process measurement solutions

Mobrey

Ultrasonic solids density monitoring and control systems

Data sheet
IP250

Features

- Control features:
  - High or low level sludge blanket alarm
  - Automation for primary sludge discharge
  - Hazardous area approval
- Top mounted tank sensor
- Obstructionless pipe section sensor
- 4-20mA output options
- HART communications options
- Simple calibration

Typical applications

- Waste water sewage sludges
- Water treatment sludges
- Industrial slurry processing
- Mineral ores
- China clay
- Slurries of sand and coal tailings
- Nuclear waste
- Process treatment sludges
- Industrial waste
- Peanut processing and other food mixtures
- Metallic paint suspensions

Principle of operation

Ultrasonic technology can be used to detect and monitor sludge interface and suspended solids.

Two ultrasonic transducers acting as transmitter and receiver are flush mounted either side of a pipe section, or built into a sensor for mounting in a settling tank. The gap between the transducers and the frequency at which they operate is selected to suit the particular application.
The resultant measurement is virtually unaffected by vibration, temperature, viscosity or the colour of the slurry.
The rugged stainless steel sensors require minimal maintenance.

Solartron Mobrey has been expert in the field of suspended solids monitoring for over 30 years.

Mobrey systems are used to monitor many slurries varying from 0.2% to 60% solids in a number of different industries.

Control units

Electrosensor
Electrosensor systems for solids density detection and control where high system integrity coupled with low cost intrinsically safe installation is required.

- LED indication of relay state
- IS EExia IIC T5
- Up to 3000m between sensor amplifier and control unit
- Two wire twisted pair cable from amplifier to control electronics

MCU200
Simple relay box for control or alarm of solids density interface, monitoring and control.

- Double pole change-over relay
- LED indication of relay state
- Selectable time delay from 0.5 to 30 secs.

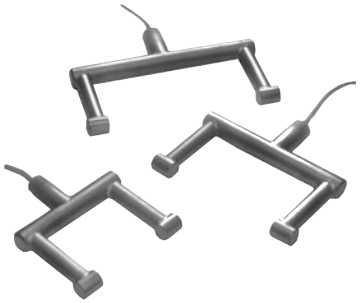
MSM400
Suspended solids monitor with a wide range of features

- 4-20mA output proportional to suspended solids
- Simple menu driven programming
- Microprocessor based
- Relays
- Automatic de-sludge control
- HART communications

Sensors

For suspended solids density control or monitoring of a settlement tank there are two basic sensor types - pipe section sensors (either complete pipe or pipe mount kit) for installation in the discharge line, and sludge blanket sensors for mounting in the tank. Both types of sensors are compatible with all control units.

Mobrey pipe section sensors
The Mobrey pipe section sensor is constructed of cast iron with stainless steel transducers. The pipe section is epoxy coated to minimise grease and debris build-up. The sensors themselves are mounted on the sides of the pipeline with their faces flush with the internal pipe wall to provide a self cleaning action by the flowing sludge.
Separate connections are available for a spray nozzle and drain valve.
Mobrey pipe sensors are also available as a weld on kit.



Top mount sensor
The 433 sensor is IP68 all welded stainless steel construction and is typically used for sludge blanket detection and suspended solids alarm.
The sludge blanket density is monitored in the gap at the lowest point of the forks of the sensor.
It is therefore positioned at a suitable height in the settlement tank to detect the highest, or lowest, required level of the sludge blanket.

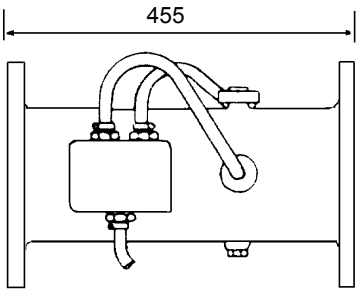
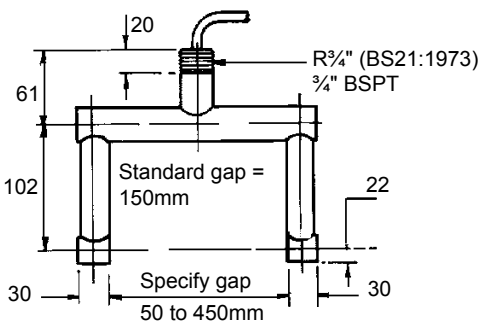
MSM pipe mount kit
The MSM448 kit is designed for use in slurry monitoring applications where the use of Mobrey pipe section sensors is not possible.
The kit of parts is supplied for the user to weld on to an existing pipe section.
It is intended that the kit is used with an MSM400 control unit. For further details contact sales office and ask for leaflet IP257.

