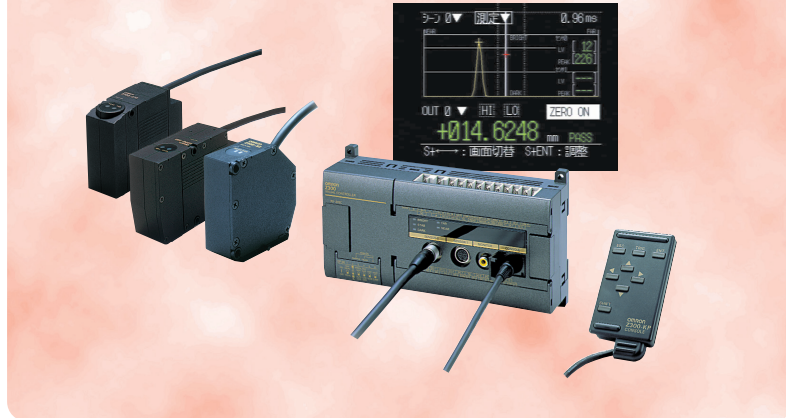


High-precision visual displacement meter

# Z300

*Employs a 2-dimensional CCD. A new type of displacement meter that takes advantage of image processing technology.*



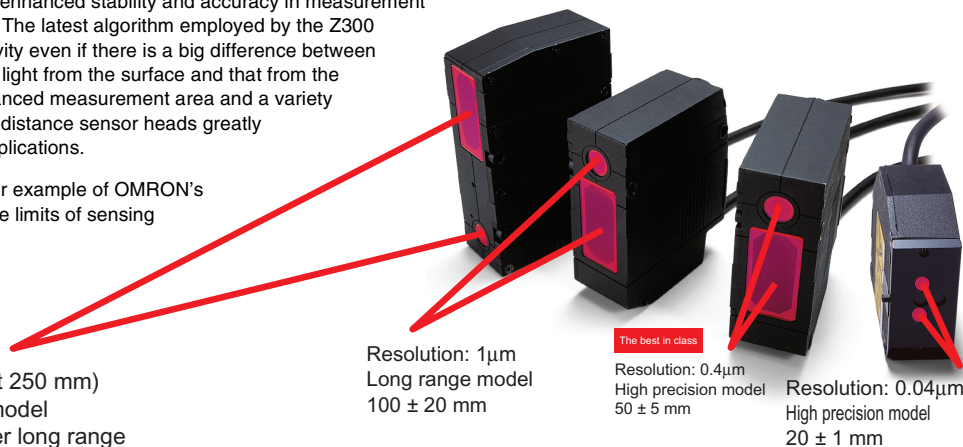
## Features

**Stable measurement of a transparent object or a glass.**

**A wide variety of sensor heads for enhanced detection possibilities.**

OMRON's Z300 makes the notion that displacement sensors cannot perform stable measurement of a transparent object or a glass a thing of the past. The newly-developed 2-dimensional CCD (S-CCD) incorporated in the Z300, combined with upgraded performance of the controller, provides enhanced stability and accuracy in measurement of a transparent object. The latest algorithm employed by the Z300 enables optimal sensitivity even if there is a big difference between the amount of reflected light from the surface and that from the bottom of a glass. Enhanced measurement area and a variety of high-resolution, long-distance sensor heads greatly expand the range of applications.

The Z300 is just another example of OMRON's ongoing challenge to the limits of sensing possibilities.

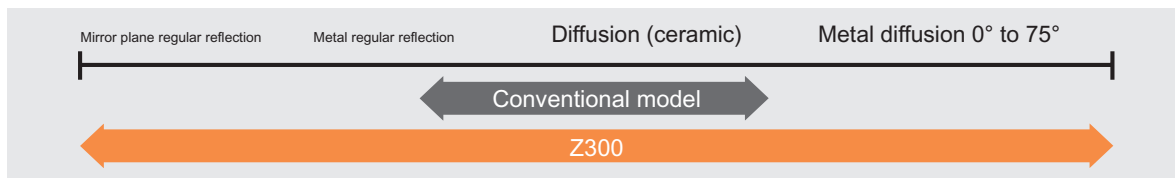


Resolution: 8 $\mu$ m (at 250 mm)  
Super long range model  
600  $\pm$  350mm Super long range

Resolution: 1 $\mu$ m  
Long range model  
100  $\pm$  20 mm

**The best in class**  
Resolution: 0.4 $\mu$ m  
High precision model  
50  $\pm$  5 mm

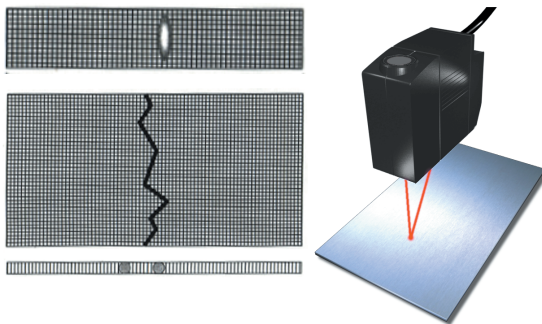
Resolution: 0.04 $\mu$ m  
High precision model  
20  $\pm$  1 mm



**The newly developed 2-dimensional CCD (S-CCD) achieves superb sensing performance.**

**A 2-dimensional CCD enables stable and high-speed measurement.**

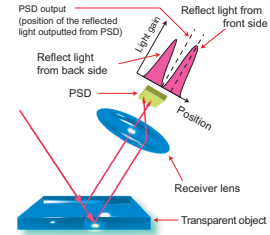
With previous 1-dimensional CCDs, flutter in the CCD would appear in the output. To stabilize the output value, it was necessary to add a signal averaging circuit, and this slowed the response time. The S-CCD with a 2-dimensional CCD divides the measurement point into 60 lines and measures each. Even if the surface of the work causes flutter in the CCD, the averaging effect for each pixel enables stable detection and high-speed processing.



**There is nothing like a CCD for measuring transparent objects.**

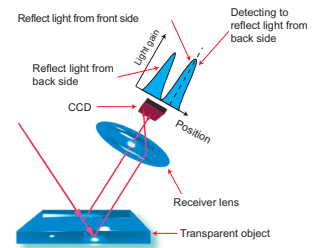
**X PSD scheme**

When a diffuse reflection type was used, measurement was not possible because there was insufficient diffuse reflected light. When a regular reflection type was used, reflected light from the rear side or background caused the PSD to incorrectly detect the position of the reflected light, preventing accurate measurement of the surface displacement.



**O CCD scheme**

In the CCD's regular reflection mode, it is possible to extract only the light from the surface. There are no effects from the rear side or background, and thus it is possible to accurately measure the displacement of a transparent body.



## View the measurement state. Monitoring as you desire...

Employs an easy-viewing color display system (when color monitor is connected). This system allows you to monitor the information you need at each stage, including test adjustment, operation, and maintenance, helping to ensure certain measurement.

