Profile measuring system

Z500

High-Precision Sensor that Measures and Displays an Object's Profile

CE NEW

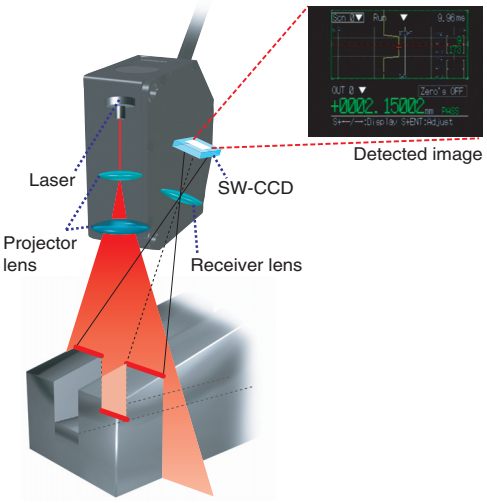
OMRON's original line beam method provides a complete solution to profile measurement problems.

Conventional non-contact measurement of the profile of an object commonly uses a displacement sensor to measure the height of the object, by moving the object or the sensor.

However, this system has several disadvantages, such as lower measurement accuracy resulting from object or sensor movement as well as high system construction cost.

By utilizing a unique wide beam method and 2-dimensional CCD, OMRON's Z500 eliminates these problems.

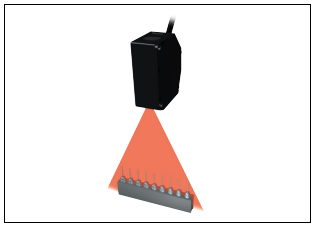
Through its capability of measuring diversely-shaped objects in a stable manner, the Z500 can meet a variety of application needs.



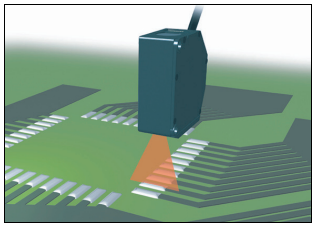
Principle of line beam method

A wide beam is applied to the object to be measured. A 2-dimensional CCD receives the reflected light to measure the 2-dimensional profile of the object.

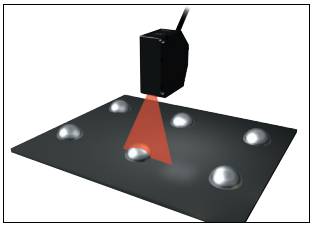
Measurement of connector pin configuration



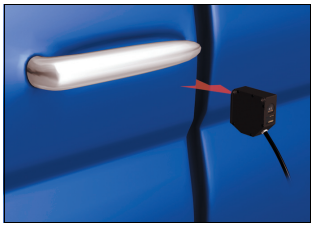
Height measurement for cream-soldered joint on PCB



Rivet height measurement



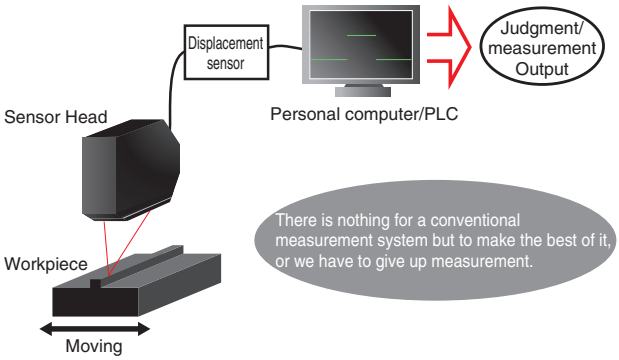
Door gap measurement



Measures the shape of object instantly.

A complete solution to the disadvantages of conventional measurement systems.

