

# Technical Datasheet



## MSM400: Controller and Sensors

### Suspended Solids Measurement and Control System

Model: MSM400 series

#### Key Features

- Ultrasonic sensor technology
- Outputs: 4-20mA, HART
- Two configurable relays for control and alarms
- LCD display, push button interface
- Local programming via keypad and menu
- Remote programming via HART field communicator
- Built in clock for time based de-sludge operation
- Auto selection of ac or dc power supplies
- Sensors for tank mount with gap widths to suit percent solids ranges
- Pipe sections with varying sizes to suit percent solids ranges
- Pipe kit for mounting to existing installed pipework
- ATEX, UKEx and IECEx hazardous area approvals

#### Product Overview

Delta Mobrey's MSM400 ultrasonic sludge density monitoring system can continuously monitor the suspended solids or sludge density within a clarifier or settlement tank, or flowing within a pipe.

The measurement of ultrasonic attenuation in a slurry is directly proportional to the amount of undissolved solids within the slurry. The MSM400 controller uses this principle to determine the percent solids, to display this value and provide a signal output.

Sensors are available for tank mounting from above, as a pipe section for in-line installation, or as a kit for installation in an existing pipeline.

Other products we can offer include:

- MCU200 sludge detection switch
- DMSP & DMCU ultrasonic level transmitters and controllers



#### Product applications

- Measurement and control of sludge density
- Blanket detection and automatic sludge pump down for settlement tanks
- Polymer dosing control in waste sludge processing
- Control of limestone slurry density for flue gas desulphurisation

#### How can we help you?

Delta Mobrey offers fast, efficient and knowledgeable support when and where you need it. Please visit our web site at [www.delta-mobrey.com](http://www.delta-mobrey.com) to find your local support centre or call us on:

**+44 (0)1252 729140**

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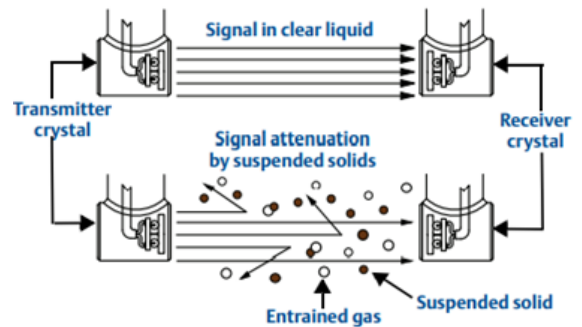
## Principles of Operation

A sensor mounted within a slurry transmits an ultrasonic signal across a gap. Solids suspended in a liquid will scatter the ultrasonic signal causing attenuation. This attenuation depends on the size, nature and amount of particles. The measured attenuation is proportional to the amount of undissolved solids within the slurry.

For typical sewage sludges, the ultrasonic sensors can detect between 1% to 30% of suspended solids. Industrial slurries such as fine pottery slips can often be measured up to 65% solids by weight.

The MSM433SD gap sensor is normally suspended in a settlement tank or separator. The MSM448SD sensor is supplied as a pipe section which can be installed within a discharge line or general pipeline. A sensor kit allows for installation on an existing pipeline.

Sensors can operate at either 1 MHz or 3.3 MHz to suit the application. The MSM400 controller selects the most suitable frequency during on-site calibration.

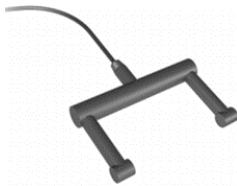


Robust stainless steel sensors may be tank mounted or housed in a pipe-section sensor on the clarifier

## Ultrasonic Sensors

- Several sensor types are available for use with the MSM400 controller
- When used with the MSM400 controller, these sensors will give an Intrinsically Safe system
- Cables are terminated with crimped ferules to connect within the MSM400 terminals
- Ultrasonic sensors should not be used in liquids with a high aeration which will attenuate the signal

MSM433



Tank mount sensors, for mounting from above

MSM448



Pipe section with sensors and optional spray nozzle. Epoxy coated to minimise product build up.

MSM-PIPEKIT-ATEX



Kit of sensors, bosses, hoses, wires and junction box. To be welded onto a pipe.

