

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 ^{*1}	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 ^{*1}	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 ^{*1}	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 ^{*1,*2}	1
8 m	ZS-XC8A	1
10 m	ZS-XC10B ^{*1}	1

^{*1} Up to two ZS-XC□B Cables can be connected (22 m max.).
^{*2} 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:1.0mW
PULSE DURATION :20msec
WAVELENGTH :650nm

EN 60825-1:1984
*A1:1996 *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 ¹	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 ²	±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 ³	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 ⁴	±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 ² 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

- ¹. Defined as 1/e² (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.
- ². 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	-

- ³. 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	-

- ⁴. 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 ¹	900 x 25 μm			25 μm		2,000 x 35 μm		Approx. 25 x 900 μm		
Linearity ²	±0.1% F.S.									
Resolution ³	0.25 μm				0.4 μm		0.25 μm			
Temperature characteristic ⁴	0.04% F.S./°C				0.02% F.S./°C		0.04% F.S./°C			
Sampling cycle ⁵	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/e² (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	Regular 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			Line beam			Spot beam
Beam diameter ¹	900 x 60 μm			50 μm dia.		900 x 60 μm		600 x 70 μm		900 x 100 μm		240 μm dia.
Linearity ²	±0.1% F.S.						±0.25% F.S.		±0.1% F.S.		±0.25% F.S.	±0.1% F.S.
Resolution ³	0.8 μm			2 μm		3 μm		5 μm		20 μm		20 μm
Temperature characteristic ⁴	0.02% F.S./°C				0.01% F.S./°C		0.02% F.S./°C		0.04% F.S./°C		0.04% F.S./°C	
Sampling cycle ⁵	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						

- *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.

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		

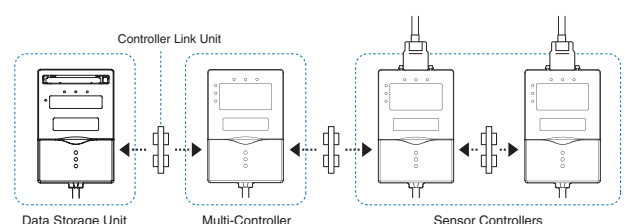
ZS-MDC11/MDC41 Multi-Controllers

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

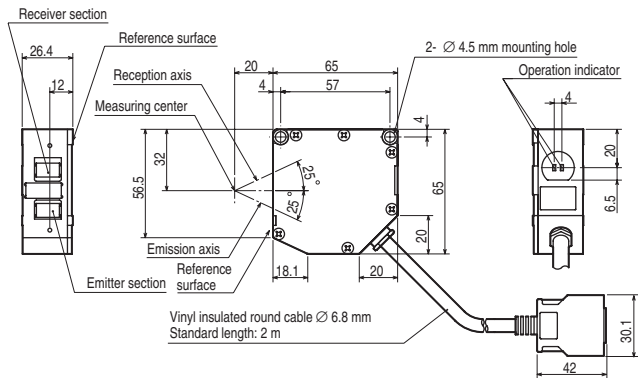
Sensor Controllers		Model	ZS-DSU11	ZS-DSU41
Number of mounted Sensor Heads		Cannot be connected		
Number of connectable Controllers		10 Controllers max. (ZS-MDC: 1 Controller, ZS-HLDC: 9 Controllers max.) ^{*1}		
Connectable Controllers		ZS-HLDC□□, ZS-MDC□□		
External interface	Connection method		Serial 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)		

*1. Control Link Units are required to connect Controllers.

