ZS FAMILY SERIES

The scalable measurement sensor for all surfaces

» Sub-micron laser measurement

» Superb scalability

» Easy to use, integrate and operate

Advanced Industrial Automation

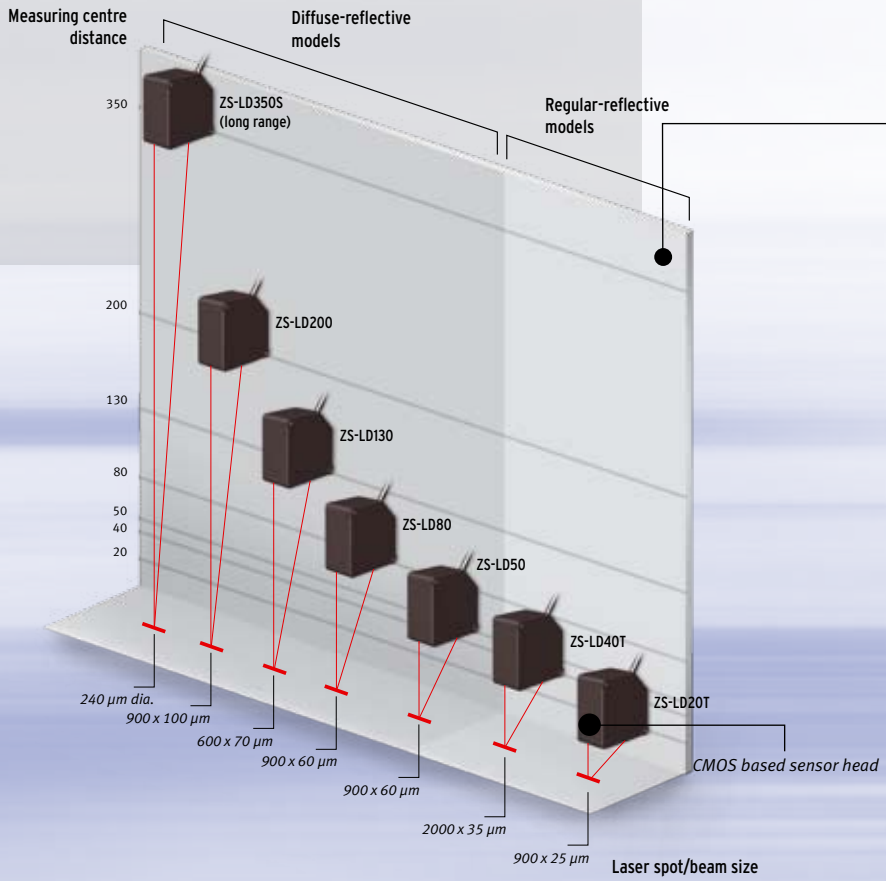
OMRON

Enhanced flexibility through smart scalability

ZS laser displacement sensors comprise a smart, modular and scalable family that offers a platform approach to solve the most challenging measurement tasks. Based on Omron CMOS technology, the ZS-L measures at sub-micron accuracy in a fraction of a millisecond – and virtually any texture. The ZS-L series comes with a sensor controller, a data storage unit and a multi-controller that coordinates up to 9 units. It enables accurate measurement of material thickness, evenness and warpage.

Key features

- Accurate and fast – 0.25 µm at less than 110 µs sampling time
- One sensor fits all – stable measurement of virtually any material structure such as glass, foil or rubber
- Powerful – can accurately measure thickness, warpage and evenness thanks to its multi-unit controller
- Smart – data storage unit for traceability and data logging
- Easy to use – built-in user interface and powerful, user-friendly PC configuration tool



Sensor Head

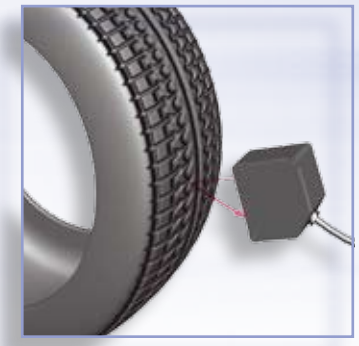
Sensor heads ZS-LD

CMOS technology packed into an ultra-compact sensor head.

