Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия +7(495)268-04-70 **Казахстан** +7(7172)727-132 **Киргизия** +996(312)96-26-47

www.delta-mobrey.nt-rt.ru | | dye@nt-rt.ru

Технические характеристики на электроды для использования с Hydrastep и Hydratect, регуляторы уровня воды в котле, анализаторы взвешенных веществ MCM400, контроллеры обнаружения взвешенных твердых частиц MCU200 компании Delta Mobrey

ELECTRODES

For use with Hydrastep & Hydratect

Electrodes are at the heart of our Hydrastep and Hydratect system.

As well as being essential to the measurement of water and steam, they are also incredibly durable and reliable.

This is due to their specific design, as each electrode is handcrafted and tested to withstand both extreme pressures and temperatures. As a result they can endure harsh conditions for many years (even decades), ensuring that your plant will continue to operate safely and consistently.

VIEW A VIDEO ABOUT OUR ELECTRODES.

FEATURES & BENEFITS

ELECTRODE TABLE

- For use up to 300 bar and 560 °C.
- Hand made in the UK
- Comprised of ceramics and exotic metals, brazed using proprietary methods
- Each electrode is inspected and tested and individually packed
- For use with both Delta Mobrey’s Hydrastep and Hydratect

ELECTRODE TABLE

Part number	Type	Range	Thread	Notes
459600602	Low Pressure	120 bar and 370 °C	M18 male	Can replace the inferior 459600802 electrode
246781ZA	High Pressure	210 bar and 370 °C	¾” female	
459600201	High Pressure	210 bar and 370 °C	No thread	Flanged electrode. A replacement electrode only suitable for older style water columns
246785Z	Super Critical	210 bar and 370 °C	7/8 ” female	For use with inserts commonly supplied with Super Critical water columns or Hydratects

Technical **Datasheet**

Boiler Water Level Controls

Modulation Level Controls

Key **Features**

- Easily adjusted for individual operating requirements
- Instant reversion to hand control in an emergency
- Glandless construction
- Fail safe design
- Unaffected by foam

Series **Overview**

Mobrey originally entered the industrial boiler control market in 1923 with a range of steam operated equipment. Since that time, the range has expanded to cover most aspects of control associated with the boiler house.

The Mobrey Modulating Controller is a single element electro-hydraulic control with an electronic feedback, used for controlling the flow of feed water into the boiler. Designed to be used alongside the Delta Mobrey Vertical Air Break Controls (VABC). It is a system of parts, comprising of:

i) A float operated control unit, either chamber mounted or directly mounted on the boiler shell, fitted with an Inductance Coil 'A' head assembly which can be made suitable for either Industrial or Marine applications.

ii) A flanged modulating feed water control valve, fitted with an Inductance Coil 'B' and twin solenoid valve assembly, which is mounted in the boiler feed water line.

iii) An electronic control box.

Product **applications**

- Water level (feed water valve) control
- First low water alarm and cutout

Other products

Other products we can offer :

- Boiler feed water modulation level controls and valves
- Sequencing blowdown valves

How to order

The instrument can be selected from the table below, which details the specification of each model. For assistance in selecting the model that best suits your needs, please contact your local sales office.

Modulation level control models

Type number	81006	81007	81008	81951
Material	Cast iron	Fabricated steel	Fabricated steel	Forged steel flange
Max. pressure kg/cm^2	13	21	21	32
Connections	Side and bottom EN1092 DN25 PN16	Side and bottom EN1092 DN25 PN40	Side and side EN1092 DN25 PN25	Direct mounted EN1092 DN100 PN40

Models are available for up to 32kg/cm2 steam working. Details on request.

Modulation control box models

Type number	80436	80660
Input supply	240 Vac 50/60 Hz ±10%	110 Vac 50/60 Hz ±10%

Important notice

Electronic control box must not be subjected to either vibration or excessive temperature. It is therefore recommended that they are NOT mounted directly on to the boiler shell.

Modulation control valve models

Type number	Flanged	No. of solenoid valves	Electrical supply
80310/*	1½" table H	2	230 Vac 50 Hz
80311/*	DN40 PN40	2	230 Vac 50 Hz
80653/*	DN40 PN40	2	110 Vac 50 Hz
80486/*	DN40 PN40	2	230 Vac 50 Hz
80310/80435/*	1½" table H	3	230 Vac 50 Hz
80311/80435/*	DN40 PN40	3	230 Vac 50 Hz
80653/80435/*	DN40 PN40	3	110 Vac 50 Hz

Note

The internal trim on the modulating valve can be changed without the need to replace the valve should operating conditions change.

* denotes the size of the valve lid & seat (A-I). Valves can be supplied without the lid and seat fitted.

Operation

A positive change of water level in the boiler alters the inductance value of Coil “A” causing an imbalance in the system. This signal is transmitted through the electronic control box to the appropriate solenoid valve on the modulating valve thus producing a change of hydraulic pressure on the piston assembly, the movement of which modulates the flow of water to the boiler.

Simultaneously this same vertical travel creates a change in the inductance value of Coil “B” until the balance is restored, thus closing the solenoid valve and hydraulically locking the modulating valve spindle.

This sequence is repeated in very small steps until the feed water input equals the required evaporation rate of the boiler.

To prevent the modulating valve responding to random water movement against the general direction of level change, a 13 mm reversal or (dead) band is incorporated in the electronic circuitry.

Low water alarm and burner cut out contacts are also provided within the control box to operate when the water level falls to a predetermined position.

Installation notes

For the further safety of boilers, it is recommended that the Mobrey Control Unit is mounted on a Mobrey Sequencing Valve.

The water connection from the boiler to the float chamber should be as short as possible and the control head float chamber should be mounted close to the gauge glasses.

The chamber band mark indicates the lowest adjustment position of the low level alarm and it is our recommendation that the positioning of the boiler control chambers relative to the water level gauge glasses and the N.W.L. is such that there is always water visible in the gauge glass even at the lowest operating band level. If required our technical staff will advise on individual installations.

Application notes

Throttle control

Modulating Valve in feed line
Suitable for automatic cold start conditions
Used for all pumps capable of operating against a closed discharge.

With a rising water level in the boiler, the modulating valve closes progressively to reduce the rate of feed into the boiler. The size of valve lid is determined by the actual capacity of the boiler plus an allowance. See below for the sizing of the valve lids.

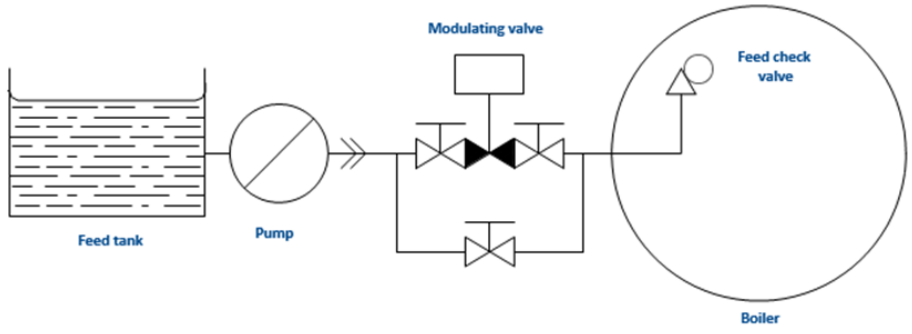
Power failure and high water shutdown – with a third solenoid valve

Where one pump is feeding more than one boiler it is imperative that a boiler cannot be overfilled. Therefore a third solenoid valve can be installed on the modulating valve which is operated by either a loss of power on the boiler control circuit or the high water alarm. In either case the valve will be closed and prevent further water entering the boiler. The third solenoid valve can be retrofitted to existing valves.

Common feed pump arrangement

Multi-boiler installations operating on a common feed system require special sizing consideration and full details should be provided so that a suitable valve can be recommended.

