



Technology Solutions

TEK-SOUND 4200A

Ultrasonic Level Transmitter



LEVEL



Introduction

Tek-Sound 4200A Ultrasonic Level Transmitter are commonly used level measurement instruments used in several industries for the continuous measurement of the level and volume of different media in open and closed tanks and for flow measurement in open channels. They are a cost-effective, reliable, and accurate solution in a wide array of applications involving both solids and liquids. Since they are non-contact devices, they require minimal maintenance and suffer minimal wear and tear. Additionally, this also ensures that they can be used under difficult process conditions.

Measuring Principle

An ultrasonic transmitter measures the level of a medium based on the propagation time of sound waves between a transducer and the surface of the medium.

It consists of a transducer with a piezoelectric crystal that converts the electrical energy generated by the transmitter into sound waves. These sound waves are transmitted towards the surface of the medium and reflected back to the transducer where the piezoelectric crystal then converts them into an electrical signal. The transmitter measures the time taken by the waves to be emitted and reflected by the surface and return to the transducer. The distance between the transmitter and the medium surface is then calculated using the time of flight of the waves and the speed of sound.

Operation

The transmitter is mounted at the top of the tank or container over the maximum level of the medium to be measured. Ultrasonic pulses are emitted from the transducer in the direction of the surface of the medium. These pulses travel through the space above the medium and are reflected back to the transducer in a straight line as echoes. The time of flight between the transmission of the ultrasonic pulses and the reception of the echoes is measured by the transmitter and is proportional to the distance between the transmitter and the medium surface.

The distance is therefore calculated using the following formula:

$$\text{Distance} = \frac{(\text{Speed of sound} \times \text{Time of flight})}{2}$$

The medium level is then derived from the distance as follows:

“Level = Range - Distance”

If the transmitter is mounted at the base of the tank or vessel, the medium level is measured based on the time taken by the ultrasonic pulses to reach the surface of the medium and return to the transmitter at the base.

