Technical **Datasheet**

delta-mobrey

MCU200: Controller and Sensors

Suspended solids detection

Model: MCU200 series

Key **Features**

- Ultrasonic technology
- Level or interface detection
- Oil in Water or Water in Oil detection
- Choice of sensors for tanks or pipes
- LED indication for Normal, Alarm and Fault
- DPDT relay output, configurable for wet to dry, or dry to wet changeover
- Cable check fault detection
- Selectable time delay
- Unaffected by liquid colour/opacity, or conductivity
- Wall mounting IP65 polycarbonate enclosure

Product **applications**

- Sludge level detection
- Settlement tank high level alarm
- Water in oil / oil in water detection
- Liquid level detection
- For use in tanks or pipes

Product **Overview**

Ultrasonic point level switches may be used in industrial processes to detect high or low liquid levels or liquid interfaces, such as a sludge blanket. They can also discriminate between liquid and air, or immiscible liquids such as oil and water. They are therefore commonly used in settlement tanks and for oil or water contamination in marine and other industries.

Other products in the series include:
- MSM400 for continuous sludge density measurement with 4-20mA , HART and relay outputs
- DMSP ultrasonic level transmitters

How can we **help you?**

Delta Mobrey offers fast, efficient and knowledgeable support when and where you need it. Please visit our website at www.delta-mobrey.com to find your local support centre or call us on:

+44 (0)1252 729140

Suspended Solids Detection
Models: MCU200

Principles of Operation

Ultrasonic technology can be used to discriminate between immiscible liquids to indicate an interface or to detect suspended solids. It is helpful to understand the operating principles in order to select the most suitable sensor.

Sludge detection (sensors 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, the ultrasonic sensors can detect 1% to 30% suspended solids within a slurry. Industrial slurries such as fine pottery slips can often be measured up to 65% solids by weight.

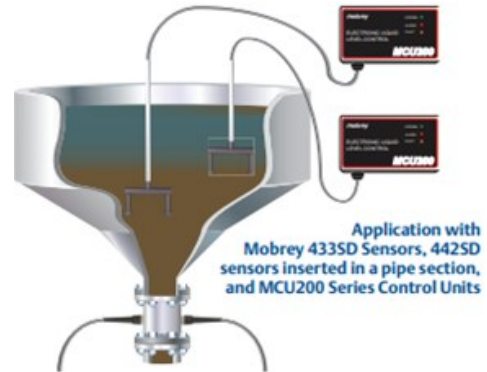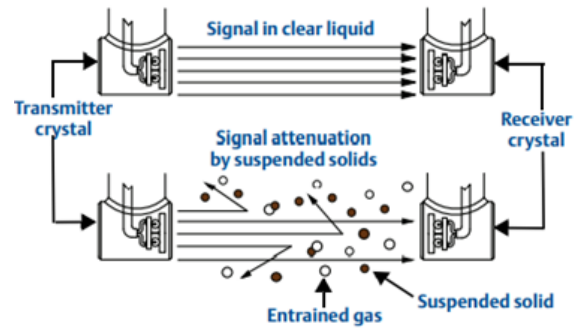The 433SD sensor is normally suspended in a settlement tank or separator.
The 422SD sensor pair is typically installed across a pipe.

Interface detection (sensor 402SD)

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

Ultrasonic attenuation is the reduction is signal 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 signal 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 horizontal, and the interface level is within the gap of the sensor, a small signal is received. The gain of the MCU200 control unit can be set to activate the relay when little signal is received.

