

The scalable measurement sensor for all surfaces

# ZS-HL series

- High dynamic sensing range for all surfaces
- High resolution of 0.25 μm
- Modular and scalable platform concept for up to 9 sensors
- Easy to use, to install and to maintain for all user levels
- Fast response time of 110 μs
- Multitasking capability manages up to 4 measurement tools in one controller



## Ordering Information

### Sensors

#### ZS-HL-series Sensor Heads

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution <sup>*1</sup>	Model
Regular Reflective	20 ± 1 mm	Line beam	1.0 mm x 20 μm	0.25 μm	ZS-HLDS2T
Diffuse Reflective	50 ± 5 mm		1.0 mm x 30 μm	0.25 μm	ZS-HLDS5T
	100 ± 20 mm		3.5 mm x 60 μm	1 μm	ZS-HLDS10
	600 ± 350 mm		16 mm x 0.3 mm	8 μm	ZS-HLDS60
	1,500 ± 500 mm		40 mm x 1.5 mm	500 μm	ZS-HLDS150

\*1: Refer to the table of ratings and specifications for details.

#### ZS-HL-series Sensor Heads (For Nozzle Gaps) also compatible with ZS-L controller

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution <sup>*1</sup>	Model
Regular Reflective	10 ± 0.5 mm	Line beam	900 x 25 μm	0.25 μm	ZS-LD10GT
	15 ± 0.75 mm				ZS-LD15GT

\*1: Refer to the table of ratings and specifications for details.

#### ZS-L-series Sensor Heads

Optical System	Sensing distance	Beam shape	Beam diameter	Resolution <sup>*1</sup>	Model
Diffuse reflection	50 ± 5 mm	Line beam	900 x 60 μm	0.8 μm	ZS-LD50
		Spot beam	50 μm dia.		ZS-LD50S
	80 ± 15 mm	Line beam	900 x 60 μm	2 μm	ZS-LD80
	130 ± 15 mm		600 x 70 μm	3 μm	ZS-LD130
	200 ± 50 mm		900 x 100 μm	5 μm	ZS-LD200
350 ± 135 mm	Spot beam	dia. 240 μm	20 μm	ZS-LD350S	
Regular reflection	20 ± 1 mm	Line beam	900 x 25 μm	0.25 μm	ZS-LD20T
		Spot beam	25 μm dia.		ZS-LD20ST
	40 ± 2.5 mm	Line beam	2,000 x 35 μm	0.4 μm	ZS-LD40T

\*1: This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.

Sensor Controllers

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-HLDC11
		PNP outputs	ZS-HLDC41
			ZS-HLDC41A (incl. USB cable + Smart Monitor)

Multi Controllers

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-MDC11
		PNP outputs	ZS-MDC41

Data Storage Units

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-DSU11
		PNP outputs	ZS-DSU41

Accessories (Sold Separately)

Controller Link

Shape	Model
	ZS-XCN

Panel Mount Adapter

Shape	Model	
	ZS-XPM1	For 1st Controller
	ZS-XPM2	For expansion (from 2nd Controller on)

Cables for Connecting to a Personal Computer

Shape	Model	Type	Qty
	ZS-XRS2	RS-232C	1
	ZS-XUSB2	USB	

Extension Cables for Sensor Heads

Cable length	Model	Qty
1 m	ZS-XC1A	1
4 m	ZS-XC4A	1
5 m	ZS-XC5B <sup>1,2</sup>	1
8 m	ZS-XC8A	1
10 m	ZS-XC10B <sup>1</sup>	1

<sup>1</sup>. Up to two ZS-XC□B Cables can be connected (22 m max.).  
<sup>2</sup>. A Robot Cable (ZS-XC5BR) is also available.

Logging Software

Name	Model
Smart Monitor Zero Professional	ZS-SW11E

Memory Card

Model	Model
F160-N64S(S)	64 MB
QM300-N128S	128 MB
F160-N256S	256 MB

Safety Precautions for Using Laser Equipment

**Laser Label Indications**

Attach the following warning label to the side of the ZS-L-series Sensor Head.

