



ultrasonic sensing

APPROVED
Class I, Div. 2 on
DCU-1100
Models

■ Description

The DCU series sensors use ultrasonic technology to provide a non-contact method of determining distance or level measurements. This versatility makes the DCU series ideal for a variety of applications. The color, translucency, dielectric constant, specific gravity or viscosity of the target does not affect an ultrasonic sensor. Ultrasonic sensors function extremely well in harsh environments, are reliable, and require little or no maintenance.

■ Operational Description

Ultrasonic sensing is very similar to radar. The sensor transmits ultrasonic sound waves. If the sound waves meet a solid or reflective object, such as a liquid, they are reflected back and detected by the sensor. The time of flight is measured, and since the speed of sound is a well-known variable, the distance to the object can be calculated.

Until recently, the many variables in the speed of sound created inaccurate readings. With the advent of microprocessor technology, these variables can now be factored into the equation and eliminated. One such variable is ambient temperature. The DCU series incorporates internal temperature compensation to adjust for

DCU

Ultrasonic Level Sensors

- Variety of operating ranges:
 - DCU-1100 series:
2 to 50 ft. (0.6 to 15.3 m)
 - DCU-1600 series:
4 to 72 in. (0.1 to 1.83 m)
 - DCU-7000 series:
7110 & 7210:
1 to 16 ft. (0.3 to 4.88 m)
7070:
1 to 32 ft. (0.3 to 9.75 m)
- Internal temperature compensation
- Programmable response time
- Maintenance free
- Programmable filtering



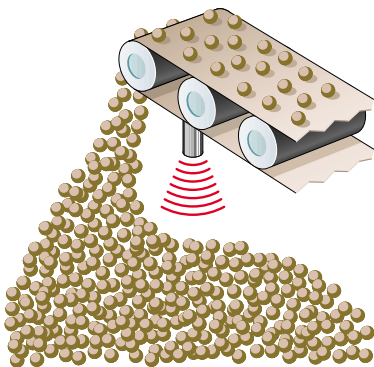
changes in ambient temperature. The DCU series also incorporates programmable filtering options to account for other variables, such as waves on a liquid, or tank irregularities. The distance to the object is converted into an analog output signal that is user adjustable.

■ Applications

The DCU series was designed for a wide range of applications, including environmental monitoring, object detection, proximity detection, and level control.

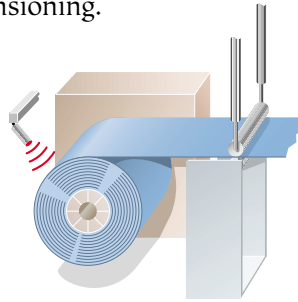
Equipment Positioning

Ultrasonic sensors provide a very effective technique for noncontact position monitoring. They are superior to mechanical devices which wear out, cause product damage, and are easily fouled.



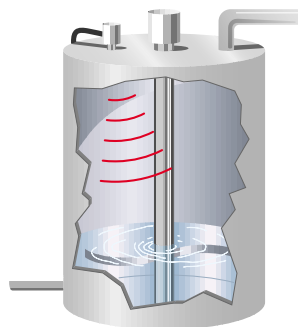
Industrial Automation

These are applications that monitor, control, or automate a repetitive process. Examples include measuring roll diameter, loop control, positioning, proximity detection and product dimensioning.



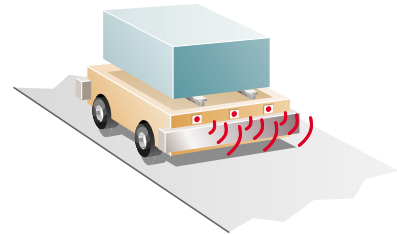
Tank Measurement and Control

These are applications where level control is required for liquid or bulk solid level and continuous indication or set point control is desired. In many applications, the output is interfaced to pumps, alarms, drives and other devices used to control level. Examples include tanks, feed bins and sand or gravel bins.



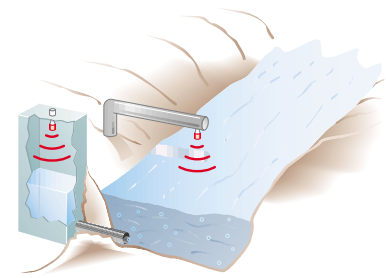
Collision Avoidance

These involve detection of objects or structures in the path of mobile equipment to avoid collisions or accidents. The trip distance of the sensor is adjustable to allow for slowing or stopping at preset distances. Examples include automated guided vehicles (AGVs), overhead cranes and fleet vehicles backing to loading docks or with restricted rear viewing.



Environmental Monitoring

Environmental monitoring applications are those where a level sensor is used to monitor the level of water or snow, and interfaced with a data collection platform. Examples include fresh or wastewater flow monitoring, stream staging, reservoir level and snow level.