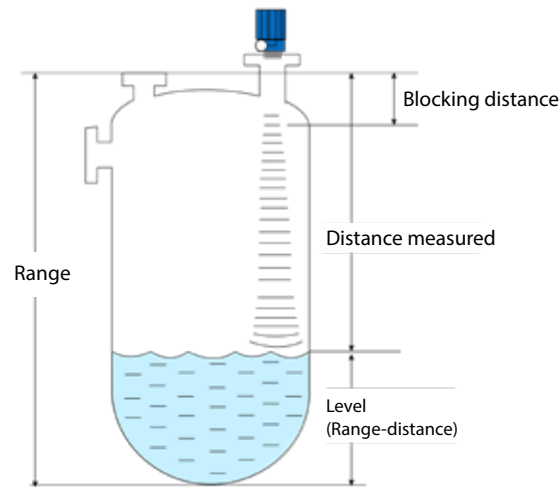


Fig. Operation of Ultrasonic Level Transmitter

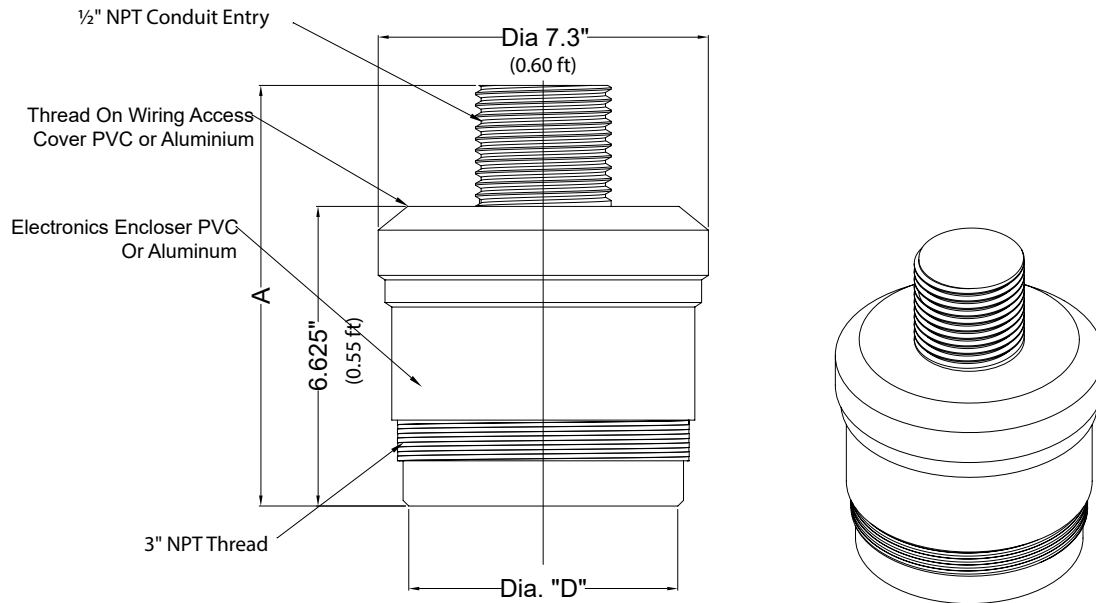
Features/Benefits

- Simple push button calibration
- Self-cleaning operation of sensor face
- Built-in temperature compensation
- 3 and 4 wire operation
- 4 mA to 20 mA or 20 mA to 4 mA outputs available
- It provides RS232 and RS485 communication protocol
- Fast Response Time (2 or 3 echoes per second)
- It has accuracy up to $\pm 0.10\%$ of max. range

Applications

- It can be used in high temperature applications
- It is used in many industries like food and beverages, pharmaceutical, water and wastewater, chemical industries

Dimensional Drawing



3 and 4 wire Ultrasonic Transmitter

Model	Operating Range	Operating Frequency	Mounting Thread	Dimension "A"	Dimension "B"	Dimension "D"
4200A-045ULCX	720" (60 ft)	45 KHz	3"	7.75" (0.64 ft)	3.0" (0.25 ft)	3.0" (0.25 ft)
4200A-052ULCX	600" (50 ft)	52 KHz	3"	9.3" (0.77 ft)	3.05" (0.25 ft)	2.2" (0.18 ft)
4200A-070ULCX	360" (30 ft)	70 KHz	3"	8.5" (0.70 ft)	2.25" (0.18 ft)	1.8" (0.15 ft)
4200A-080ULCX	240" (20 ft)	80 KHz	3"	8.5" (0.70 ft)	2.25" (0.18 ft)	1.8" (0.15 ft)
4200A-081ULCX	192" (16 ft)	81 KHz	3"	8.4" (0.70 ft)	8.4" (0.70 ft)	1.5" (0.12 ft)
4200A-148ULCX	108" (9 ft)	148 KHz	1"	8.25" (0.68 ft)	8.25" (0.68 ft)	1.1" (0.09 ft)

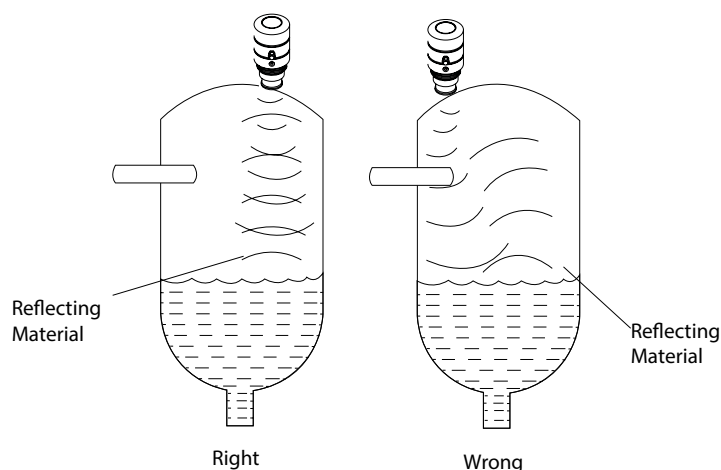
Specifications

OPERATIONAL	
Accuracy	±0.10% of max. range (in lab using 4-20 mA current output)
	±0.25% of max. range (typically in field)
Response time	Standard unit 2-3 echos/sec.
	Fast protocol 10-30 echos/sec.
Beam angle	10-12 degree at-3dB
Loss of echo	Hold 1 min., 22 mA or 2 mA output
Temperature compensation	In-built
Calibration	Push-button or programmable via optional communications port
Temperature (Electronics Enclosure)	-40 °F to 140 °F (- 40 °C to 60 °C) continuous operation
Pressure	5 bar max. using high temperature and pressure sensor

