

# Welding Bead Sensor Z510

## In-line Inspection of Welding Beads

- Inspect for welding flaws by measuring the bead shape.
- Accumulate and output the profile data. Greatly simplify the management of welding bead quality.
- The high-speed 10-ms measurement period allows 100% in-line inspection.
- Automatic light intensity (brightness) adjustment provides stable measurement of fluctuating metal surfaces.
- The compact sensor head contains both the transmitter and receiver, so mounting space is not an issue.



Z510

## Features

Improve quality by performing 100% inspection of weld strength uniformity.

Display the Inspection Results or 3D Shape Data

Item	OK	Q / 201	Last
Flatness	OK		
Step	-0000	51846 mm	PASS
Depth: Bead	-0000	33351 mm	PASS
Gap	+0000	24302 mm	PASS
Flatness	-0000	23053 mm	PASS
PEAK-PTM	+0000	50620 mm	PASS
Length	+0000	25438 mm	PASS

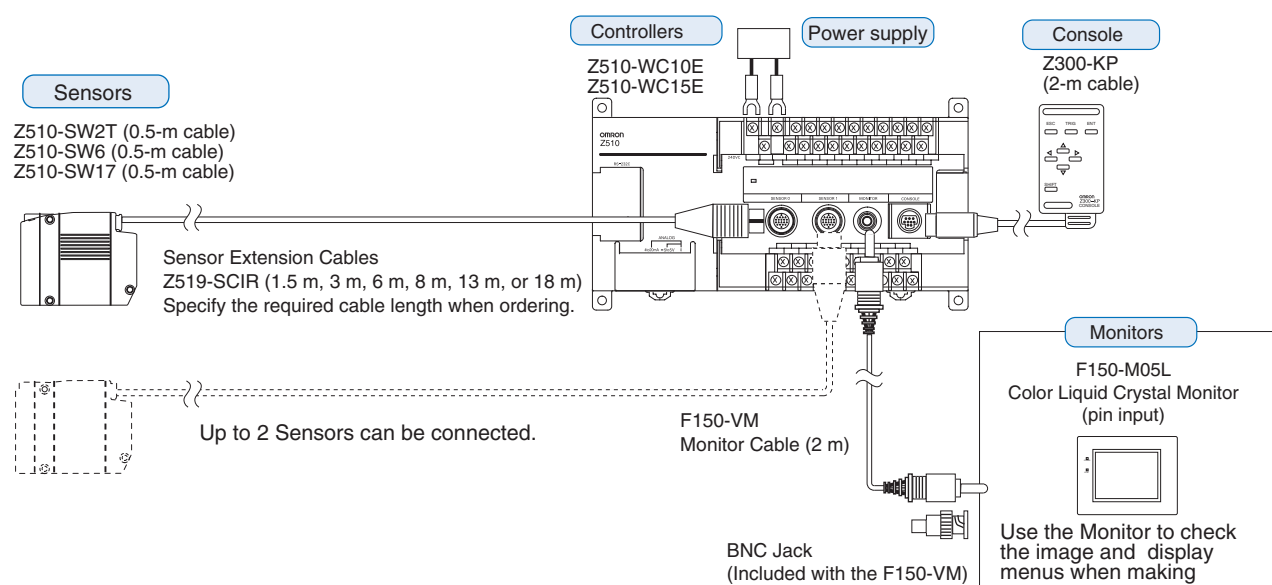
ESC: Back SFT + ENT/ESC ; Save/Load

Detect Various Bead Flaws

- Bead shape
- Cracks or pinholes
- Gaps in the weld

Wide laser beam for fast, highly accurate inspections

## Basic System Configuration



## Specifications

Controllers:  
Z510-WC10E and Z510-WC15E

### General Specifications

Item	Specification
Supply voltage	21.6 to 26.4 VDC
Current consumption	1 A max. (with 2 Sensors connected)
Insulation resistance	20 MΩ min. (at 100 V DC) between DC external terminals and GR terminal (with internal surge absorber removed)
Dielectric strength	1,000 VAC, 50/60 Hz between DC external terminals and GR terminal (with internal surge absorber removed)
Leakage current	10 mA max.
Noise resistance	1,500 V <sub>P-P</sub> ; pulse width: 0.1 μs/1 μs; rising edge: 1-ns pulse
Vibration resistance	10 to 150 Hz (double amplitude of 0.1 mm) for 8 minutes each in the X, Y, and Z directions
Shock resistance	200 m/s <sup>2</sup> 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no icing or condensation) Storage: -15 to 60°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Atmosphere	No corrosive gases
Grounding	Less than 100 Ω
Degree of protection	IEC60529 IP20 (In-panel)
Material	Case: ABS