### Monitoring - real time

#### Digital monitor



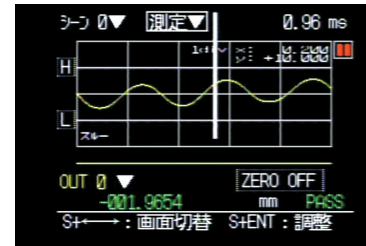
Digital display enables easy viewing of the measured value. The decision is indicated in two colors as "Pass" (green) or "High/Low" (red), making it easy to discern a rejection.

#### Image monitor



The position of the measurement point and the intensity of the reflected light are expressed on the monitor. The operator can easily check whether optimum measurement is taking place.

#### Trend monitor



Triggered monitoring of continuous measurement values over a certain time using the time system. Identify at a glance changes in measured values of a moving or rotating work and the correlation with the trigger.

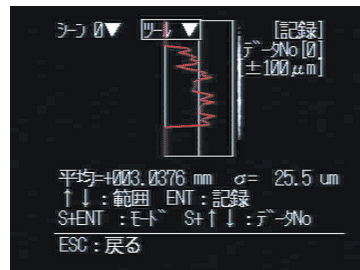
### Monitoring - recording and playback

#### Test mode



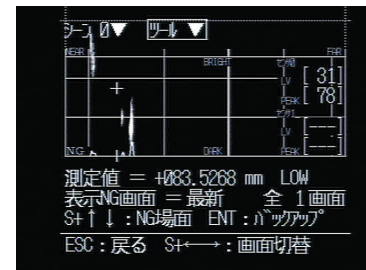
Store any amount of measured data. Use for a work test.

#### Record and play back the conditions during test mode



The conditions of a test performed off-line in a different location can be saved. When installed in-line, the data can be referenced.

#### Record and play back the conditions when a rejection decision (High/Low) occurs.



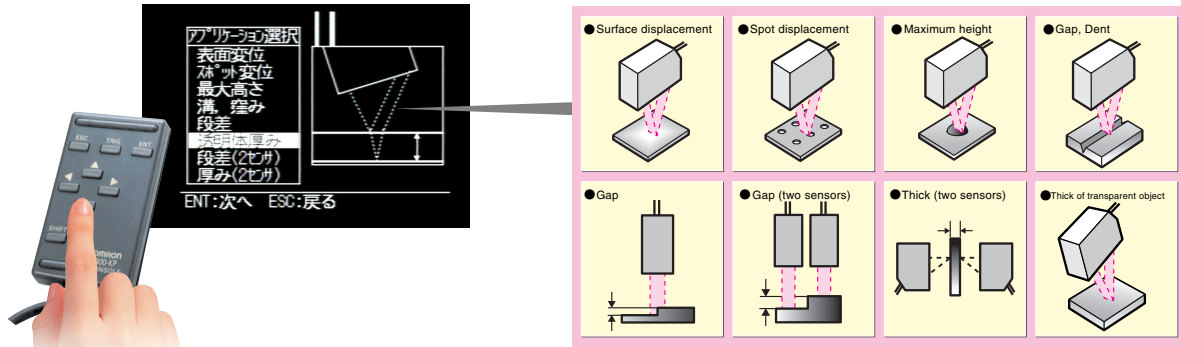
Up to 20 conditions (reflected light, measurement data, etc.) of a measurement that received a rejection decision in-line can be saved. This information can be used to analyze and troubleshoot problems in the work.

**Dialogue-type menus provide strong support for programming.**

**Application menu**

Menus allow you to set the main measuring methods with ease.

Follow the guidance of the monitor screen to set measuring conditions.



**Expert menu**

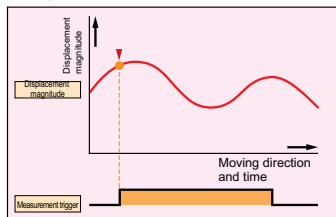
For measurement applications that cannot be handled by the Application menu, use the "Expert menu" to program detailed setting conditions.

**Enhanced hold functions and freedom to set triggers widen the range of application.**

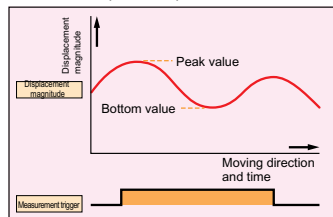
The Z300 makes it possible to implement hold functions with just the controller. Trigger (measurement timing) functions are also enhanced, with a wide range of features. Applications that were previously very difficult can now be performed with ease.

**Hold function**

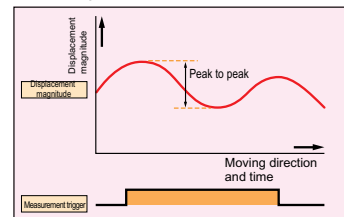
**Sample hold**



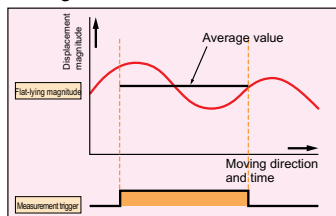
**Peak hold (bottom)**



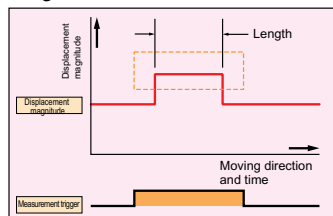
**Peak to peak hold**



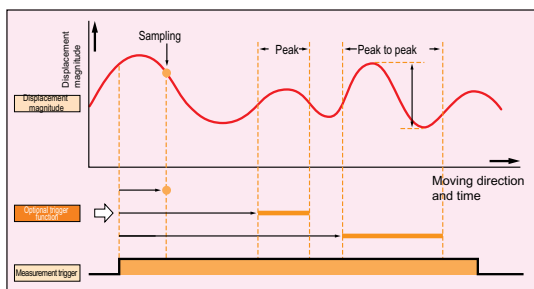
**Average hold**



**Length hold**



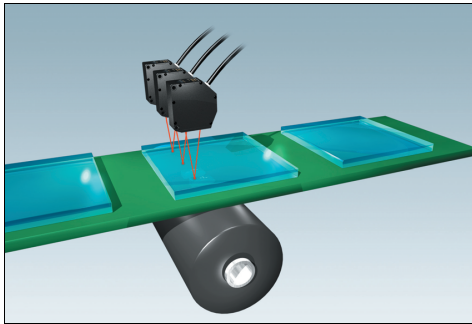
**Selectable trigger function**



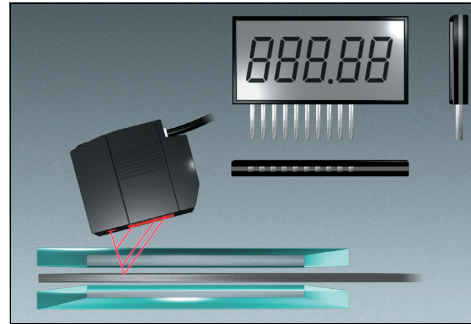
It is possible to build measurement timing arbitrarily inside a controller based on timing, such as a synchronization sensor. (It is based on the setting of delay time.) Maximum of four timings can be programmed.