Measurement by displacement sensor

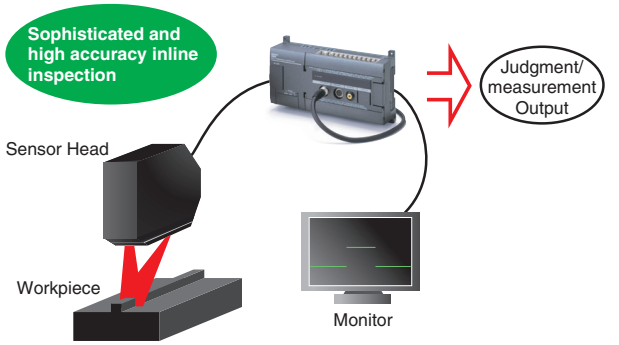


Problems to be resolved
- Object or sensor needs to be moved.
- Personal computer or other device is required for measurement data processing.

Increased system construction cost
Measurement accuracy deterioration caused by movement of object or sensor and data processing.
Measurement takes a long time.

When you use Z500, ---

Measurement by Z500 model



Enjoy the following advantages from Z500 !
- Moving the object or sensor is no longer necessary.
- Various data processing and calculation functions are performed automatically.

Lower system construction cost
Higher measurement accuracy
Shorter measurement time

Accurate and stable measurement.

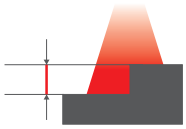
OMRON's original 2-dimensional SW-CCD and multiple light intensity control system enable stable measurement of objects with round shape and other surface conditions.

A variety of measurement items.

Various measurement items, such as level difference, width, and edge position, can be selected depending on the specific application.

Permitting simultaneous measurement of up to 8 items, the Z500 is applicable to various measurement purposes.

2-point level difference (Step: 2 pts)

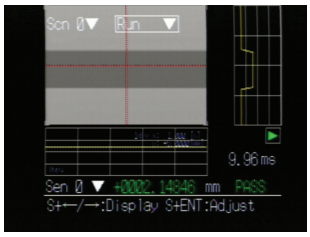


Width

Edge position

Four types of monitor screens

Measurement data can be displayed on 4 types of monitor screens.
These screens enable analysis and evaluation of measurement data from various viewpoints.



Profile monitor

Time-series change of profile (data on cross section height) can be checked on a 3D gray scale image.

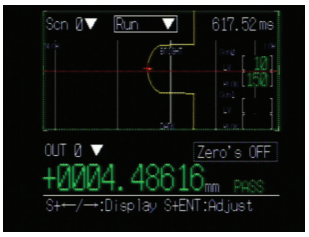
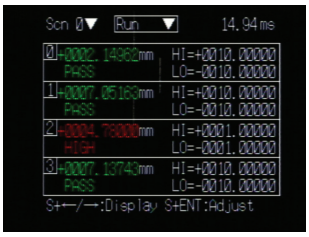


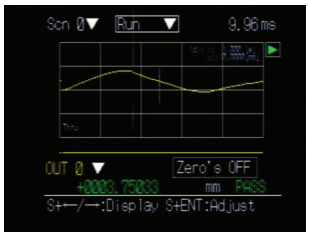
Image monitor

Both measurement data and profile image can be checked at the same time.