Suspended Solids Detection
Models: MCU200

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

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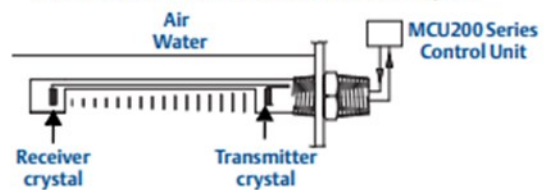
Sensor in oil:
The ultrasonic beam is attenuated and will not reach the receiver crystal
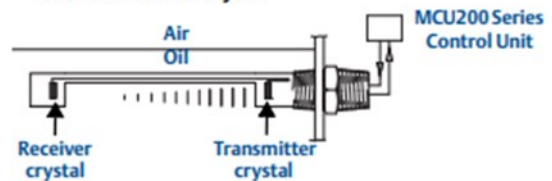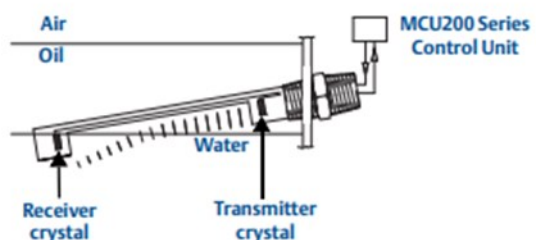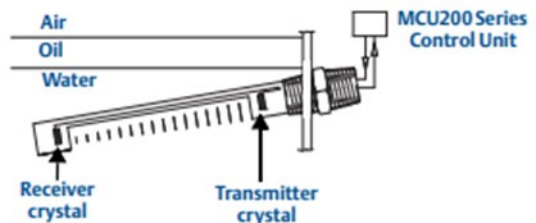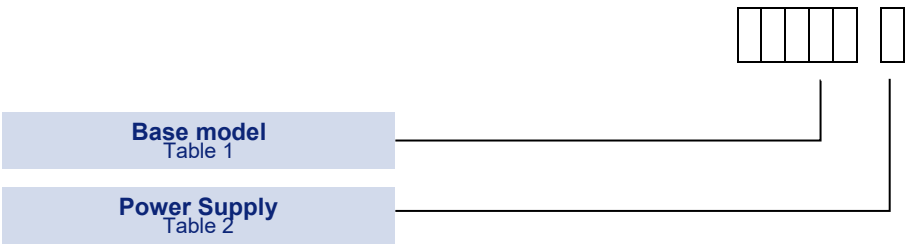

Sensor in water:
The ultrasonic beam reaches the receiver crystal

INTERFACE DETECTION BY REFRACTION

Principles of Operation

Base model
Table 1

Power Supply
Table 2

MCU Control Unit

TABLE 1

| Base Model	Code
Interface sensor	MCU200

TABLE 2

Power Supply	Code
MCU control unit. For use with all sensors. 220/110Vac (50/60 Hz). Safe area only.	1
MCU control unit. For use with all sensors. 24Vdc. Safe area only.	3

All Ultrasonic Sensors

- All sensors can be used with the MCU200 series of controllers.
- Cables are terminated with crimped ferules to connect within the MCU200 series controller
- Ultrasonic sensors should not be used in liquids with high aeration of foam which will attenuate the signal

433SD Tank Mount Sensors

433SD tank mount sensors are commonly mounted within a settlement tank from above, to detect a rising sludge blanket level
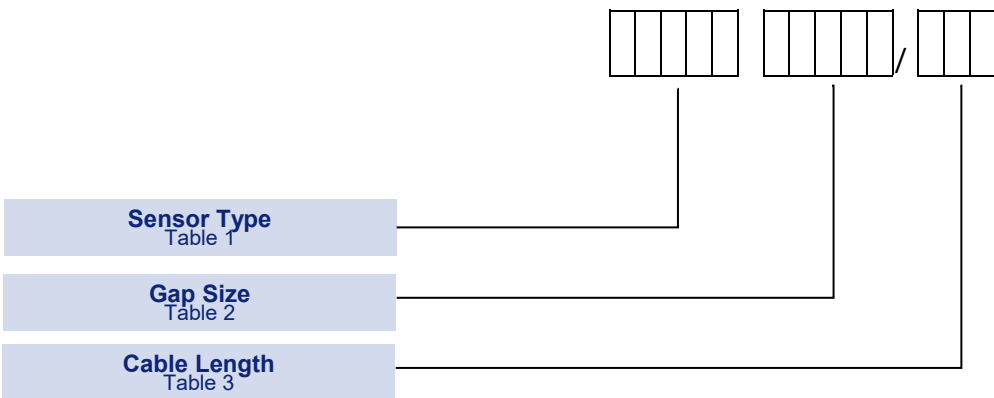
Suspended Solids Detection
Models: MCU200
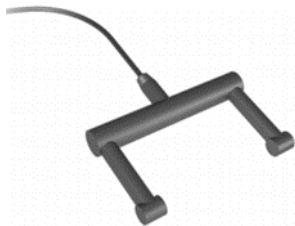
Gap Size Selection