## Gap Size Selection

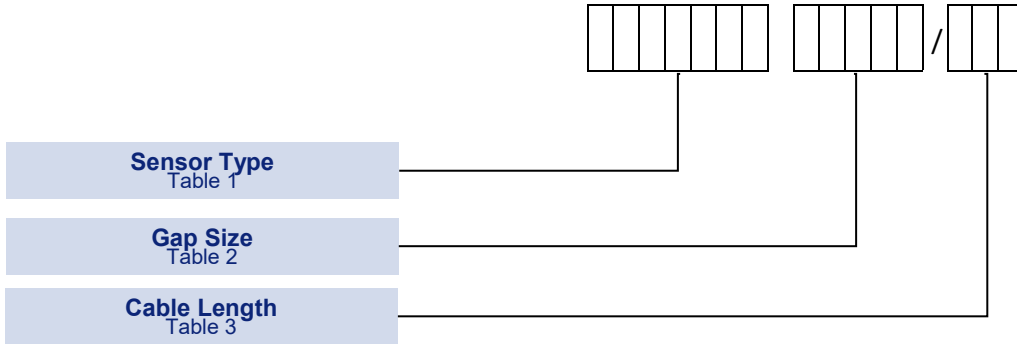
All sensors operate by sending an ultrasonic signal between a transmitter and receiver. The gap between these is defined at the order stage and is chosen according to the application. The table below gives an approximate guide. In general, a wide gap should be used on low density sludges or slurries and a narrow gap for denser sludges or slurries.

Sensor Gap Size	Primary Sludge at 1MHz	Primary Sludge at 3.3MHz	Secondary Sludge at 3.3MHz
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%

These % solids ranges are based on typical attenuation factors for municipal waste-water sludge. Within the 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 MSM433SD, then select the gap width and the cable length.



**Tank mount sensors**

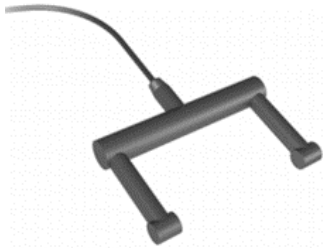


TABLE 1

Sensor Type	Code
Tank mount sensor for MSM400 series	MSM433A

TABLE 2

Gap Size	Code
100mm (4 inch) tank mount gap sensor. 1 MHz / 3.3 MHz.	100TD
150mm (6 inch) tank mount gap sensor. 1 MHz / 3.3 MHz	150TD
200mm (8 inch) tank mount gap sensor. 1 MHz / 3.3 MHz.	200TD
300mm (12 inch) tank mount gap sensor. 1 MHz / 3.3 MHz.	300TD
450mm (18 inch) tank mount gap sensor. 3.7 MHz only.	450TD

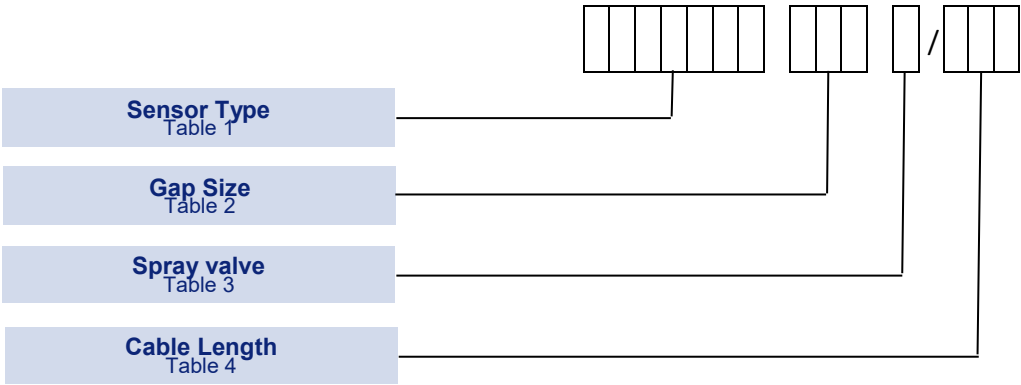
TABLE 3

Cable Length	Code
Cable length 7 meters (23 ft)	M07
Customer defined cable length up to a maximum of 30m (may incur a longer lead time and additional cost)	MXX

Note: the MSM400 controller will operate at either 1 MHz or 3.3 MHz.

## How to order a pipe section

All pipe sections sensors begin MSM448A, then select the connection, cleaning valve and cable length.