### Characteristics

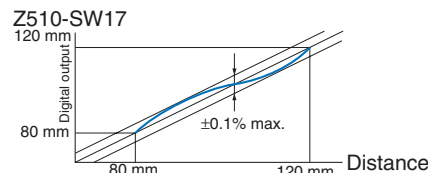
Item	Specification
Number of Sensors	Up to 2 Sensors can be connected.
Number of scenes	16
Light intensity tracking function	Automatic (The light intensity tracking range can be specified.) Fixed (Select one of 31 stages.)
Measurement items	Select one of the following 6 items: Deviation from reference surface, Bead height, Width, Bead change, Peak/Bottom, Inspection length
Region specification	A region can be specified in the direction of the line beam.
Data storage	2,048 points max.
Trigger function	Free-run, External 1, External 2, or Auto
Results output	<ul style="list-style-type: none"> <li>Judgement output <ul style="list-style-type: none"> <li>RS-232C output</li> <li>Terminal block output</li> </ul> </li> <li>Measurement value output (measurement value) <ul style="list-style-type: none"> <li>RS-232C output</li> <li>Analog output</li> </ul> </li> </ul>
Terminal block	8 input points: TRIGGER, LD-OFF, RE-SET, DI0, and DI4 to DI7 12 output points: DO0 to DO5, DO8, DO15, DO17 to DO19, and GATE
Monitor interface	1 channel (for pin jack or overscan monitor)
Analog output resolution	The full-scale output can be divided into 40,000 gradations max. Resolution (See note.): 0.25 mV (±5 V) 0.4 μA (4 to 20 mA)
Weight	Approx. 700 g (Controller only)

Note: This resolution is for measurements with an OMRON K3AS Linear Sensor Controller connected and values averaged over 64 measurements.

Sensors: Z510-SW2T, Z510-SW6, and Z510-SW17

Sensor model		Z510-SW2T		Z510-SW6		Z510-SW17	
Measurement mode		Mirror reflection	Diffuse reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection
Measurement distance at center		20 mm (16 mm with beam cover mounted)	5.2 mm	50 mm	44 mm	100 mm	94 mm
Measurement range		±0.8 mm		±5 mm	±4 mm	±20 mm	±16 mm
Light source		Visible semiconductor laser (Wavelength: 670 nm, 15 mW max., class 3B)		Visible semiconductor laser (Wavelength: 658 nm, 15 mW max., class 3B)			
Beam dimensions (See note 1.)		20 μm × 4 mm typical at the reference distance (2-mm measurement region)		30 μm × 24 mm typical at the reference distance (6-mm measurement region)		60 μm × 45 mm typical at the reference distance (17-mm measurement region)	
Linearity		±0.1% F.S. (See note 2.)	±0.1% F.S. (See note 3.)	±0.1% F.S. (See note 4.)			
Resolution		0.25 μm (See notes 5 and 6.)		0.3 μm (See notes 7 and 8.)		1 μm (See notes 7 and 8.)	
Sampling period		9.94 ms					
LED indicator (Laser indicator)		Lit when the laser is ON.					
Temperature characteristic (See note 9.)		0.01% F.S./°C					
Environmental resistance	Degree of protection	IP64		IP66			
	Ambient operating illumination	Illumination at light-receiver surface: 3,000 lx max. (incandescent light)					
	Ambient temperature	Operating: 0 to 50° C (with no icing or condensation) Storage: -15 to 60° C (with no icing or condensation)					
	Ambient humidity	Operating and storage: 35% to 85% (with no condensation)					
	Vibration (destruction)	10 to 150 Hz (double amplitude of 0.35 mm) for 8 minutes each in the X, Y, and Z directions					
Materials		Controller: Die-cast aluminum Cable sheathing: Heat-resistant PVC Connector: Zinc alloy and brass					
Cable length		0.5 m					
Minimum bending radius		68 mm					
Weight		Approx. 350 g		Approx. 600 g			

- Note:**
- The minimum light intensity at the edges of the beam is defined as  $1/e^2$  (13.5%) of the intensity at the center of the beam. Some light will scatter beyond this beam region and the measurement may be affected if the immediate vicinity around the workpiece is highly reflective.
  - This is the error with respect to the theoretical line of the displacement output when measuring the standard OMRON quartz glass. The linearity may vary depending on the workpiece being used.
  - This is the error with respect to the theoretical line of the displacement output when measuring a standard OMRON stainless-steel block. The linearity may vary depending on the workpiece being used.
  - This is the error with respect to the theoretical line of the displacement output when measuring the standard OMRON white alumina ceramic. The linearity may vary depending on the workpiece being used.
  - This is the displacement output's peak-to-peak displacement conversion value. These figures are for measurement of the standard OMRON quartz glass (mirror reflection) or standard OMRON stainless-steel block (diffuse reflection) at the center of the measurement region. The resolution performance characteristics may not be met when operating in a magnetic field.
  - These figures are for Sensors connected to a Z510-WC10E or Z510-WC15E and averaged over 16 measurements. The averaged data was transmitted to a PC through an RS-232C connection for storage and processing.
  - This is the displacement output's peak-to-peak displacement conversion value. (These figures are for measurement of the standard OMRON white alumina ceramic at the center of the measurement region.) The resolution performance characteristics may not be met when operating in a strong magnetic field.
  - These figures are for Sensors connected to a Z510-WC10E or Z510-WC15E and averaged over 64 measurements. The averaged data was transmitted to a PC through an RS-232C connection for storage and calculations.
  - This is the value measured when the gap between the Sensor and workpiece (white alumina ceramic) is fixed with an aluminum jig.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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