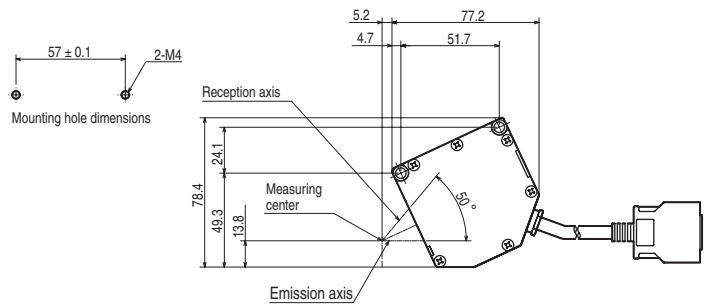
Dimensions

Sensor Heads

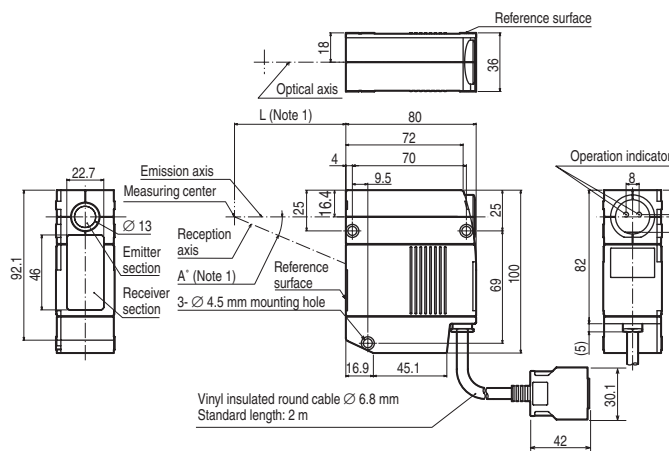
ZS-HLDS2T



When used in diffuse reflection

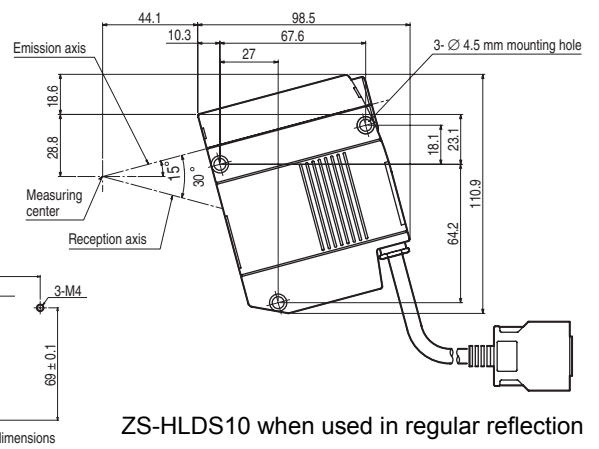


ZS-HLDS5T/HLDS10

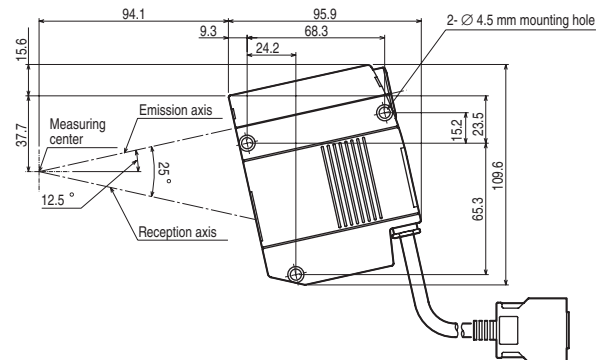


(Note 1): In the case of ZS-HLDS5T, L=50, A=30°
In the case of ZS-HLDS10, L=100, A=25°

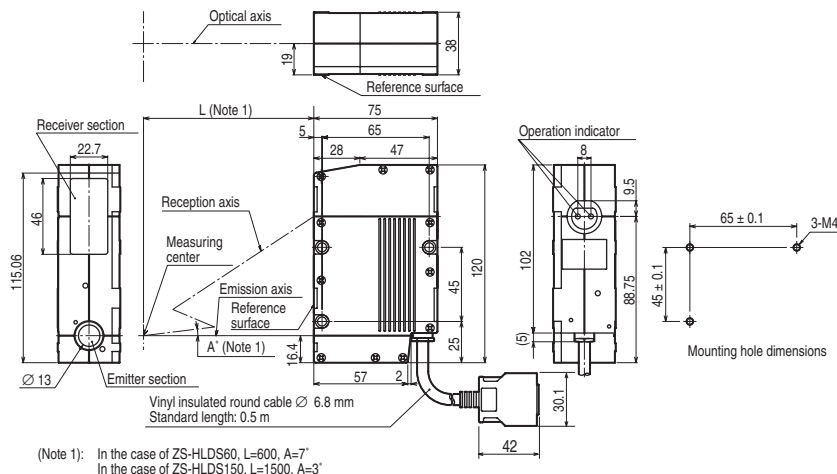
ZS-HLDS5T when used in regular reflection



