HIGH ACCURACY

measurement instruments

PRODUCT DATASHEET

www.high-accuracy.com

Product Data Sheet
March 2015
IP201, Rev DB

Mobrey Ultrasonic Liquid Level Detection

Systems for Interface Applications

CE

- Choice of Mobrey ultrasonic liquid point level switches for use in tanks and pipelines
- Mobrey MCU200 industrial control unit with alarm and fault output relays
- No moving parts
- Simple installation
- Unaffected by conductivity, droplets, most coatings, or liquid color/opacity

mobrey

EMERSON™
Process Management

Ultrasonic Liquid Level Detection System Overview

Mobrey 402SD
Tank-Mounted Ultrasonic Point Level Switch
(Gap Type Sensor)

Mobrey 433SD
Tank-Mounted Ultrasonic Point Level Switch
(Gap Type Sensor)

Mobrey 442SD
Ultrasonic Point Level Switch for Pipe Section
(Gap Type Sensor)

Mobrey MCU200 Series
Industrial Control Unit
(MCU201/MCU203)

Ultrasonic liquid point level switches (gap type sensors) are used in non-hazardous area industrial processes to detect high or low liquid levels or liquid interface.

Mobrey ultrasonic point level switches are activated when there is a liquid present between the sensor's transmitter and receiver crystals. In this way, the absence of liquid results in a low level being indicated.

The level switches are fitted with dual-coaxial cable for connection to a control unit. This cable can be extended with suitable coaxial extensions up to 164 ft. (50 m).

Typical applications include interface detection duty for immiscible liquids and sludge blanket level.

See "Specifications" on page -7 for technical details.

Mobrey ultrasonic liquid level control systems for Interface Applications Contain

- A wall-mountable Mobrey MCU200 Series industrial control unit for monitoring the level switch state and provide the required switching function
- A tank-mountable Mobrey 402SD or 433SD ultrasonic point level switch containing transmitter and receiver piezo-electric crystals

Mobrey MCU200 Series Industrial Control Units

The MCU201 and MCU203 control units provide simple and economical control electronics for wall-mounting near a tank or pipeline containing a single ultrasonic level switch.

MCU200 Series features:

- Wall-mounting IP65 polycarbonate enclosure
- 115/230 Vac (*MCU201*) or 24 Vdc (*MCU203*)
- Suitable for use with all Mobrey ultrasonic liquid point level switches
- DPDT relay output for wet-to-dry or dry-to-wet changeover indication, external control, or alarm condition indication
- Accepts a voltage-free contact input e.g. to actuate a pump control function via the output DPDT relay
- Three LED indicators – Normal, Alarm, and Fault
- Selectable time delay
- Continuous cable check (between sensor and MCU200)

Contents

Interface detection and sludge measurement

Ultrasonic technology can be used to discriminate between immiscible liquids to indicate the interface and to detect and monitor suspended solids.

Interface detection (402SD)

For interface detection between immiscible liquids, two techniques are available: *ultrasonic attenuation* and *ultrasonic refraction*.

Ultrasonic attenuation is the reduction in beam energy as it is transmitted through the liquid. Viscous liquids, emulsions, and liquids with entrained solids generally have a higher ultrasonic attenuation than low viscosity clear liquids such as water. When the attenuation difference is sufficient, the amplifier gain can be adjusted so that the ultrasonic beam passes through the less attenuative liquid but is stopped by the more attenuative liquid.

The refraction technique is used to detect the interface where two immiscible liquids have similar attenuations. When the sensor is oriented at an angle of 10 degrees from the horizontal, and the interface level is within the gap of the level switch, a small signal is received. The gain of the MCU200 Series control unit can be set to actuate the relay when little signal is received. For further information on suitability of this application, consult your local Customer Care representative.