Application

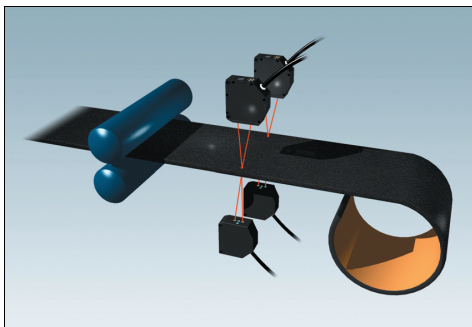
Measuring the thickness of transparent film



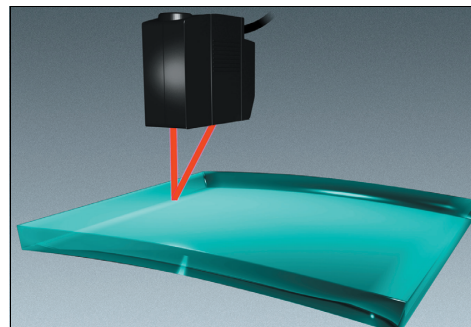
Verification of electrode position in the display module.



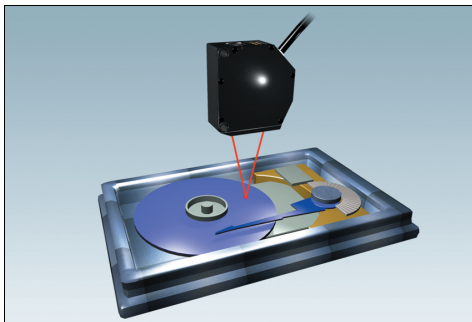
Measuring the thickness of sheet materials



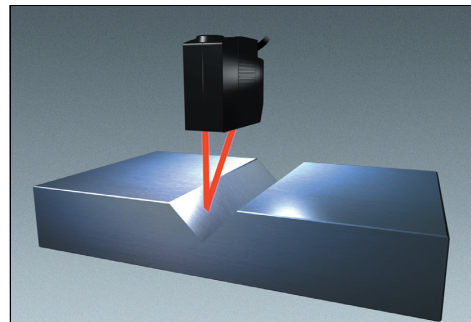
Measurement of warping in transparent plastic



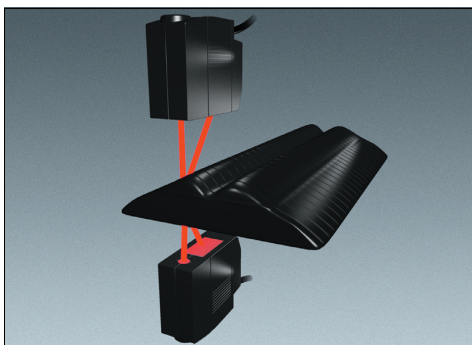
Inspecting the surface uniformity of a hard disk



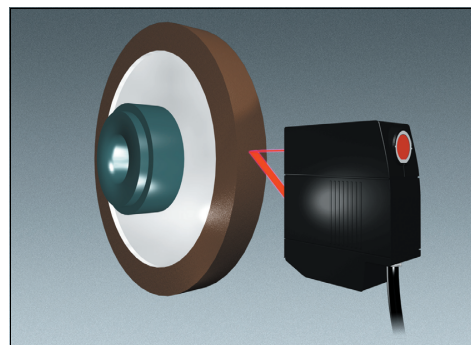
Shape measurement for welding robot control



Tire and black rubber thickness

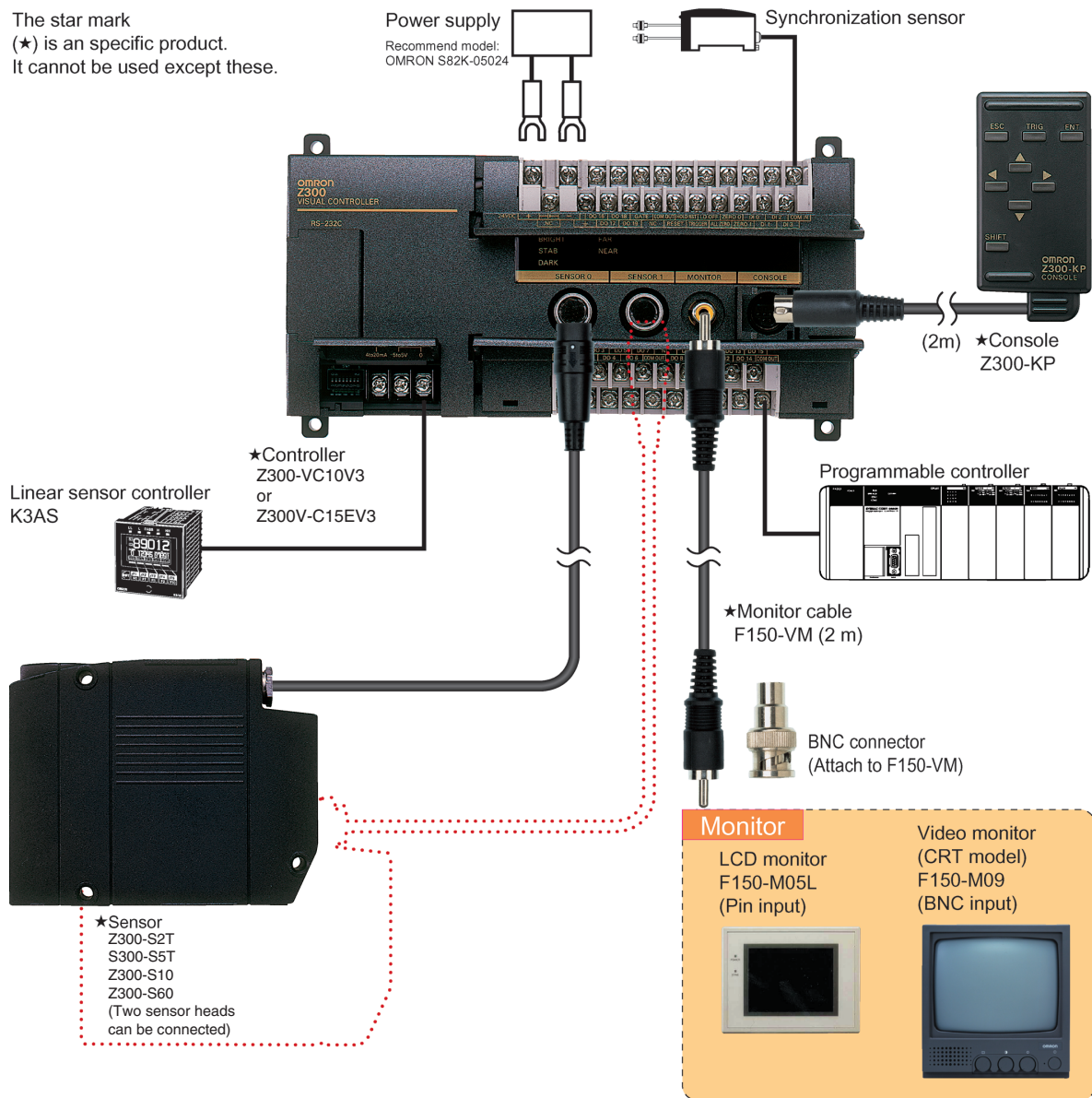


Grinding measurement of a whetstone



## System configuration

The star mark  
(★) is a specific product.  
It cannot be used except these.