Digital monitor

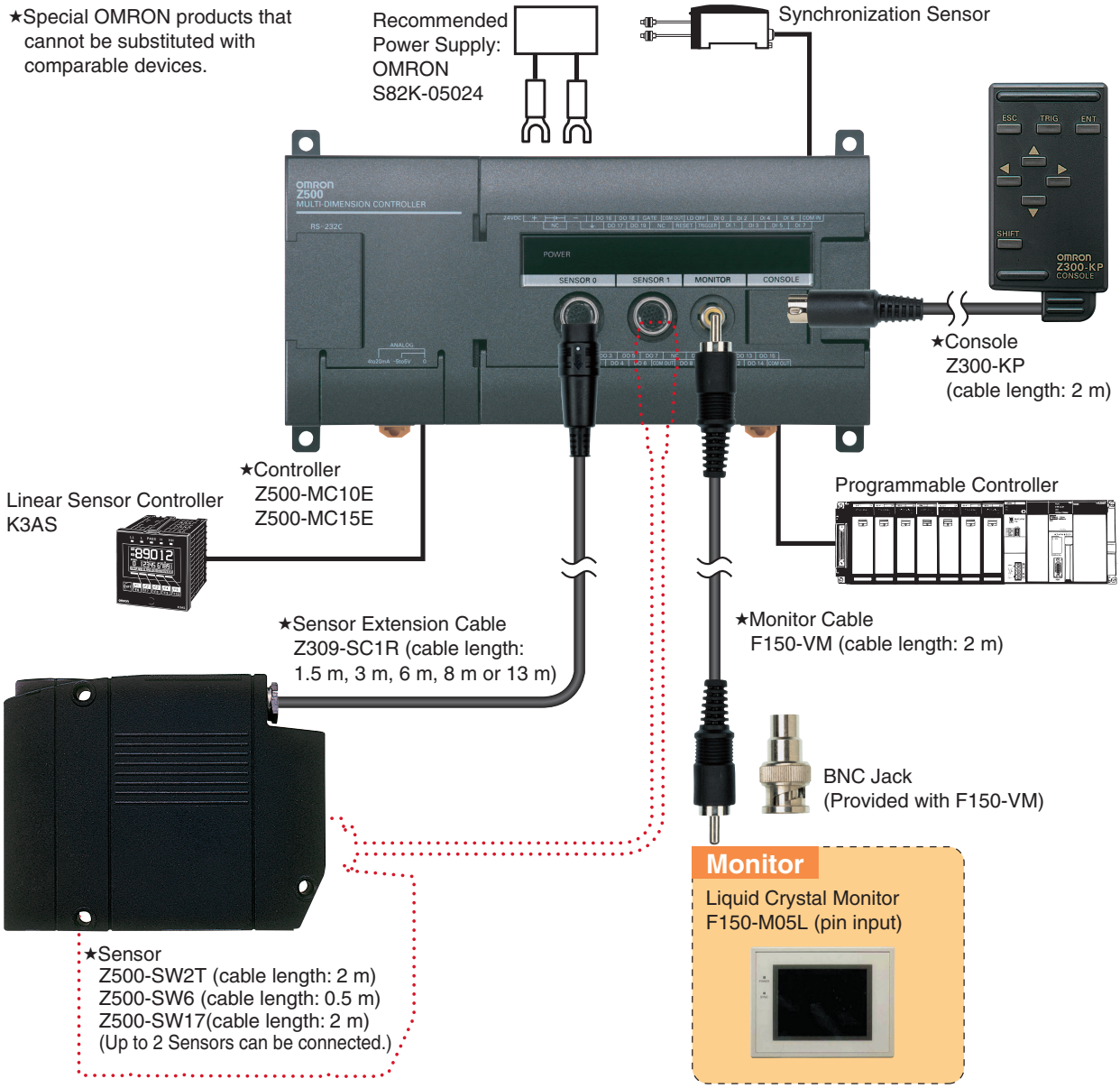
Two or more measurement data can be checked at the same time.



Trend monitor

Time-series change of measurement data can be checked.

System configuration



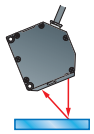
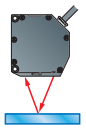
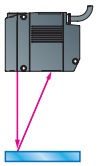
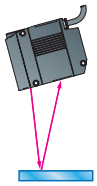
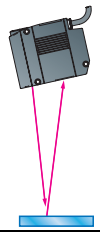
Ordering Information (Shaded models are normally stocked.)

