MX1A and MX1B: Laser Displacement Detection Sensors

- Built-in math capabilities available (MX1B only)
- Digital display on amplifier; easy setting and monitoring (MX1B only)
- Miniature sensor head is compact for high-density installations
- Excellent linearity: ±0.0008" (or 20 µm) ±0.5% of displacement (MX1A-B; MX1B-B)
- High resolution sensing: 0.0004" or 10 µm = 10mV (MX1A-B; MX1B-B)
- Two sensing ranges: 1.18" to 1.97" (30 to 50mm) and 1.97" to 5.12" (50 to 130mm)
- MX1B can measure thickness or differences in surface levels when used in combination with another MX1A or MX1B
- The shape, size, color, and material of the object do not detract from accurate measurement (see Note 1 below)
- Delayed laser, remote interlock, power supply key switch, and laser LED are all included on the sensor head — these features ensure safe operation
- Mount the amplifier on a 1.378" (35mm) DIN rail

1. *Laser sensing of mirror-like surfaces is not recommended. For best results detecting reflective surfaces, tilt the sensor to reduce direct laser reflection. Sensing at a small angle (approximately ±10°) does not significantly reduce the sensing accuracy or linearity of the resulting analog output.*

2. ***Warning:** Class IIIb laser. Do not allow the laser to shine directly into the eyes. Always consider eye safety when installing a laser sensor. Make sure the laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See laser safety information on page M-20.*

CE

General Specifications	
Power Voltage	120V AC @ 50/60Hz
Allowable Range	85% to 110% of the rated voltage
Power Consumption	MX1A: 15VA, MX1B: 25VA
Dielectric Strength	Between terminal (except A.OUT, CAL OUT/IN, AG, and FG terminals) and housing: 1,500V AC, 1 minute
Insulation Resistance	Between terminal (except A.OUT, CAL OUT/IN, AG, and FG terminals) and housing: 100MΩ (minimum), with 500V DC megger
Operating Temperature	0°C to +50°C (performance will be adversely affected if the sensor becomes coated with ice)
Operating Humidity	45% to 85% RH (avoid condensation)
Storage Temperature	–20°C to +70°C
Vibration Resistance	Damage limits: 16.7Hz, 2G, 1 hour in each of 3 axes (when de-energized)
Shock Resistance	Damage limits: 100m/s^2 (approximately 10G), 3 shocks in each of 3 axes
Extraneous Light Immunity	Incandescent light: 3,000 lux (maximum), defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of intended object
Material	Housing: diecast zinc; Filter and lens: acrylic; (sensor head only)
Degree of Protection	IP65 (sensor head only) — IEC Pub 529, sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to particle or water blasts
Weight, Amplifier	MX1A: Approximately 2.0kg, MX1B: Approximately 2.5kg
Weight, Sensor Head	Short cable (P/N ends in "S"): Approximately 500g Long cable (P/N ends in "L"): Approximately 800g
Dimensions, Amplifier (HxWxD)	MX1A: 4.21" x 5.12" x 4.41" (107 x 130 x 112mm) MX1B: 4.21" x 6.69" x 4.41" (107 x 170 x 112mm)
Dimensions, Sensor Head (HxWxD)	1.73" x 0.73" x 1.79" (44 x 18.5 x 45.5mm)

Part Numbers: MX1A and MX1B Sensors

Part Number	Sensing Range	Resolution	Features	Sensor Head Cable Length
MX1A – A 12 R6S **MX1A – A 12 R6L**	1.97" to 5.12" (50 to 130mm)	0.002" (50 µm)	Display and calculation not available	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1B – A 12 R6S **MX1B – A 12 R6L**			Display and calculation standard	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1A – B 12 R6S **MX1A – B 12 R6L**	1.18" to 1.97" (30 to 50mm)	0.0004" (10 µm)	Display and calculation not available	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1B – B 12 R6S **MX1B – B 12 R6L**			Display and calculation standard	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)

IMPORTANT: The sensor head and amplifier are calibrated in pairs — use units with the same serial number together to avoid damage to the laser diode. Using different serial numbers together or making alterations to the sensor amplifier head or cable will void the factory warranty.