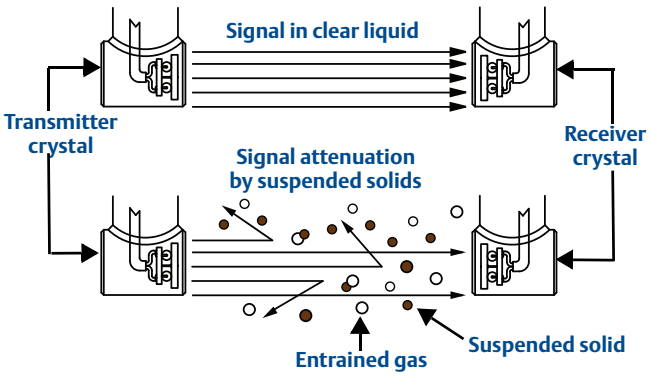
Sludge measurement (433SD and 442SD)

Solids suspended in a liquid will scatter ultrasonic beams, causing attenuation. This attenuation depends on the size and nature of the particles.

For typical sewage sludges, it is possible to use Mobrey ultrasonic systems to detect 1% to 15% suspended solids within a slurry. Industrial slurries such as fine pottery slips can often be measured up to 65% solids by weight.

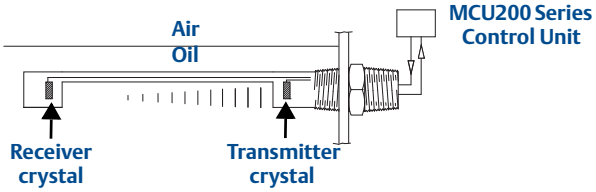
The 433SD sensor is normally suspended in a tank or separator. The 442SD sensors are typically installed as a pair in a section of pipe to detect sludge density.

ULTRASONIC ATTENUATION

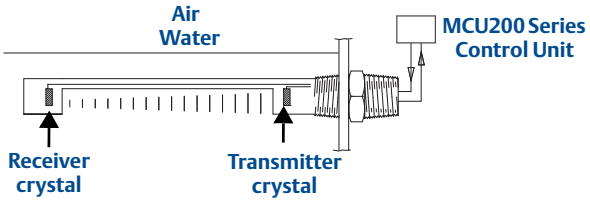


INTERFACE DETECTION BY ATTENUATION

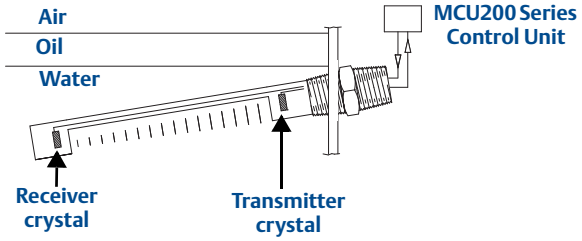
Sensor in oil:
The ultrasonic beam is attenuated and will not reach the receiver crystal

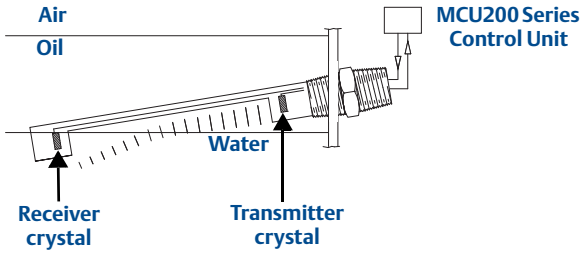


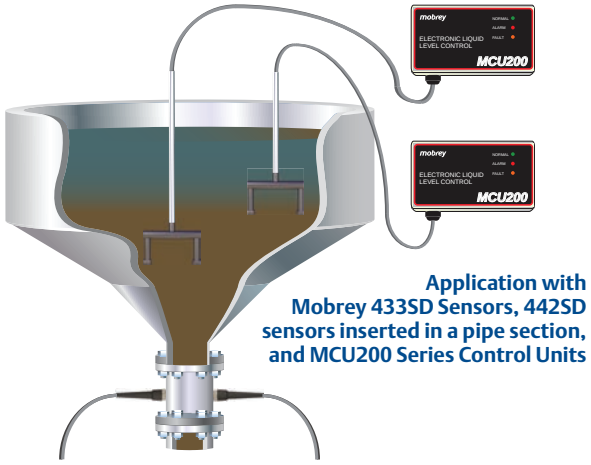
Sensor in water:
The ultrasonic beam reaches the receiver crystal