## Pipe section with sensors



TABLE 1	
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Sensor Type	Code
Pipe section with sensors	MSM448A

TABLE 2	
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Pipe and flange size	Code
DN100 PN10/16 flanged pipe section with 1 & 3.3MHz sensors	100
DN150 PN10/16 flanged pipe section with 1 & 3.3MHz sensors	150
DN200 PN10 only flanged pipe section with 1 & 3.3MHz sensors	200
ASME B16.5 Class 150 4 inch (100mm) flanged pipe section with 1 & 3.3 MHz sensors	A10
ASME B16.5 Class 150 6 inch (150mm) flanged pipe section with 1 & 3.3MHz sensors	A15
ASME B16.5 Class 150 8inch (200mm) flanged pipe section with 1 & 3.3MHz sensors	A20

TABLE 3	
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Spray valve	Code
Spray valve (SIZE	VD
No spray valve fitted	PD

TABLE 4	
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Cable Length	Code
Cable length 7 meters (23 ft)	M07
Customer defined cable length up to a maximum of 30m (may incur a longer lead time and additional cost)	MXX

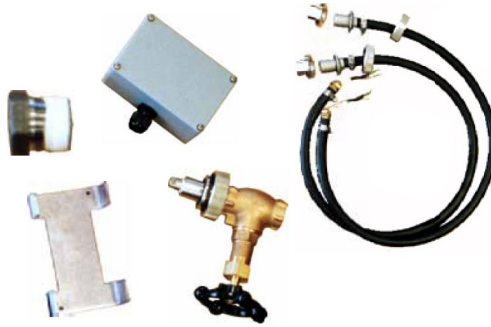
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**How to order the MSM pipe mount kit**

**Pipe mount kit**

TABLE 1: The pipe kit has no model options.

Base Model	Code
Pipe kit	MSM-PIPEKIT-ATEX



**How to order the MSM400 control unit**

**MSM Control Unit**

TABLE 1: The control unit has no model options.

Base Model	Code
MSM400 controller for both 110/220Vac and 24Vdc supply	MSM400



## Technical Specification

Ultrasonic gap Sensors	MSM433	MSM448	MSM400 PIPEKIT
Installation	Tank mount, from above	Pipe mount	To existing pipe work
Mounting connection	3/4 inch BSPT	Various flange options	Weldolets to mount sensors
Materials	316 Stainless Steel sensors	316 Stainless Steel sensors Epoxy coated Carbon Steel pipe section	316 Stainless Steel sensors
Operating temperature	-40 to 55°C (-40 to 130°F)	-40 to 70°C (-40 to 158°F)	-40 to 70°C (-40 to 158°F)
Maximum pressure	105 bar (1523 psi)	10 bar (145 psi)	Dependant on customer installation
Operating frequency	1 MHz / 3.3 MHz		
Ingress protection	IP68		
Cable length	7m (23 ft) (other lengths available)		
Cable type	PTFE-insulated dual screened/shielded coaxial with PVC sheaf. Minimum bend radius 35 mm (1.4 inches) Terminated with crimped ferules to connect with controller terminals		

MSM400 Series Controller	
Power supply dc	15 to 30Vdc, 24Vdc nominal Power consumption 6W nominal
Power supply ac	115 or 230Vac ±15% (switch selectable) Power consumption 10VA nominal
Number of sensor inputs	One
Trigger input	5vdc
Display	Integral 32 x 122 pixels LCD with backlight for up to 4 lines of characters
Keypad	Integral membrane keypad with six buttons for menu system navigation
Current output	4-20mA or 0-20mA software selectable
Current output range	3.8 to 20.5mA
Current output load	Maximum resistance 1K Ohms at 22mA
Digital output	HART 5 comms
Relay output	Two Single-Pole Changeover (SPDT)
Relay rating	5A at 240Vac resistive
Frequency selection	1 MHz (higher sensitivity) or 3.7 MHz (standard) via software
Operating temperature	-30 to 55°C (-22 to 131°F)
Enclosure rating	IP65
Enclosure size	256.5mm x 236.7mm (10 x 9.3 inches)
Electrical safety	EN61010-1
Enclosure materials	ABS enclosure with clear polycarbonate lid
Cable entry & glands	Pre-drilled holes: 3 x 16mm & 3 x 20mm. 2 x M16 & 3 x M20 glands supplied
Mounting style	Wall mount (brackets included)
Fixing holes	Six holes, 5mm (0.2 in) diameter
Weight	1.9 kg