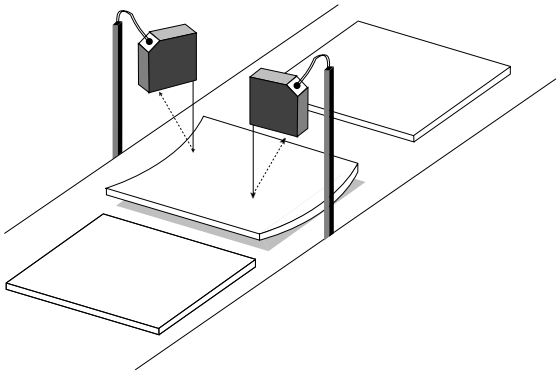
		MX1A-A, MX1B-A	MX1A-B, MX1B-B
Functional Specifications	**Reference Sensing Distance**	3.54" (90mm)	1.57" (40mm)
	Detectable Sensing Range	±1.57" (40mm)	±0.39" (10mm)
	Analog Offset	±1V (±0.16" or 4mm) zero adjustment range	±1V (±0.04" or 1mm) zero adjustment range
	Analog Response Speed	Selectable: High-speed (F) = 1ms, Normal speed (S) = 20ms	
	Analog Output, Measured	±10V DC, 10mA (maximum), measured analog output voltage is proportional to displacement as follows: 0.25V per mm (MX1A-A and MX1B-A), 1V per mm (MX1A-B and MX1B-B)	
	Resolution*	0.002" (50 µm) = 12.5 mV	0.0004" (10 µm) = 10mV
	Linearity	±0.004" (100 µm) ±0.5% of displacement	±0.0008" (20 µm) ±0.5% of displacement
	Analog Input, Calculated (MX1B only)	Voltage range: ±10V DC; Impedance: 100kΩ, measured analog output from an MX1A or MX1B is used as the calculated analog input for the MX1B only; the calculated output voltage is proportional to the calculated values for the thickness or difference in levels: 0.25V per mm (MX1A-A and MX1B-A), 1V per mm (MX1A-B and MX1B-B)	
	Analog Output, Calculated (MX1B only)	±10V DC, 10mA (maximum), measured analog output from an MX1A or MX1B is used as the calculated analog input for MX1B only; the calculated output voltage is proportional to the calculated values for the thickness or difference in levels: 6.35V per inch or 0.25V per mm (MX1A-A and MX1B-A), 25.32V per inch or 1V per mm (MX1A-B and MX1B-B)	
	Digital Output	Transistor 30V DC, 0.1A/point (maximum), upper LED is lit when measured value > preset, lower LED is lit when < preset	
	Digital Output Setting	Separate settings for upper and lower limits (infinite turn)	
	Digital Output Response	Rise and fall: 500 µsec (maximum)	
	Out LED	On: digital output turns on	
	Upper and Lower LEDs	Upper LED on: Upper limit output turns on	Lower LED on: Lower limit output turns on
	Enable Input (Synchronous)	Controls inspection output with synchronous signal (one coupler)	
	Enable LED	On: For synchronous signal input	
	Alarm Input **Alarm Output**	Using 2 units together: Main unit (MX1B only) takes the alarm output from the sub unit (MX1A or MX1B) Transistor 30V DC, 0.1A / pt. (maximum), alarm output is lit when alarm condition exists, as displayed by the alarm LEDs	
	Alarm LEDs	Dark on: Reflected light is insufficient Far on: Detected distance > maximum	Bright on: Reflected light is excessive Near on: Detected distance < minimum
	Calculation Over LED	On: Analog output (calculated) exceeds output range, MX1B only	
	Alarm Input LED	On: When alarm input turns on, MX1B only (when using two units together)	
	Power LED (on both amplifier and sensor head)	Green LED when power is on Orange LED when a laser is emitted during normal operation Laser beam emitted approximately 10 seconds after power-up; laser emission can be controlled while the power is on, using remote interlock provided	
	Temperature Drift	±2 mV per °C (maximum)	
	Frequency	11.3KHz	
	Hysteresis	Selectable: Narrow (N) = 40 mV or wide (W) = 200 mV	
	Light Source	Laser diode (780 nm)	
	Receiving Element	PSD (position sensitive device)	