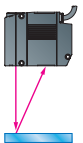
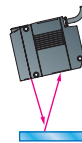
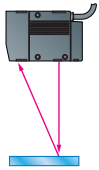


## Ordering Information (Shaded models are normally stocked.)

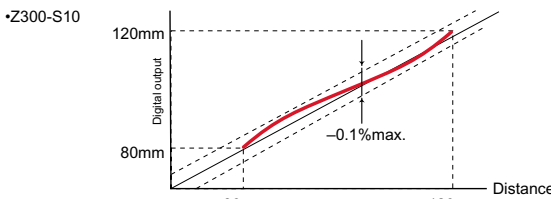
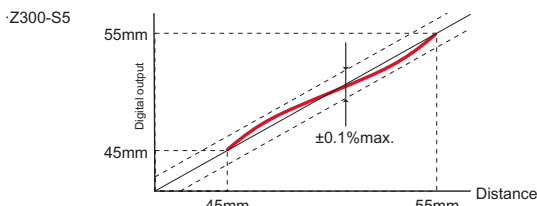
Name	Item	Model
Sensor		Z300-S2T
		Z300-S5T
		Z300-S10
		Z300-S60
Controller NPN		Z300-VC10EV3
Controller PNP		Z300-VC15EV3
Console		Z300-KP
LCD monitor		F150-M05L
Video monitor		F150-M09
Sensor extension cable		Z309-SC1 3M
		Z309-SC1 8M
Monitor cable		F150-VM

Rating/performance

Sensor: Z300-S10/Z300-S5/Z300-S60

Model		Z300-S10 (long-range type)		Z300-S60 (Super long-range type)
		Diffuse reflection mode	Regular reflection mode	Diffuse reflection mode only
Measurement Modes				
Item				
Measurement center distance		100 mm	94 mm	600 mm
Measurement range		±20 mm	±16 mm	±350 mm (F.S. 700 mm)
Light source		Visible semiconductor laser (wavelength 670 nm, 1 mW max., Class 2)		Visible semiconductor laser (wavelength 658 nm, 15 mW max., Class 3B) *1
Minimum beam shape *2		60 μm × 1000 μm typical (standard distance)		0.3 mm × 16(10.3*) mm (at 500 mm) *Effective area of CCD
Linearity*3		±0.1% F.S.		±0.07%F.S (250 mm to 750 mm) ±0.1%F.S (750 mm to 950 mm)
Resolution*4		1 μm*5		8 μm (at 250 mm) 40 μm (at 600 mm)
Sampling period *6		500 μs (at high speed)		
LED indicator	NEAR lamp	Illuminates when the object is near the measurement center distance, and is on the near side of the measurement center distance in the measurement range. The lamp flashes when the object is out of the measurement range or insufficient light is received.		
	FAR lamp	Illuminates when the object is near the measurement center distance, and is on the far side of the measurement center distance in the measurement range. The lamp flashes when the object is out of the measurement range or insufficient light is received.		
Temperature drift*7		0.01% F.S. /°C		
Environmental Resistant	Protective structure	IEC 60529 IP67		IEC Standard IP66*8
	Ambient illuminance	Incandescent lamp: 3,000 lux max.		
	Ambient temperature	Operating: 0°C to 50°C, Storage: -15°C to 60°C (with no icing or condensation)		
	Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)		
	Vibration resistance	10 to 150 Hz, 0.35-mm double amplitude for 8 minutes each in X, Y, and Z directions		
Material		Diecast aluminum		
Cable length		2 m		50 cm + extension cable
Minimum bending radius		68 mm		
Weight		Approx. 600 g		Approx. 1000 g

- \*1. For Class 2 types, please inquire.
- \*2. Defined at 1/e<sup>2</sup> (13.5%) of the central light intensity. If there is stray light outside of the defined area and the reflectance of the light around the work is higher than the work, detection errors may result.
- \*3. The error with respect to the ideal straight line of displacement output during measurement of our standard while aluminum ceramic. The linearity may vary depending on the object.

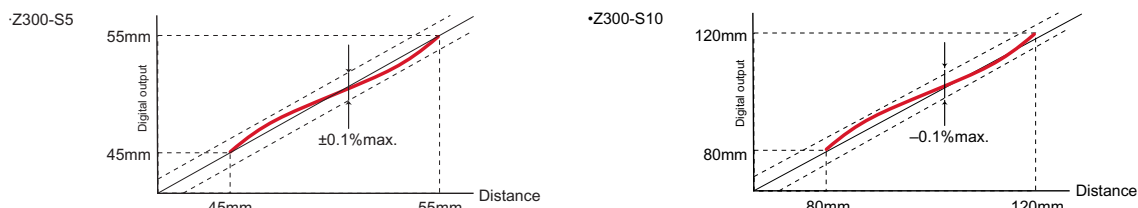


- \*4. The converted displacement value of peak-to-peak displacement output (when our standard aluminum ceramic is measured). In an electromagnetic field, resolution performance may not be satisfactory.
- \*5. Using an average measurement count of 64 times with the Z300-VC10V3.
- \*6. Using an average measurement count of 512 times with the Z300-VC10V3.
- \*7. Measured value when set to high-speed mode.
- \*8. Value when the distance between the sensor and the object (white aluminum ceramic) is fixed with an aluminum jig and the Z300-VC10V3 controller is connected.
- \*9. For IP 67 items, please inquire.

Sensor: Z300-S2T/Z300-S5T

Item	Model	Z300-S2T		Z300-S5T	
	Measurement Modes	Diffuse reflection	Specular reflection	Diffuse reflection	Specular reflection
Measurement center distance		5.2 mm	20 mm	50 mm	44 mm
Measurement range		±1 mm		±5 mm	±4 mm
Light source		Visible laser diode (wavelength 650 nm, 1 mW max., Class 2)		Visible laser diode (wavelength 670 nm, 1 mW max., Class 2)*1	
Minimum beam shape *2		20 μm × 300 μm typical (standard distance)		30 μm × 400 μm typical (standard distance)	
Linearity*3		±0.05% F.S.	±0.05% F.S.	±0.1% F.S.	±0.1% F.S.
Resolution*4		0.4 μm *5	0.4 μm	0.4 μm	0.4 μm
Sampling period *6		540 μs (at high speed)			
LED indicator	NEAR lamp	Illuminates when the object is near the measurement center distance, and is on the near side of the measurement center distance in the measurement range. The lamp flashes when the object is out of the measurement range or insufficient light is received.			
	FAR lamp	Illuminates when the object is near the measurement center distance, and is on the far side of the measurement center distance in the measurement range. The lamp flashes when the object is out of the measurement range or insufficient light is received.			
Temperature drift*7		0.01% F.S./°C			
Environmental Resistant	Protective structure	IEC 60529 IP67		IEC Standard IP66*8	
	Ambient illuminance	Incandescent lamp: 3,000 lux max.			
	Ambient temperature	Operating: 0°C to 50°C, Storage: -15°C to 60°C (with no icing or condensation)			
	Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)			
	Vibration resistance	10 to 150 Hz, 0.35-mm double amplitude for 8 minutes each in X, Y, and Z directions			
Material		Diecast aluminum			
Cable length		2 m		50 cm + extension cable	
Minimum bending radius		68 mm			
Weight		Approx. 350 g		Approx. 600 g	