INTERFACE DETECTION BY REFRACTION







Application with Mobrey 433SD Sensors, 442SD sensors inserted in a pipe section, and MCU200 Series Control Units

Ordering Information for 433SD

- Level switches may be mounted in any orientation to signal liquid presence or at a 10 degree angle to detect the interface
- Ultrasonic sensor operation can be adversely affected by high aeration or foam in the liquid. If you have an application query, contact Customer Support for advice on the selection of a suitable liquid level detection system
- Supplied with 33 ft. (10 m) of cable as standard. Contact Rosemount Measurement for other cable lengths up to 164 ft. (50 m)
- If the MCU control unit is required, add MCU201 (115/230 Vac) or MCU203 (24 Vdc) at the time of ordering the 402SD, 433SD or 442SD

Additional information

MCU201/203 ordering: page 6
Dimensions: page 8
Specifications: page 7

Table 1. 433SD ordering information

Model	Product Description
433SD	Tank-mountable sensor, ¾-in. BSPT, non-hazardous area use only
Gap Size – see Table 2 for measurement ranges in %solids	
801M1(1)	4-in. (100 mm) gap sensor for MCU200 Series
805M1(1)	6-in. (150 mm) gap sensor for MCU200 Series
802M1(1)	8-in. (200 mm) gap sensor for MCU200 Series
803M1(1)	12-in. (300 mm) gap sensor for MCU200 Series
804M3(1)	18-in. (450 mm) gap sensor for MCU200 Series
Cable Length(2)	
/ M10	Supplied with 33 ft. (10 m) PTFE-insulated dual-coaxial cable
Typical Model Number: 433SD 805M1 / M10	

(1) If the MCU control unit is required, add MCU201 (115/230 Vac) or MCU203 (24 Vdc) at the time of ordering a level switch.

(2) For other cable lengths, contact Rosemount Measurement.

Table 2. Typical Measuring Ranges in %solids for Mobrey 433SD Sensors

Sensor Gap Size	PRIMARY SLUDGE (1 MHz)	PRIMARY SLUDGE (3.7 MHz)	SECONDARY SLUDGE (3.7 MHz)
4 in. (100 mm)	3 to 29%	1 to 6%	2 to 15%
6 in. (150 mm)	2 to 19%	1 to 4%	1 to 10%
8 in. (200 mm)	2 to 14.5%	0.5 to 3%	1 to 7.5%
12 in. (300 mm)	1 to 10%	0.5 to 2%	0.5 to 5%
18 in. (450 mm)	N/A	0.5 to 1.3%	0.5 to 3.3%
Note: These %solid ranges are based on typical attenuation factors for municipal wastewater sludge.			

Ordering Information for 402SD and 442SD

402SD

442SD

- Level switches may be mounted in any orientation to signal liquid presence
- Ultrasonic sensor operations can be adversely affected by high aeration, solids, or foam in the liquid. If you have an application query, contact Customer Support for advice on the selection of a suitable liquid level detection system
- Supplied with 10 ft. (3 m) of cable as standard. Contact Rosemount Measurement for other cable lengths up to 164 ft. (50 m)
- If the MCU control unit is required, add MCU201 (115/230 Vac) or MCU203 (24 Vdc) at the time of ordering the 402SD, 433SD or 442SD

Additional information

MCU201/203 ordering: page 6
Dimensions: page 8
Specifications: page 7

Table 3. 402SD and 442SD ordering information

Model	Product Description
402SD	Interface sensor, ¾-in. BSPT (internal or external thread), non-hazardous area use only
442SD(1)	Pipe-mountable sensors (pair), ¾-in. BSPT (internal or external thread), non-hazardous area use only
Sensor Compatibility with Rosemount Measurement Systems	
80(2)	MCU control unit
Cable Length(3)	
/ M03	Supplied with 10 ft. (3 m) PTFE-insulated dual-coaxial cable
Typical Model Number: 402SD 80 / M03	

(1) This is a pair of opposing sensors for installation horizontally across a customer's own pipe section.

(2) If the MCU control unit is required, add MCU201 (115/230 Vac) or MCU203 (24 Vdc) at the time of ordering a level switch.