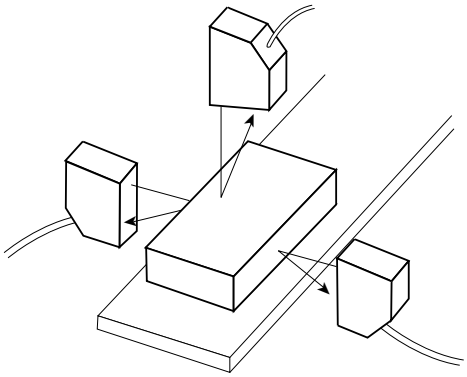
1. These specifications were developed from tests using a white ceramic object at the reference sensing distance, using the normal response speed at (20ms) 25ºC.

*2. * Peak to peak of analog output noise.*

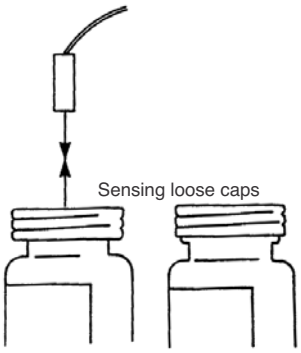
Applications

Checking for warped boards

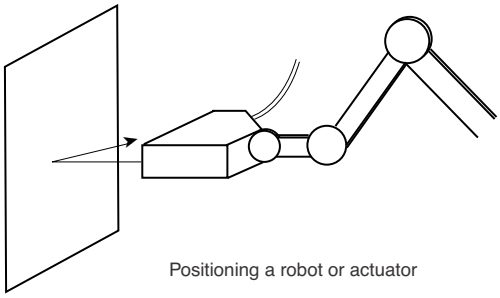




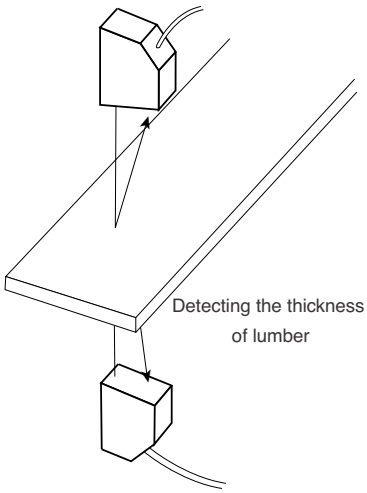
Detecting the height and width of wood or blocks



