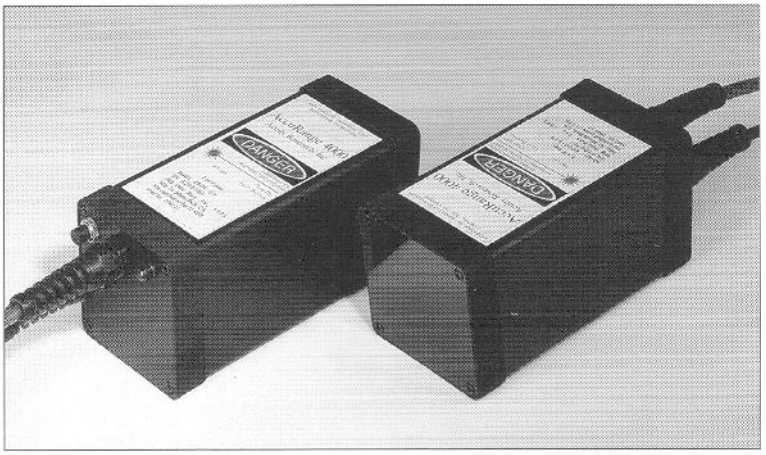
AccuRange 4000 by Acuity RESEARCH

The AccuRange 4000 is an optical distance measurement sensor with a useful range of zero to 50 feet for most diffuse reflective surfaces, with an eye safe version available for use with reflective tape. It operates by emitting a collimated laser beam that is reflected from the target surface and collected by the sensor. The sensor is suitable for a wide variety of distance measurement applications that demand high accuracy and fast response times.

Key Features

- Zero to 50 feet operating range for most surfaces.
- 0.1 in (2.5mm) accuracy, 0.02 in (0.5mm) short-term repeatability. Digital output in inches or mm.
- Optional RS-485/422, 4-20 mA current loop, and pulse width outputs. RS-232 serial output standard.
- Reflected signal amplitude output for grayscale images.
- Fast response time: 50 KHz maximum sample rate.
- Lightweight, compact, low power design.
- Tightly collimated output beam for small spot size.
- Three output beam configurations available: Visible, infrared, or eye safe infrared for reflective tape targets.
- Ideally suited to level and position measurement, machine vision, autonomous vehicle navigation, and 3D imaging applications.



AccuRange 4000 Technical Specifications

Standard Configurations

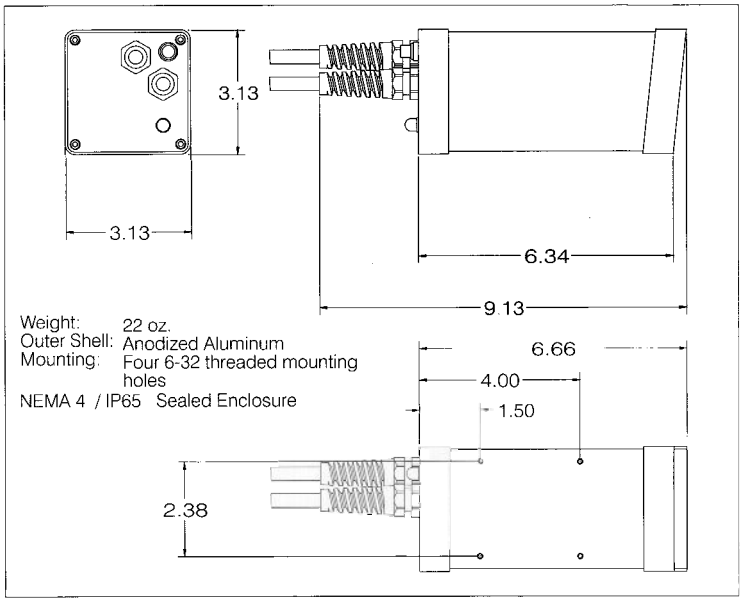
4000-LIR: Emitter: 780 nm
IR laser diode
Optical power:
8 milliwatts max.
Effective Range:
50 feet
Optional 20mW max.

4000-LV: Emitter: 670 nm
Visible red laser diode
Optical power:
5 milliwatts max.
Effective Range:
40 feet

4000-RET: Emitter: 780 nm
IR laser diode
Optical power:
130 microwatts max.
Effective Range:
50 ft cal, 150 ft uncalib.

Class I
Eye Safe
Laser Product

Mechanical



Weight: 22 oz.
Outer Shell: Anodized Aluminum
Mounting: Four 6-32 threaded mounting holes
NEMA 4 / IP65 Sealed Enclosure

Of these configurations, the 4000-RET and 4000-LIR have the lower measurement noise, greater sensitivity and maximum range. The 4000-LV features visible light output. See the relevant specifications. Custom configurations are also possible.

Interface

Power

Sensor Power: +5 Volts (+5V min, +6V max) @ 400 mA
Heater Power: +5 Volts (+5V min, +6V max) @ 4 A, temperature dependent. May be used to stabilize sensor temperature in low-temperature environments.