Typical installation of the modulation valve



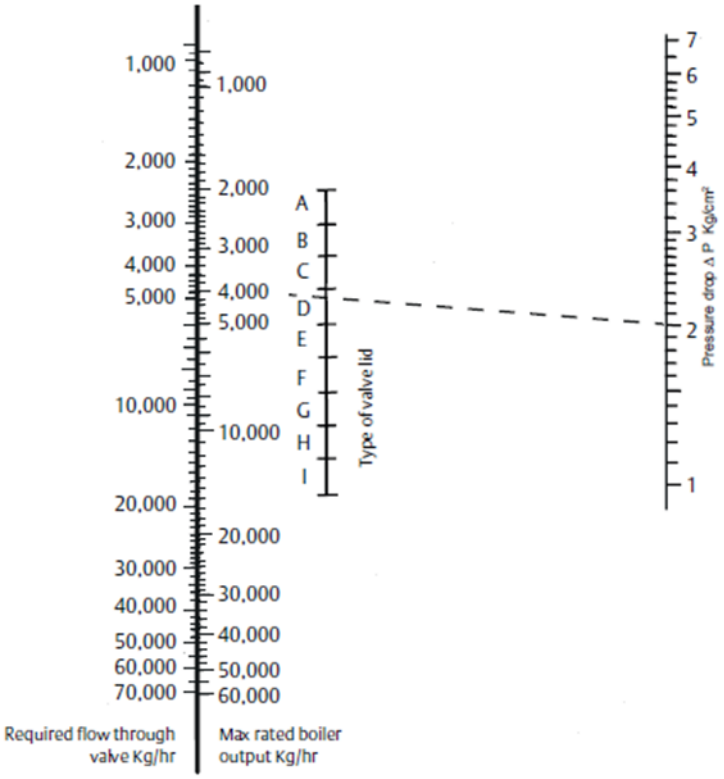
Sizing of valve lids

A range of valve lids and associated seats are available, and provide linear flow characteristics. A table of Cv values for water (S.G.=1) is given below for valve lids in the fully open position.

Sizing of the valve lids

Type of lid	Cv = kg/hr for 1 kg/cm²
A	1690
B	2260
C	3030
D	4100
E	5480
F	7480
G	9840
H	13520
I	18480

Modulation control valve sizing chart



The formula for determining the Cv value and correct size of valve lid are given below. The pressure drop across the valve should be 1.4 kg/cm² or greater – normally, the higher the pressure drop the better the degree of control. The lid size is that with the nearest Cv value above the calculated value.

$$Cv = \frac{Q}{\sqrt{P}}$$

Where:

Q = Actual Evaporation of Boiler plus 15 per cent margin kg/hr.
P = Pump discharge pressure in kg/ cm² when passing Q quantity of water minus (boiler max working pressure + 0.4 kg/cm²).

In the following example, an allowance of 0.4 kg/cm² has been made for all feed line losses. In practice, the allowance should be that of the installation under consideration and may well be in excess of 0.4 kg/cm², particularly where the feed pump is remote from the boiler and/or where an anti-siphon valve adjacent to the boiler feed check valve has been fitted.

Example

Boiler evaporation (actual) = 4000 kg/hr.
Boiler working pressure = 6.6 kg/cm²
Pump discharge pressure at Q quantity = 6.6 kg/cm²

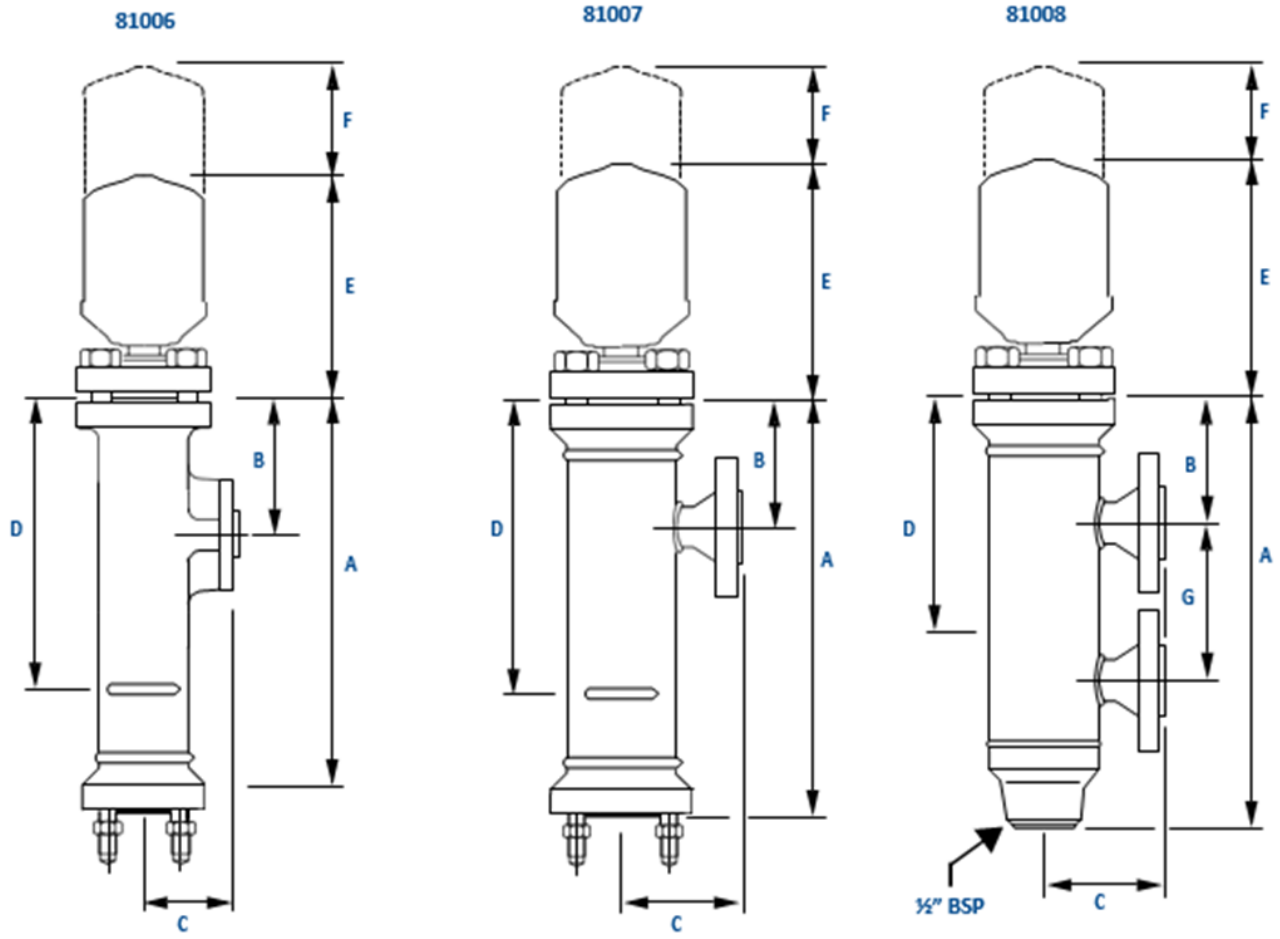
$$Cv = \frac{4000 \times 1.15}{\sqrt{11 - (6.6 + 0.4)}} = 2300$$

Lid required: Type C

Technical Specifications

Dimensional and operating data

Standard control heads and chambers



Type number	81006	81007	81008	81951
Material	Cast iron	Fabricated steel	Fabricated steel	Forged steel flange
Max. pressure kg/cm²	13	21	21	32
Connections	Side and bottom EN1092 DN25 PN16	Side and bottom EN1092 DN25 PN40	Side and side EN1092 DN25 PN25	Direct mounted EN1092 DN100 PN40
A	468	468	570	–
B	100	100	100	–
C	102	87	100	–
D	277	277	335	–
E	390	390	390	390
F	430	430	430	430
G	–	–	270	–

Chamber mounted models

Float chambers are manufactured in these approved materials:

Cast iron equal to BS1452 Grade 17
– for up to 13 kg/cm2 rating.

Fabricated steel BS3602 - HFS 27
– for both 21 kg/cm2 and 32 kg/cm2 ratings.

For chamber dimensions and process connections arrangement refer to the dimensional and operating information above.

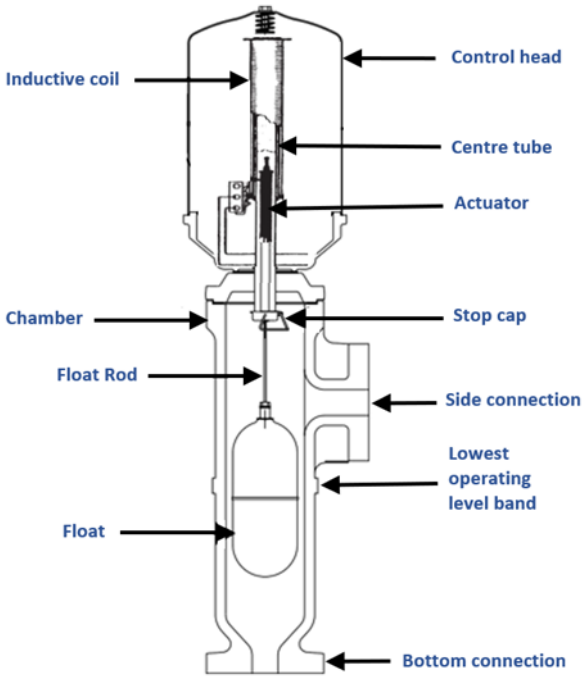
Control heads contain an inductive coil in a housing comprising die-cast base with a zinc coated mild steel casing.