Sensing loose caps

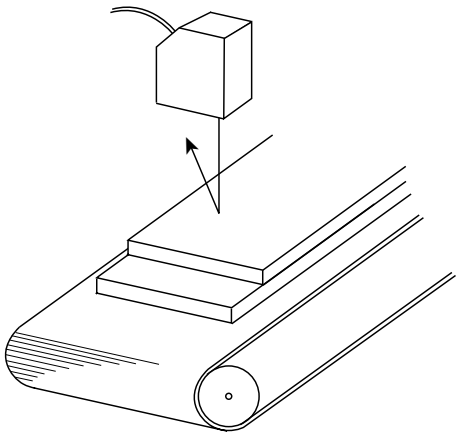


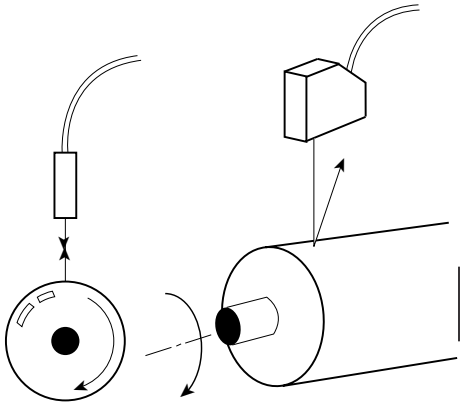
Positioning a robot or actuator



Detecting the thickness of lumber

Detecting overlapping sheets
Counting sheets of paper

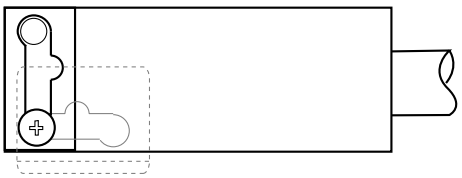


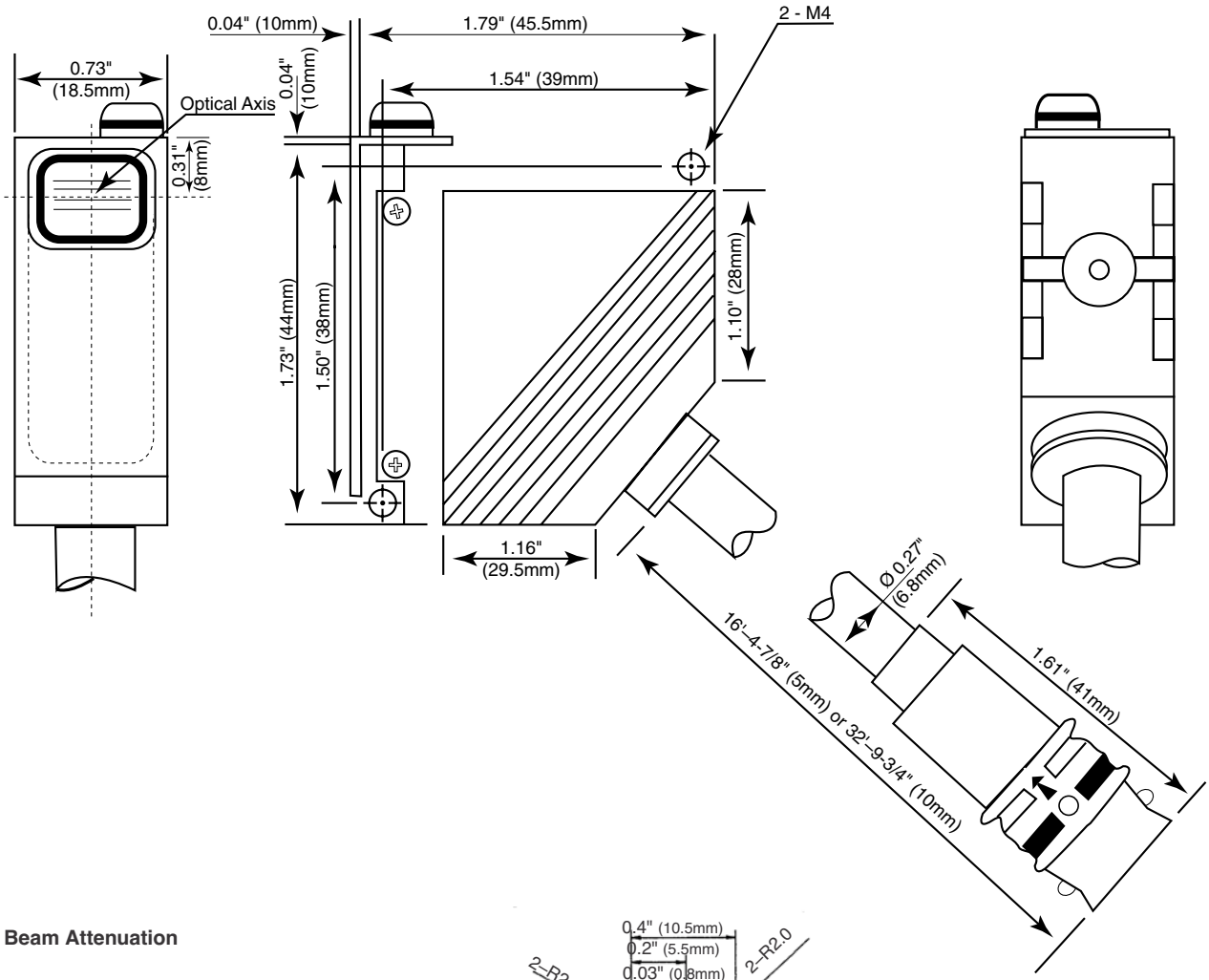


Sensing the roundness of a roller

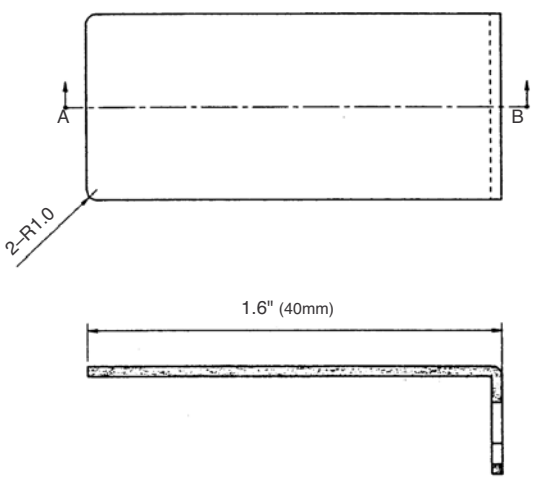
Dimensions

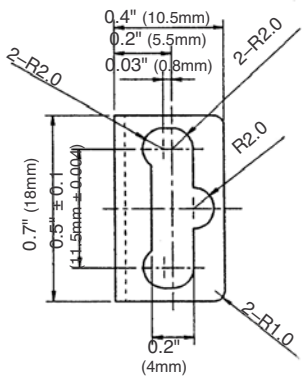
Sensor Head



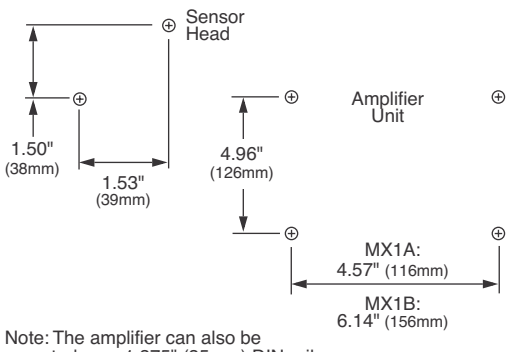


Beam Attenuation





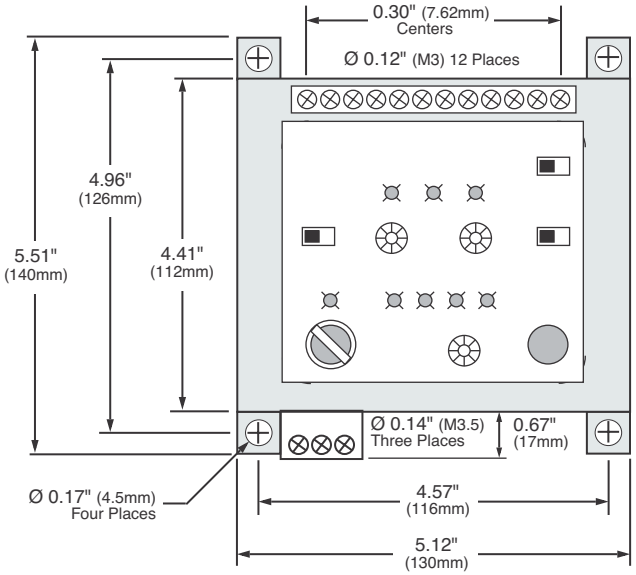
Panel Cut-Out



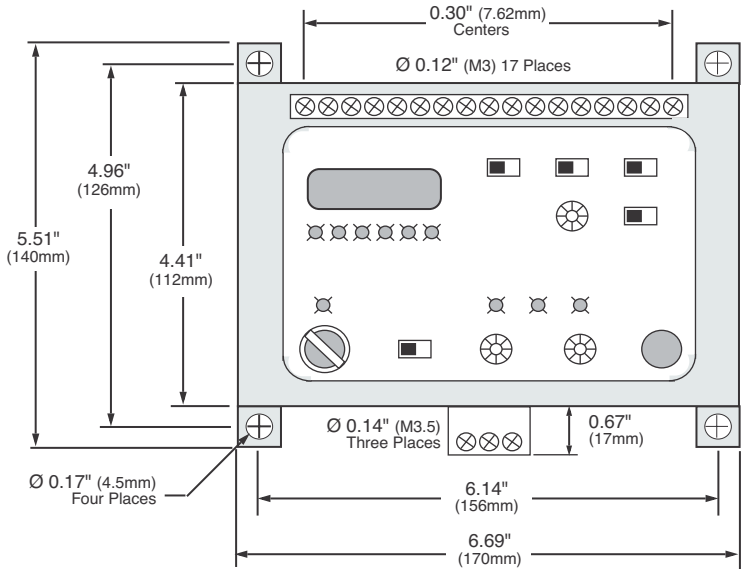
Note: The amplifier can also be mounted on a 1.375" (35mm) DIN rail.

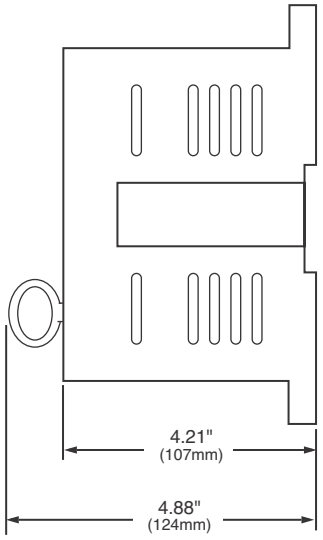
Dimensions, continued

MX1A Amplifier Unit



MX1B Amplifier Unit





Side View
Typical for
MX1A and
MX1B

Q
Sensors

Laser Safety Information