Name / Item	Model	Remarks
Sensor	**Z500-SW2T**	Cable length: 2 m
	Z500-SW6	Cable length: 0.5 m
	Z500-SW17	Cable length: 2 m
Controller	**Z500-MC10E**	——
Console	**Z300-KP**	——
Liquid Crystal Monitor	**F150-M05L**	——
Video Monitor	**F150-M09**	——
Sensor Extension Cable	**Z309-SC1R** (See note)	Cable length: 3 m, 6 m, 8 m or 13 m
Monitor Cable	**F150-VM**	Cable length: 2 m
Setup Manual	**Z158-E1-1A**	——
Operation Manual	**Z159-E1-1**	——

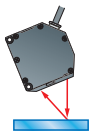
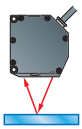
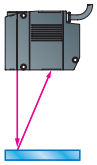
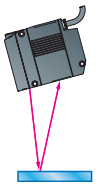
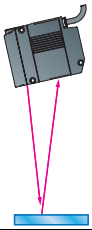
Note: Specify the required cable length when ordering.

Rating/Performance

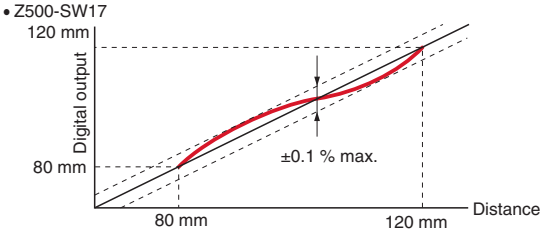
Sensor Z500-SW2T/-SW6/-SW17

Model	Z500-SW2		Z500-SW6		Z500-SW17	
Item / Measurement mode	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection
						
Distance to measurement center	5.2 mm	20 mm (with beam cover attached: 16 mm)	50 mm	44 mm	100 mm	94 mm
Measurement range	±0.8 mm		±5 mm	±4 mm	±20 mm	±16 mm
Light source	Visible-light semiconductor laser (See note 10) (Wavelength 650 nm, 1 mΩ max., Class 2)		Visible-light semiconductor laser (Wavelength 658 nm, 15 mΩ max., Class 3B)			
Beam dimensions (See note 1)	Reference distance: 20 μm × 4 mm TYP. (Measurement region: 2 mm)		Reference distance: 30 μm × 24 mm TYP. (Measurement region: 6 mm)		Reference distance: 60 μm × 45 mm TYP. (Measurement region: 17 mm)	
Linearity	±0.1% F.S. (See note 3)	±0.1% F.S. (See note 2)	±0.1% F.S. (See note 4)			
Resolution	0.25 μm (See notes 5 and 6)		0.3 μm (See notes 7 and 8)		1 μm (See notes 7 and 8)	
Sampling cycle	9.94 ms					
LED indicators (LASER indicator)	Lit while laser is ON.					
Temperature characteristic (See note 9)	0.01 F.S./°C					
Environment resistance: Degree of protection	IEC IP64		IEC IP66			
Environment resistance: Ambient operating illumination	Illumination at light-receiving surface: 3,000 lx max., incandescent light					
Environment resistance: Ambient temperature	Operating: 0 to +50 °C, Storage: -15 to +60 °C (with no icing or condensation)					
Environment resistance: Ambient humidity	Operating and storage: 35% to 85% RH (with no condensation)					
Environment resistance: Vibration resistance	10 to 150 Hz (single amplitude: 0.35 mm) for 80 min. each in X, Y, and Z directions					
Materials	Unit: Die-cast aluminum Cable sheathing: Heat-resistant chlorinated vinyl Connector: zinc alloy and brass					
Cable length	2 m		0.5 m		2 m	

(Table continutes on next page.)