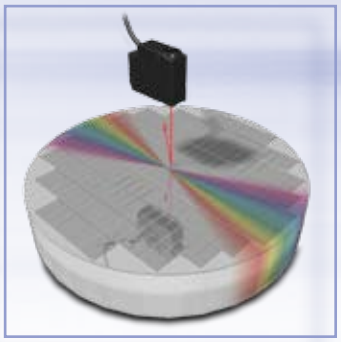
- Wide choice of sensor head from 20 mm to 350 mm sensing distance
- Digital technology leads to high immunity to noise disturbance, allowing long cable extension up to 22 m
- Up to IP67 protection class
- Laser class 2

CMOS technology enables unique, surface-independent detection

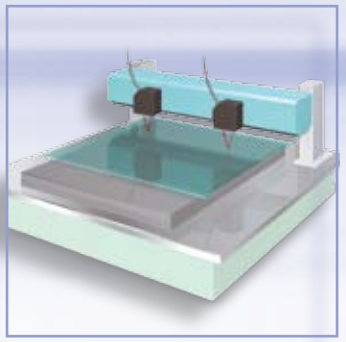
Measures various types of different targets, offering high accuracy on all surfaces



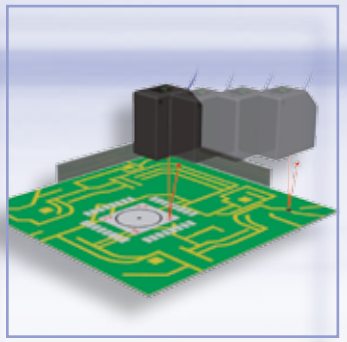
Type profile inspection



Wafer thickness and warping inspection



Glass evenness inspection



PC board height inspection

Up to 9 sensor controllers

High-speed bus

Monitor

SmartMonitor tool

Professional tool for configuration, set up and monitoring.

- Provides high-speed simultaneous multi-channel graphs
- Includes Excel macro for simple analysis
- Supports documentation and quality assurance tasks

Record

ZS-DSU data storage unit

Fast data storage allowing easy debugging and system set up.

- High-speed sampling rate: 150 µs
- Powerful support for logging data using various trigger functions
- Supports compact flash card for extended memory

Control

ZS-MDC multi-sensing controller unit

Coordinates data transfer between sensor controllers and performs high-speed calculation for complex measurements tasks.

- Coordinates data between up to nine controllers
- Fast calculation of measurements such as:
  - Thickness
  - Evenness
  - Warpage
  - 4 different tasks
  - Free math

Operate

ZS-LDC sensor controller

Ensures you always have the best measurement performance.

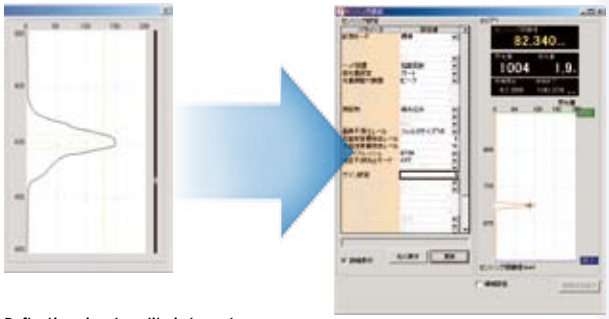
- Supports a wide range of sensor heads from short range (20 mm) to long range (350 mm)
- High accuracy – 0.4 µm
- Fast response time – 110 µs
- USB and RS-232 port
- Intuitive set up through built-in keypad and digital operator

Smart set up for different surfaces

Simply select your surface type and the ZS smart sensor concept sets all specific parameters for your application

Direct setting with function keys

Direct measurement of PCB surface profile structure



Reflection signal quality is traced during measurement. Reliable and safe operation is ensured through easy set up and control

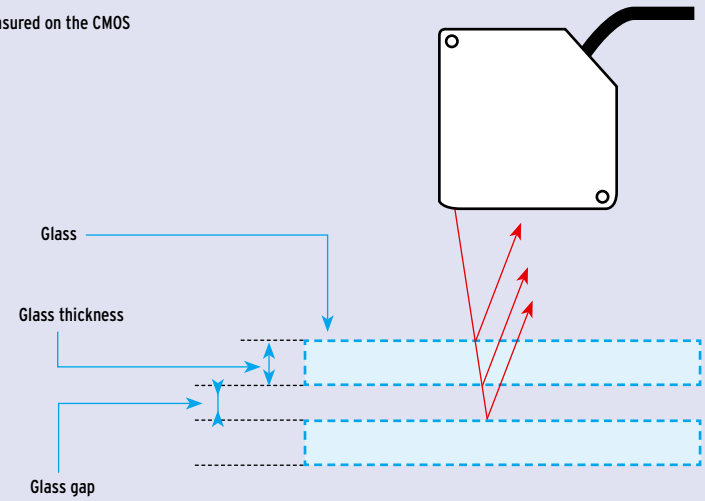
ZS-LD50/LD80
Stable measurements for PCBs, black resin and metal

To achieve stable sensing of PCBs, resins, black rubber, and other light-penetrating objects, all you need to do is select the surface type.