**WARNING**

LASER RADIATION

DO NOT STARE INTO BEAM

CLASS 2 LASER PRODUCT

MAXIMUM OUTPUT: 10mW

PULSE DURATION: <math>250\mu\text{s}</math>

WAVELENGTH: 650nm

EN 60825-1:1984

\*A11:1996 \*A2:2001

Specifications

Sensor Heads

ZS-HL-series Sensor Heads

Item	ZS-HLDS2T		ZS-HLDS5T		ZS-HLDS10		ZS-HLDS60	ZS-HLDS150	
Applicable Controllers	ZS-HLDC Series								
Optical system	Regular reflection	Diffuse reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Diffuse reflection	
Measurement center distance	20 mm	5.2 mm	50 mm	44 mm	100 mm	94 mm	600 mm	1,500 mm	
Measuring range	±1 mm		±5 mm	±4 mm	±20 mm	±16 mm	±350 mm	±500 mm	
Light source	Visible semiconductor laser (wavelength 650 nm, 1 mW max., Class 2)						Visible semiconductor laser (wavelength 658 nm, 1 mW max., Class 2)		
Beam type	Line beam								
Beam diameter <sup>1</sup>	20 μm × 1.0 mm		30 μm × 1.0 mm		60 μm × 3.5 mm		0.3 mm × 16 mm	1.5 mm × 40 mm	
Linearity <sup>2</sup>	±0.05 %F.S.		±0.1 %F.S.				±0.07 %F.S. (250 mm to 750 mm) ±0.1 %F.S. (750 mm to 950 mm)	±0.2 %F.S.	
Resolution <sup>3</sup>	0.25 μm (average 256)		0.25 μm (average 512)		1 μm (average 64)		8 μm (average 64) (at 250 mm) 40 μm (average 64) (at 600 mm)	500 μm (average 64)	
Temperature characteristic <sup>4</sup>	±0.01 %F.S./°C								
Sampling cycle	110 μs (High-Speed mode), 500 μs (Standard mode), 2.2 ms (High-Resolution mode), 4.4 ms (High-Sensitivity mode)								
Indicators	NEAR indicator	Lits near the measurement center, and nearer than the measurement center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.							
	FAR indicator	Lits near the measurement center, and further than the measurement center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.							
Operating ambient illumination	Illumination on received light surface 3,000 lx or less (incandescent light)						Illumination on received light surface 1,000 lx or less (incandescent light)	Illumination on received light surface 500 lx or less (incandescent light)	
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 % (with no condensation)								
Degree of protection	IP64 (IEC60529)		When the cable length is 0.5 m: IP66 (IEC60529) When the cable length is 2 m: IP67 (IEC60529)				IP66 (IEC60529)		
Vibration resistance (destructive)	10 to 150 Hz, 0.7 mm double amplitude, 80 min each in X, Y, and Z directions								
Shock resistance (destructive)	150 m/s <sup>2</sup> 3 times each in six directions (up/down, left/right, forward/backward)								
Materials	Case: aluminum die-cast, front cover: glass								
Cable length	0.5 m, 2 m						0.5 mm		
Weight	Approx. 350 g		Approx. 600 g				Approx. 800 g		

F.S.: Full scale of measurement

<sup>1</sup>. Defined as 1/e<sup>2</sup> (13.5 %) of the center optical intensity in the measurement center distance. The beam diameter is sometimes influenced by the ambient conditions of the workpiece such as leaked light from the main beam.

<sup>2</sup>. This is the error on the measured value with respect to an ideal straight line. Linear curve may change according to the workpiece. The following lists the workpieces

Model	Diffusive reflection	Mirror reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T/HLDS10	White alumina ceramic	Glass
ZS-HLDS60/HLDS150	White alumina ceramic	-

<sup>3</sup>. This is the "peak-to-peak" displacement conversion value of the displacement output in the measurement center distance when High-Resolution mode and the average number in the table are set (For ZS-HLDS60, the maximum resolution at 250 mm is also included). The following lists the workpieces.