Power and Signal Cable

Color	Function	Direction
Red	Power	In
Black	Ground	
Orange	Heater Power	In
Brown	Heater Return	
Yellow	Temperature	Out
Blue	Pulse or Current	Out
Green	Ambient Light	Out
Purple	Amplitude	Out

Data and Communications

Serial Interface

RS-232 serial output or optional RS-485 or 422 on a 9-pin PC-compatible cable. Output may be in an internally calibrated distance format with a resolution of .01" or 1mm, or in an uncalibrated format which includes uncompensated range and signal strength, background light, and sensor temperature.

Data Formats

ASCII Mode:

Calibrated Output: 3-6 bytes.
Distance 0 to 650 inches in units of .01"
CR,LF terminated
Low Level Outputs: 9-24 bytes
CR,LF terminated

Binary Mode:

Calibrated Output: 3 bytes.
Distance 0 to 650 inches in units of .01"
FF terminated
Low Level Outputs: 8 bytes
FFFF terminated

Device Configuration via AccuRange Command Set

Baud Rate: 300-38400 baud*
Sample Rate
ASCII or Binary Output
Maximum Range *
Reversible scale direction
Laser On/Off*
Zero Point Set
Current Loop Zero, Span*
Current Loop Mode (Off/Calibrated/Uncalibrated)*
Serial Mode (Off/Calibrated/Uncalibrated)*
Take Single Sample

* May also be set without serial communication, using pushbutton/LED interface.

Optional Pulse Width Output

Uncalibrated range output: 18 to 50000 samples/sec
0.5V peak to peak square wave signal

Supplementary Voltage Outputs

Analog voltage signals: Standard on the power/signal cable. Voltage outputs are 0-5 volt analog levels indicating target signal strength, background illumination, and sensor temperature.

The pulse width and voltage outputs are typcially used for external calibration at sample rates above 1000/second.

Optional 4-20 mA Current Loop

Replaces pulse width output on the power/signal cable.
Calibrated output to 1 KHz or high-speed uncalibrated output to 3 KHz
Adjustable zero and span points
Adjustable zero current: 4 mA default

Operating Temperature: 0 - 113°F.

Performance

Two forms of output are available from the sensor. Calibrated output is distance in units of .01". Calibration compensates for sensor temperature and target reflectance, and is performed in the sensor. The sample rate for calibrated output is limited to 1 KHz. For higher speed output, the uncalibrated serial outputs or pulse width and voltage signals may be used.

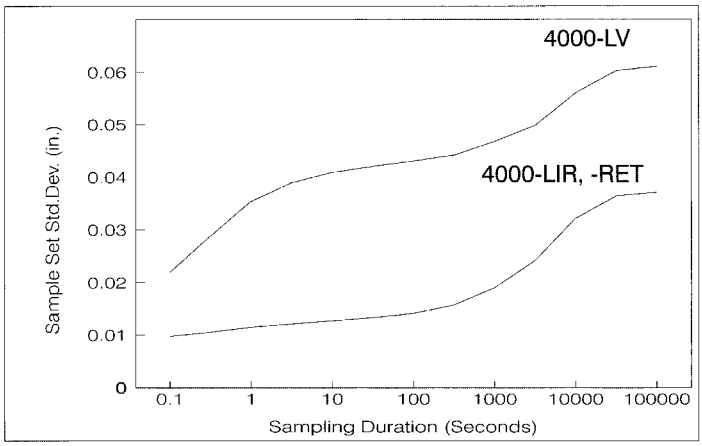
Useable Range

4000-LIR: 0 to 54 feet (calibrated)[1]
4000-RET: 0 to 54 feet (calibrated)
4000-LV : 0 to 40 feet (calibrated)[1]
0 to 150 feet (uncalibrated, with reflective target)

Short Term Measurement Noise

.0005 inches / $\sqrt{Hz}$
(all samples within 0.3 sec.)

Long Term Drift



Standard deviation of measurement error (drift) vs. time

Calibrated Absolute Accuracy

Standard Deviation of Range Error:
4000-LIR and 4000-RET: .1"
4000- LV: .3"

Range Signal Response Time

< 1 sample for all sample rates

Amplitude, Ambient Light, and Temperature Outputs

Analog signals, 0-5 Volts
Response Times (except temperature): 20 microseconds
Amplitude: Logarithmic signal
Ambient (Background) Light: Linear signal
Temperature: Linear 0-140°F. (31.3 millivolts/degree)

Optical

Laser Beam Diameter: 0.1"
Laser Beam Divergence: 0.5 milliradians
Return Light Collection Aperture Diameter: 2.5"

The AccuRange High Speed Interface is also available, with sample rates to 50,000 samples/second for all AccuRange 4000 outputs.

Note 1: To 85% diffuse reflectance target.

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