- \*1. For Class 2 types, please inquire.
- \*2. Defined at 1/e2 (13.5%) of the central light intensity. If there is stray light outside of the defined area and the reflectance of the light around the work is higher than the work, detection errors may result.
- \*3. The error with respect to the ideal straight line of displacement output during measurement of our standard white aluminum ceramic. The linearity may vary depending on the object.



- \*4. The converted displacement value of peak-to-peak displacement output (when our standard aluminum ceramic is measured). In an electromagnetic field, resolution performance may not be satisfactory.
- \*5. Using an average measurement count of 512 times with the Z300-VC10V3.
- \*6. Using an average measurement count of 512 times with the Z300-VC10V3.
- \*7. Measured value when set to high-speed mode.
- \*8. Value when the distance between the sensor and the object (white aluminum ceramic) is fixed with an aluminum jig and the Z300-VC10V3 controller is connected.
- \*7. Measured value when set to high-speed mode.
- \*8. Value when the distance between the sensor and the object (white aluminum ceramic) is fixed with an aluminum jig and the Z300-VC10V3 controller is connected.
- \*9. For IP 67 items, please inquire.



Controller: Z300-VC10V3/Z300-VC15V

Item mode	VISUAL mode		NON VISUAL mode	
General specifications	Power supply voltage	21.6 to 26.4 V DC (including ripple)		
	Current consumption	1 A or less (when two sensors are connected)		
	Insulation resistance	Between external DC terminals and ground terminal: 20 MΩ or higher (using 100-V DC insulation resistance tester) (with built-in surge protector disconnected)		
	Dielectric strength	Between external DC terminals and ground terminal: 1000 V AC 50/60 Hz (with built-in surge protector disconnected)		
	Leakage current	10 mA max.		
	Noise resistance	1500 V p-p, pulse width of 0.1 μs/1 μs, Rise: 1-ns pulse		
	Vibration resistance	10 to 150 Hz (vibration width 0.1 mm) X, Y, Z directions 8 min.		
	Shock resistance	200 m/s <sup>2</sup> , 6 directions, 3 times each		
	Ambient temperature	Operating: 0 to +50°C, storage: -15 to +60°C (with no icing or condensation)		
	Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)		
	Ambient Conditions	No corrosive gas		
	Ground	D-type ground (ground resistance 100 Ω or less) * The previous No. 3 type grounding		
	Protective structure	Built-in panel type (IEC60529 Standard IP20)		
	Material	Unit: ABS		
Performance specifications	Number of connected sensors	2 units	1 unit	
	Number of scenes	16	1	
	Image recording function	Maximum of 20 rejection images, maximum of 4 peripheral images Up to 4 work surface images can be recorded	—	
	Processing method	Dark/light center, edge center	Edge center	
	Image pre-processing	Noise elimination, smoothing	None	
	Average/filter	Average count (12 levels, 1 to 4096 times), HPF (high-pass filter)	Average count (SLOW: 64 times, FAST: 1 time)	
	Light intensity follow function	Auto (light intensity follow range can be specified), fixed (selected from 32 levels)	Auto (light intensity follow range cannot be specified), fixed (selected from HIGH or LOW)	
	Applications	Select from following 8 types: surface displacement, spot displacement, maximum height, groove/depression, level difference, thickness of transparent object, level difference (2 sensors), thickness (2 sensors)	—	
	Range specification	Area of line beam direction + displacement direction can be specified.	—	
	2-area measurement mode	Absolute coordinate mode, relative coordinate mode	—	
	Hold function	Sampling, peak, bottom, peak-to-peak, average, length	—	
	2-sensor measurement mode	Simultaneous measurement, alternating measurement	—	
	Measurement data	4 outputs/scene	1	
	Calculation functions	The following calculations are possible for each of OUT 0 to 3 K+A, K-A, K+(A+B), K+iA-B, K-(A+B) A, B: Specified measurement points K: Any constant	—	
Result output	Decision output (HIGH, PASS, LOW, ERROR) <ul style="list-style-type: none"> <li>↳ RS-232C output</li> <li>↳ Terminal block output</li> </ul> • Measured value output (measured value) <ul style="list-style-type: none"> <li>↳ RS-232C output</li> <li>↳ Terminal block output</li> <li>↳ Analog output</li> </ul>	Analog output of measured values		
Terminal block	11 input points: TRIGGER, HOLD-RESET, LD-OFF, ALL-ZERO, ZERO0, ZERO1, RESET, DI0 to DI3 21 output points: DO0 to DO20	LD-OFF		
Monitor I/F	1 CH (supports pin jack and over scan monitor)	—		
Analog output resolution	Full-scale output at maximum of 40,000 levels Resolution * 0.25 mV (± V), 0.4 μA (4-20 μA)			
Weight	Approximately 700 g (unit only)			
Accessories	Operation manual, 1 resistor (250 Ω, 1/2 W)			

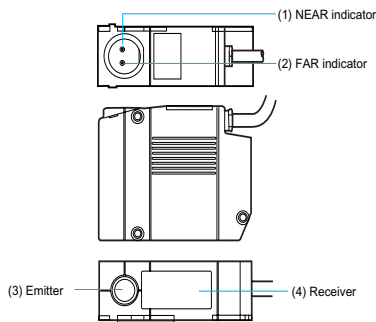
\* Measured at an average count of 64 times with our K3AS Linear Sensor Controller connected

