RPS-412A

High Accuracy Ultrasonic Sensor

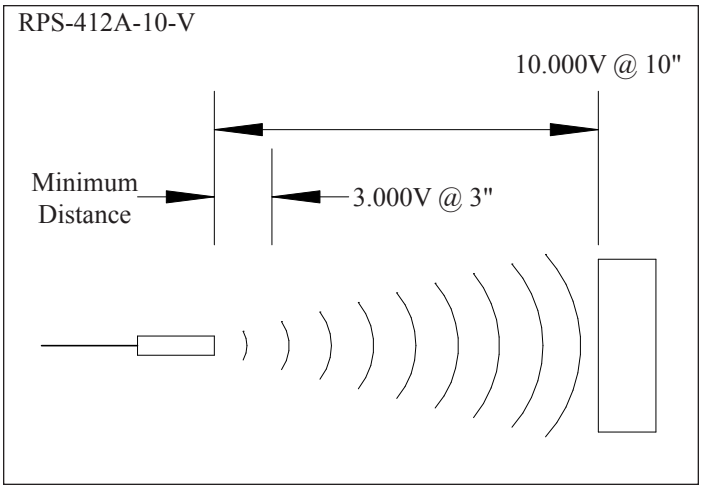
Features

- Input Voltage 20 - 30VDC
- Analog Voltage Output
- Short Circuit Protected
- Wide Temperature Range
- Temperature Compensation
- Self Contained Sensor
- Quick Disconnect Connector
- Stainless Steel Housing

The RPS-412A is a high accuracy analog ultrasonic sensor (±0.002" or 0.05% of range, which ever is greater, at 25°C) with a resolution of 0.0005". The sensor monitors and compensates for air temperature 50 times per second, using the temperature compensation bar located in front of the transducer. This temperature compensation method also compensates for changes in relative humidity, changes in barometric pressure, and other factors that influence the speed of sound.

The RPS-412A has a 47mm stainless steel barrel housing. The stainless steel housing is electrically isolated from the sensor electronics. The sensor comes with two jam nuts for mounting.

The RPS-412A has a 0 - 10V analog output. The analog output is a fixed Volts per inch. The RPS-412A-16-V is 0.625V per inch and the RPS-412A-10-V is 1.000V per inch. For example, when using the RPS-412A-10-V model, a target placed 3" from the sensor face will result in a sensor output of 3.000V and a target placed 10" from the sensor face will result in a sensor output of 10.000V. The RPS-412A is also available with a 4 - 20mA analog output. Please contact Migatron for more information on the 4 - 20mA models, and to discuss your application.



The RPS-412A is designed to take advantage of today's PLC and computer analog input cards. The analog input card will determine the resolution of the system. The analog-to-digital conversion should have, at least, 14 bit resolution. The numerical values programmed into the PLC or computer will determine the zero and span.

If two RPS-412A sensors are used next to each other cross-talk interference may occur between the two sensors. In this case the two sensors should be synchronized (Sync) to prevent cross-talk. In some applications the sensor may need to stop transmitting (Tx) and receiving sound at certain times. With the Tx option the user can control when the sensor transmits. Please contact Migatron for more information on models with the Sync/Tx option, and to discuss your application.

RPS-412A Setup, Calibration & Wiring Instructions

Air Temperature:

The air temperature between the sensor and target must be constant. Any variations in air temperature will compromise the accuracy of the sensor. The sensor can compensate for changes in air temperature provided the air temperature is constant between the sensor and target. If the air temperature varies between the sensor and target the sensor cannot compensate for the temperature variation. For example: If the air temperature is 20°C from the sensor face to 5", and the air temperature is 25°C from 5" to 10". The sensor will compensate for the 20°C air temperature, and ignore the 25°C air temperature.

Sensor Alignment:

The sensor must be properly aligned to obtain the best accuracy. In general the target should be perpendicular to the center line of the sensor. To align the sensor manually place the target you will be measuring at the farthest distance it will be from the sensor. Monitor the color of the LED on the sensor (green is no signal, light red is a weak signal, and bright red is a strong signal) align the sensor, so the LED is the brightest red color you can get. This will be the optimum alignment of the sensor.

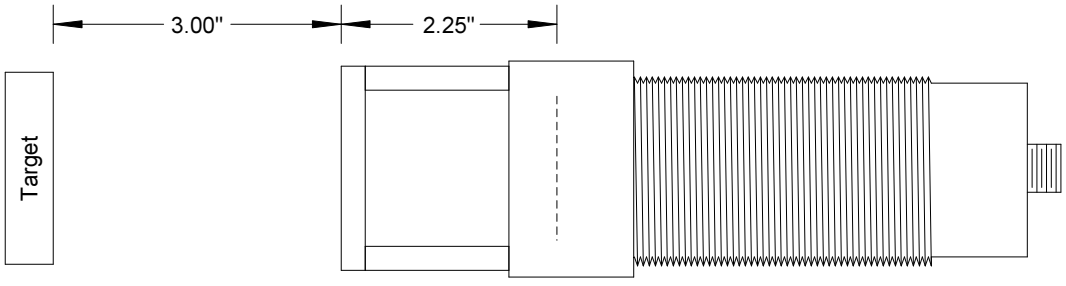
Calibration:

The sensor comes pre calibrated from the factory. The sensor may also be re-calibrated in the field. Follow the steps below to re-calibrate.

