MaxBotix® Inc.

"Creating vision for the future"

The temperature operation range of the MaxSonar ultrasonic sensors is -40C to +65C (with limited operation to +85C).

Temperature Compensation that uses the time of flight in seconds, and temperature in degrees centigrade and yields the distance in meters works for all of our products.

$Dm = TOF *((20.05*SQRT(Tc+273.15))/2)$

Where

>   TOF is the measured Time Of Flight in seconds,
>   Tc is the ambient temperature in degrees C,
>   SQRT is the symbol* for square root (* in Microsoft Excel)

and

>   Dm is the distance in meters.
.
For 23 degrees C and 0.0058 seconds (or 5.8mS) the distance calculates to 1.0006 meter.
If using the Serial output, first convert the distance reported by the sensor to TOF by using 147uS per inch (TOF = inches * 1.47E-4) or 58uS per cm (TOF = cm * 5.8E-5) and then insert the TOF into the above formula.
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Many prefer to use the analog voltage output.
All of the following formulas use the following symbols.

where

>   Tc is the temperature in degrees C
>   Vm is the analog voltage output from our product (measured by the user)
>   Vcc is the supply voltage powering the MaxSonar product

and

>   Dm is the distance in meters.

Please choose the correct formula for your MaxSonar-Product.

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Temperature Compensation when using the Analog Voltage Range output on the
regular XL-MaxSonar sensor line (that output a voltage of one bit per cm).

$Dm = (Vm/(Vcc/1024)*(58e-6uS)) * (20.05*SQRT(Tc+273.15)/2)$

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Temperature Compensation when using the Analog Output on
the Long Range XL-MaxSonar products (that output a voltage of one bit per two cm)

$DM = (Vm/(Vcc/1024)*(29e-6uS)) * (20.05*SQRT(Tc+273.15)/2)$

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Temperature Compensation when using the LV-MaxSonar Analog Output
on the LV-MaxSonar products (that output a voltage of two bits per inch)

$Dm = (Vm/(Vcc/1024)*(147e-6uS)) * (20.05*SQRT(Tc+273.15)/2)$

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Source of the speed of sound formula is Poole's work, and it is the most used of the speed of sound formulas.