Item / Model	Z500-SW2		Z500-SW6		Z500-SW17	
Measurement mode	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection
						
Minimum bending radius	68 mm					
Weight (including packaging)	Approx. 600 g (Unit: Approx. 350 g)		Approx. 700 g (Unit: Approx. 600 g)		Approx. 800 g (Unit: Approx. 600 g)	
Accessories	3 ferrite cores, laser warning labels (English)					

Note: 1 . Defined at $1/e^2$ (13.5%) of the density at the light center. Light may, however, be present outside this range and if the reflection factor of the light around the workpiece is high compared to the workpiece, measurement may be affected.
2 . Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard quartz glass. The linearity varies with the type of workpiece.
3 . Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard SUS blocks. The linearity varies with the type of workpiece.
4 . Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard white alumina ceramics. The linearity varies with the type of workpiece.



5 . Displacement conversion value for peak-to-peak of displacement output. These figures are for measurement of OMRON standard quartz glass (mirror reflection mode) or OMRON standard SUS blocks (diffuse reflection mode) at the measurement center. In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.
6 . These figures are for when the Sensor is connected to the Z500-MC10E/MC15E, the average number of measurements is 16. Measurement data are sent to PC via RS-232C cable for calculation of their average values.
7 . Displacement conversion value for peak-to-peak of displacement output (for measurement of OMRON standard white alumina ceramic at the measurement center). In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.
8 . With the Z500-MC10E/MC15E, at an average number of measurements of 64. Measurement data are sent to PC via RS-232C cable for calculation of their average values.
9 . Value for measurement with the space between the Sensor and the workpiece (white alumina ceramic) secured with an aluminum jig.
10.Higher power laser type (Class 3B) is also available. For further information, please contact us.

Controller Z500-MC10E/MC15E

Item	Model	Z500-MC10E	Z500-MC15E
	Input/Output Type	NPN	PNP
Performance specifications	Number of Sensors that can be mounted	2	
	Number of scenes	16	
	Light intensity tracking function	Automatic (The light intensity tracking range can be specified)/Fixed (Select from 31 stages) Multiple (The light intensity range can be specified)	
	Measurement item	Select from the following 8 types: Height, Step: 2 pts, Step: 3 pts, Edge position, With, Edge center, Peak/Bottom, Define	
	Region specification	Region specification of line beam and displacement direction is possible.	
	Number of data to be stored	2048 points max.	
	Trigger function	Free/External 1/External 2/Auto	
	Results output	• Judgment output → RS-232C output → Terminal block output • Measurement value output (measurement value) → RS-232C output → Analog output	
	Terminal block	11 input points: $\overline{\text{TRIGGER}}$, $\overline{\text{LD-OFF}}$, $\overline{\text{RESET}}$, $\overline{\text{D10}}$ to $\overline{\text{D17}}$ 21 output points: $\overline{\text{DO0}}$ to $\overline{\text{DO19}}$, $\overline{\text{GATE}}$	
	Monitor interface	1CH (for pin jack or overscan monitor)	
	Analog output resolution	The full scale for output can be divided into a maximum of 40,000 gradations. Resolution (See note): 0.25 mV (±5 V), 0.4 μA (4 to 20 mA)	
General specifications	Power supply voltage	21.6 to 26.4 VDC	
	Current consumption	1 A max. (with 2 Sensors connected)	
	Insulation resistance	20 MΩ min. between all DC external terminals and GR terminal (100 VDC megger) (with internal surge absorber removed)	
	Dielectric strength	1000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)	
	Leakage current	10 mA max.	
	Noise resistance	1500 Vp-p; pulse width: 0.1 μs/1 μs, Rising edge: 1-ns pulse	
	Vibration resistance	10 to 150 Hz (double amplitude: 0.1 mm) for 8 min. each in X, Y, and Z directions	
	Shock resistance	200 m/s^2, 3 times each in 6 directions	
	Ambient temperature	Operating: 0 to +50 °C, Storage: -15 to +60 °C (with no icing or condensation)	
	Ambient humidity	Operating and storage: 35% to 85% RH (with no condensation)	
	Ambient environment	No corrosive gases	
	Ground	Ground the Z500's ground terminal to less than 100 Ω.	
	Degree of protection	IEC IP20 (in-panel)	
	Material	Unit: ABS	
	Weight (including packaging)	Approx. 1300 g (Unit: Approx. 700 g)	
	Accessories	2 manuals, 1 resistor (250 Ω, 1/2 W)	

Note: For measurement at an average number of times of 64 with an OMRON K3AS Linear Sensor Controller connected.