Sensor Gap Size	Primary Sludge at 1MHz	Primary Sludge at 3.7MHz	Secondary Sludge at 3.7MHz
100 mm (4 inch)	3 to 29%	1 to 6%	2 to 15%
150 mm (6 inch)	2 to 19%	1 to 4%	1 to 10%
200 mm (8 inch)	2 to 14.5%	0.5 to 3%	1 to 7.5%
300 mm (12 inch)	1 to 10%	0.5 to 2%	0.5 to 5%
450 mm (18 inch)	N/A	0.5 to 1.3%	0.5 to 3.3%
Note: These % solids ranges are based on typical attenuation factors for municipal waste-water sludge. Within the UK's waste-water industry, experience has found a 6 inch gap sensor at 1 MHz is suitable for a majority of Primary Sludge applications, and an 18 inch gap sensor at 3.7 MHz is suitable for a majority of Secondary Sludge applications.			

How to order tank mount sensors

All tank mount sensors begin 433SD, then select the gap width and the cable length.
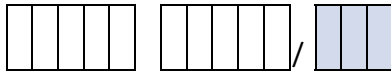
Sensor Type
Table 1

Gap Size
Table 2

Cable Length
Table 3

Suspended Solids Detection
Models: MCU200

Tank mount sensors

TABLE 1

Sensor Type	Code
Tank mount sensor for MCU200 series	443SD

TABLE 2

Gap Size	Code
100mm (4 inch) tank mount gap sensor. 1 MHz / 3.7 MHz.	801M1
150mm (6 inch) tank mount gap sensor. 1 MHz / 3.7 MHz	805M1
200mm (8 inch) tank mount gap sensor. 1 MHz / 3.7 MHz.	805M1
300mm (12 inch) tank mount gap sensor. 1 MHz / 3.7 MHz.	803M1
450mm (18 inch) tank mount gap sensor. 3.7 MHz only.	804M3

TABLE 3

Cable Length	Code
Cable length 10 meters	M10
Cable length 20 meters	M20
Customer defined cable length up to a maximum of 30m (may incur a longer lead time and additional cost)	MXX

Note: the MCU200 controller can be set to operate at either 1 MHz or 3.7 MHz. The standard frequency is 3.7 MHz, but

402SD interface sensors

402SD interface sensors are typically positioned either horizontally or at a 10 degree angle to detect a liquid interface.
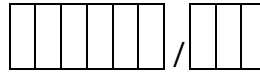
442SD pipe mount sensors

442SD pipe mount sensors may be mounted across a pipe of from 100mm (4")
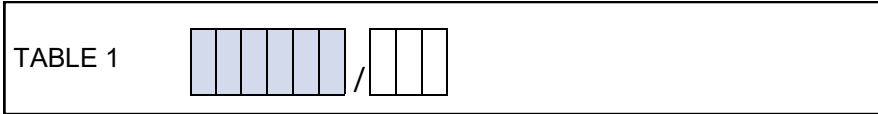
to 300mm (12") diameter.

Suspended Solids Detection
Models: MCU200

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How to order interface and pipe mount sensors

Sensor Type
Table 1

Cable Length
Table 2

Interface and pipe mount sensors

TABLE 1

Sensor Type	Code
Interface sensor. 3.7 MHz only.	402SD80
Pipe mount sensor. 1 MHz / 3.7 MHz.	442SD80

TABLE 2
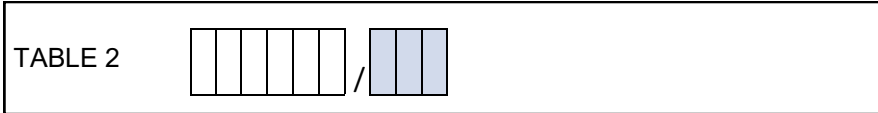
Gap Size	Code
Cable length 3 meters	M03
Cable length 6 meters	M06
Customer defined cable length up to a maximum of 30m (may incur a longer lead time and additional cost)	MXX

