

## AR500 Laser Position Sensors

### Principles of Operation

The AR500 is a triangulation sensor that measures distance by projecting a beam of laser light that creates a spot on a target surface. Reflected light from the surface is viewed from an angle by a CMOS detector array inside the AR500 sensor. The target's distance is calculated from the image pixel data using the sensor's microprocessor. The distance is transmitted through serial communications, analog outputs or optionally, via Ethernet. A variety of models are specified, each to allow a different measurement range and standoff.



### Definitions

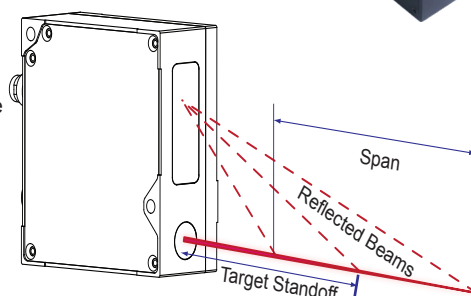
**Span:** Working distance between measurement endpoints over which the sensor will reliably measure displacement

**Standoff:** Offset distance from the face of the sensor to the middle of the span. Accuracy is greatest at the standoff distance and the laser spot size is smallest at this focal point. AR700 standoff location tolerance is +/-0.25mm.

**Linearity:** The largest deviation from a best-fit straight line over the measurement range, created by data from the sensor with reference taken from a true distance scale. Stated as +/-% of the Span.

**Resolution:** Smallest increment of change in distance that a sensor can detect. Stated as % of the Span.

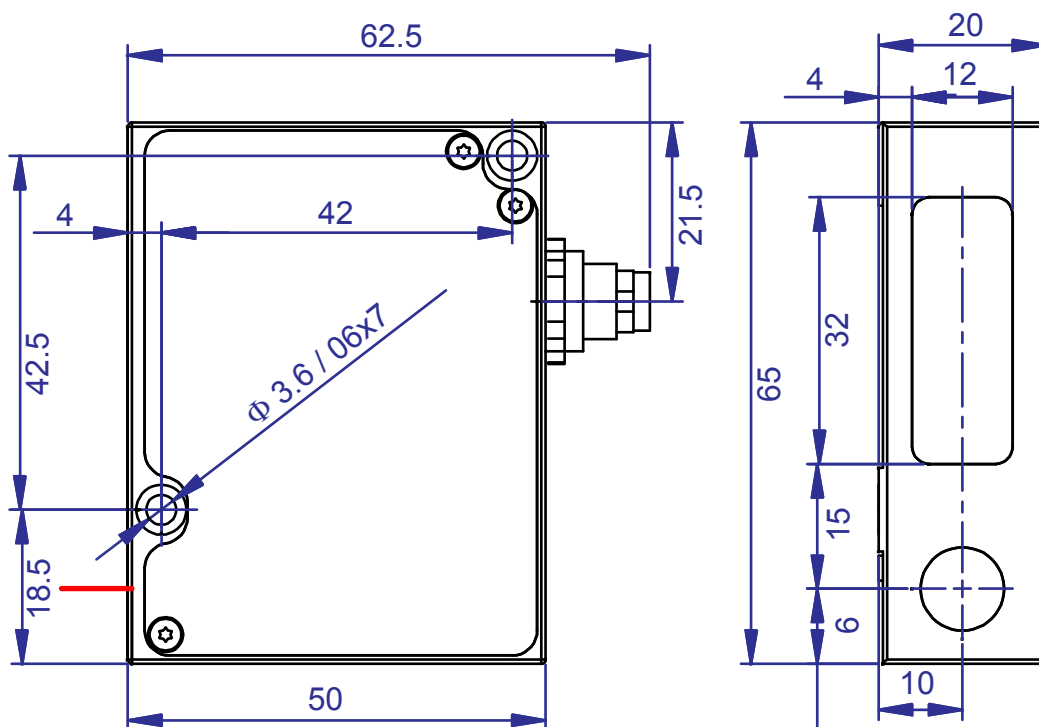
**Sample Rate:** Speed that data samples are obtained from the sensor.