(3) For other cable lengths, contact Rosemount Measurement.

Ordering Information for MCU200 Series Control Units

- Wall-mounting IP65 polycarbonate enclosure
- If the MCU control unit is required, add MCU201 (115/230 Vac) or MCU203 (24 Vdc) at the time of ordering the 402SD, 433SD or 442SD
- The 402SD, 433SD, and 442SD sensors and MCU200 Series control units are for use in non-hazardous areas only

Additional information

Specifications: page 7
Dimensions: page 8

Table 4. Mobrey MCU200 Series ordering information

Model	Product Description
MCU201	230/115 Vac version (50/60 Hz) MCU200 Series control unit, **non-hazardous area use only**
MCU203	24 Vdc version (grounded negative) MCU200 Series control unit, **non-hazardous area use only**
Typical Model Number: MCU201	

Specifications

Table 5. Specification for the Mobrey Ultrasonic Point Level Switches (Gap Sensors)

Ultrasonic Point Level Switches	Mobrey 402SD	Mobrey 433SD	Mobrey 442SD
Repeatability	2 mm	2 mm	2 mm
Operating Temperature	–94 to 302 °F (–70 to 150 °C)	–40 to 158 °F (–40 to 70 °C)	–94 to 302 °F (–70 to 150 °C)
Maximum Pressure	1523 psi (105 bar)	1523 psi (105 bar)	1523 psi (105 bar)
Power Consumption	< 10 mW at sensor	< 10 mW at sensor	< 10 mW at sensor
Standard Frequency	3.7 MHz	1 MHz / 3.7 MHz	1 MHz / 3.7 MHz
Standard Cable Length	10 ft. (3 m)	33 ft. (10 m)	10 ft. (3 m) per sensor
Cable Entry	Cable entry to sensor is IP65	Cable entry to sensor is IP68	Cable entry to sensor is IP65
Sensor Cable	Standard is PTFE-insulated dual-coaxial with PVC sheath. Minimum bend radius is 1.4 in. (35 mm)		
Note: The 402SD. 433SD, and 442SD are for non-hazardous area use only			

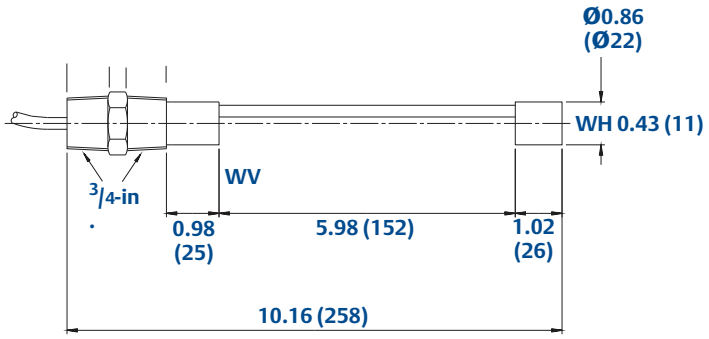
Table 6. Specification for the Standard Industrial Control Unit (Mobrey MCU201 and MCU203)

Mobrey MCU200 Series	MCU201	MCU203
Number of Level Switch Inputs	1	1
Power Supply (Selector Switch)	110/120 Vac or 220/240 Vac selectable	24 Vdc grounded (earthed) negative
Power Consumption	6 VA	2.4 W
Relay Output	Double-Pole Changeover (DPDT)	
	Energized when sensor is wet or dry (selectable by switch)	
Relay Rating	5A at 230V	5A at 230V
Box Dimensions	7.9 x 4.7 x 3 in. (200 x 120 x 75 mm)	7.9 x 4.7 x 3 in. (200 x 120 x 75 mm)
Box Rating	IP65 Polycarbonate	IP65 Polycarbonate
Holes for glands	3 off 0.63 in. (16 mm) diameter	3 off 0.63 in. (16 mm) diameter
Fixing centres (WxH) for Wall Mount	7.4 x 3.4 in. (188 x 88 mm)	7.4 x 3.4 in. (188 x 88 mm)
Fixing Hole Diameter	0.16 in. (4 mm)	0.16 in. (4 mm)
Frequency Selection	By switch on PC board	By switch on PC board
LED Indicators	Visible through the box lid	
	Green for normal. Red for alarm condition. Amber LED for fault condition	
	Selectable for wet/dry sensor, as appropriate for the application	
Gain Potentiometer	Fitted with scale and separate range switch to adjust for sensor type and site conditions	
Response Time	Selectable delay of 0.5, 2, 8 or 30 seconds	
	Delay selectable for wet-to-dry or dry-to-wet changeover	
	50 ms response in opposite direction	
Sensor Cable Check	Selectable to monitor coax screen to sensor for continuity	
	Fault lights fault LED and sets relay to alarm state	
Auxiliary Input	External closed circuit input to MCU200 latches the output relay to achieve pump control	
Note: MCU200 Series control units are for non-hazardous area use only		