Model	Diffusive reflection	Mirror reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T	White alumina ceramic	Glass
ZS-HLDS10	White alumina ceramic	
ZS-HLDS60/HLDS150	White alumina ceramic	-

<sup>4</sup>. Value obtained when the sensor part and object part are fixed with an aluminum jig.

ZS-L-series Sensor Heads

Item	Model	ZS-LD20T		ZS-LD20ST		ZS-LD40T		ZS-LD10GT	ZS-LD15GT		
Applicable Controllers	ZS-HLDC / ZS-LDC Series										
Optical system	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection				
Measuring center distance	20 mm	6.3 mm	20 mm	6.3 mm	40 mm	30 mm	10 mm	15 mm			
Measuring range	±1 mm	±1 mm	±1 mm	±1 mm	±2.5 mm	±2 mm	±0.5 mm	±0.75 mm			
Light source	Visible semiconductor laser (wavelength: 650 nm, 1 mW max., Class 2)										
Beam shape	Line beam			Spot beam		Line beam					
Beam diameter <sup>*1</sup>	900 x 25 µm		25 µm		2,000 x 35 µm			Approx. 25 x 900 µm			
Linearity <sup>*2</sup>	±0.1% F.S.										
Resolution <sup>*3</sup>	0.25 µm					0.4 µm		0.25 µm			
Temperature characteristic <sup>*4</sup>	0.04% F.S./°C					0.02% F.S./°C		0.04% F.S./°C			
Sampling cycle <sup>*5</sup>	110 µs										
Indicators	NEAR indicator	Lights near the measuring center distance, and nearer than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
	FAR indicator	Lights near the measuring center distance, and further than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
Operating ambient illumination	Illumination on received light surface: 3,000 lx or less (incandescent light)										
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% (with no condensation)										
Degree of protection	Cable length 0.5 m: IP66, cable length 2 m: IP67							IP40			
Materials	Case: Aluminum die-cast, Front cover: Glass										
Cable length	0.5 m, 2 m										
Weight	Approx. 350 g							Approx. 400 g			
Accessories	Laser labels (1 each for JIS/EN, 3 for FDA), Ferrite cores (2), Insure Locks (2), Instruction Sheet							Laser safety labels (1 each for JIS/EN), ferrite cores (2), insure locks (2)			

- \*1. Defined as  $1/e^2$  (13.5 %) of the center optical intensity at the actual measurement center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.
- \*2. This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode of the ZS-LD20T/40T/50. Linearity may change according to the workpiece.
- \*3. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.
- \*4. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.
- \*5. This value is obtained when the measuring mode is set to the high-speed mode.

Item	Model	ZS-LD50		ZS-LD50S		ZS-LD80		ZS-LD130		ZS-LD200		ZS-LD350S
Applicable Controllers	ZS-HLDC / ZS-LDC Series											
Optical system	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Diffuse reflection
Measuring center distance	50 mm	47 mm	50 mm	47 mm	80 mm	78 mm	130 mm	130 mm	200 mm	200 mm	350 mm	
Measuring range	±5 mm	±4 mm	±5 mm	±4 mm	±15 mm	±14 mm	±15 mm	±12 mm	±50 mm	±48 mm	±135 mm	
Light source	Visible semiconductor laser (wavelength: 650 nm, 1 mW max., Class 2)											
Beam shape	Line beam			Spot beam		Line beam						Spot beam
Beam diameter <sup>*1</sup>	900 x 60 µm			50 µm dia.		900 x 60 µm		600 x 70 µm		900 x 100 µm		240 µm dia.
Linearity <sup>*2</sup>	±0.1% F.S.							±0.25% F.S.	±0.1% F.S.	±0.25% F.S.	±0.1% F.S.	
Resolution <sup>*3</sup>	0.8 µm				2 µm		3 µm		5 µm		20 µm	
Temperature characteristic <sup>*4</sup>	0.02% F.S./°C					0.01% F.S./°C		0.02% F.S./°C			0.04% F.S./°C	
Sampling cycle <sup>*5</sup>	110 µs											
Indicators	NEAR indicator	Lights near the measuring center distance, and nearer than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.										
	FAR indicator	Lights near the measuring center distance, and further than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.										
Operating ambient illumination	Illumination on received light surface: 3,000 lx or less (incandescent light)						Illumination on received light surface: 2,000 lx or less (incandescent light)		Illumination on received light surface: 3,000 lx or less (incandescent light)			