ZS-HLDS10 when used in regular reflection



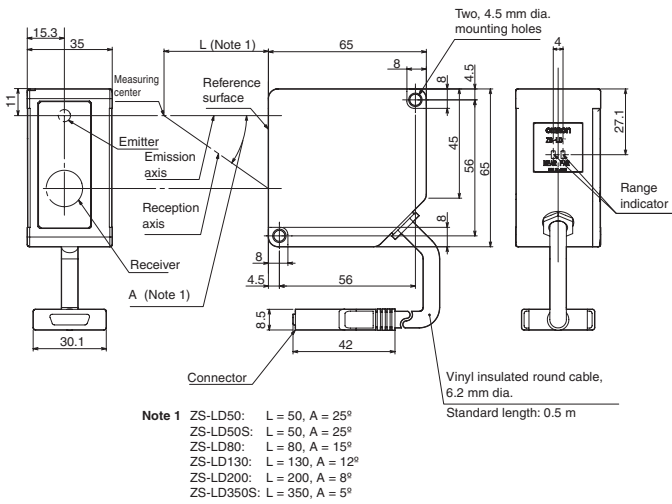
ZS-HLDS60/HLDS150



(Note 1): In the case of ZS-HLDS60, L=600, A=7°
In the case of ZS-HLDS150, L=1500, A=3°