Monitor

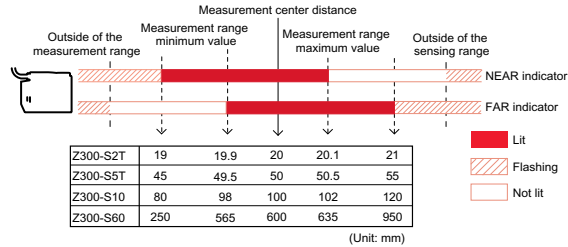
Item	Product name Model	LCD monitor	Video monitor
		<b>F150-M05L</b>	<b>F150-M09</b>
Size	5.5 type	9 inches	
Type	TFT color LCD	Monochrome CRT	
Resolution	320 × 240 dots	800TV or higher (center)	
Input signal	NTSC composite video (1.0 V / 75 Ω)		
Power supply voltage	20.4 to 26.4 VDC	100 to 240 VAC (-15%, +10%)	
Current consumption	Approx. 700 mA	Approx. 200 mA	
Ambient temperature	Operating: 0°C to 50°C, Storage: -25°C to 65°C (with no icing or condensation)	Operating: -10°C to 50°C, Storage: -20°C to 65°C (with no icing or condensation)	
Ambient humidity	Operating/Storage: 35% to 85%RH (with no condensation)	Operating/Storage: 10% to 90%RH (with no condensation)	
Weight * Unit only	Approx. 1 kg	Approx. 4.5 kg	
Accessories	Operation manual, 4 clamps	Instruction manual	

## Name and function of each part

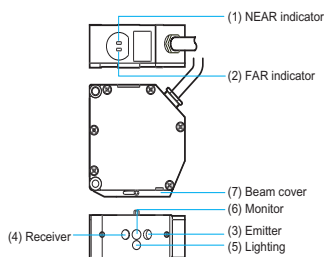
### Sensor: Z300-S5T/-S10/-S60



(1), (2) When the distance from the sensor front to the work is within the measurement range, these lamps illuminate in response to the distance. If the work is outside the measurement range or there is insufficient light, both lamps will blink.



### Sensor: Z300-S2T



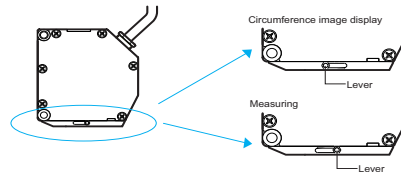
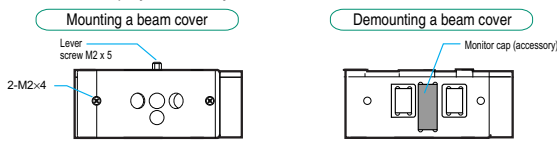
This indicator lamp also functions as a laser emission warning light.

- Immediately after turning on the power, at least one of the indicator lamps will illuminate steadily or blink.
- During the first 15 to 25 seconds after turning on the power, both indicator lamps will remain off, indicating that the laser light is off.
- During laser emission, one of the indicator lamps will illuminate steadily or blink.
- When the laser is off, both indicator lamps will be off.

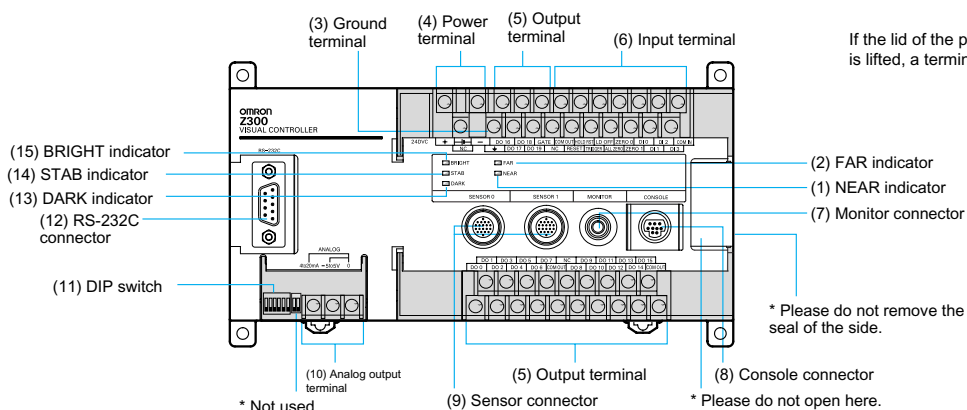
(3) Laser projector  
 (4) Laser receiver  
 (5) Illumination for display of peripheral images.  
 (6) Load a peripheral image.  
 (7) Switch from measurement to peripheral image display, and then from peripheral image display to measurement. To display a peripheral image, loosen the screw on the beam cover lever and then move the lever to the left. To switch to measurement, move the lever to the right. The lever screw should be tightened to a torque of 1.5 to 3 kgf·cm using a slotted screwdriver.

### Check

- Using Z300-S2T
- When you remove and measure a beam cover, please attach the monitor cap attached to the sensor in the position of the following figure.
- When you display a circumference image, please be sure to attach a beam cover. Where a beam cover is removed, a circumference image cannot be displayed correctly.



### Controller: Z300-VC10V3/Z300-VC15V3



If the lid of the portion of is lifted, a terminal will appear.

\* Please do not remove the seal of the side.

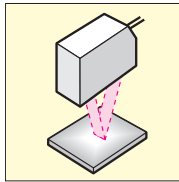
\* Please do not open here.

- (3) Wire the ground wire.
- (4) Connect to the power supply unit.
- (5), (6) Connect to a programmable controller or other external device.
- (7) Connect the monitor.
- (8) Connect the console.
- (9) Connect the sensor.
- (10) Connect if using an analog output.
- (11) Set if using in NON VISUAL mode.
- (12) Connect to a computer, programmable controller, or other external device.
- (13), (14), (15) Illuminates according to the light intensity in the sensor unit. If LDOFF is input from the terminal block or RS-232C, or the sensor is not connected, all indicator lamps will blink.
- BRIGHT indicator lamp: Illuminates when the light intensity is too high.
- DARK indicator lamp: Illuminates when the light intensity is too low.
- STAB indicator lamp: Illuminates when the light intensity is suitable.

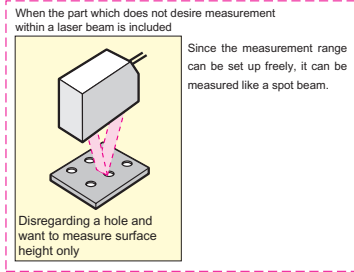
## Setting menu

### Application menu

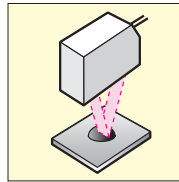
#### Surface displacement



Make stable measurements of the average displacement magnitude in the laser beam, even if there are gaps (hair line scratches, etc.).

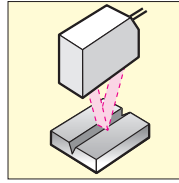


#### Maximum height



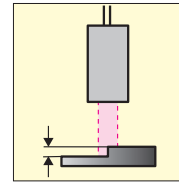
The highest position in a laser beam is measured.

#### Gap, Dent

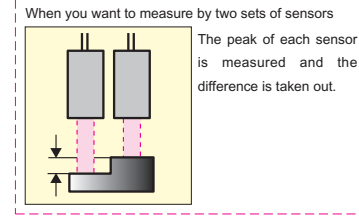


The lowest position in a laser beam is measured.

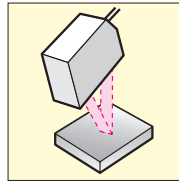
#### Gap



Between a peak and a bottom is measured within a laser beam.