Two 25mm BS.4568 cable entries are provided.

The centre tube is made of non-magnetic stainless steel and expanded into the top cover flange. It is fitted with a stop cap which also acts as a guide for the float rod carrying the actuator.

Floats are manufactured in Monel metal.

Float rods are manufactured in stainless steel.

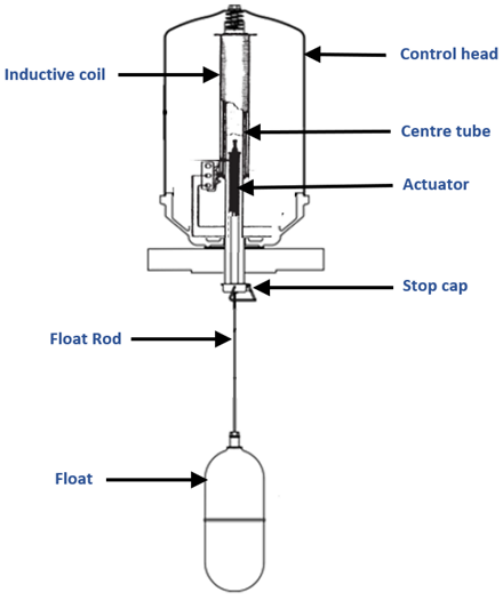


The Chamber band mark indicates the lowest adjustment position of the low level alarm. We recommend that the positioning of the boiler control chamber is relative to the water level gauge glass and that, even at the lowest operating band level, the N.W.L. is such that there is always water visible in a gauge glass.

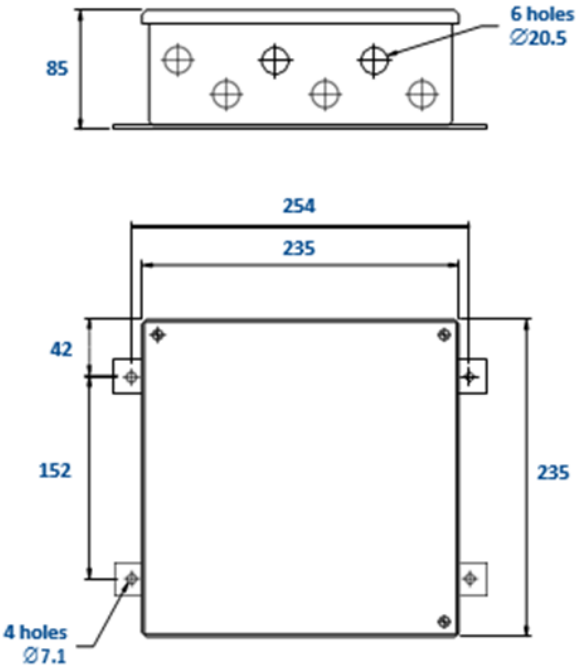
Direct mounted models

Direct Mounted Modulation Level Controls have the same principles of operation and piece parts as the chamber-mounted equivalents, except that the chamber is exchanged for (1) a large round flange and (2) the tube assembly for mounting the control directly on to the boiler shell connection.

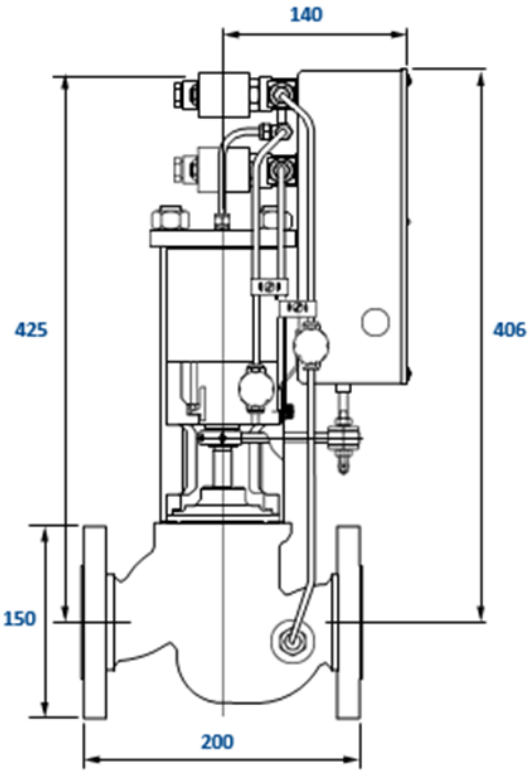
A fixed or removable stilling or guide tube should be provided to ensure that the float rod is not damaged and the correct vertical movement is achieved.



Control box



Modulation valve



Electrical characteristics

Input circuit protected by 1 amp HRC fuse.

Alarm and control relays protected by 2 amp HRC fuses. Relay contacts voltage free rating:-

Maximum voltage: 250 Vac

Maximum current: 2 amp

Facility available to special order for separate supply to solenoid valves with 2 Amp HRC

Valve body material: Cast steel

Flanged EN1092 DN40 PN40 or 1½" BS10 table H

Minimum feed line pressure: 5.3 kg/cm^2

Maximum feed line pressure: 40 kg/cm^2

Maximum feed line temperature: 120^{O}C*

*180^{O}C is available as high temperature option on request.

Technical **Datasheet**

delta-mobrey

Boiler Water Level Controls

Sequencing blowdown valves

Key **Features**

- One valve to provide separate blowdown of:
  - Control Chamber
  - Steam Connection
  - Water Connection
- Blowdown by predetermined sequence
- Back seating ensures packing is not subjected to continuous pressure
- Stainless steel trim
- Available with Metric or Imperial flanged connections as standard

Product **applications**

- Steam boiler external level control chamber isolation and purge

Series **Overview**

A purpose built flanged angle pattern isolating and sequencing valve with ½" BSPT screwed drain connection and back seating features, all valve trims are in stainless steel.

The Delta Mobrey sequencing valve is designed to function as a combined water isolating valve and a sequencing blowdown valve to provide positive purging of the water connection, float chamber and steam connection of a boiler control.

Blowdown of float chamber and connections is effected separately and in a predetermined sequence by the operation of the single specially designed hand-wheel.

The operation of the valve helps to ensure the water port does not become blocked by sediment, mud or debris. It also provides a positive test of the boiler water level control, ensuring that any associated equipment, such as the feedwater pump or valve, and any alarms, cutouts or lockouts operate as expected.

Other products

Other products we can offer :

Chamber mounted boiler water level controls

Direct mounted boiler water level controls

Boiler feed water modulation level controls and valves

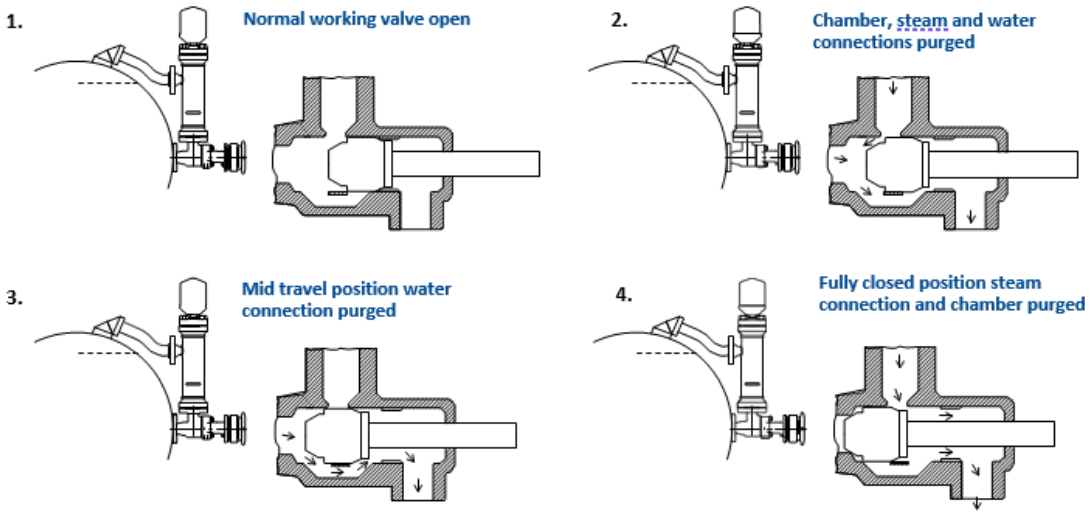
How to order

The instrument can be selected from the table below, which details the specification of each model. For assistance in selecting the model that best suits your needs, please contact your local sales office.