Monitor

Item	Monitor	Liquid Crystal Monitor
	Model	**F150-M05L**
Panel size		5.5 inches
Panel type		TFT color liquid crystal
Resolution		320 × 240 dots
Input signal		NTSC composite video (1.0 V/75 Ω)
Power supply voltage		20.4 to 26.4 VDC
Current consumption		Approx. 700 mA
Ambient temperature		Operating: 0 to +50 °C, Storage: -25 to +65 °C (with no icing or condensation)
Ambient humidity		Operating and storage: 35% to 85% RH (with no condensation)
Weight (including packaging)		Approx. 870 g (Unit: Approx. 610 g)
Accessories		Operation manual, 4 mounting brackets

Laser Safety

The Z500-SW2T Sensor Head is a Class 2 Laser Product according to EN60825-1 (IEC60825-1) and Class II Laser Product according to FDA (21 CFR1040.10) (see note). The Z500-SW6 and Z500-SW17 Sensor Heads are Class 3B and Class IIIB Laser Products, respectively. The Z500 Series is meant to be built into final system equipment. Pay special attention to the following precautions for the safe use of the product:

Note: Europe: Class 2 and Class 3B of EN60825-1: 1994 = IEC60825-1: 1993
U.S.A.: Class II and Class IIIB of FDA (21 CFR1040.10)

	Z500-SW2T	Z500-SW6/Z500-SW17
Wavelength	650 nm	658 nm
Maximum pulse duration	10 ms	17.5 ms
Cycle	0.5 to 10 ms	0.5 to 25 ms
Peak power	1 mW max.	15 mW max.
Class	2	3B

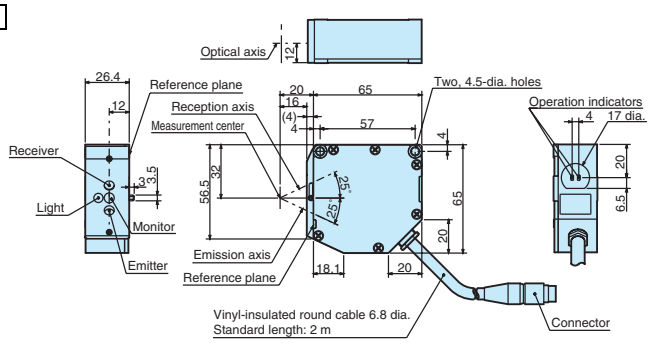
(1) Use this product as specified in the operation manual. Otherwise, you may be exposed to hazardous laser radiation.
(2) The Z500 series radiates laser beams in the visible light range. Do not expose your eyes directly to the laser radiation. Ensure that the laser beam path is terminated during use. If a mirror or shiny surface is positioned in the laser beam path, ensure that the reflected beam path is also terminated. If the Unit must be used without terminating the laser beam path, position the laser beam path so that it is not at eye level.
(3) To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.
(4) The user should return the product to OMRON for all repair and servicing.
(5) As for countries other than those of Europe and the U.S.A., observe the regulations and standards specified by each country.