Item	Model	ZS-LD50	ZS-LD50S	ZS-LD80	ZS-LD130	ZS-LD200	ZS-LD350S
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% (with no condensation)					
Degree of protection		Cable length 0.5 m: IP66, cable length 2 m: IP67					
Materials		Case: Aluminum die-cast, Front cover: Glass					
Cable length		0.5 m, 2 m					
Weight		Approx. 350 g					
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), Ferrite cores (2), Insure Locks (2), Instruction Sheet					

- <sup>1</sup>. Defined as  $1/e^2$  (13.5 %) of the center optical intensity at the actual measurement center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.
- <sup>2</sup>. This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode of the ZS-LD20T/40T/50. Linearity may change according to the workpiece.
- <sup>3</sup>. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.
- <sup>4</sup>. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.
- <sup>5</sup>. This value is obtained when the measuring mode is set to the high-speed mode.

## Sensor Controllers

### ZS-HLDC11/HLDC41

Sensor Controllers		Model	ZS-HLDC11	ZS-HLDC41
No. of samples to average			1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, or 4096	
Number of mounted Sensors			1 per Sensor Controller	
External interface	Connection method		Serial I/O: connector, Other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, Full Speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Outputs	Judgement outputs	3 outputs: HIGH, PASS, and LOW NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW PNP open-collector, 50 mA max., residual voltage: 1.2 V max.
Linear outputs		Selectable from 2 types of output, voltage or current (selected by slide switch on base). Voltage output: -10 to 10 V, output impedance: 40Ω. Current output: 4 to 20 mA, maximum load resistance: 300Ω.		
Inputs	Laser OFF, ZERO reset timing, RESET	ON: Short-circuited with 0V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage OFF: Open (leakage current: 0.1 mA max.)	
Functions		Display:	Measured value, threshold value, voltage/current, received light amount, and resolution	
		Sensing:	Mode, gain, measurement object, head installation	
		Filter:	Smooth, average, and differentiation	
		Outputs:	Scaling, various hold values, and zero reset	
		I/O settings:	Linear (focus/correction), judgements (hysteresis and timer), non-measurement, and bank (switching and clear)	
		System:	Save, initialization, measurement information display, communications settings, key lock, language, and data load	
		Task:	Single- or multi-task	
Status indicators			HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (orange), and ENABLE (green)	
Segment display	Main display		8-segment red LED, 6 digits	
	Sub-display		8-segment green LED, 6 digits	
LCD			16 digits x 2 rows, Color of characters: green, Resolution per character: 5 x 8 pixel matrix	
Setting inputs	Setting keys		Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
	Slide switch		Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	
Power supply voltage			21.6 V to 26.4 VDC (including ripple)	
Current consumption			0.5 A max. (when Sensor Head is connected)	
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% (with no condensation)	
Materials			Case: Polycarbonate (PC)	
Weight			Approx. 280 g (excluding packing materials and accessories)	
Accessories			Ferrite core (1), Instruction Sheet	

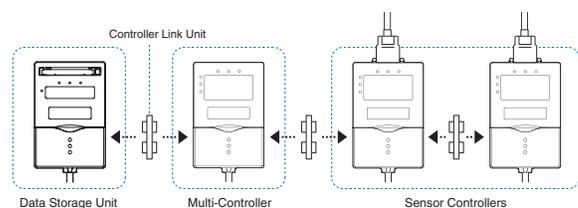
### ZS-MDC11/MDC41 Multi-Controllers

Basic specifications are the same as those for the Sensor Controllers.

The following points, however, are different.

