

## Small Industrial Ultrasonic Sensors Pack a Big Punch



The XL-MaxSonar® line of MaxBotix® Inc., ultrasonic range sensors has arrived. This low cost, super high performance sensor is available in both indoor and outdoor versions. The XL-MaxSonar® sensor line maintains the same look and feel of the existing LV-MaxSonar® sensor line, with small size, low power, stable range readings, object detection to the front sensor face, and more, but now has even more reliable distance readings. The XL-MaxSonar® line has fully automatic real-time background calibration, much higher acoustic output power, greatly improved real-time noise rejection, centimeter resolution, longer distance range measurement, and for some models real-time analog envelope output and various analog hardware gains from 250 to 4000. These features result in virtually noise free distance readings for most users. The XL-MaxSonar® sensor line is available with factory calibrated beam patterns.

### Real-Time Automatic Calibration

For the XL-MaxSonar® products, the real-time fully automatic calibration happens in the background, so that for every range reading, the sensor is calibrated to operate properly for that individual reading. Even if the sensor is powered up with an object pressing against the front sensor face, the presence of the object will be reported correctly. Or even if during operation, the power supply voltage droops (range of \*3.3V to 5V), or if the temperature changes (range of \*-40°C to +65°C), the automatic calibration runs in the background and sets the parameters for the sensor to operate correctly.

\*Operation at 3.3V while at temperatures below -10°C might not be suitable for all sensors and installations.

### High Acoustic Power

For the XL-MaxSonar® products, the high acoustic power allows for the ultrasonic energy to effectively overpower many outside acoustic noise sources. This allows for proper operation in many environments such as micro UAV vehicles, where a lower powered sensor would be unusable. (For example, although the LV-MaxSonar®-EZ product line worked very well for micro UAV airplanes, mainly because of advanced filtering, it did not work as well for micro UAV helicopters or planes with speeds in excess of 55-mph, since wind noise exceeded the acoustic power. Contrast this with the higher power XL-MaxSonar®, where now micro UAV helicopters have a sensor they can use with confidence.)

### Real-Time Noise Filtering

The XL-MaxSonar® products now reject noise with \*equal effectiveness, independent of hardware or software gain. For the XL-MaxSonar® products, the real-time filtering of the analog envelope is held to a new standard. For all the products in this sensor line, for regular continuous noise sources such as motors and vibrations found on robots and UAVs, the sensor learns and then removes the noise, allowing reliable readings. In addition, when the engine noise increases, or an additional noise source comes into play, the filtering learns and changes to compensate. (This can be contrasted with the LV-MaxSonar®-EZ product line where the sensor learns the background noise during the initial calibration, but the LV-MaxSonar®-EZ product line did not compensate for noise sources that changed after this initial calibration. In addition, for the LV-MaxSonar®-EZ product line, products with increased sensitivity (i.e. the LV-MaxSonar®-EZ0) also had increased susceptibility to noise, but the XL-MaxSonar® products now all reject noise equally.) \*MaxBotix® Inc., initial testing shows this to be true, but we will have to see how this plays out in real world tests by end users.

### Increased Resolution and Range

The XL-MaxSonar® products with increased acoustic power, auto calibration, and better noise filtering allows for stable distance readings with centimeter resolution. In addition, the higher power allows for longer-range measurements.

### Real-Time Analog Envelope and Various Gains

The real time analog envelope provided to the user is taken directly from the end of the analog chain of the XL-MaxSonar® product. The output is the log compressed voltage output of the acoustic return signal. When powered with five volts, the sensors compress the waveform into an analog output range of about three volts. Most users will only use this to verify product installation and operation, but other users may desire to perform their own signal processing. Hence, users wanting fine details of the waveforms may deliberately select a lower gain product. Conversely, users wanting long-range or details outside the central field of view will choose a higher gain product.

**MaxBotix® Inc.**

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