Part number	Flange connections to EN1092 (except where noted)	Valve body and stuffing box material	Maximum working pressure (bar)
80938	DN25 PN16	Cast iron	13 (1)
80947	DN25 PN25	Gunmetal	21
80951	DN25 PN40	Cast steel	32
81390	BS10 Table 'H'	Gunmetal	21

(1) The maximum working pressure is 10.5 bar for Lloyds applications

Sequence of operation



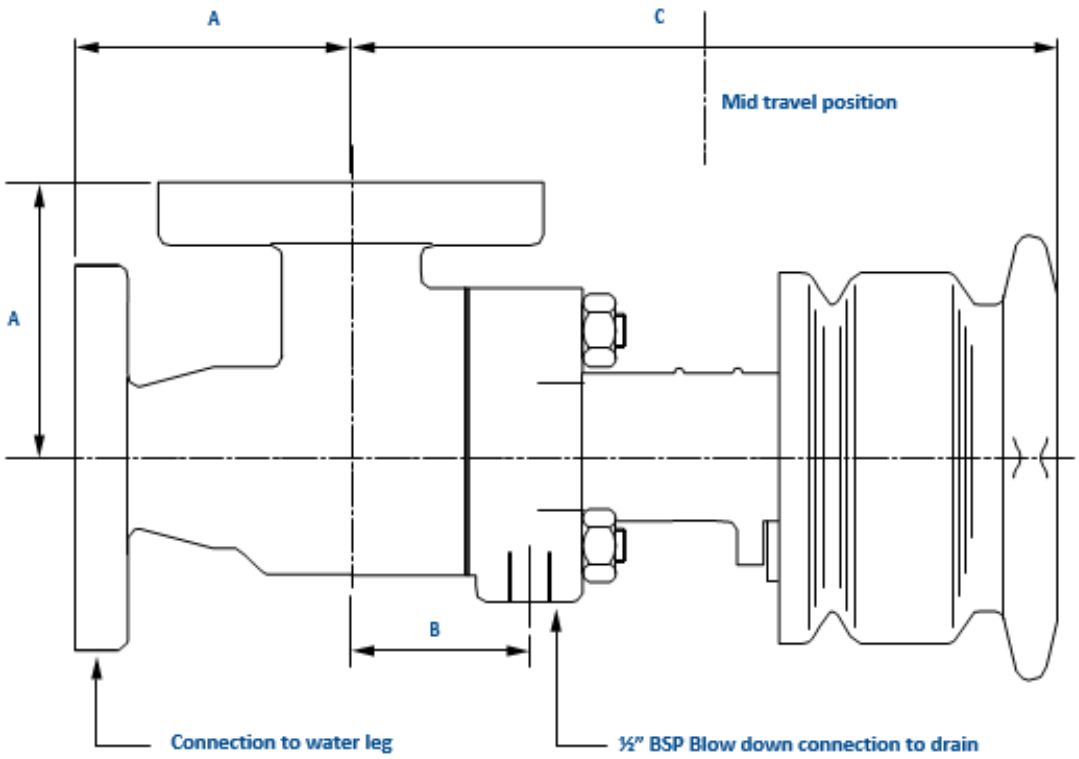
Important

The blowdown connection should be piped directly to an independent covered drain, or tun dish with removable lid, capable of accepting the full discharge without danger of blow-back. The bore of blowdown pipe should not be less than 12 mm and the length should be kept as short as possible. Sight glasses must not be fitted in the blowdown line.

Blowdown procedure card

Delta Mobrey produce a useful blowdown produces card, reference number BP109, which is available on request.

GENERAL DIMENSIONS



Part number	Dimensions (mm)		
	A	B	C
80938	83	54	219
80947	83	54	219
80951	83	54	219
81390	83	54	210

Technical **Datasheet**

Boiler Water Level Controls

Vertical Air Break Controls

Key **Features**

- Unique 3 magnet latching switch mechanism
- No spring in switch mechanism
- Glandless construction
- Fail safe design
- Unaffected by foam

Series **Overview**

Mobrey originally entered the industrial boiler control market in 1923 with a range of steam operated equipment. Since that time, the range has expanded to cover most aspects of control associated with the boiler house.

The Delta Mobrey Vertical Air Break Controls (VABC) are a comprehensive range of magnetically operated water level controls for steam boilers. They are designed to meet all requirements for automatic on/off control of boiler feed pump, burner cut out, high and/or low level alarm or any combination of these.

Models available with Industrial (NEMA4) or Marine Heads. TÜV approved models are available in chambers and for direct mounting.

The Delta Mobrey VABC is a gland-less construction. A primary permanent magnet is attached to the float rod and slides vertically inside a non-magnetic stainless steel centre tube. Movements of the float are transmitted to a secondary magnet in each switch unit.

There are two pairs of contacts which are operated with a snap-action and held by repulsion between the secondary magnet and the tertiary magnet of the switch unit assembly.

Other products

Other products we can offer :

- Boiler feed water modulation level controls and valves
- Sequencing blowdown valves

Product **applications**

- Water level (pump) control
- First low water alarm and cutout
- Second low water alarm and lockout
- High water alarm

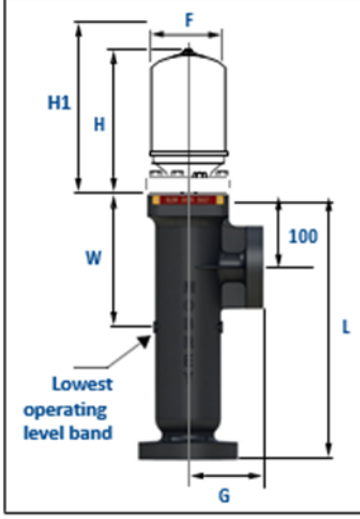
How to order

The instrument can be selected from the table below, which details the specification of each model. For assistance in selecting the model that best suits your needs, please contact your local sales office.

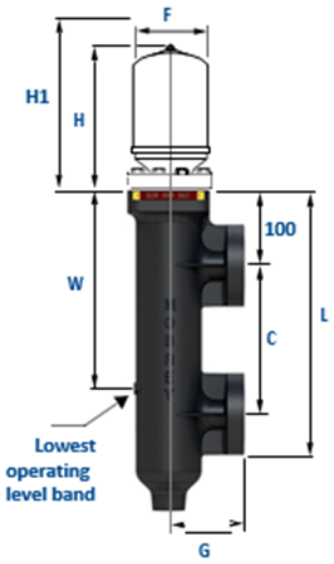
Explanation of type numbers

- The type numbers are arbitrary except that BX denotes chamber mounting and BD denotes direct mounting.
- The stroke number (e.g. ****/n) indicates the number of switch units fitted as standard. When extra switches are required, this stroke number will indicate the total number of switches to be provided.
- When Marine models are required the letter 'M' is inserted after the letters BX and before the number, e.g., the Industrial and NEMA 4 model BX05/2 becomes BXM05/2 when in Marine construction.
- Certain direct mount model have a test facility incorporated. These are identified by the letter 'T' after the letters BD and before the number, e.g. BDT02/2.