## Approvals



### GLOBAL CERTIFICATION

IECEX Certified  
INTRINSICALLY SAFE

#### **MSM400 Controller**

Certificate number IECEX ITS 13.0044X  
[Ex ia Ga] IIC -40°C ≤ Ta ≤ +55°C)

#### **MSM Sensors**

Certificate number IECEX ITS 13.0044X  
II 1 G Ex ia IIC T6...T3 Ga -40°C ≤ Ta ≤ \*\*  
(\*\* : T6 = +70°C, T5 = +85°C, T4 = +120°C, T3 = +150°C,)



### EUROPEAN DIRECTIVES

#### **Electromagnetic Compatibility Directive (EMC) 2014/30/EU**

The control unit and sensors are compliant to the EMC directive

#### **Low Voltage Directive (LVD) 2014/35/EU**

The control unit complies with the LVD directive

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

The pipe-section complies with the PED directive  
The controller and sensors are outside of the scope of the PED directive



#### **ATEX Directive 2014/34/EU**

INTRINSICALLY SAFE

#### **MSM400 Controller**

Certificate number ITS00ATEX2002X  
II (1) G [Ex ia Ga] IIC -40°C ≤ Ta ≤ +55°C

#### **MSM Sensors**

Certificate number ITS00ATEX2003X  
II 1 G Ex ia IIC T6...T3 Ga -40°C ≤ Ta ≤ \*\*  
(\*\* : T6 = +70°C, T5 = +85°C, T4 = +120°C, T3 = +150°C)

### UK REGULATIONS

#### **Electromagnetic Compatibility Regulations (SI 2016 No. 1091)**

The control unit and sensors are compliant to the EMC regulations

#### **Electrical Equipment (Safety) Regulations (SI 2016 No 1101)**

The control unit complies with the EE(S)R regulations

#### **Pressure Equipment (Safety) Regulations (SI 2016 No 1105)**

The pipe-section complies with the PE(S)R regulations  
The controller and sensors are outside of the scope of the PE(S)R regulations