ELECTRICAL		
Power	AC	115 VAC 60 Hz or 230 VAC 50 Hz (+/-20%), 1.7 VA
	DC	12 to 30 VDC, 0.07 A max. at 24 VDC R load = $(V_s - 6) / 24$ mA
Output	RS232 or RS485 or 4 to 20 mA	

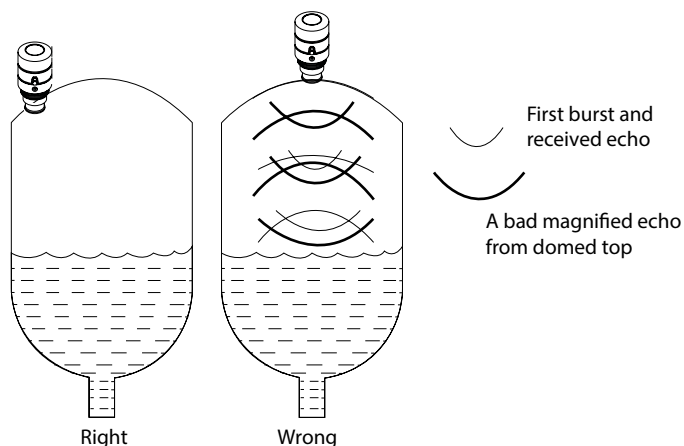
MECHANICAL	
Conduit entry	1/2" NPT hole (PVC conduit only)
Enclosure	PVC-94V0 or Aluminum
Ingress protection	NEMA 6 (IP68)

Installation



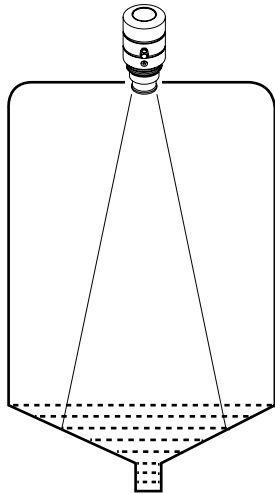
Installation on tanks with obstruction

During installation make sure that you do not have any large objects in front of transducer or antenna.



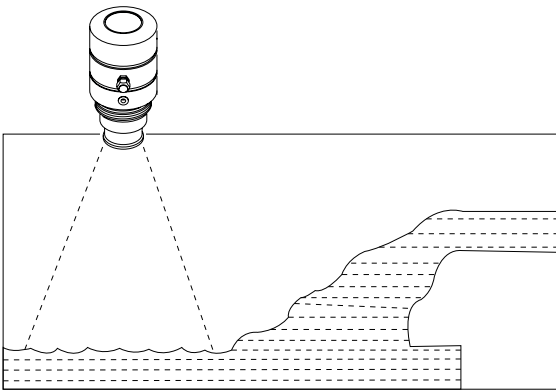
Installation on tanks with domed top

When mounting a Level device in a tank that has a domed top, the mounting cannot be in the centre.



Installation on vessels with conical bottom

In vessels with conical bottom, it can be advantageous to mount the sensor in the centre of the vessel, as measurement is then possible down to the lowest point of the vessel bottom.



Installation on vessels with inflowing medium

Do not mount instruments in or above the filling stream. Make sure that you detect the product surface, not the inflowing product.

Popular Models

Model Number	Description
4200A-045ULCX-PVPVC	60' Range, 3" NPT Process Connection, 3/4 wire
4200A-052ULCX-PVPVC	50' Range, 3" NPT Process Connection, 3/4 wire
4200A-070ULCX-PVPVC	30' Range, 3" NPT Process Connection, 3/4 wire
4200A-080ULCX-PVPVC	20' Range, 3" NPT Process Connection, 3/4 wire
4200A-081ULCX-PVPVC	16' Range, 3" NPT Process Connection, 3/4 wire
4200A-148ULCX-PVPVC	9' Range, 1" NPT Process Connection, 3/4 wire