

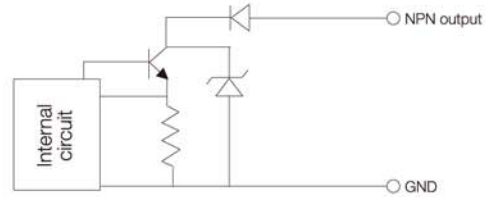
CD3

CD1

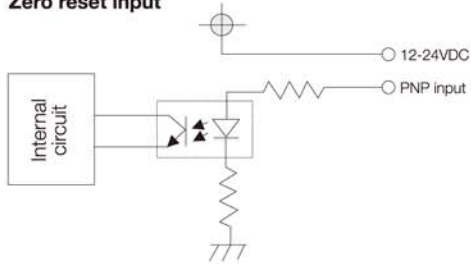
**NPN model bank input**  
**Hold input**  
**Zero reset input**



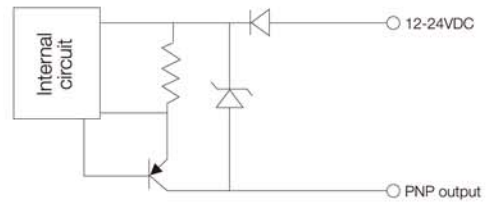
**NPN model control output**  
**Alarm output**



**PNP model bank input**  
**Hold input**  
**Zero reset input**



**NPN model control output**  
**Alarm output**



**Analog output (A/B)**

