



Automotive Applications:

Error-proof auto engine assembly operations to meet automakers' 100% quality requirement by performing these inspections:

- Profile measurement
- Inspection of intricate geometry and contours
- Position of components
- Inspection of engine and drive train parts



Problem:

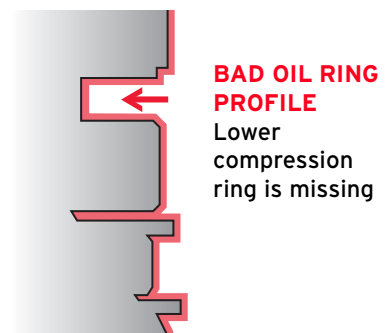
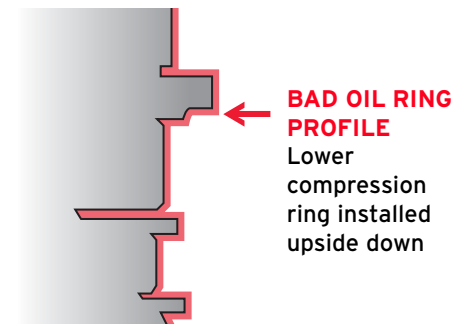
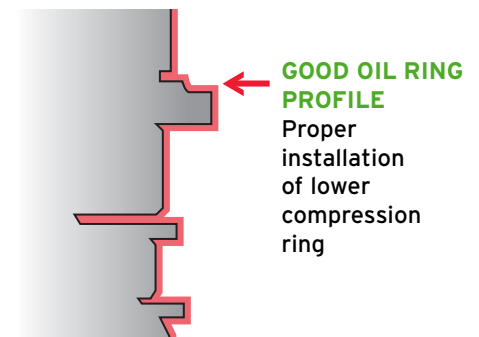
Long-term engine performance requires that pistons move smoothly and consistently in the cylinder bores. During engine assembly, the critical factor is proper placement and seating of the ring set on the piston's grooves. Any ring assembly errors will cause large warranty costs and loss of customer confidence if the problem goes undetected.



Omron "FACTS" Advantage

Z500-SW6 Laser Sensor Z500-MC10E-001 Controller

Omron's Z500 offers a unique combination of a wide-beam laser and two-dimensional CCD receiver that allows the sensor to make extremely accurate 2D profile measurements in a single pass without moving either the piston or the sensor. This approach eliminates accuracy problems and excessive installation costs typical of inspecting with a conventional point beam displacement sensor to measure piston height and ring dimensions. The Z500 delivers multiple inspection capabilities and monitoring options to handle changing requirements across a range of quality checks in automotive assembly applications.



Profile Measurement Application Details

Issue

- Automakers increasingly require 100% inspection of all incoming parts to ensure problems are corrected at a lower-value stage of assembly.
- Proper piston ring installation is a critical quality inspection point.
- The orientation and presence of the lower compression ring affects both gas sealing and oil control.

Cause

Incorrectly placed piston rings occur for a variety of reasons including human error and incorrect insertion. Engine assemblers must find a reliable and cost-effective way to detect these defects. The traditional inspection method using a point-beam displacement sensor requires moving either the piston or sensor to build a profile of ring installation. That solution presents problems:

- Movement of sensor or piston creates incomplete or inaccurate inspections.
- Operational stability is affected by oil mist and ambient light
- High fixturing and construction costs.
- Complex mix of sensors and control interfaces requires multi-department service intervention.
- Creates a bottleneck due to the long inspection cycle.

Omron's Unique Solution

- Fast, 0.5-second typical inspection time.
- Easy I/O interface to existing PLC or PC controllers.
- Self-contained sensor – light source and sensor all in one. No extra lights to setup.
- Easy-to-see visible laser line shows inspection area.
- Live real-time monitor screen shows actual inspection image and OK and NG conditions.
- Absolute and relative measurements combined with position compensation minimize fixturing requirements.

Results

- Defect and assembly inspection time meets production speeds – 0.5 seconds.
- Off-the-shelf product available worldwide. No proprietary or special software needed.
- No laptop required for programming.
- Easy setup and maintenance with integrated laser and sensor
- 100% verifiable inspection.
- Increased operational stability—Z500 lasers are less affected by oil mist and ambient light.
- Integrated sensing and control interfaces simplify troubleshooting and reduce downtime, eliminating intervention from multiple departments.