Smart setting software for advanced functionality

The SmartMonitor Zero Professional software provides a function that changes measurement levels (edge thresholds) to reduce error caused by light penetration, enabling many types of PCBs to be handled. The measurement level can be increased to adjust the measurement position for peak light reception. This function enables stable detection of PCB surfaces. If there is insufficient light in high-speed mode, gain settings (0 to 5) can be used to compensate.

A New Glass Mode
Different reflections can be measured on the CMOS



ZS-LD20T/ZS-LD40T
The smart way to measure glass and mirror surfaces

Detecting transparent objects

When a light beam hits the surface of an object, a certain amount of the light is reflected, some is transmitted through the object and the rest is absorbed. In the case of transparent materials such as glass, the ZS-L can obtain reflected light from the top surface, from the middle and from the bottom section of glass.

- Superior features for semiconductor wafer, glass and other measurements requiring precision.
- An unprecedented stationary measurement precision of 0.01 µm; the highest in this product class.
- Enables stable measurement of height and undulations in transparent, coated glass on worktables. Menus let you easily set the measurement conditions for a wide range of glass to achieve stable measurements.
- Outstanding measurement stability and high-speed response at submicron resolution enables measurement of flat glass thickness during the production process.

Set sensing directly
FUN (setting mode)

Direct setting with function keys

Set sensing directly

FUN (setting mode)

Clear 6-digit 2-line data display measures value against calculated one

Function keys and menu-driven operation for easy set-up. Teach-to-measure function is also available

Connect directly to a computer using USB

ZS-LDC – The most compact fully digital controller for the highest control functionality

Small and compact

The ZS-LDC controller is the size of a business card and is packed with Omron's leading-edge digital technology.

See what the sensor is doing

In RUN (measurement) mode, measured values and information are displayed using 2 rows of 8-segment LEDs. The large LED display improves visibility. Measurement information includes the threshold, current, resolution, and received light amount and is available with simple key operations. LCD screens can be customized to change the display of desired information to terminology that is easier to understand.

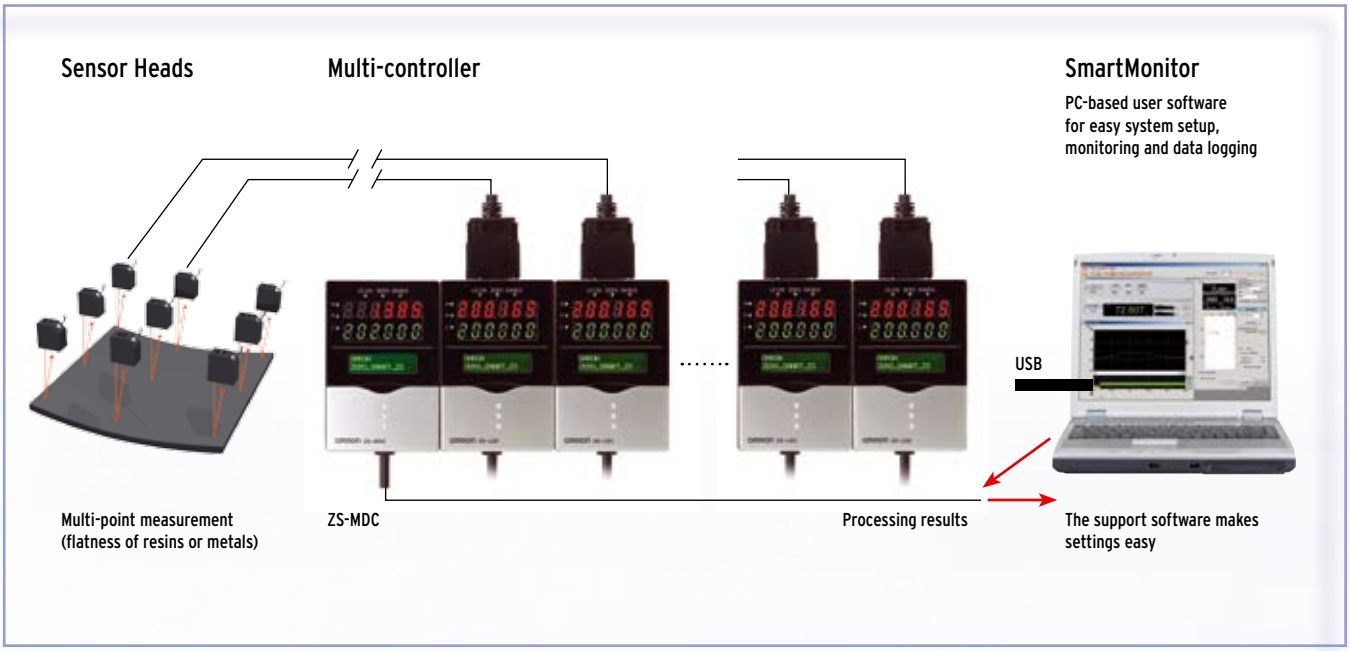
Easy to use (no programming)