#### **Explosive Atmospheres Regulations (SI 2016 No 1107)**

INTRINSICALLY SAFE

#### **MSM400 Controller**

Certificate number ITS21UKEX0389X  
II (1) G [Ex ia Ga] IIC -40°C ≤ Ta ≤ +55°C

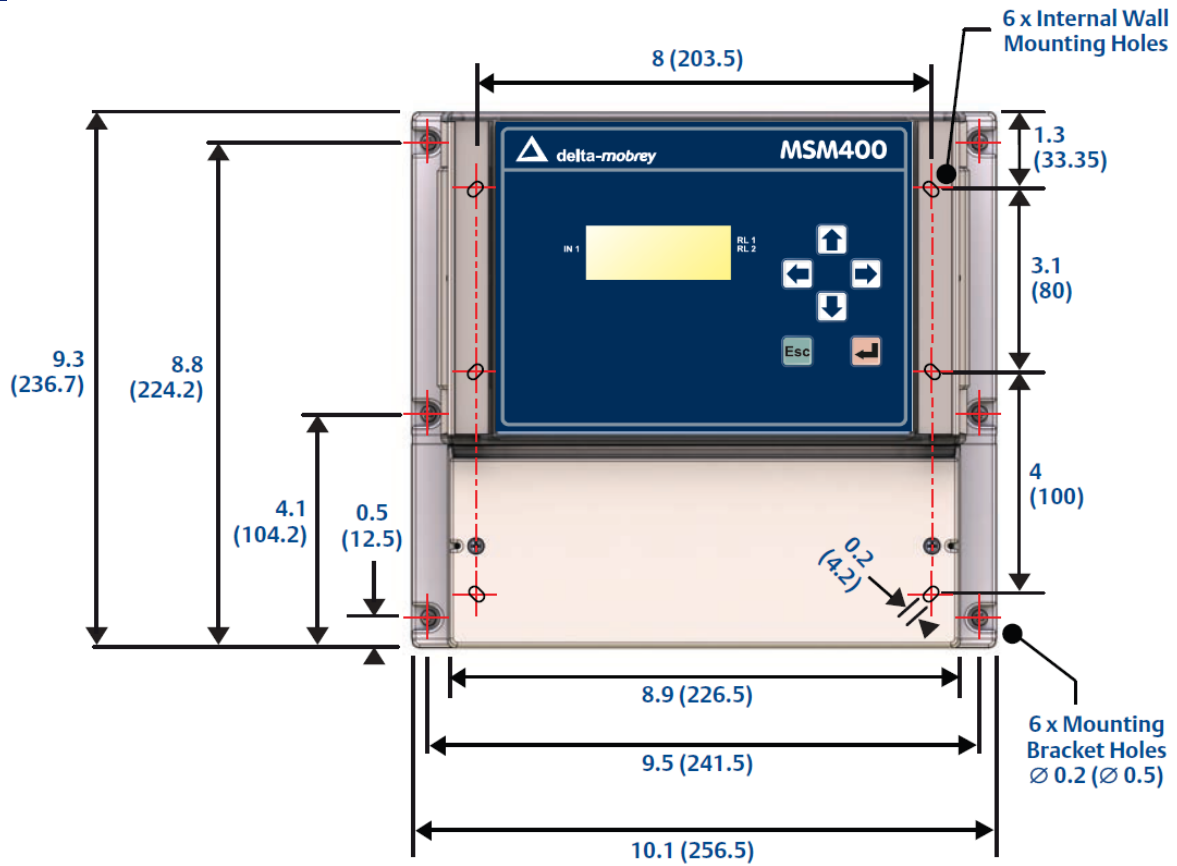
#### **MSM Sensors**

Certificate number ITS21UKEX0388X  
II 1 G Ex ia IIC T6...T3 Ga -40°C ≤ Ta ≤ \*\*  
(\*\* : T6 = +70°C, T5 = +85°C, T4 = +120°C, T3 = +150°C)

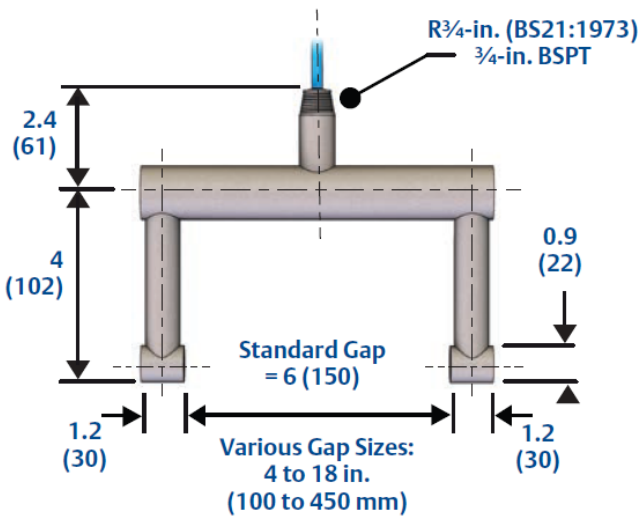




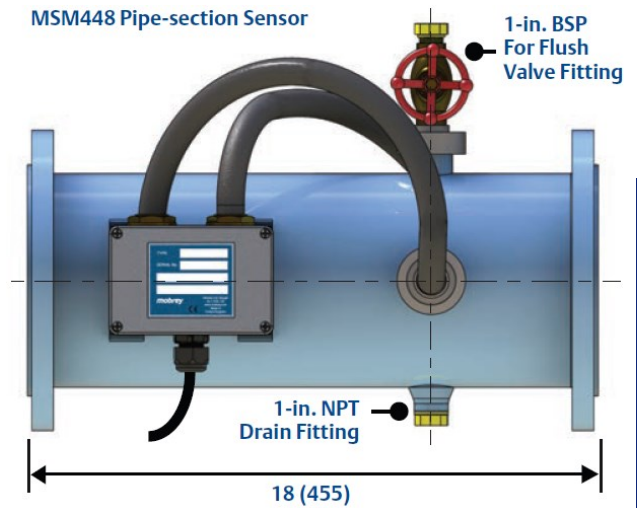
**Dimensional drawings**



**MSM433 In-tank Sensor**



**MSM448 Pipe-section Sensor**



**Suspended Solids Measurement**  
Models: MSM400

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**Delta Mobrey Limited**  
Hudson House, Albany Park, Camberley Surrey, GU16 7PL, UK.  
T+44 (0)1252 729140 F+44 (0)1252 729168 E sales@delta-mobrey.com W www.delta-mobrey.com