Technical specification

Control units

Specification	Electrosensor	MCU200	MSM400
Housing dimensions (mm)(H x W x D)	150 x 75 x 112	120 x 200 x 75	237 x 257 x 84
Fixing centres	2 off holes Ø 3 on C/L 100mm apart	188 x 88 (4 off holes Ø 4.5)	373 x 254
Enclosure rating	IP20	IP65	IP65
Cable entries	Grommet	3 off holes Ø 16 mm	3 off M16, 3 off M20 glands
Mounting options	Wall mount (din rail opt.)	Wall mount	Wall mount
Operating temp.	- 20°C to + 65°C	- 40°C to + 55°C	- 3°C to + 55°C
Output (Main relay)	SPCO 5A resistive	DPCO 5A resistive	DPCO 5A resistive
Output (Fault relay)	SPCO 5A	No	DPCO 5A resistive (or volt free contact)
Current output	No	No	4-20mA
Override input	No	Contact closure	5V logic or contact closure or 24V (30V max) logic (4V min)
Power supply	115/230V 50/60Hz (24V dc option)	115/230V 50/60Hz (24V dc option)	115/230V 50/60Hz 24V dc
Frequency	1 or 3.7MHz selectable at head amp.	1 or 3.7MHz selectable	1 or 3.3MHz automatic selection
Cable termination from the sensors	Captive screw terminal block	Captive screw terminal block	Captive screw terminal block
Max. cable size	1.5mm^2	1.5mm^2	2.5mm^2
Hazardous area approval	EExia IICT5	No	EExia IIC

Sensors

	Mobrey pipe section sensors	Tank mount sensors
Material pipe section	Malleable cast iron epoxy coated	N/A
Material sensors	316 Stainless steel	316 Stainless steel
Drain fitting	1" NPT	N/A
Mounting connection	In line installation	¾" BSPT (suitable for 25mm conduit)
Flanges	DN100, DN150, DN200 to BS4772 (others on request)	Gap size 100, 150, 200 & 300mm as std. (others on request)
Max pressure	10 Bar (PN10)	105 Bar
Operating temp.	-40°C to +120°C (others on request)	-40°C to +70°C (150°C on request)
Sensor cable	Oil hose protected Dual RG178B/U miniature coax.	Dual RG178B/U miniature coax.
Cable length	7 metres (others on request)	7 metres (others on request)
Cable junction box	IP65 Aluminium alloy	Sensor is IP68
Dimensions		

Site installation

It is recommended that for best performance the Mobrey pipe section sensor is installed in the discharge line from the settlement tank as close as possible to the exit from the tank. It is important to retain the hydrostatic pressure head on the sludge discharge to keep dissolved air or decomposition gases in solution; any aeration of the sludge in the measurement section will be monitored as a high sludge density. For the same reason the sludge must not be allowed to free fall into a sump or pass through a centrifugal pump upstream of the measurement section.
The suspended sensor for in-tank monitoring should be installed in the main flow of liquid to the sludge discharge hopper, to avoid sludge traps close to the tank walls.

If the screening on the site is poor, care must be taken to avoid ragging up of the sensor. Where rotating scrapers are used it is possible to suspend the sensor from the bridge itself: in this case the control unit must also mounted on the bridge.
It should be noted that both types of sensor are adversely affected by excessive entrained gas.