In FUN (setting) mode, setting menus are displayed on the 2 rows of the LCD. The LCD's many display capabilities provide clear guidance for making settings. Function keys correspond to displayed menu items and measurement conditions, and other settings can be made intuitively. You can also easily switch the display language. Communication with the operator is better than ever before.

Connect directly to a PC

A USB 2.0 and RS-232C connection are provided as standard. LVDS, a new-generation high-speed communications interface, is used between the sensor head and controller, which is an industry first. If the USB is used to connect to the computer, high-speed all-digital measurement data transfer is possible.

Small and compact controller, as small as a business card



ZS-MDC – Connect & Calculate: Affordable multi-point sensing has never been easier

For complex applications such as measurement and inspection of flatness, thickness, steps etc., the ZS-MDC is the ideal answer. It can coordinate up to nine sensor controllers in split milliseconds.

Measurement Tools

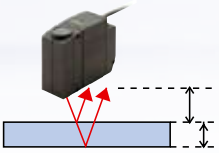
- Height measurement
- Step and gap measurement X-Y
- Thickness measurement K-(A+B)
- Flatness measurement Max-Min
- Average measurement
- Eccentricity measurement Peak to Peak
- Warpage/Evenness K+mX+nY

ZS-H – The highest precision combined with multitasking capabilities

For optimum quality of produced goods and zero defect production, you need highest precision and smart measurement tools. The ZS-HL expansion of the ZS series enables you to solve the most powerful measurement inspection tasks.

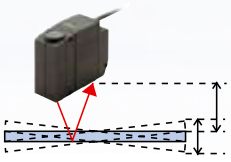
- Long range sensor heads
  Unique 1500 mm sensing distance
- Highest precision and linearity
  0.25µm with 0.05% linearity
- Head range includes nozzle gap sensor
  for leading edge inspection of moving targets
- Powerful multitasking function
  4 measurement tools in one controller

Simultaneous measurement and output of up to 4 features



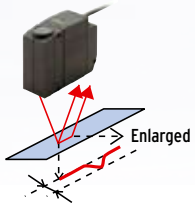
When simultaneous measurement of distance to glass, glass thickness, gap etc., is required in glass measurement applications.

Setting example
Task 1: Average
Task 2: Thickness



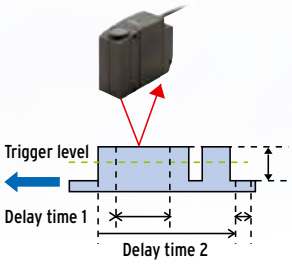
For simultaneous measurement of HDD surface deflection and distance to HDD surface.

Setting example
Task 1: Average, Average hold
Task 2: Average, Point-to-point hold



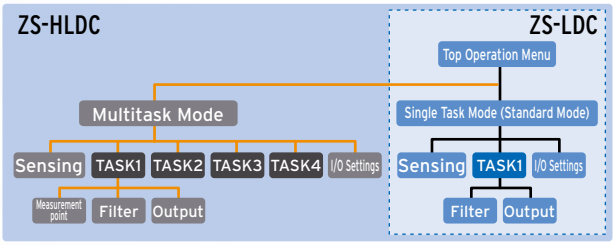
For detection of small recesses and protrusions in measurement location.