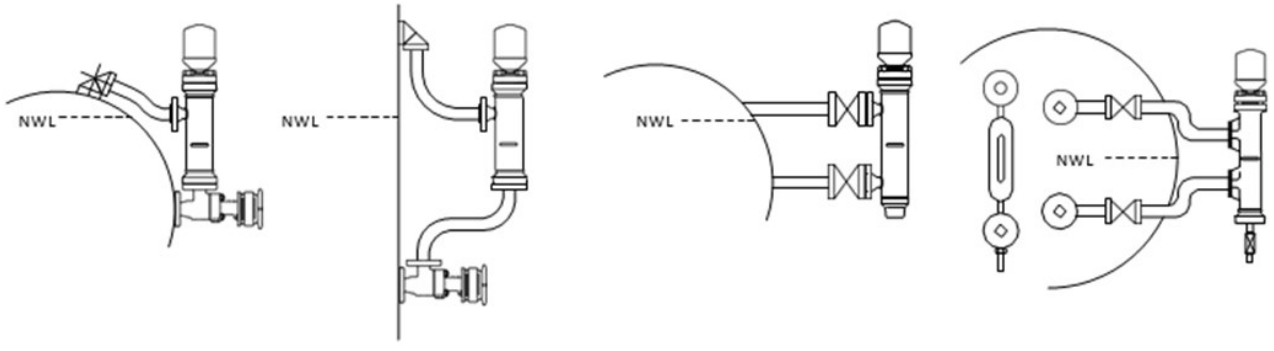
Side and bottom chamber mounted models: dimensional and operating data

Chamber and switch head	Type number	Operate range (mm)	No. of switches		EN1092 flanged and screwed connections	Dimensions						
			Std.	Max.		C	G	H	H1	L	W	F
	**Cast iron chamber (working pressure: 13 kg/cm²)**											
	BX02/1	62	1	-	DN25 PN16	-	102	193	303	366	182	160
	BX05/2	150	2	4	DN25 PN16	-	102	293	497	468	277	160
	BX07/2	250	2	6	DN25 PN16	-	102	393	602	557	370	160
	Fabricated steel chamber (working pressure: 21 kg/cm²)											
	BX09/1	62	1	-	DN25 PN40	-	87	193	303	366	182	160
	BX10/2	150	2	4	DN25 PN40	-	87	293	497	468	277	160
	BX11/2	250	2	6	DN25 PN40	-	87	393	602	557	370	160
	Fabricated steel chamber (working pressure: 32 kg/cm²)											
	BX12/1	62	1	-	DN25 PN40	-	102	193	303	366	182	160
	BX13/2	150	2	4	DN25 PN40	-	102	293	497	468	277	160
	BX14/2	250	2	6	DN25 PN40	-	102	393	602	557	370	160

Side and side chamber mounted models: dimensional and operating data

Chamber and switch head	Type number	Operate range (mm)	No. of switches		EN1092 flanged connections	Dimensions						
			Std.	Max.		C	G	H	H1	L	W	F
	Cast iron chamber with 1-in. BSP drain connection (working pressure: 13 kg/cm²)											
	BX03/1	62	1	-	DN 25 PN16	216	102	193	303	448	277	160
	BX15/1	62	1	-	DN20 PN16	180	100	193	303	480	240	160
	BX87/1	62	1	-	DN20 PN16	180	135	193	303	480	240	160
	BX16/2	120	2	4	DN20 PN16	180	100	293	497	480	240	160
	BX88/2	120	2	4	DN20 PN16	180	135	293	497	480	240	160
	BX06/2	150	2	4	DN 25 PN16	216	102	293	497	448	277	160
	BX08/2	250	2	6	DN 25 PN16	317	102	393	597	557	370	160
	Fabricated steel chamber with ½-in. BSP drain connection (working pressure: 21 kg/cm²)											
	BX17/1	62	1	-	DN20 PN40	270	100	193	303	570	335	160
	BX45/1	62	1	-	DN25 PN40	270	100	193	303	570	335	160
	BX18/2	120	2	4	DN20 PN40	270	100	293	497	570	335	160
	BX19/2	150	2	4	DN20 PN40	270	100	293	497	570	335	160
	BX20/2	150	2	4	DN25 PN40	270	100	393	497	570	335	160
	BX21/2	215	2	6	DN20 PN40	270	100	393	602	570	335	160
	BX22/2	215	2	6	DN25 PN40	270	100	393	602	570	335	160
	Fabricated steel chamber with ½-in. BSP drain connection (working pressure: 32 kg/cm²)											
	BX23/1	62	1	-	DN 25 PN40	350	112	193	303	595	372	160
	BX24/2	150	2	4	DN 25 PN40	350	112	293	497	595	372	160
	BX25/2	250	2	6	DN 25 PN40	350	112	393	597	595	372	160

Typical mounting arrangements for chamber mounted controls



Side and bottom entry chamber with sequencing valve on horizontal boiler

Side and bottom entry chamber with sequencing valve on vertical boiler

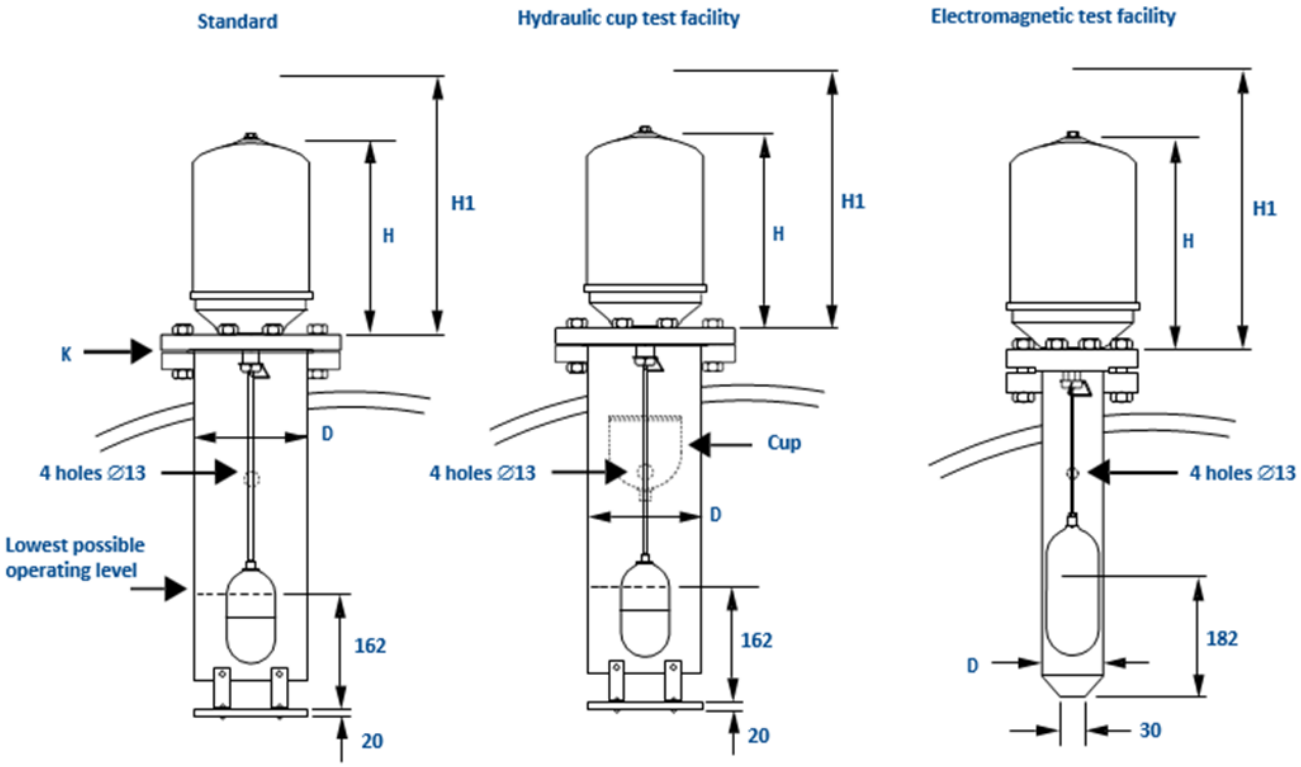
Side and side entry chamber on horizontal boiler