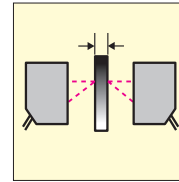


#### Thickness of transparent object



The thickness of a transparent object can be measured by one sensor.

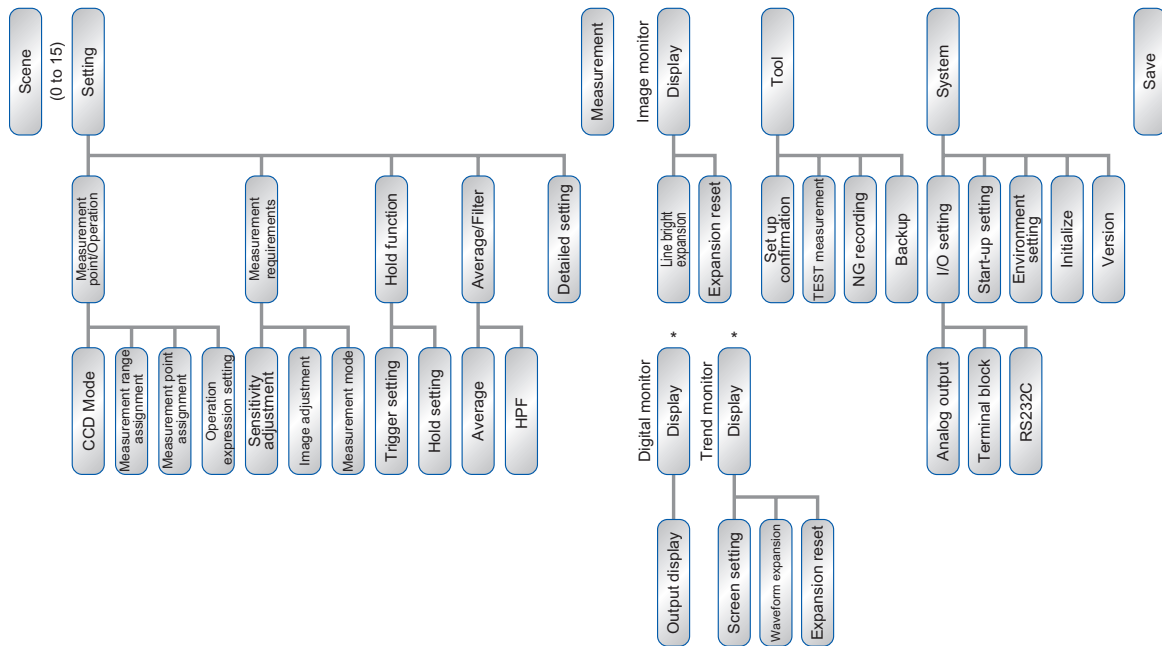
#### Thickness (2 cm)



Between a peak and a bottom is measured within a laser beam.

### Expert menu

\* The hierarchy of display mode changes by kinds of screen.



## Precautions

### Warning

Be careful not to expose your eyes to the laser beam directly or to the light reflected by a mirror-smooth object.

The laser beam emitted from the laser has high power density and its entry to your eyes may cause blindness.



### For safe use of laser products

The Z300 uses a laser light source. The laser is classified in accordance with JIS Standards (JIS-C6802).

	Z300-S2T	Z300-S5T	Z300-S10	Z300-S60
Wave-length	650 nm	670 nm	670 nm	658 nm
Maximum output	1 mW max.	1 mW max.	1 mW max.	15 mW max.
Class	2			3B
Maximum pulse width	7ms	7ms	7ms	17.5ms
Period	0.5 to 10 ms	0.5 to 10 ms	0.5 to 10 ms	0.5 to 25 ms

### Labels related to laser

The following warning label is attached to the side of the sensor on the Z300.



Z300-S2T  
Z300-S5T  
Z300-S10

Z300-S60

### About safety devices

The Z300 is equipped with a laser emission warning lamp and a laser-off input circuit. An interlock function can be configured using an external circuit.

### About operation

- If there is a reflective body with a specular surface in the light path, install a light shielding cover. If the light path must be left open, ensure that it is not at eye height.
- The safe distance (Nominal Optical Hazard Distance: NOHD) is approximately 1 m (15 m for the Z300-S60); however, endeavor to terminate the light path in so far as is possible. The optimum terminating material has a delustering coating and minimal reflection.
- When installing or adjusting the Z300-S60 use laser-protective glasses.

### Overview of JIS C6802 Standard

Safety measures that users must implement based on the class of laser product are as follows.

Class Requirements	Class 1	Class 2	Class 3A	Class 3B*	Class 4
Remote interlock connector	Not required			Connect to room or door circuit	
Key control	Not required			Remove key when not needed	
Beam attenuator	Not required			Prevent inadvertent light exposure during use	
Emission indicator device	Not required			Indicates that laser is in operation	
Warning sign	Not required			Observe the cautions in the warning sign	
Beam path	Not required	Terminate ends of necessary beam paths			
Mirror reflection	Not required			Prevent unexpected reflection	
Eye protection	Not required			Required when technical or administrative methods cannot be carried out, and when the MPE is exceeded.	
Protection clothes	Not required			Required in some cases	Specific instructions are required
Training	Not required			Required for all operators and maintenance personnel	

\* A Class 3B laser product that does not exceed 5 times the Class 2 AEL and which has a remote interlock connector, shade-based control, a beam attenuator, an emission warning device, and with respect to eye protection, has a wavelength range of 400 nm to 700 nm, is treated as a Class 3A laser product.

### FDA approval pending

Products equipped with this device are subject to the laser regulations of the FDA (Food and Drug Administration) if exported to the U.S.A. The Z300 is scheduled for registration with the CDRH (Center for Devices and Radiological Health).

Correct Use

About warming up

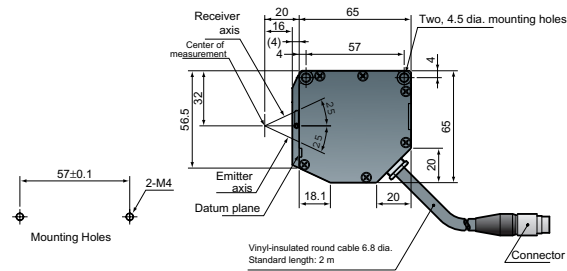
After turning on the power, wait about 30 minutes before using the equipment. The circuits are not stable after turning on the power, and thus measured values tend to gradually drift.

Mounting the sensor head of the Z300-S2T, Z300-S10, Z300-S5T

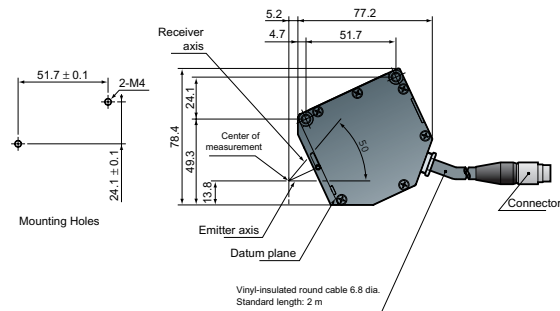
The sensor head of the Z300-S2T can be mounted in two ways to allow use as a regular reflection optical device, or a diffuse reflection optical device.