Dimensional Drawings

Mobrey level switch dimensions

Notes
1. Dimensions are in inches (mm).
2. “WH” shows approximate switching level with the gap horizontal.
3. “WV” shows approximate switching level with the gap vertical.



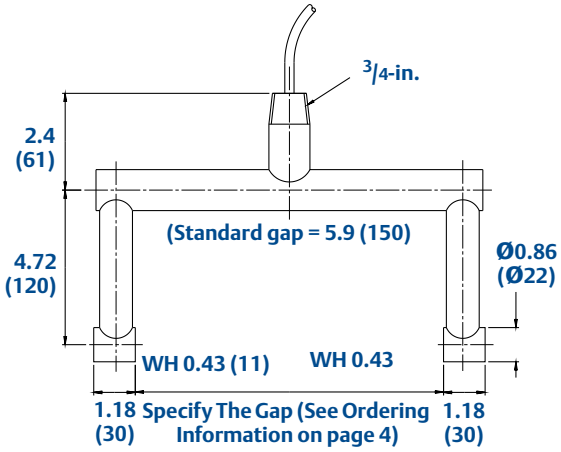
Sensor type 402SD

316 stainless steel

Duty: Interface, immiscible liquids

Liquid type: Clean, viscous with solids

See Table 5 on page 7 for the full specification



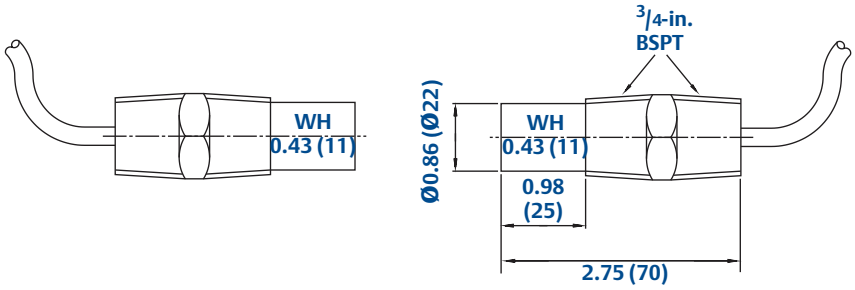
Sensor type 433SD

316 stainless steel

Duty: Sludge blanket or interface, immiscible liquids

Liquid type: Viscous or with solids in suspension

See Table 5 on page 7 for the full specification



Sensor type 442SD

Across Pipe

Duty: Pipelines

Liquid type: Clean or sludge density

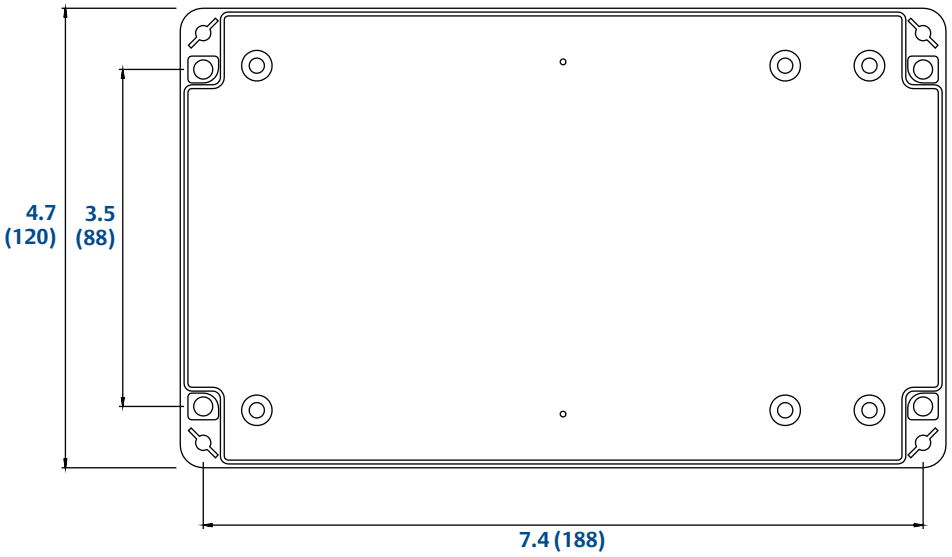
See Table 5 on page 7 for the full specification

Mobrey MCU201/MCU203 Dimensions

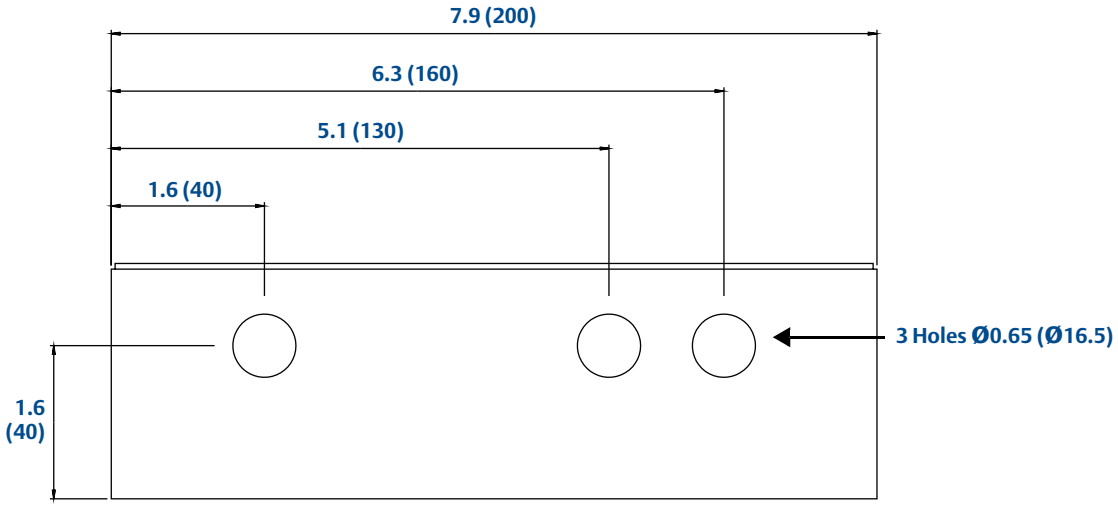
Notes
Dimensions are in inches (mm). See Table 6 on page 7 for the full specification.

MOBREY MCU200 SERIES
INDUSTRIAL CONTROL UNIT (MCU201/MCU203)

TOP VIEW



BOTTOM VIEW



HIGH ACCURACY

measurement instruments

Our offering:

	Pressure Measurement		Level Measurement
	Temperature Measurement		Flow Measurement
	Marine Measurement & Analytical		Gas Analysis
	Liquid Analysis		Flame and Gas Detection
	Tank Gauging		Wireless Infrastructure
	Acoustic & Discrete	HIGH ACCURACY measurement instruments	

www.high-accuracy.com

Emerson Process Management
Rosemount Measurement Ltd.
158 Edinbugh Avenue,
Slough, Berks., SL1 4UE, UK
Tel +44 (0)1753 756600
Fax +44 (0)1753 823589
www.emersonprocess.com

Emerson Process Management
Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317, USA
Tel (USA) 1 800 999 9307
Tel (International) +1 952 906 8888
Fax +1 952 906 8889

mobrey

EMERSON™
Process Management