Side and side entry chamber on steam drum of water tube boiler

Direct mounted models: dimensional and operating data

Type number	Working pressure at saturated steam kg/cm²	Operate range in mm	No of switches		Forged steel flanged connections	Float length x diameter	Dimensions			Max. float rod length
			Std.	Max.			D min.	H	H1	
Standard										
BD01/1	21.0	62	1	1	EN1092 DN100 PN40	152 x 67	77	193	303	765
BD02/2		150	2	4				293	497	
BD03/2		250	2	6				393	597	
BD04/1	32.0	62	1	1	EN1092 DN100 PN40	155 x 90	100	193	303	1016
BD05/2		150	2	4				293	497	
BD06/2		250	2	6				393	597	
BD07/2	21.0	120	2	4	BM115mm Sq	152 x 67	77	293	497	260
BD08/1		62	1	1				193	303	765
BD09/1		62	1	1				193	303	356
BD10/1		62	1	1				193	303	260
BD11/2	21.0	150	2	4	BM115mm Sq	152 x 67	77	293	497	765
BD12/2		150	2	4				293	497	356
BD13/2		150	2	4				293	497	298.5
BD14/2		215	2	6				293	602	356
BD15/2		250	2	6				293	602	765
BD16/2		250	2	6				293	602	394
BD21/2	32.0	150	2	4	EN1092 DN100 PN40	155 x 90	100	293	497	385
BD22/2		250	2	6			100	393	602	385
BD41/2	21.0	62	1	1	EN1092 DN100 PN40	152 x 67	77	193	303	298.5
BD42/2		62	1	1			77	193	303	394
BD43/1	32.0	62	1	1	EN1092 DN100 PN40	155 x 90	100	193	303	1016
BD44/2		150	2	4			100	293	497	1016
Hydraulic cup test facility										
BDT01/1	32.0	62	1	1	EN1092 DN100 PN40	155 x 90	100	193	303	1016
BDT02/2		150	2	4				293	497	
BDT03/2		250	2	6				393	597	
Electromagnetic test facility										
BDT04/1	21.0	–	1	–	BM128mm sq DN100 PN40	155 x 90	100	293	497	1016
BDT05/1	32.0	–	1	–						

Typical mounting arrangements for direct mounted controls

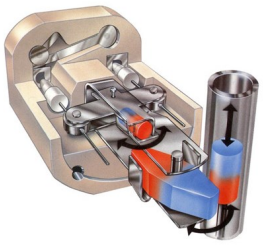


Technical Specifications

Electrical ratings for Single-Pole Double-Throw (SPDT) operation

AC maximum values			DC maximum values				
VA	Volts	Amps	Watts	Volts	Resistive amps	Inductive amps	Inductive time constant
2000(1)	440	5	50	250	5	0.5(2)	40 ms

(1) Maximum power factor is 0.4.
(2) Maximum up to 2 A dependent upon time constant of circuit. Consult factory.

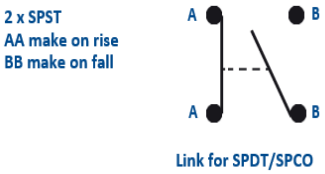


Note

- Switches must not be used for the direct starting of motors.
- Contacts should be wired in series with the operating coils of relays, contact starters or solenoid valves, and fused separately.
- Two 25 mm BS4568 cable entries are provided for the electrical connections. A sufficient length of flexible cable must be fitted to permit easy removal of the switch head and float assembly for routine maintenance.

Operating Levels

Differentials

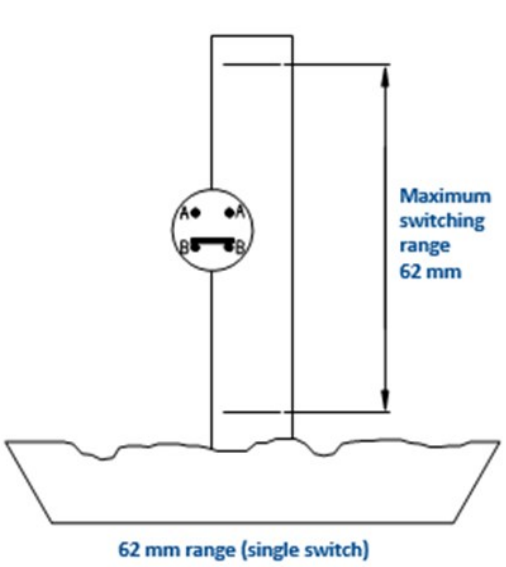


Each level switch has a nominal fixed water level differential of 25 mm between circuits A-A and B-B. To obtain a differential greater than 25 mm, two switch units must be used. The minimum water level differential for two switch units is 33 mm, with switch centres positioned 8 mm apart.

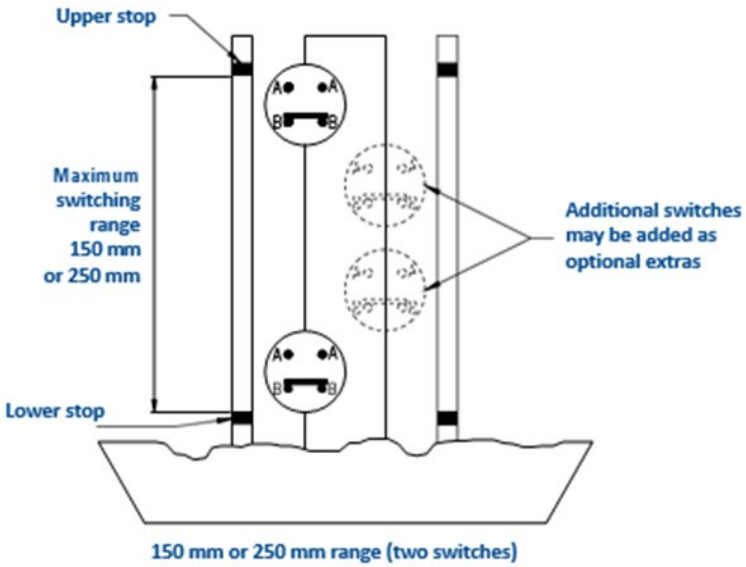
The maximum adjustable differential for two switch mechanisms varies with the operating range of each model,i.e. the distance between a rising and falling level which is required to operate the switches positioned at the extreme ends of their adjustments.

Switches have adjustments as follows:

- 62 mm range: 37 mm adjustment + 25 mm fixed differential = 62 mm
- 150 mm range: 125 mm adjustment + 25 mm fixed differential = 150 mm
- 250mm range: 225 mm adjustment + 25 mm fixed differential = 250mm



62 mm range (single switch)



150 mm or 250 mm range (two switches)

Chamber mounted models

Float chambers are manufactured in these approved materials:

Cast iron equal to BS1452 Grade 17
– for up to 13 kg/cm2 rating.

Fabricated steel BS3602 - HFS 27
– for both 21 kg/cm2 and 32 kg/cm2 ratings.

For chamber dimensions and process connections arrangement refer to the ordering information above.

Switch heads contain one or more switching mechanism units mounted in a housing comprising die-cast base with a zinc coated mild steel casing.

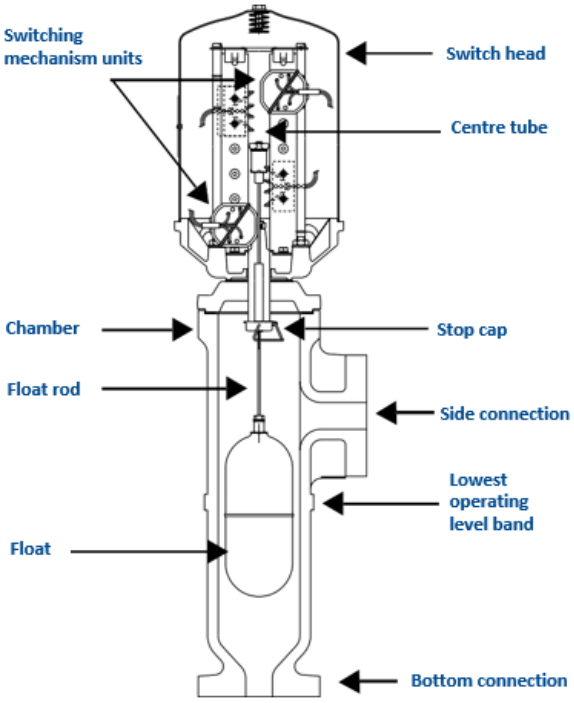
Two 25mm BS.4568 cable entries are provided.

Switching mechanism units have single pole double throw contacts, are latching and are positioned and held in place by clamp screws.

The centre tube is made of non-magnetic stainless steel and expanded into the top cover flange. It is fitted with a stop cap which also acts as a guide for the float rod carrying the primary magnet.

Floats are manufactured in Monel metal.

Float rods are manufactured in stainless steel.



The Chamber band mark indicates the lowest adjustment position of the low level alarm. We recommend that the positioning of the boiler control chamber is relative to the water level gauge glass and that, even at the lowest operating band level, the N.W.L. is such that there is always water visible in a gauge glass. Arrangements of Delta Mobrey Vertical Air Break Controls on various types of boiler are shown below.