Bill of Materials

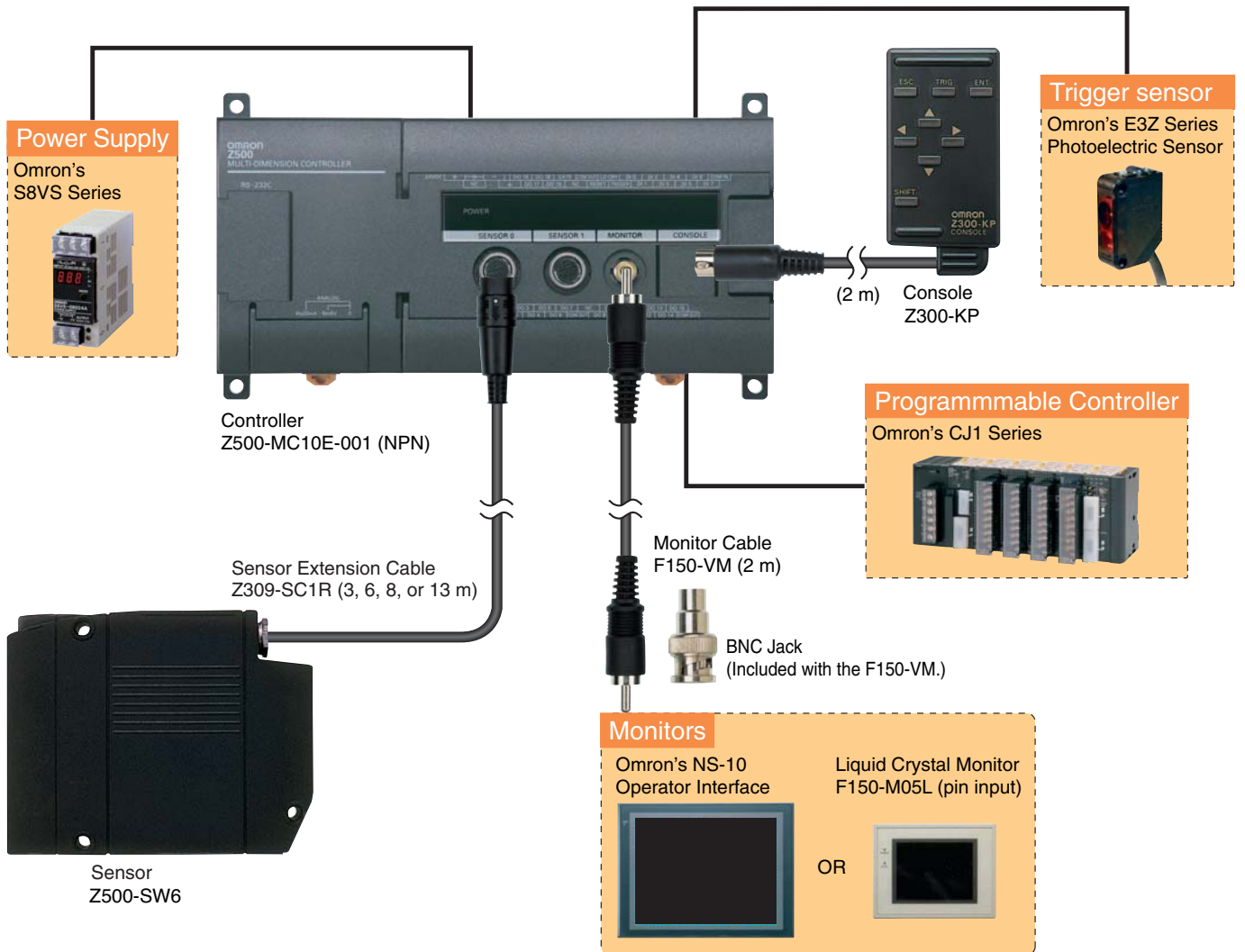
Description	Part Number
Laser Sensor	Z500-SW6
Controller	Z500-MC10E-001 (NPN)
Monitor	NS10-TV01BV1 + NS-CA002 or F150-M05L
Monitor Cable	F150-VM
Sensor Extension Cable	Z309-SC1R (specify 3m, 6m, 8m or 13m length)
Console	Z300-KP
Power Supply	S8VS-06024A/B

System Configuration

The configuration described here is one of many ways to solve similar inspection problems. Let an Omron specialist propose the best system for your application.

Optional Products

For a complete Omron solution



Specifications

Sensor	Z500-SW6
Measurement range	± 5 mm (diffuse reflection) at 50 mm measurement distance
Light source	Visible-light semiconductor laser, 658 nm wavelength, Class 3B
Linearity	± 0.1% F.S.
Resolution	0.3 µm
Cable length	0.5 m

Controller	
Input/Output type	NPN (Z500-MC10E-001)
Number of sensors	2 sensors can be mounted
Measurement functions	Angle, Height, Step (2 points), Step (3 points), Edge position, Width, Edge center, Peak/bottom, Define
Area of interest	Region specification of line beam and displacement direction is possible
Trigger functions	Free, External 1, External 2, Auto
Results output	Judgment output via RS-232C output and terminal block Measurement value output via RS-232C and analog (4-20 mA) output
Data displays	Profile monitor: Data on cross section height can be checked on a 3D gray scale image Image monitor: Both measurement data and profile image can be checked at the same time Digital monitor: Two or more measurement data can be checked at the same time Trend monitor: Time-series change of measurement data can be checked

Monitor	NS10-TV01BV1* + NS-CA001	F150-M05L
Screen size	10.4 inches	5.5 inches
Display type	TFT color liquid crystal	TFT color liquid crystal
Resolution	640 x 480 dots	320 x 240 dots
Input signal	NTSC composite video	NTSC composite video

*Also available in 8" and 12" screens



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