Setting example
Task 1: Step



For measurement of steps in different locations with moving sensor or workpiece.

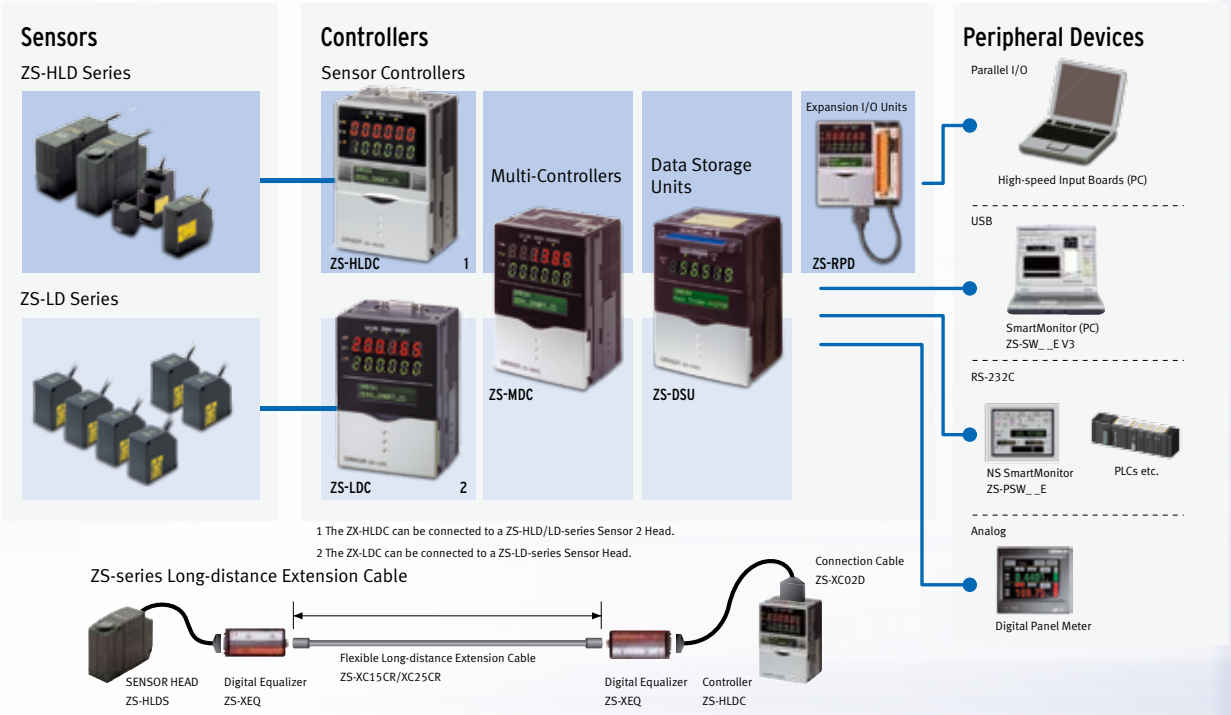
Setting example
Task 1: Average
Self-down trigger
Average hold
With delay
Task 2: Average
Average hold
With delay
Task 3: Calculation
(Task 2 – Task 1)



Smart scalability ensures the optimum solution

Take advantage of the excellent scalability of the ZS family and set up your application by choosing the ZS controller and head that best fit your application. ZS-L and ZS-H are fully compatible and can be mixed within a system.

... to the most powerful sensing application using ZS family heads, controllers, multi-controllers and data storage units.

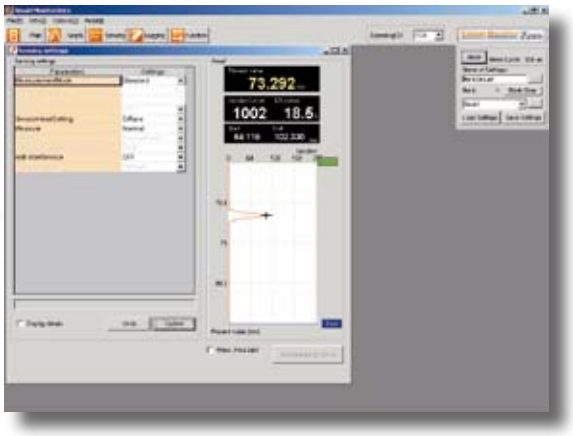


The ZS family: The most powerful smart measurement sensor system in the industry.