### AR500 Standard Model Specifications units in Metric unless noted Imperial

| AR500 model                                       | -5  | -10  | -25         | -50       | -100                     | -250       | -500   | -750         | -1000       |
|---|---|--|-------------|-----------|--------------------------|------------|--|--------------|-------------|
| Span [in.]  | 5 [0.20]  | 10 [0.39]  | 25 [0.98]   | 50 [1.97] | 100 [3.94]               | 250 [9.84] | 500 [19.7]   | 750.0 [29.5] | 1000 [39.4] |
| Standoff [in.]                                    | 12.5 [0.49]   | 20 [0.79]  | 57.5 [2.26] | 90 [3.54] | 110 [4.33]               | 205 [8.07] | 375 [14.8]   | 520 [20.5]   | 745 [29.3]  |
| Linearity (+/-) $\mu\text{m}$<br>[ $10^{-3}$ in.] | 0.15% of Span, 500 Hz, to white target (85% diffuse reflectance)  |  |             |           |                          |            |  |              |             |
|   | 7.5 [0.3]   | 15 [0.59]  | 37.5 [1.48] | 75 [2.95] | 150 [5.91]               | 375 [14.8] | 750 [29.5]   | 1125 [44.3]  | 1500 [59.1] |
| Resolution $\mu\text{m}$<br>[ $10^{-3}$ in.]      | 0.01% of Span   |  |             |           |                          |            |  |              |             |
|   | 0.5 [0.02]  | 1.0 [0.04]   | 2.5 [0.1]   | 5.0 [0.2] | 10 [0.4]                 | 25 [1.0]   | 50 [2.0]   | 75.0 [3.0]   | 100 [4.0]   |
| Laser spot size $\mu\text{m}$                     | 40  | 50   | 60          | 80        | 70                       | 130        | 140  | 300          | 500         |
| Weight no cable [oz.]                             | 100 grams [3.5 oz.]   |  |             |           |                          |            |  |              |             |
| Laser class                                       | 2   | 2  | 2           | 2         | 3R                       | 3R         | 3R   | 3R           | 3R          |
|   | Complies with 21 CFR 1040 with Laser Notice #50 and IEC/EN 60825-1:2001   |  |             |           |                          |            |  |              |             |
| Laser type STANDARD                               | 660 nm, $\leq 0.95$ mw, visible RED   |  |             |           | 660 nm, $\leq 3$ mW RED  |            | 650 nm, $\leq 4.8$ nm visible RED  |              |             |
| Laser type OPTIONAL                               | 405 nm, $\leq 0.95$ mw, visible BLUE  |  |             |           | 405 nm, $\leq 3$ mW BLUE |            | 660nm, 20mW visible RED (Class 3B)<br>405 nm, $\leq 3$ mW BLUE<br>405 nm, 20mW BLUE (Class 3B) |              |             |
| Power   | 9 - 36 Volts DC, 250 mA max. Voltage tolerance -5% to +10%  |  |             |           |                          |            |  |              |             |
| Sample rates                                      | <b>STANDARD:</b> to 9400 Hz, or sample trigger (serial command or Hardware)   |  |             |           |                          |            |  |              |             |
| Operating Temp                                    | -10 - 60°C [14 - 140°F]; to -30°C with optional heater; to 120°C with optional air-cooling; 95% Humidity (non-condensing)   |  |             |           |                          |            |  |              |             |
| Environmental                                     | NEMA – 4X, IP67. Keep optical windows clean for best performance. Aluminum case. Compliant with the RoHS directive regarding the reduction of the use of lead and other hazardous substances. |  |             |           |                          |            |  |              |             |
| Shock / Vibration                                 | Shock: 30 grams / 6 ms; Vibration: 20 g / 10...1000Hz, 6 hours, for each of XYZ axes  |  |             |           |                          |            |  |              |             |
| Temperature Drift                                 | 0.02% of span / °C  |  |             |           |                          |            |  |              |             |
| Interfaces  | Serial  | <b>STANDARD:</b> RS232 full duplex (460.8 Kbits/sec); <b>OPTION:</b> RS485       |             |           |                          |            |  |              |             |
|   | Analog  | <b>STANDARD:</b> 4-20 mA; <b>OPTION:</b> 0-10V                                   |             |           |                          |            |  |              |             |
|   | Ethernet  | <b>OPTION:</b> Ethernet (minimum quantity required)                              |             |           |                          |            |  |              |             |
|   | Logic   | <b>STANDARD:</b> Programmable (see manual), NPN: 100 mA max; 40 V max for output |             |           |                          |            |  |              |             |
|   | Sync Trigger  | <b>STANDARD:</b> 2.4 – 5 V (CMOS, TTL)   |             |           |                          |            |  |              |             |
| Cable   | length: 6 ft. (1.8 m), weight: 5.8 oz. (165 g), 12 conductor, Polyurethane sheathing. Binder 712 connector.   |  |             |           |                          |            |  |              |             |

## Mechanical Dimensions units in mm.



## AR500 Sensor Options

**Connectivity kit:** Includes terminal blocks, serial cable with molded DB9 connector, AC power supply with 110 VAC or 240 VAC

**High power lasers:** Diode upgrades to visible red or blue for high sample rates on dark surfaces or in high ambient light.

**Cables:** Optional, longer cables. Contact us for custom cabling needs.

**Serial interface:** Optional RS485 interface for long-distance connections. Replaces RS232.

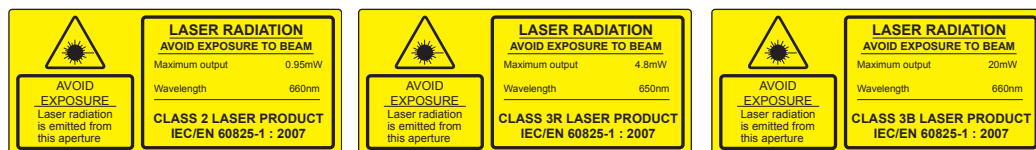
**Analog interface:** Optional 0-10 V analog interface signal. Replaces 4-20mA signal

**Internal heater:** Permits sensor use to  $-30^{\circ}\text{C}$

**Air-cooled jacket:** Enclosure with forced air to cool sensor for use up to  $120^{\circ}\text{C}$ . Sensor must be calibrated inside jacket at factory.

**Spray guard:** Open-sided enclosure which helps to keep debris off optical windows.

## Laser Safety Labels



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