Suspended Solids Detection
Models: MCU200

Technical Specification

MCU200 Series Controller	MCU201	MCU203
Power supply	110/220 Vac or 220/240 Vac selectable	24Vdc grounded (earthed) negative
Power consumption	6VA	2.4W
Number of sensor inputs	One	
Relay output	Double-Pole Changeover (DPDT)	
	Energised when sensor is wet or dry (configurable)	
Relay rating	5A at 230V	
Enclosure size	200 x 120 x 75mm (7.9 x 4.7 x 3.0 inches)	
Enclosure rating	IP65 Polycarbonate	
Holes for glands	3 off 16mm (0.63 inches)	
Fixing centers for wall mount	188 x 88mm W x H (7.4 x 3.4 inches)	
Fixing hole diameter	4mm (0.16 inches)	
Frequency selection	1 MHz (higher sensitivity) or 3.7 MHz (standard) by switch	
LED indicators	Green for Normal. Red for Alarm. Amber for Fault. Visible through lid.	
	Green or Red selectable for wet or dry.	
Gain setting	Range switch and gain potentiometer to adjust for sensor and application	
Response time	Selectable delay of 0.5, 2, 8 or 30 seconds	
	Delay selectable for wet-to-dry or dry-to-wet changeover	
	50ms response in opposite direction	
Sensor cable check	Selectable to monitor coax screen for continuity	
	Fault condition lights the fault LED and sets relay to alarm state	
Auxiliary Input	External closed circuit input latches the output relay to achieve pump control	

Ultrasonic gap Sensors	402SD80	433SD80	442SD80
Repeatability	2mm	2mm	2mm
Operating temperature	-70 to 150°C (-94 to 302°F)	-40 to 70°C (-40 to 158°F)	-70 to 150°C (-94 to 302°F)
Maximum pressure	105 bar (1523 psi)	105 bar (1523 psi)	105 bar (1523 psi)
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
Cable length	3m (10 ft)	10m (33 ft)	3m (10 ft)
Sensor cable entry	IP65	IP65	IP65
Sensor cable	PTFE-insulated dual coaxial with PVC sheaf. Minimum bend radius 35 mm (1.4 inches) Terminated with crimped ferules to connect within MCU200 controller terminals		
Note: MCU200 series controllers and the 4**SD sensors are for non-hazardous area use only			

Suspended Solids Detection
Models: MCU200

Approvals

EUROPEAN DIRECTIVES

Electromagnetic Compatibility Directive (EMC) 2014/30/EU

Compliant to EMC directive
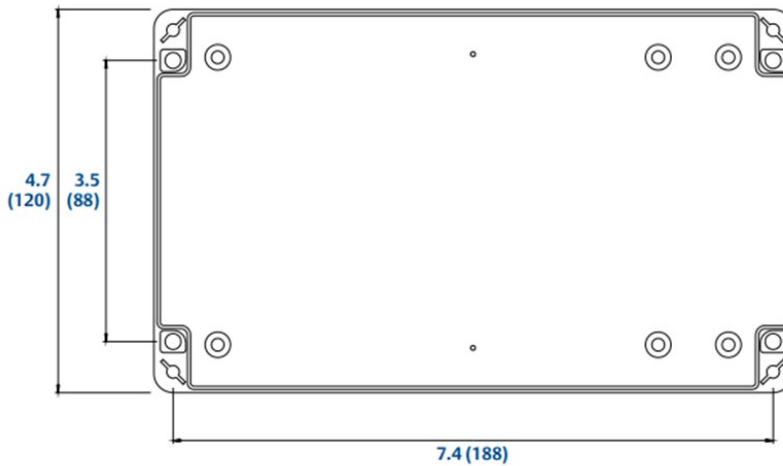
Low Voltage Directive (LVD) 2014/35/EU

Compliant to LVD directive

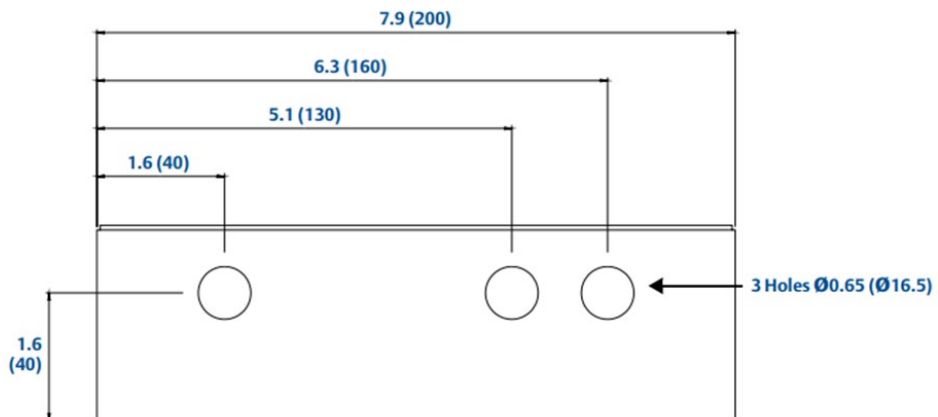**Pressure Equipment Directive (PED) 2014/68/EU:**