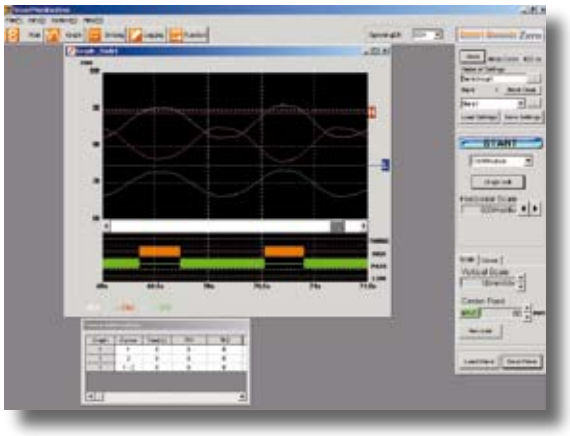
ZS-SW11E
The SmartMonitor PC tool that puts you in full control

The ultimate tool for easy system set up, parameter configuration and data logging, the SmartMonitor offers:

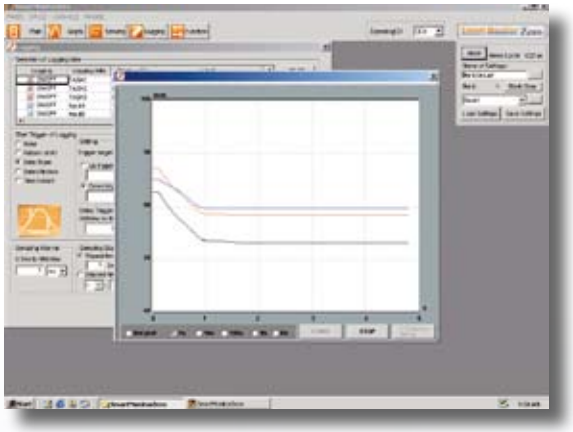
- Up to 9-channel data logging and display simultaneously
- Data logging intervals as short as 2 ms for precise monitoring at critical transients
- Export to Excel files
- Comprehensive macros using filters, slope compensation, filter median transitions, differentiation, integration, math functions and more



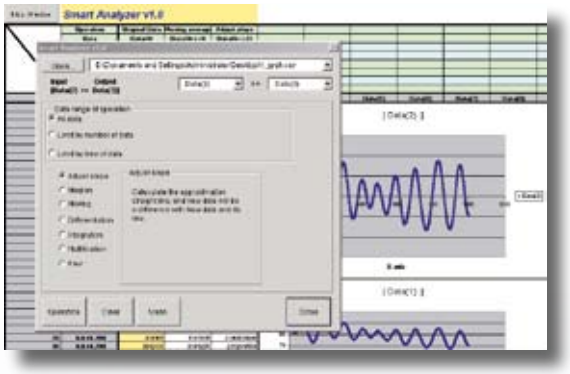
Sensing (Light Brightness)



Multi-channel Waveform Displays



Logging



Analysis

Recommended Operating Environment

- SmartMonitor Zero Professional
  OS: Windows 2000 or XP
  CPU: Pentium III, 850 MHz or higher
  (recommended: 2 GHz or higher)
  Memory: 128 MB or higher
  (recommended: 256 MB or higher)
  Available hard disk space: 50 MB or more
  Display: 800 x 600, high colour (16-bit) or higher
  (recommended: 1024 x 768, true colour (32-bit) or higher)
  If the recommended specifications are not used, data may be broken in the middle or waveforms may not be displayed properly for logging, high-speed graphs, and multi-channel waveforms.

- SmartAnalyzer Macro Edition
  This is a Microsoft Excel macro program;
  Microsoft Excel 2000 or higher is required.