1. Check Sensor Alignment before calibration, see Sensor Alignment above.

2. P1 must be adjusted first.

3. Place the target at the near distance (closest distance target will get to sensor). Measure the distance from the target to the temperature compensation bar. **(Do not touch the face of the transducer.)**



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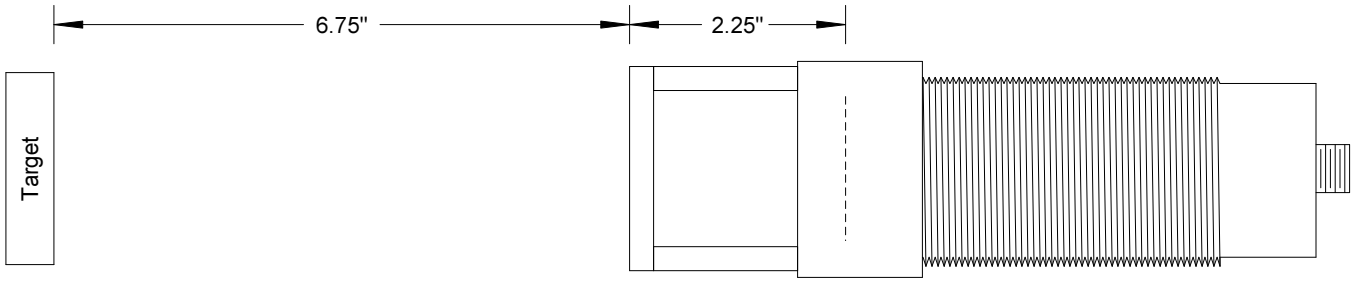
4. Calculate the voltage for the near distance. Add 2.25" to the measured distance and then multiply by the volts per inch. Adjust P1 for the calculated voltage.

RPS-412A-10-V: 2.25" + 3.00" = 5.25" x 1.000V/" = 5.250V

RPS-412A-16-V: 2.25" + 3.00" = 5.25" x 0.625V/" = 3.281V

5. Place the target at the far distance (farthest distance target will be from sensor). Measure the distance from the target to the temperature compensation bar. **(Do not touch the face of the transducer.)**



6. Calculate the voltage for the far distance. Add 2.25" to the measured distance and then multiply by the volts per inch. Adjust P2 for the calculated voltage.

RPS-412A-10-V: 2.25" + 6.75" = 9.00" x 1.000V/" = 9.000V

RPS-412A-16-V: 2.25" + 6.75" = 9.00" x 0.625V/" = 5.625V

7. Repeat the adjustment of P1 and P2 one or more times to achieve the best accuracy.

Wiring:

The RPS-412A has three ground (GND) wires. Power GND and Analog Signal GND are connected together inside the sensor. However, when installing the sensor it is important to connect the Power GND to the power supply GND and Analog Signal GND to the minus input of the PLC. This configuration is intended to keep GND currents associated with powering the sensor on the Power GND wire while maintaining a clean GND connection for the Analog Signal via the Analog Signal GND.

The third GND is Case GND. The stainless steel housing (case) is connected to the metal shell of the M12 receptacle, located on the back of the sensor. By using a shielded M12 cable, with the shield connected to the coupling nut of the cable, the case can be grounded with the drain wire from the shielded M12 cable. Other grounding configurations are possible, and may need to be explored if GND noise is interfering with the operation of the sensor.

Specifications:

Model:	Range:	Volts per Inch:
RPS-412A-10-V	3 - 10"	1.000V
RPS-412A-16-V	3 - 16"	0.625V

Accuracy:	±0.002", or ± 0.05% of range (which ever is greater) @ 25ºC. ±0.2% of range from 0 - 50ºC
Resolution:	0.0005"
Power Input:	20 - 30VDC Reverse Polarity Protected
Input Current:	65mA Typical
Operating Temperature:	0 - 50ºC or 32 - 122ºF
Humidity:	0 - 95% Non-Condensing
Output:	Analog Voltage Output, Short Circuit Protected Load 500 Ohms to Infinity
Transducer Frequency:	60kHz
Housing:	Stainless Steel
Protection:	IP10
Sample Rate:	20ms Typical
Update Time:	2s Maximum
Weight:	22 ounces