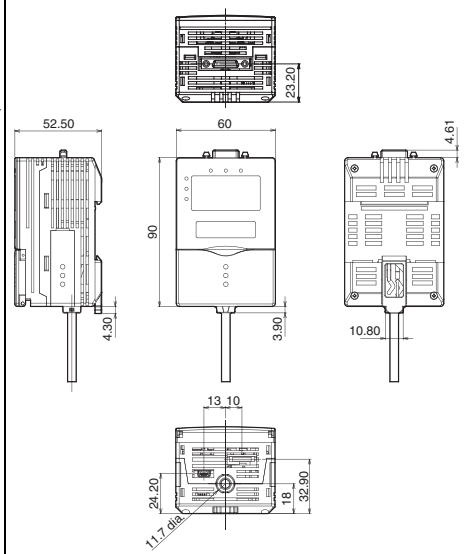
Sensor Heads

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

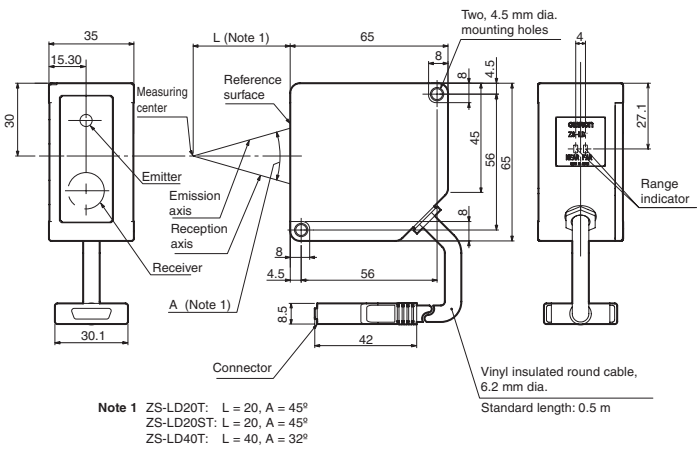


Sensor Controllers

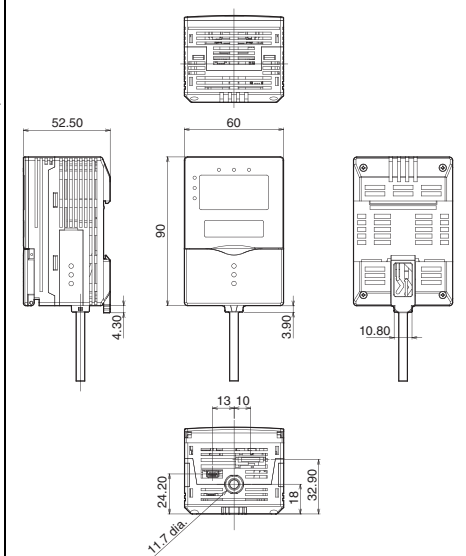
ZS-HLDC11/HLDC41



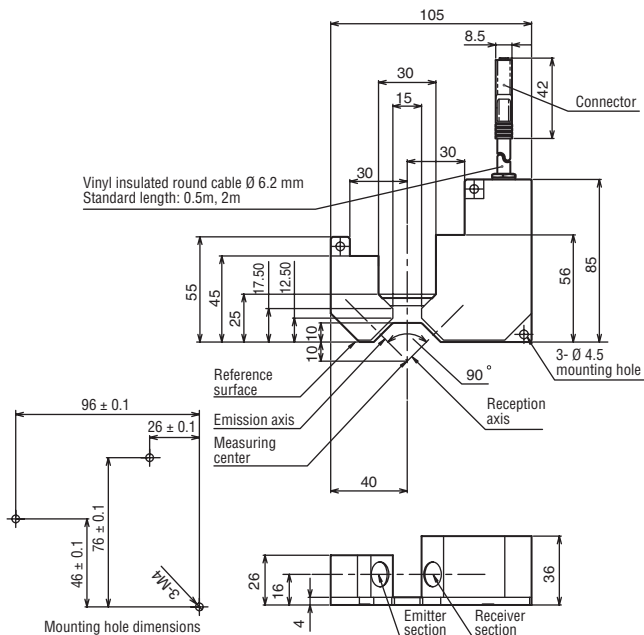
ZS-LD20T/LD20ST/LD40T



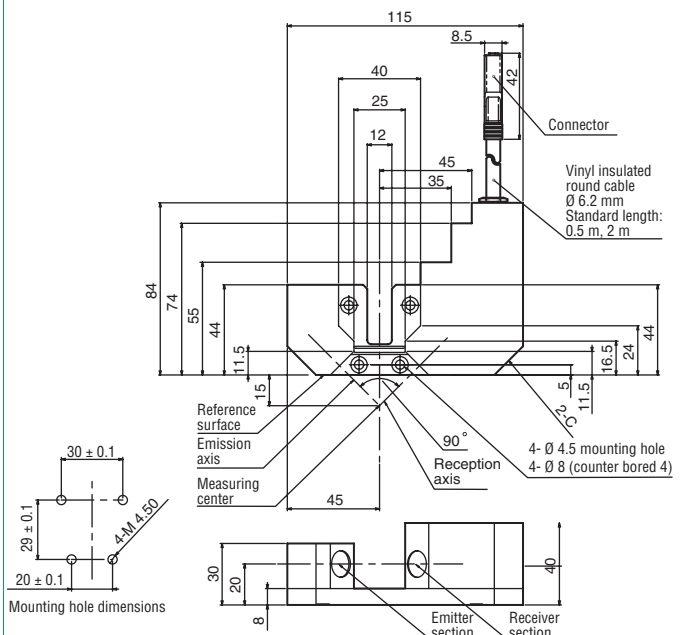
ZS-MDC11/MDC41 Multi-Controllers



ZS-LD10GT

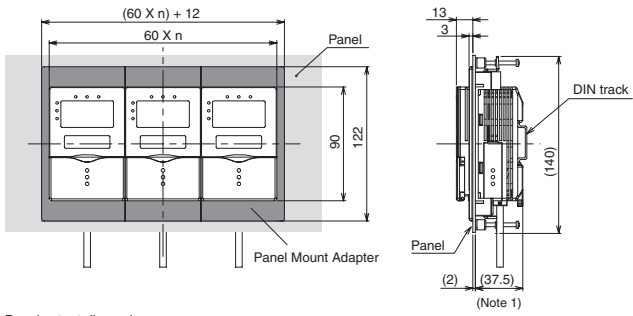


ZS-LD15GT

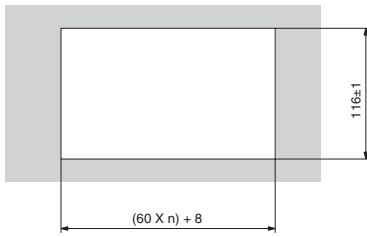


Panel Mount Adapters

ZS-XPM1/XPM2 (Dimension for Panel Mounting)



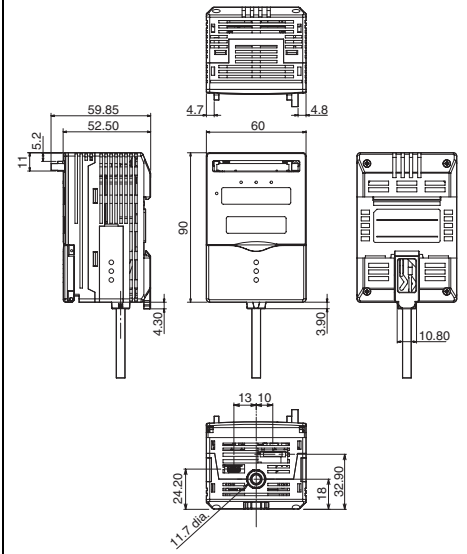
Panel cutout dimensions



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



READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

WARRANTY

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OMRON EUROPE B.V.

Wegalaan 67-69,
 NL-2132 JD, Hoofddorp,
 The Netherlands
 Phone: +31 23 568 13 00
 Fax: +31 23 568 13 88
 www.omron-industrial.com