Installation: If a sensor is installed so that the laser beam may shine or reflect into the eyes of a person passing by or working in the vicinity, place an opaque sheet of material in front of the beam to prevent potential eye injury. For people working near a laser sensor, protective glasses which screen out a significant amount of the harmful radiation are recommended at all times.

All laser sensors also include a remote interlock terminal which can be used to turn the laser on or off with an external switch, as required, to operate the sensor safely from a remote location. As required by law for all class IIIb lasers, the MX1A and MX1B sensors feature a safety key switch. For the MX1A and MX1B, an LED indicator is lit (green) upon laser transmission; 10 seconds later the LED changes color (amber) when the laser beam turns on.

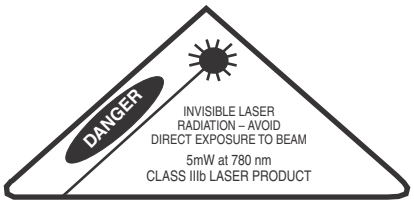
To avoid exposure to harmful radiation, never disassemble a laser sensor.

WARNING: Do not allow class IIIa and IIIb laser beams to shine directly into the eyes. Do not allow lasers to reflect from a glossy, shiny, or reflective surface into the eyes.

Labelling: IDEC laser sensors include **CDRH-approved** safety warnings shown on the right and below, in compliance with federal regulations of the **Center for Devices and Radiological Health**.

MX1C Miniature Laser Sensor:
Class IIIa Laser (670nm) Visible Beam

MX1A and MX1B Laser Sensors:
Class IIIb Laser (780nm) Invisible Beam



All Laser Sensors:
Identification and Certification

mfd.: **FEBRUARY 1997**
Product conforms to
21 CFR1040

MX1A/B Invisible Laser:
Aperture Warning

AVOID EXPOSURE –
Invisible laser radiation is emitted from this aperture.

MX1C Visible Laser:
Aperture Warning

AVOID EXPOSURE –
Laser light is emitted from this aperture.

Q Sensors