 This product is out of the scope of the PED directive
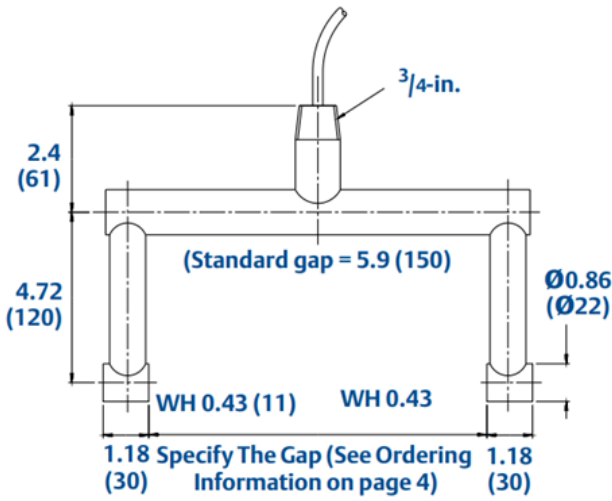
## Technical Specification

TOP VIEW

BOTTOM VIEW

Suspended Solids Detection
Models: MCU200

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Dimensional drawings

2.4 (61)

4.72 (120)

³/4-in.

(Standard gap = 5.9 (150))

Ø0.86 (Ø22)

WH 0.43 (11)   WH 0.43

1.18 (30)   Specify The Gap (See Ordering Information on page 4)   1.18 (30)

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

Ø0.86 (Ø22)

WH 0.43 (11)

³/4-in.

WV

0.98 (25)   5.98 (152)   1.02 (26)

10.16 (258)
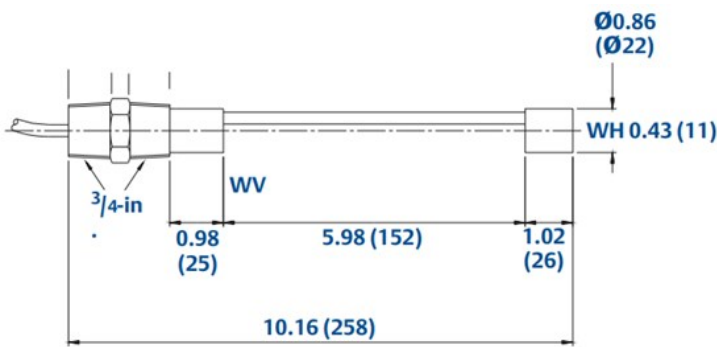
Sensor type 402SD

316 stainless steel

Duty: Interface, immiscible liquids

Liquid type: Clean, viscous with solids

See Table 5 on page 7 for the full specification

³/4-in. BSPT

Across Pipe

WH 0.43 (11)

Ø0.86 (Ø22)

WH 0.43 (11)

0.98 (25)

2.75 (70)
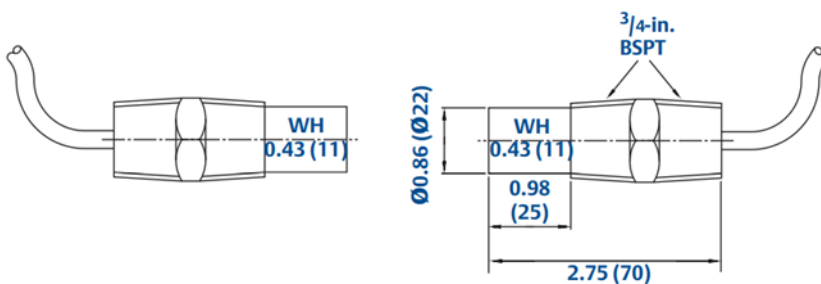
Sensor type 442SD

Across Pipe

Duty: Pipelines

Liquid type: Clean or sludge density

See Table 5 on page 7 for the full specification

Suspended Solids Detection
Models: MCU200

ISO9001

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