ZS-HL-series Sensor Controllers

Shape	Supply voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-HLDC11
		PNP outputs	ZS-HLDC41

ZS-L-series Sensor Controllers

Shape	Supply voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-LDC11
		PNP outputs	ZS-LDC41

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

Specifications

ZS-L-series Sensor Heads

Item	Model	ZS-LD20T		ZS-LD20ST		ZS-LD40T		ZS-LD10GT	ZS-LD15GT
Applicable Controllers		ZS-HLDC/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	±0.5mm	±0.75 mm
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)							
Beam shape		Line beam		Spot beam		Line beam			
Beam diameter *1		900 x 25 μm		25 μm dia.		2,000 x 35 μm		Approx. 25 x 900 μm	
Linearity *2		±0.1%F.S.							
Resolution *3		0.25 μm		0.25 μm		0.4 μm		0.25 μm	0.25 μm
Temperature characteristic *4		0.04% FS/°C		0.04% FS/°C		0.02% FS/°C		0.04% FS/°C	
Sampling cycle		110 μs (High-speed Mode), 500 μs (Standard Mode), 2.2 ms (High-precision Mode), 4.4 ms (High-sensitivity Mode)							
LED Indicators	NEAR indica	Lights near the measuring center distance, and closer 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 farther 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: 3000 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 measuring 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 and glass in the regular reflection mode. 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 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.

ZS-L-series Sensor Heads

Item	Model	ZS-LD50		ZS-LD50S		ZS-LD80		ZS-LD130		ZS-LD200		ZS-LD350S
Applicable Controllers		ZS-HLDC/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
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., JIS Class 2)										
Beam shape		Line beam		Spot beam		Line 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.		±0.1%F.S.							±0.25% F.S.	±0.1% F.S.	±0.25% F.S.	±0.1%F.S.
Resolution *3		0.8 µm		0.8 µm		2 µm		3 µm		5 µm		20 µm
Temperature characteristic *4		0.02% FS/°C		0.02% FS/°C		0.01% FS/°C		0.02% FS/°C		0.02% FS/°C		0.04% FS/°C
Sampling cycle *5		110 µs (High-speed Mode), 500 µs (Standard Mode), 2.2 ms (High-precision Mode), 4.4 ms (High-sensitivity Mode)										
LED Indicators	NEAR indica	Lights near the measuring center distance, and closer 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 farther 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: 3000 lx or less (incandescent light)						Illumination on received light surface: 2000 lx or less (incandescent light)		Illumination on received light surface: 3000 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										
Materials		Case: Aluminum die-cast, Front cover: Glass										
Cable length		0.5 m, 2 m										
Weight		Approx. 350g										
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (2), insure locks (2), instruction sheet										

*1 Defined as 1/e2 (13.5%) of the center optical intensity at the actual measuring 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 and glass in the ZS-LD50/LD50S regular reflection mode. 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 and glass in the ZS-LD50/LD50S 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.

ZS-HL-series Sensor Heads

Item	Model	ZS-HLDS2T		ZS-HLDS5T		ZS-HLDS10	
Applicable Controllers		ZS-HLDC series					
Optical system		Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection
Measuring center distance		20 mm	5.2 mm	44 mm	50 mm	94 mm	100 mm
Measuring range		±1 mm	±1 mm	±4 mm	±5 mm	±16 mm	±20 mm
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)					
Beam shape		Line beam					
Beam diameter *1		1.0 mm x 20 µm		1.0 mm x 30 µm		3.5 mm x 60 µm	
Linearity *2		±0.05%F.S.		±0.1%F.S.			
Resolution *3		0.25 µm (No. of samples to average: 256)		0.25 µm (No. of samples to average: 512)		1 µm (No. of samples to average: 64)	
Temperature characteristic *4		0.01%F.S./°C					
Sampling cycle		110 µs (High-speed Mode), 500 µs (Standard Mode), 2.2 µs (High-precision Mode), 4.4 µs (High-sensitivity Mode)					
LED Indicators	NEAR indica	Lights near the measuring center distance, and closer 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 farther 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: 3000 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		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		Approx. 600 g			
Accessories		Laser labels (1 each for JIS/EN), ferrite cores (2), insure locks (2), instruction sheet					

*1 Defined as $1/e^2$ (13.5%) of the center optical intensity at the actual measuring 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. Linearity may change according to the workpiece. The following options are available.

Model	Diffuse reflection	Regular reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T/HLDS10	White aluminum ceramic	Glass
ZS-HLDS60/HLDS150	White aluminum ceramic	---

*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 within the graph. The maximum resolution at 250 mm is also shown for the ZS-HLDS60. The following options are available.

Model	Diffuse reflection	Regular reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T	White aluminum ceramic	
ZS-HLDS10/HLDS60/ HLDS150	White aluminum ceramic	

*4 This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.