Select the optimum mounting method according to the object of detection and its surface to achieve high-precision measurement.

**Using for regular reflection  
Z300-S2T**



**Using for diffuse reflection  
Z300-S2T**

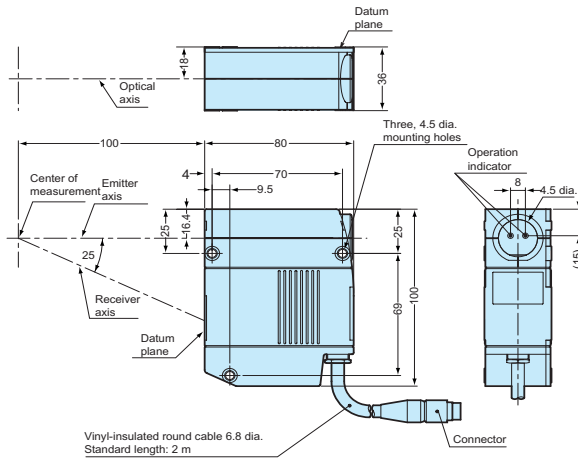


(Unit: mm)

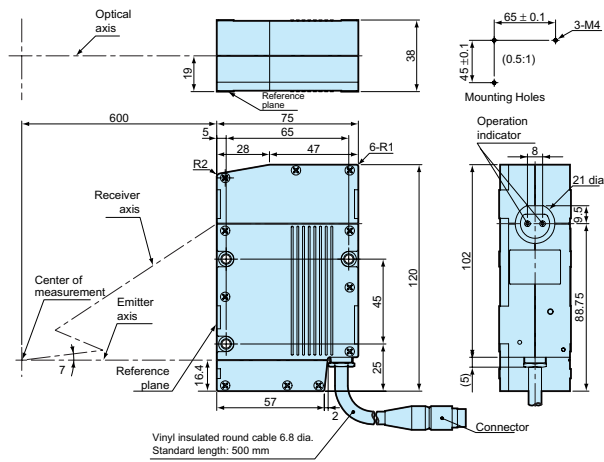
Dimensions (Unit: mm)

Sensor

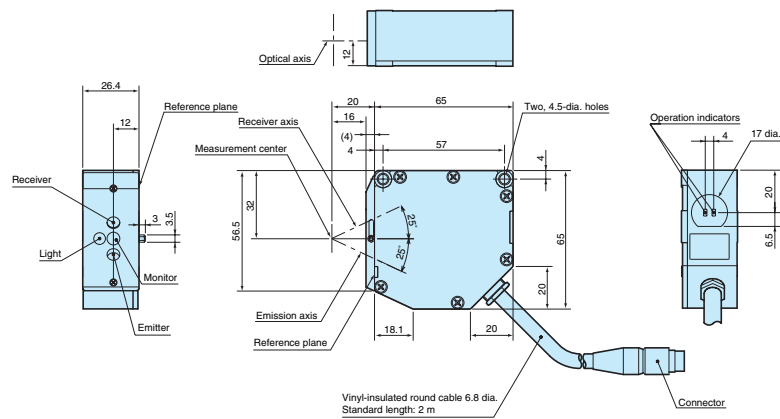
Z300-S10



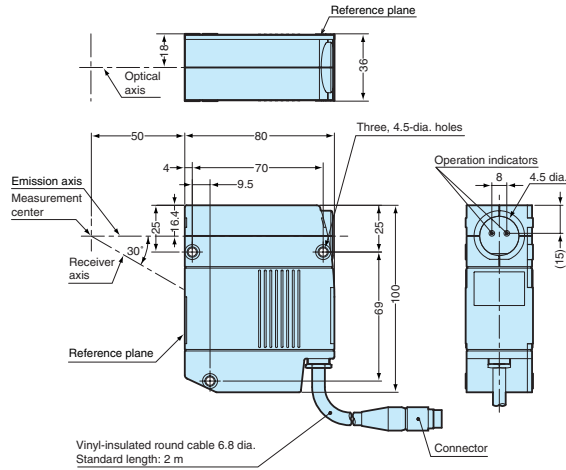
Z300-S60



Z300-S2T

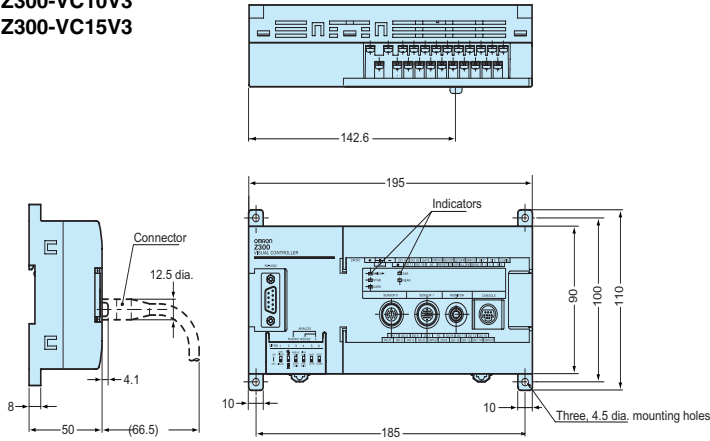


**Z300-S5T**



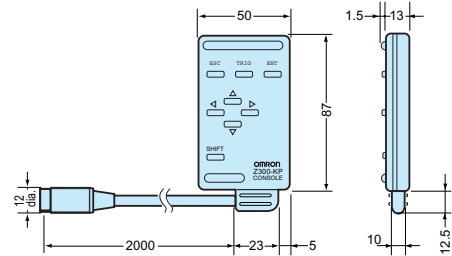
**Controller**

**Z300-VC10V3  
Z300-VC15V3**



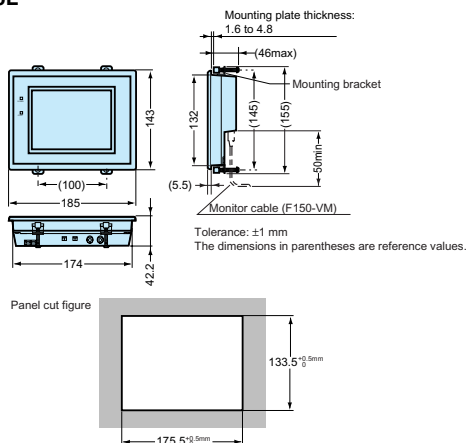
**Console**

**Z300-KP**



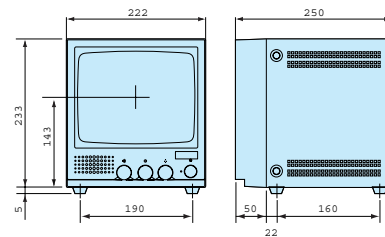
**LCD monitor**

**F150-M05L**



**Video monitor**

**F150-M09**





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