Dimensions (Unit: mm)

Sensor

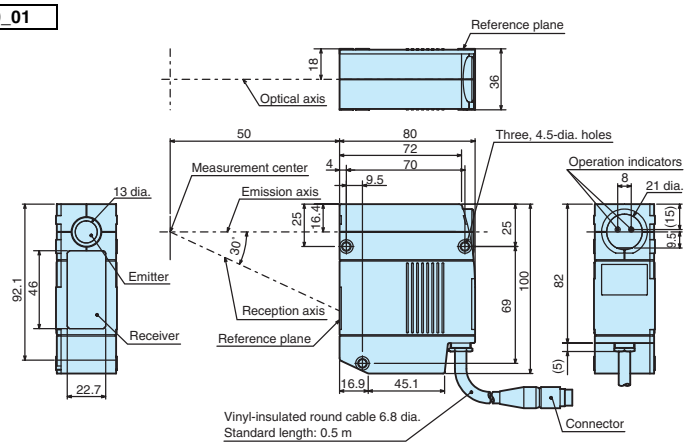
Z500-SW2T

CAD file	Z500_01



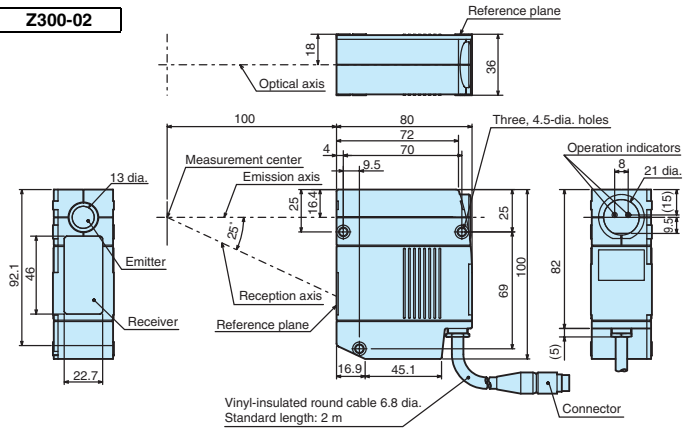
Z500-SW6

CAD file	Z300_01



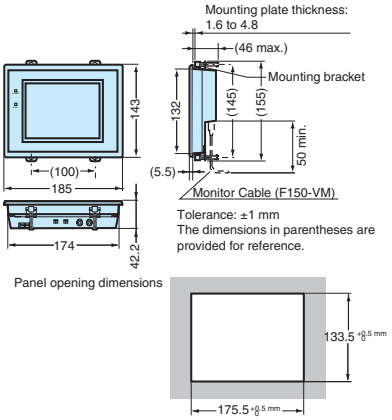
Sensor
Z500-SW17

CAD file	Z300-02



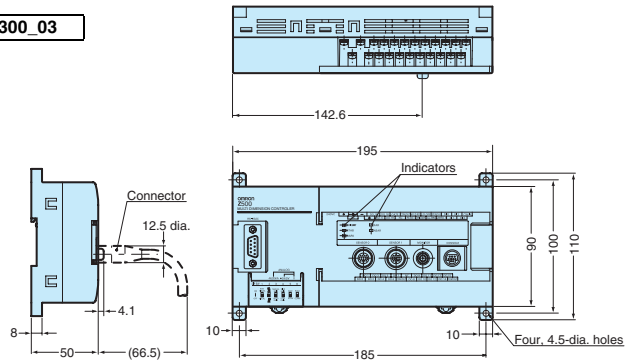
Liquid Crystal Monitor
F150-M05L

CAD file	F150_06



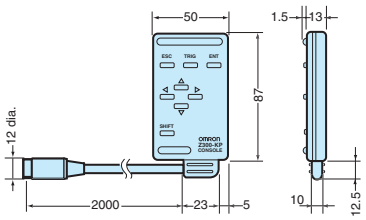
Controller
Z500-MC10E/MC15E

CAD file	Z300_03



Console
Z300-KP

CAD file	F150_02



Certain Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all catalogs, manuals or other documents, whether electronic or in writing, relating to the sale of goods or services (collectively, the "Goods") by Omron Electronics LLC and its subsidiary companies ("Seller"). Seller hereby objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms. Please contact your Omron representative to confirm any additional terms for sales from your Omron company.
2. Prices. All prices stated are current, subject to change without notice by Seller. Buyer agrees to pay the price in effect at time of shipment.
3. Discounts. Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Seller's payment terms and (ii) Buyer has no past due amounts owing to Seller.
4. Orders. Seller will accept no order less than $200 net billing.
5. Governmental Approvals. Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Goods.
6. Taxes. All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Seller or required to be collected directly or indirectly by Seller for the manufacture, production, sale, delivery, importation, consumption or use of the Goods sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Seller.
7. Financial. If the financial position of Buyer at any time becomes unsatisfactory to Seller, Seller reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Seller may (without liability and in addition to other remedies) cancel any unshipped portion of Goods sold hereunder and stop any Goods in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
8. Cancellation; Etc. Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Seller fully against all costs or expenses arising in connection therewith.
9. Force Majeure. Seller shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
10. Shipping; Delivery. Unless otherwise expressly agreed in writing by Seller:
    a. Shipments shall be by a carrier selected by Seller;
    b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
    c. All sales and shipments of Goods shall be FOB shipping point (unless otherwise stated in writing by Seller), at which point title to and all risk of loss of the Goods shall pass from Seller to Buyer, provided that Seller shall retain a security interest in the Goods until the full purchase price is paid by Buyer;
    d. Delivery and shipping dates are estimates only.
    e. Seller will package Goods as it deems proper for protection against normal handling and extra charges apply to special conditions.
11. Claims. Any claim by Buyer against Seller for shortage or damage to the Goods occurring before delivery to the carrier must be presented in writing to Seller within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Goods from Seller in the condition claimed.