ZS-HL/L-series Sensor Controllers

ItemModel			ZS-HLDC11/LDC11	ZS-HLDC41/LDC41
No. of samples to average			1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
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 max.), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Output	**Judgment output**	HIGH/PASS/LOW 3 outputs NPN open collector, 30 VDC, 50 mA max., residual voltage 1.2 V max.	HIGH/PASS/LOW: 3 outputs PNP open collector, 50 mA max., residual voltage 1.2 V max.
		Linear output	Selectable from 2 types of output, voltage or current (selected by slide switch on bottom). • Voltage output: .10 to 10 V, output impedance: 40 Ω • Current output: 4 to 20 mA, maximum load resistance: 300 Ω	
	Inputs	**Laser OFF, ZERO reset timing, RESET**	ON: Short-circuited with 0 V 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/terminal block output *1 Sensing: Mode, gain, measurement object, head installation Measurement point *2: Average, peak, bottom, thickness, step, and calculations Filter: Smooth, average, and differentiation Outputs: Scaling, various hold values, and zero reset I/O settings: Linear (focus/correction), judgments (hysteresis and timer), non-measurement, and bank (switching and clear) *2 System: Save, initialization, measurement information display, communications settings, key lock, language, and data load Task: ZS-HLDC□1: Single task or multitask (up to 4) ZS-LDC□1: Single task	
Status indicators			HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (green), and ENABLE (green)	
Segment display		**Main digital**	8-segment red LED, 6 digits	
		Sub-digital	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. (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)	
Degree of protection			IP 20	
Weight			Approx. 280 g (excluding packing materials and accessories)	
Accessories			Ferrite core (1), instruction sheet	

*1 Terminal block output is a function of the ZS-HLDC□1.
*2 Can be used with ZS-HLDC□1 when Multitask Mode selected.

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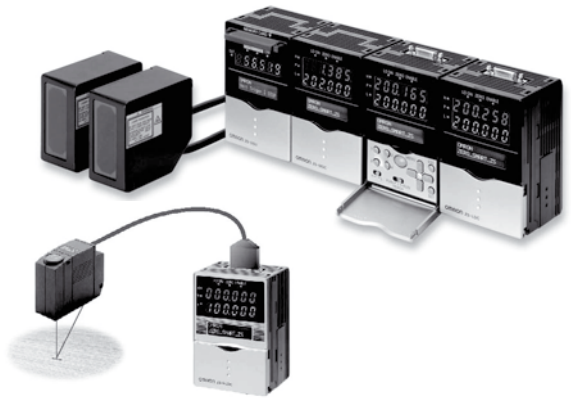

The scalable measurement sensor for all surfaces

Smart ZS family series offers superb dynamic sensing range for all surfaces from black rubber to glass and mirror surfaces by simply scaling it to your needs.

- 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, install and maintain for all user levels
- Fast response time of 110 µs

CE

Features

The scalable platform for more flexibility

- Connect and expand up to 9 controllers
- Connect multi-calculation controller for advanced calculations like evenness or flatness
- Connect data storage module for process-data logging
- Connect PC software for easy system set up and signal monitoring
- Sensor head with 2D-CMOS technology with high dynamic sensing range for measuring black rubber, plastic, shiny, glass and mirror surfaces
- Advanced application settings
- Easy reconfiguration and teaching

Measurement tools:

- Hight measurement
- Step measurement
- Thickness measurement
- Flatness measurement
- Average measurement
- Excentricity
- Warpage / Evenness

ZSH:

- Multitasking capability manages up to 4 measurement tools in one controller

Ordering information

Sensor heads

ZS-L-series Sensor Heads

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution *1	Model
Regular Reflective Models	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	2000 x 35 µm		ZS-LD40T
Diffuse Reflective Models	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	Line beam	600 x 70 µm	3 µm	ZS-LD130
	200 ±50 mm	Line beam	900 x 100 µm	5 µm	ZS-LD200
	350 ±135 mm	Spot beam	240 µm dia.	20 µm	ZS-LD350S

*1 No. of samples to average: 128 when set to High-precision Mode.

ZS-HL-series Sensor Heads

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution *1	Model
Regular Reflective Models	20 ±1 mm	Line beam	1.0 mm x 20 µm	0.25 µm	ZS-HLDS2T
Diffuse Reflective Models	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
	1500±500 mm		40 mm x 1.5 mm	500 µm	ZS-HLDS150

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 Models	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.