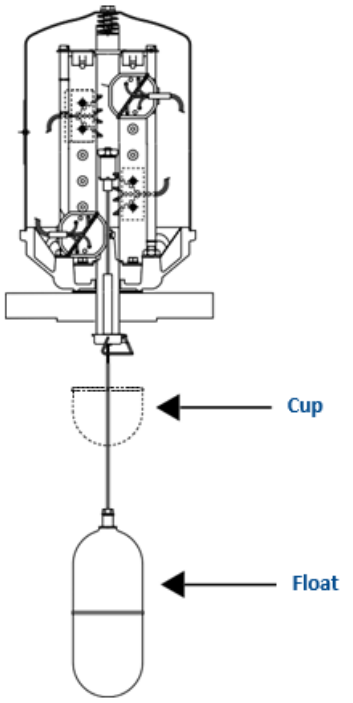
Direct mounted models (standard models)

Direct Mounted Vertical Air Break Controls have the same principles of operation and piece parts as the chamber-mounted equivalents, except that the chamber is exchanged for (1) a large round flange and (2) the tube assembly for mounting the control directly on to the boiler shell connection.

A fixed or removable stilling or guide tube should be provided to ensure that the float rod is not damaged and the correct vertical movement is achieved.

Direct mounted controls incorporating test facilities

These controls have the provision for testing the operation of the mechanism without lowering the level of water in the boiler. Testing can be initiated manually or by a timer. U.K. Patent 1279504 or 1473939 and international equivalents.



Hydraulic cup test facility

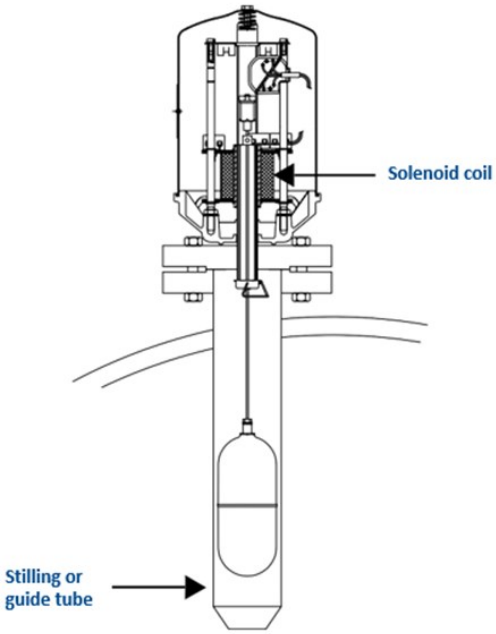
The test is achieved by lowering the float to the low water alarm level, by the following means:

The float rod includes a cup, above the float, which is fed with water from the boiler feed pump via small bore pipework and valves through the control mounting flange for approximately 24 seconds. The additional weight overcomes the buoyancy of the float, causing it to sink, stop the burner firing and operate the alarm system. After closing the test valve in the supply from the feed pump to the control, a small hole in the bottom of the cup drains off the water, permitting the float to rise to the normal operating position. Control of the water supply to the cup can alternatively be by means of a solenoid valve, which can be initiated by a timer or a manually operated push button. In this design the alarm switch remains fully adjustable.

Electromagnetic test facility

The switch head includes an inductive coil below the single switch subassembly. This surrounds an armature located inside the stainless steel centre tube and fixed to the float rod.

To initiate the test cycle, the coil can be energised by a timer or a manually operated push button and the float will be thrust downwards to stop the burner firing and operate the alarm system. When the coil is de-energised the float rises to its normal level. In this design the alarm switch unit is not adjustable.



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.

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

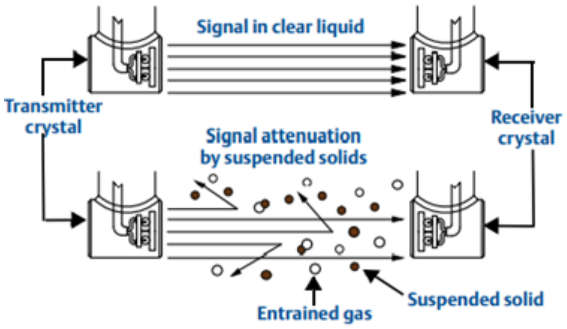
Other products we can offer include:

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

Suspended Solids Measurement
Models: MSM400

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 in a discharge line or general pipeline. A sensor kit allows for installation on an existing pipeline.

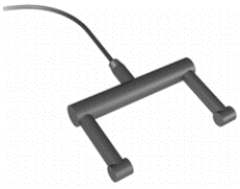
Sensors can operate at either 1 MHz or 3.3 MHz to suit the application. The MSM400 controller selects the most suitable frequency during on-site calibration.

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

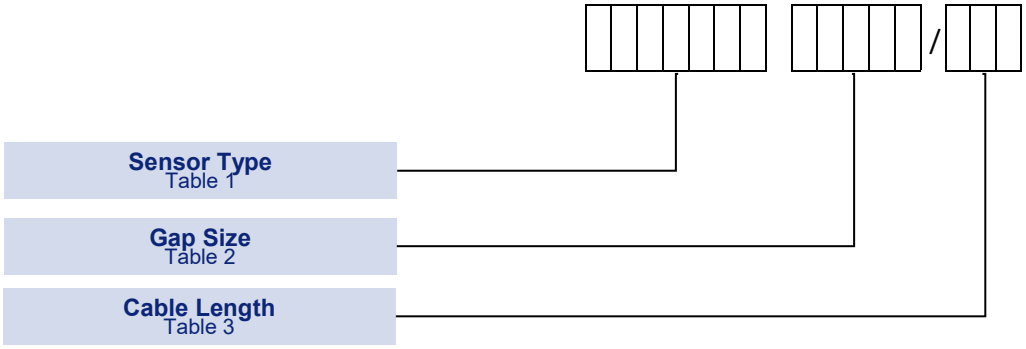
All sensors operate by sending an ultrasonic signal between a transmitter and receiver. The gap between these is defined at the order stage and is chosen according to the application. The table below gives an approximate guide. In general, a wide gap should be used on low density sludges or slurries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

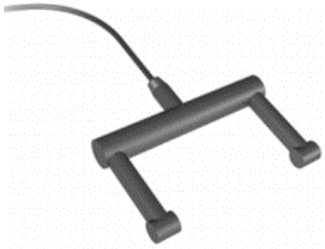


TABLE 1 ☐☐☐☐☐☐☐ ☐☐☐☐☐ / ☐☐☐

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

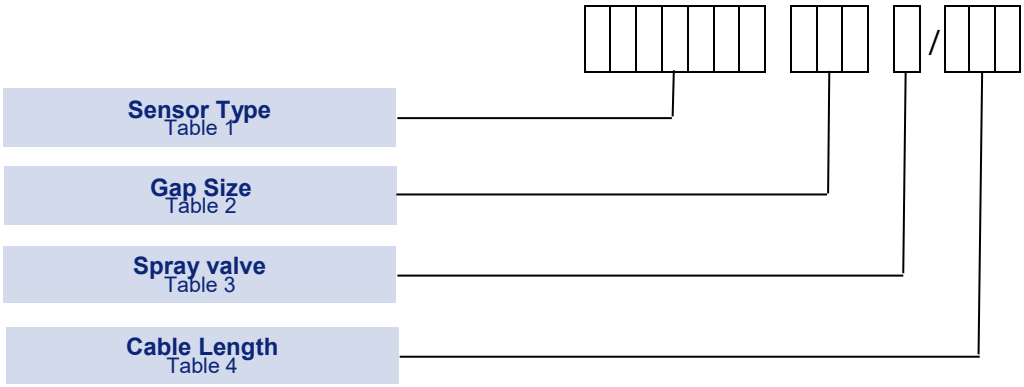
TABLE 3 ☐☐☐☐☐☐☐ ☐☐☐☐☐ / ☐☐☐

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

Sensor Type	Code
Pipe section with sensors	MSM448A

TABLE 2

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

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

TABLE 4

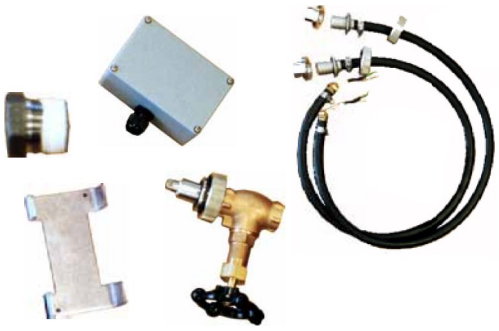
Cable Length	Code
Cable length 7 meters (23 ft)	M07
Customer defined cable length up to a maximum of 30m (may incur a longer lead time and additional cost)	MXX