12. Warranties. (a) Exclusive Warranty. Seller's exclusive warranty is that the Goods will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Seller (or such other period expressed in writing by Seller). Seller disclaims all other warranties, express or implied. (b) Limitations. SELLER MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE GOODS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE GOODS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Seller further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Goods or otherwise of any intellectual property right. (c) Buyer Remedy. Seller's sole obligation hereunder shall be to replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Good or, at Seller's election, to repay or credit Buyer an amount equal to the purchase price of the Good; provided that in no event shall Seller be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Goods unless Seller's analysis confirms that the Goods were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any goods by Buyer must be approved in writing by Seller before shipment. Seller shall not be liable for the suitability or unsuitability or the results from the use of Goods in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.
13. Damage Limits; Etc. SELLER SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE GOODS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Seller exceed the individual price of the Good on which liability is asserted.
14. Indemnities. Buyer shall indemnify and hold harmless Seller, its affiliates and its employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Seller is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Goods. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Seller and defend or settle any action brought against Seller to the extent that it is based on a claim that any Good made to Buyer specifications infringed intellectual property rights of another party.
15. Property; Confidentiality. The intellectual property embodied in the Goods is the exclusive property of Seller and its affiliates and Buyer shall not attempt to duplicate it in any way without the written permission of Seller. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Seller. All information and materials supplied by Seller to Buyer relating to the Goods are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
16. Miscellaneous. (a) Waiver. No failure or delay by Seller in exercising any right and no course of dealing between Buyer and Seller shall operate as a waiver of rights by Seller. (b) Assignment. Buyer may not assign its rights hereunder without Seller's written consent. (c) Amendment. These Terms constitute the entire agreement between Buyer and Seller relating to the Goods, and no provision may be changed or waived unless in writing signed by the parties. (d) Severability. If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (e) Setoff. Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (f) As used herein, "including" means "including without limitation".

Certain Precautions on Specificatons and Use

1. Suitability of Use. Seller shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Good in the Buyer's application or use of the Good. At Buyer's request, Seller will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Good. This information by itself is not sufficient for a complete determination of the suitability of the Good in combination with the end product, machine, system, or other application or use. The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of this Good, nor is it intended to imply that the uses listed may be suitable for this Good:
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   (iii) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Good.

   NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE SELLER'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
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