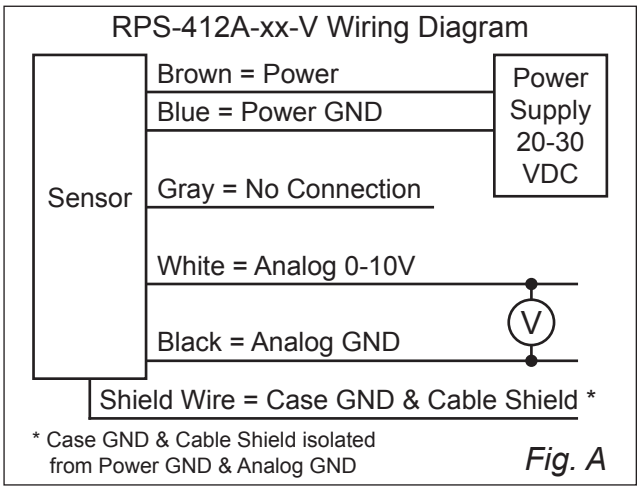


Fig. A

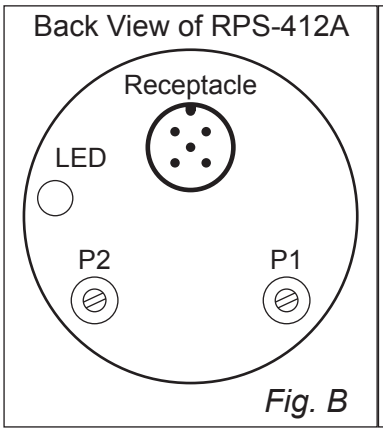
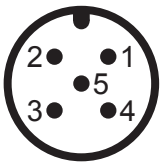


Fig. B



1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray

Fig. C

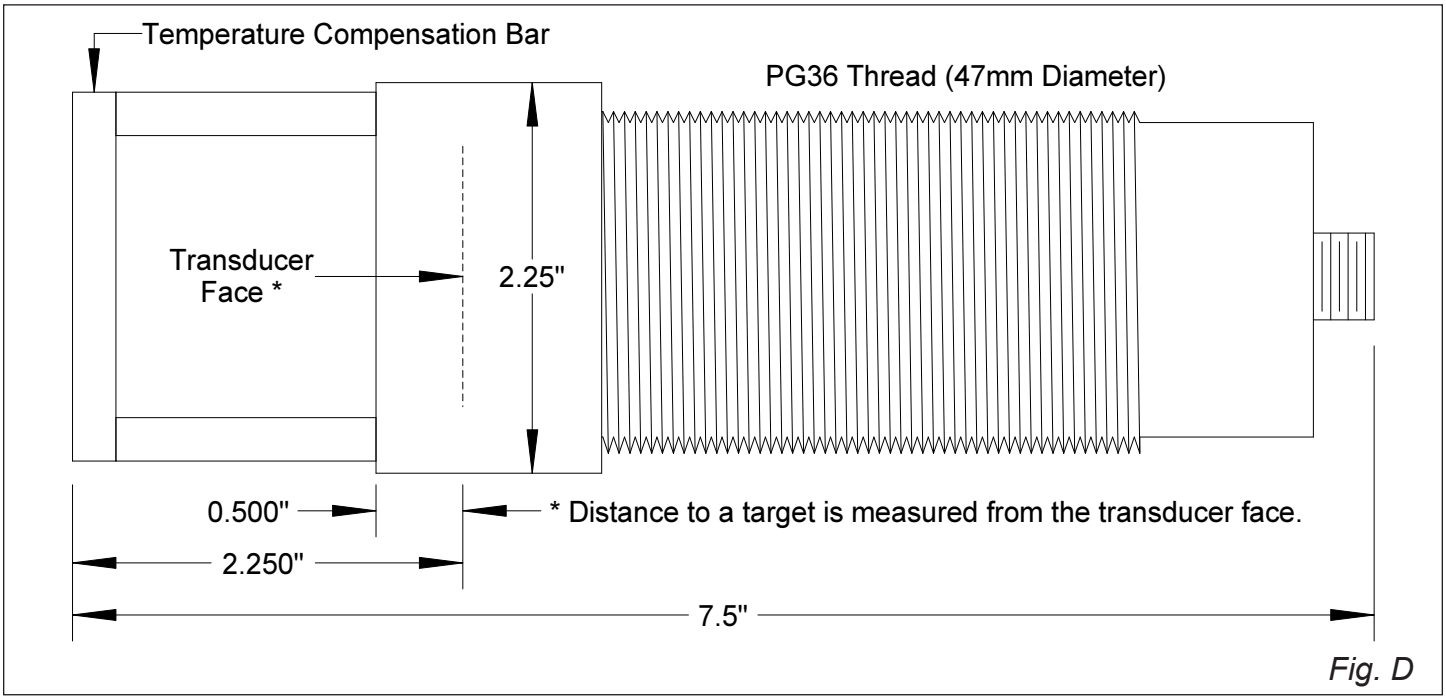


Fig. D

PART NUMBER	RANGE	OUTPUT / DESCRIPTION
RPS-412A-10-V	3 - 10"	0 - 10VDC Analog Output - Cable Sold Separately
RPS-412A-16-V	3 - 16"	0 - 10VDC Analog Output - Cable Sold Separately
F32-5001300		2 meter QD Cable, M12 5-Pin 22 AWG Shielded

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