- (1) Sensor Heads cannot be connected.
- (2) A maximum 9 of Controllers can be connected. Control Link Units are required to connect Controllers.
- (3) Processing functions between Controllers:  
Math functions

Controller Link Unit  
Connection Using  
the ZS-XCN



Data Storage Units

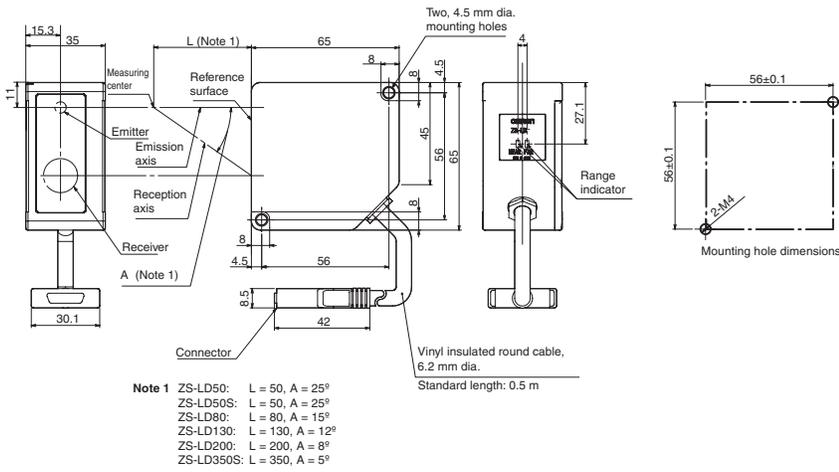
Sensor Controllers		Model	ZS-DSU11	ZS-DSU41
Number of mounted Sensor Heads		Cannot be connected		
Number of connectable Controllers		10 Controllers max. (ZS-MDC: 1 Controller, ZS-HLDC: 9 Controllers max.) <sup>1)</sup>		
Connectable Controllers		ZS-HLDC□□□, ZS-MDC□□		
External interface	Connection method		Serial I/O: connector, Other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, Full Speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Outputs		3 outputs: HIGH, PASS, and LOW NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW PNP open-collector, 50 mA max., residual voltage: 1.2 V max.
Inputs		ON: Short-circuited with 0V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage OFF: Open (leakage current: 0.1 mA max.)	
Data resolution		32 bits		
Functions	Logging trigger functions		Start and stop triggers can be set separately; external triggers, data triggers (self-triggers), and time triggers	
	Other functions		External banks, alarm outputs, saved data format customization, and clock	
Status indicators		OUT (orange), PWR (green), ACCESS (orange), and ERR (red)		
Segment display		8-segment green LEDs, 6 digits		
LCD		16 digits x 2 rows, Color of characters: green, Resolution per character: 5 x 8 pixel matrix		
Setting inputs	Setting keys		Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
	Slide switch		Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	
Power supply voltage		21.6 V to 26.4 VDC (including ripple)		
Current consumption		0.5 A max.		
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% (with no condensation)		
Materials		Case: Polycarbonate (PC)		
Weight		Approx. 280 g (excluding packing materials and accessories)		
Accessories		Ferrite core (1) Instruction Sheet, Tools for Data Storage Unit: CSV File Converter for Data Storage Unit, Smart Analyzer Macro Edition (Excel macros for analysis of collected data)		

<sup>1)</sup> Control Link Units are required to connect Controllers.