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■ Specifications

Model	DCU-1100	DCU-1600	DCU-7000
Operating Range	2 to 50 ft. (0.6 to 15.3 m)	4 to 72 in. (0.1 to 2 m)	DCU-7070: 1 to 35 ft. (0.3 to 10.7 m) DCU-7110 & 7210: 1 to 16 ft. (0.3 to 4.9 m)
Output	(2) solid state relays and 4-20 mA	4-20 mA	0-5 V
Supply Voltage	24 VDC*	24 VDC*	24 VDC**
Total Current Draw	110 mA @ 24 VDC	80 mA @ 24 VDC	80 mA @ 24 VDC
Maximum Rated Power	3 W	2.5 W	2.5 W
Housing	PVC	PVC	DCU-7110 & 7210: PVC DCU-7070: Stainless steel
Mounting	3 NPT or 3 in. 150 lb. flange	1 NPT, 2 NPT, or 2 in. sanitary 3A flange	DCU-7110: 2 NPT DCU-7070 & 7210: Band clamp
Transducer Type	DCU-1104: ceramic, PVC faced DCU-1108: ceramic, Teflon® faced	Ceramic	DCU-7110: Ceramic, PVC faced DCU-7070 & 7210: Electrostatic
Ratings	NEMA 4X	NEMA 6P, IP67	DCU-7110: NEMA 4X DCU-7070 & 7210: NEMA 12
Approvals (pending)	FM Class I, Div. 2	n/a	n/a
Response Time	Programmable (120 ms minimum)	Programmable	Programmable (5 sec. minimum upon excitation)
Sample Rate	Programmable (8-0.125 Hz)	Programmable (60 to 1000 ms)	12 Hz
Resolution	0.1 in. (2.5 mm)	0.13 in. (3.3 mm)	0.05 in. (1.3 mm)
Accuracy (with no temperature gradient)	±0.25% of detected range	±0.25% of detected range	±0.25% of detected range
Adjustments	Integrated keypad	RS-232	RS-232
Operating Temperature	-30 to 140°F (-34 to 60°C)	-40 to 140°F (-40 to 60°C); DCU-1633 is rated to 250°F (121°C) for < 39 min.	-30 to 140°F (-34 to 60°C)
Temperature Compensation	Internal	Internal	Internal
Beam Pattern	9° off axis	9° off axis	9° off axis
Connections	(10) conductor cable (6 ft. (1.8 m) standard length)	(8) conductor cable (6 ft. (1.8 m) standard length)	(8) conductor cable (6 ft. (1.8 m) standard length)
Frequency	42 kHz	143 kHz	DCU-7110: 69 kHz DCU-7070 & 7210: 50 kHz

* The sensor will operate from 12-28 VDC, but the sensor performance will be diminished if the voltage is less than 24 VDC.

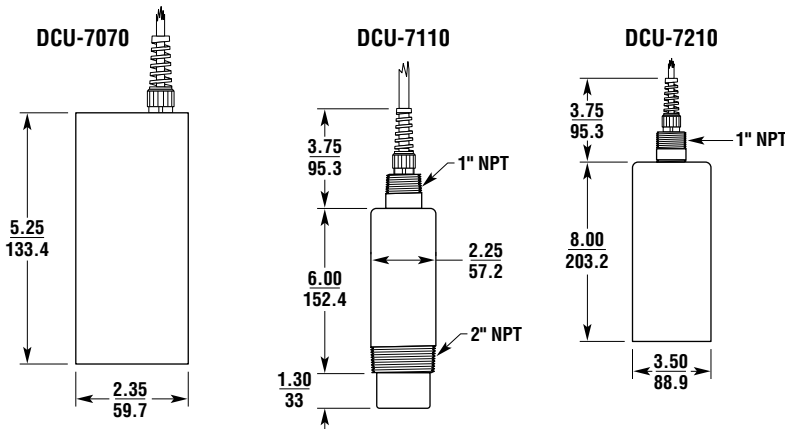
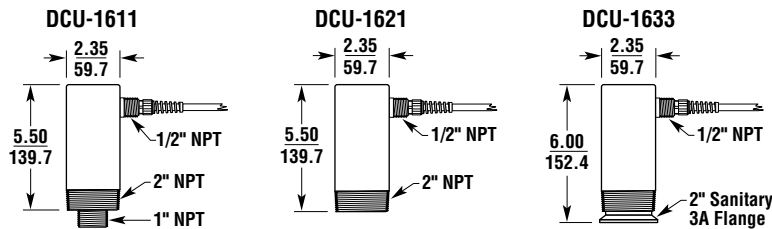
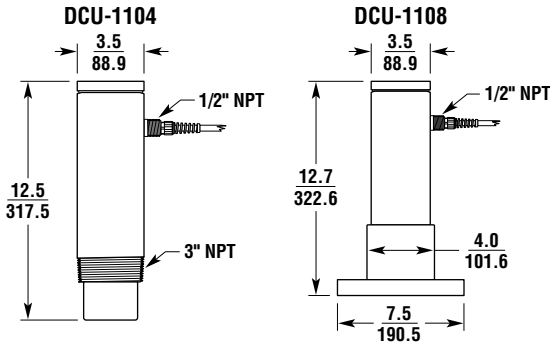
** The DCU-7110 will operate from 12-28 VDC, but the sensor performance will be diminished if the voltage is less than 24 VDC.

Specifications are subject to change without notice.



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■ **Dimensions — in./mm**



■ **Wiring**

	DCU-1100	DCU-1600	DCU-7000
Red	+ 24 VDC	+ 24 VDC	+ 24 VDC
Black	- VDC	- VDC	- VDC
Green	Clock synch	4-20 mA ground	Analog ground
White	Digital pulse width	Digital pulse width	0-5 V analog output
Blue	Relay 1 common	RS-232 receive	RS-232 receive
Grey	Relay 1 normally open		
Purple	Relay 2 common		
Brown	Relay 2 normally open	RS-232 ground	RS-232 ground
Orange	4-20 mA output	4-20 mA output	Excitation
Yellow	4-20 mA ground	RS-232 transmit	RS-232 transmit

■ **Ordering Information**

DCU-1100 Series

Mounting Option	
4	3 NPT
8	3 in. 150 lb. flange

DCU-1600 Series

Mounting Option	
11	1 NPT
21	2 NPT
33	2 in. sanitary 3A flange

DCU-7000 Series

Option	
070	32 ft. (9.8 m) range, SS housing, electrostatic transducer
110	16 ft. (4.9 m) range, PVC housing, ceramic transducer
210	16 ft. (4.9 m) range, PVC housing, electrostatic transducer

For information on ultrasonic sensing accessories, see page A24.