Calibration range

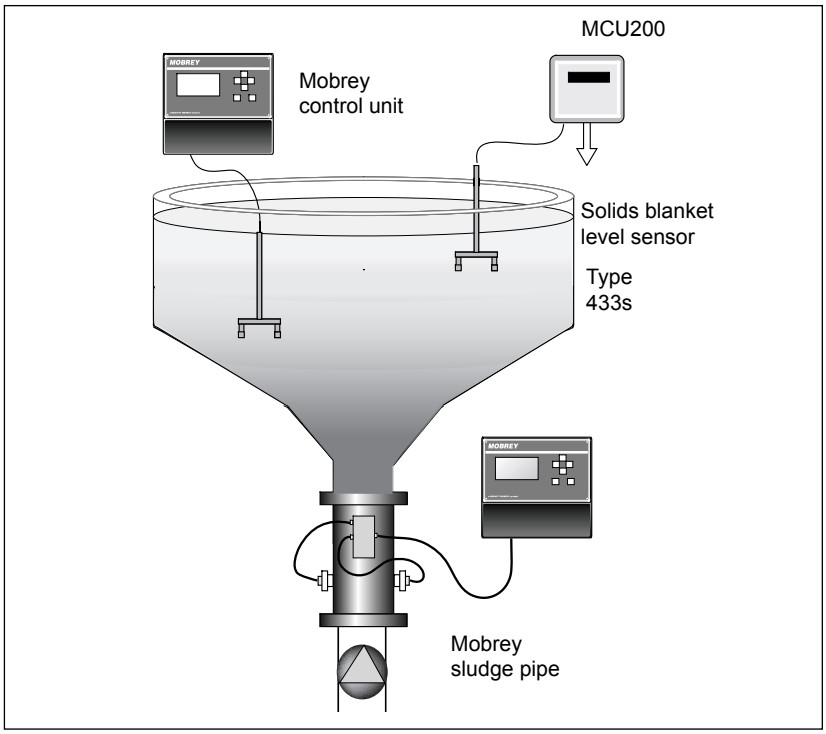
Ultrasonic sludge density controls provide a relay switch output at a pre-set level that is detected between the sensors. The actual setting is established on site by trials with a typical sludge for that process.

The range of operation of the sensors varies with the ultrasonic frequency used and the gap between sensor faces. Typical ranges for 6" and 8" gaps are quoted in the table. In our experience 150mm gaps are suitable for most types of primary sludges and 450mm gaps are suitable for secondary sludges and potable water slurries.

Sewage sludge	Primary sludges		Secondary sludges
Frequency	**1MHz**	**3.7MHz**	**3.7MHz**
150mm gap sensor / pipe	1 - 20%	0.2 - 4%	0.5 - 10%
200mm gap sensor / pipe	0.7 - 14%	-	0.4 - 8%
450mm gap sensor	-	-	0.15 - 3%

Blanket level detection and simple de-sludge control

The ultrasonic sensor system when suspended in the settlement tank provides a relay output to control solids density blankets at a preset level. This reduces the volume of liquid sent to disposal, digestion or treatment and maintains a high average percent solids to optimise the treatment process.
The sensor may also be suspended in the outlet hopper, or alternatively a pipe section may be used in the discharge line. The de-sludge operation is normally started on a clock timer and stopped using the sensor.
A second sludge blanket sensor positioned higher in the settlement tank can be used with a control unit to inhibit the de-sludge sequence if there are insufficient solids collected in the tank. Alternatively the top sensor could start the de-sludge process and the lower sensor could stop it.



Ordering codes

Control units

Code	Control unit
MCU201	MCU200 230/115V version 50/60Hz
MCU203	MCU200 24V DC version
MSM401	MSM400 standard control unit non IS
MSM400	MSM400 standard control unit IS
MSM401/S*	MSM400 special control unit non IS
MSM400/S*	MSM400 special control unit IS

MES	Mobrey Electrosensor			
	Code	**Instrinsic safety**		
	1	Intrinsically safe E Exia IIC T5		
	2	Non IS		
		Code	**Enclosure**	
		D	DIN rail enclosure	
		L	Stand alone enclosure	
			Code	**Voltage input**
			1	230V AC MES*L only
			2	115V AC MES*L only
			3	24V DC (non I.S.)
			Code	**Relay output**
			S	SPCO

MES	1	L	/	1	S	Typical model number

The MSM pipe mount kit comprises:

2 off MSM448 type sensors with 900mm cable, dual frequency 1 & 3.3mHz

- Extension cable 10 metres
- Spray valve and weld-on pipe fitting
- Junction box support bracket
- 2 off weld-on pipe fittings for MSM448 sensors
- Junction box and cable gland (M16)
- 1" NPT drain plug

Sensors: When ordering sensors please consult the sales office for correct size and type.

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IP250
Nov 02