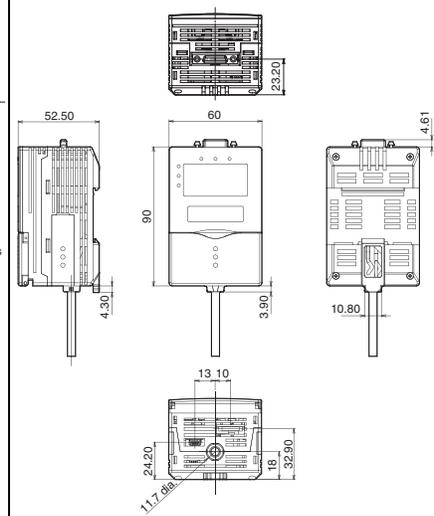
Sensor Heads

ZS-LD50/LD50S/LD80/ZS-LD130/LD200/ZS-LD350S

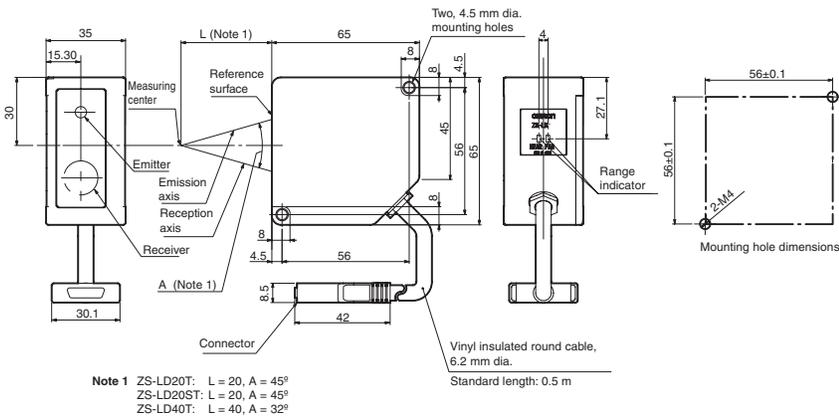


Sensor Controllers

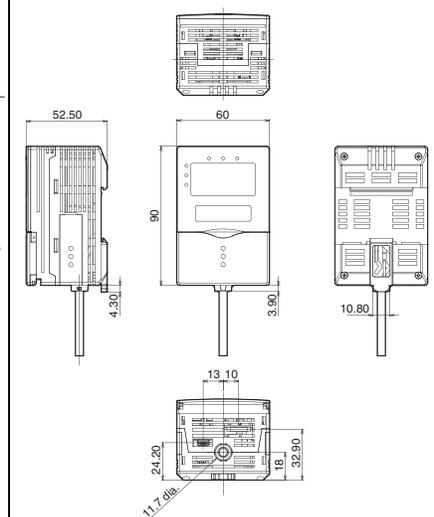
ZS-HLDC11/HLDC41



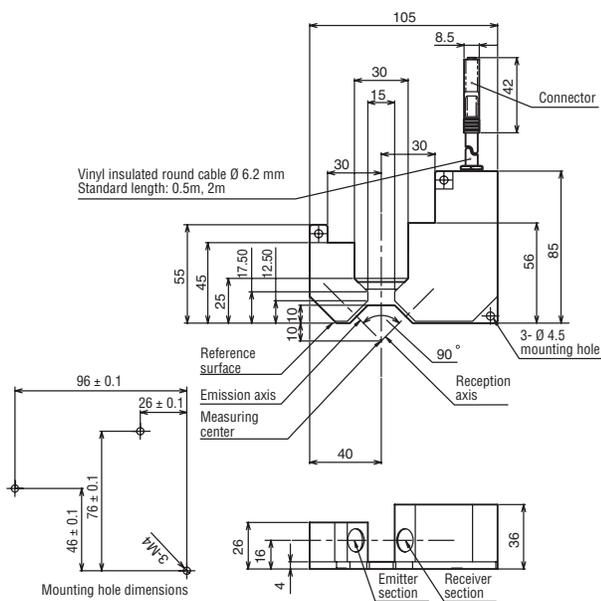
ZS-LD20T/LD20ST/LD40T



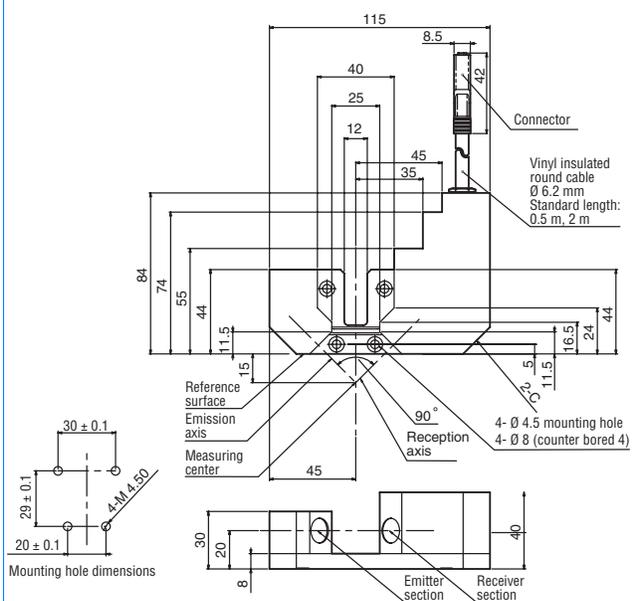
ZS-MDC11/MDC41 Multi-Controllers



ZS-LD10GT

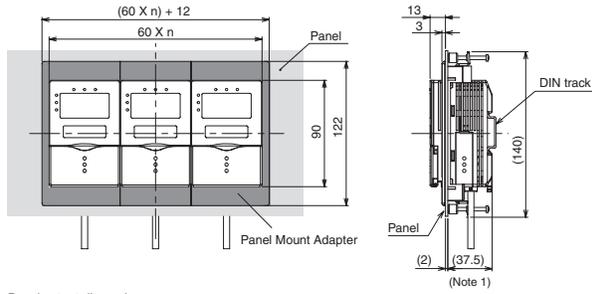


ZS-LD15GT

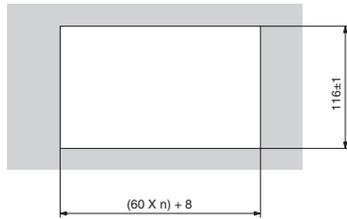


### Panel Mount Adapters

#### ZS-XPM1/XPM2 (Dimension for Panel Mounting)



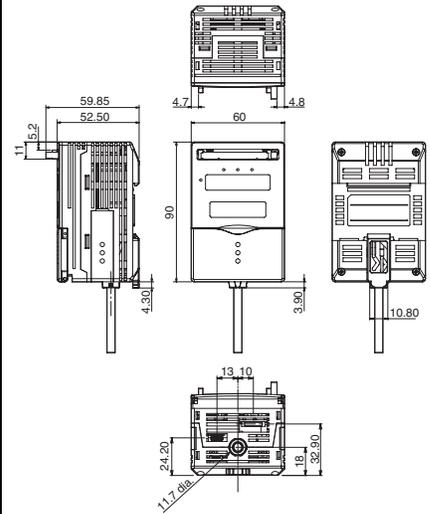
Panel cutout dimensions



**Note 1:** Dimensions are shown for a panel thickness of 2.0 mm.  
n: Number of gang-mounted Controllers (1 to 11)

### Data Storage Unit

#### ZS-DSU11/DSU41



# Terms and Conditions of Sale

1. **Offer; Acceptance.** These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron 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.
2. **Prices; Payment Terms.** All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
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 Omron's payment terms and (ii) Buyer has no past due amounts.
4. **Interest.** Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. **Orders.** Omron will accept no order less than \$200 net billing.
6. **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 Products.
7. **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 Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. **Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron 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, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products 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.
9. **Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. **Force Majeure.** Omron 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.
11. **Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
  - a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
  - 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 Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
  - d. Delivery and shipping dates are estimates only; and
  - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. **Warranties.** (a) **Exclusive Warranty.** Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products 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. See <http://www.omron247.com> or contact your Omron representative for published information.
14. **Limitation on Liability; Etc.** OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
15. **Indemnities.** Buyer shall indemnify and hold harmless Omron Companies and their 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 Omron 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 Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
16. **Property; Confidentiality.** Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
17. **Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

## Certain Precautions on Specifications and Use

1. **Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
  - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
  - (ii) Use in consumer products or any use in significant quantities.
  - (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
  - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. **Performance Data.** Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.
4. **Change in Specifications.** Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.
5. **Errors and Omissions.** Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Complete "Terms and Conditions of Sale" for product purchase and use are on Omron's website at [www.omron.com/oei](http://www.omron.com/oei) – under the "About Us" tab, in the Legal Matters section.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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