How to order the MSM pipe mount kit

TABLE 1: **The pipe kit has no model options.**

Pipe mount kit

Base Model	Code
Pipe kit	MSM-PIPEKIT-ATEX



How to order the MSM400 control unit

TABLE 1: **The control unit has no model options.**

MSM Control Unit

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

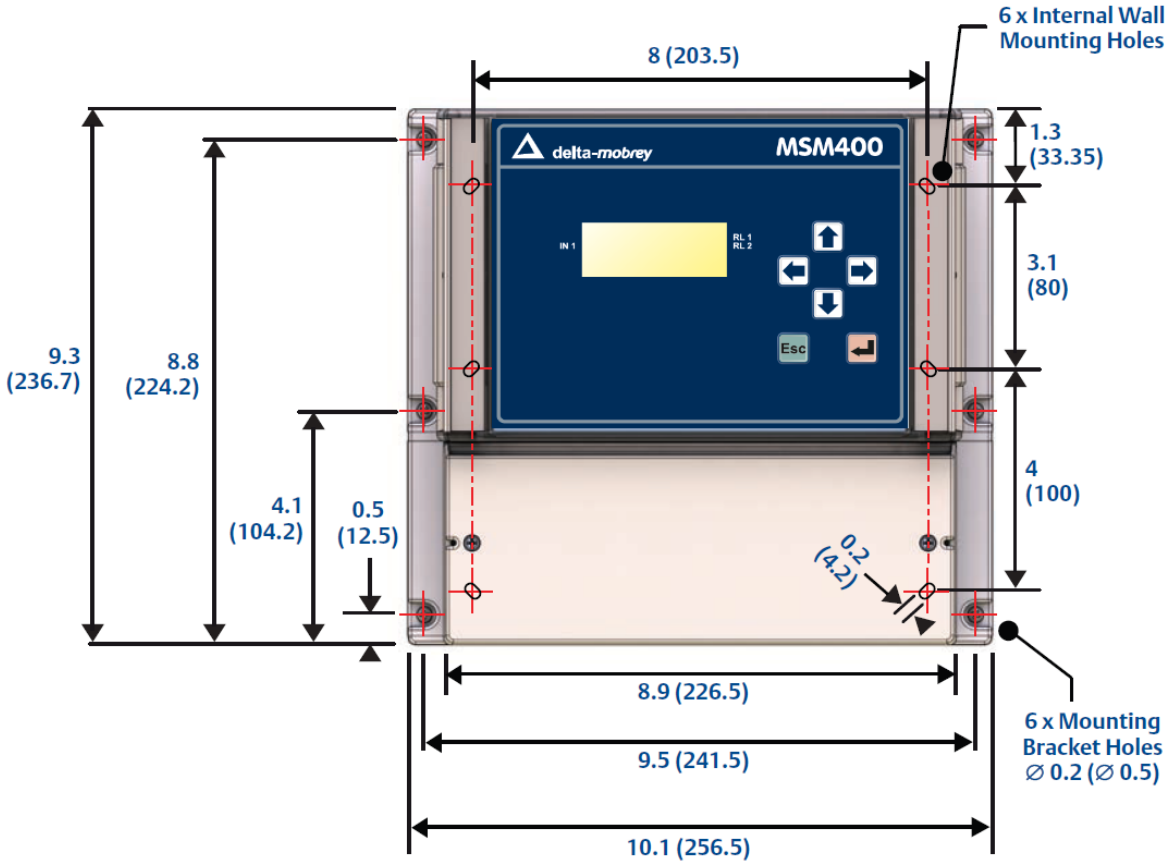
MSM Sensors

Certificate number ITS21UKEX0388X

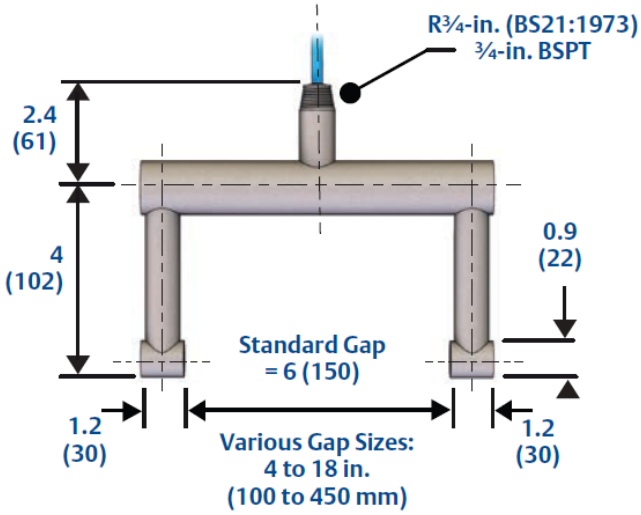
II 1 G Ex ia IIC T6...T3 Ga -40°C ≤ Ta ≤ **

(** : T6 = +70°C, T5 = +85°C, T4 = +120°C, T3 = +150°C)

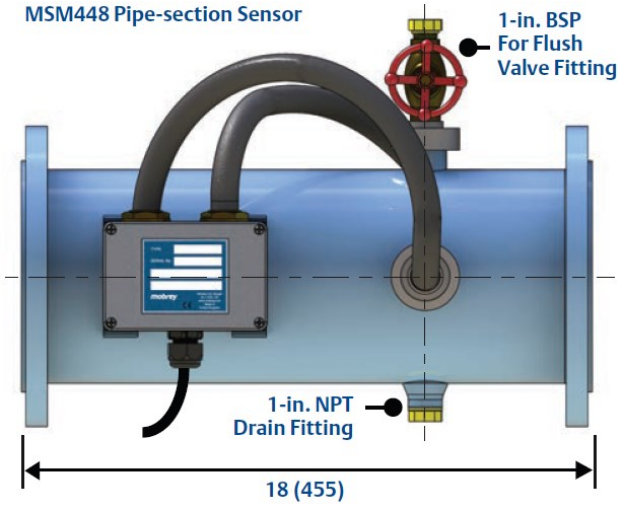
Dimensional drawings



MSM433 In-tank Sensor



MSM448 Pipe-section Sensor



Technical **Datasheet**

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 **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

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

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.

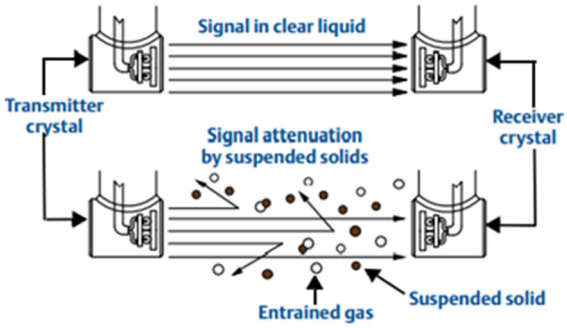
For typical sewage sludges, the ultrasonic sensors can detect 1% to 30% suspended solids within a slurry. Industrial slurries such as fine pottery slips can often be measured up to 65% solids by weight.

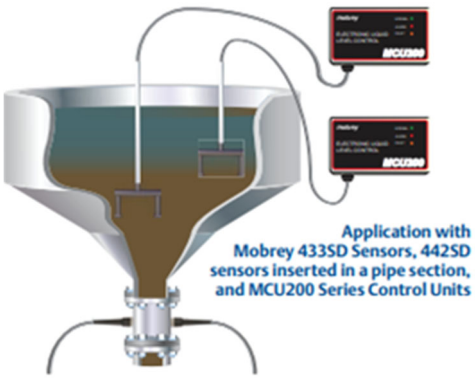
The 433SD sensor is normally suspended in a settlement tank or separator.
The 422SD sensor pair is typically installed across a pipe.

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.

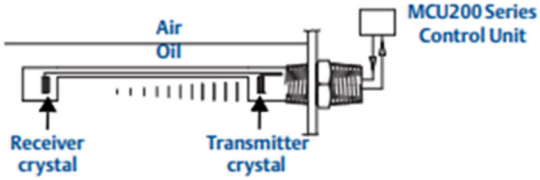
The refraction technique is used to detect the interface where two immiscible liquids have similar attenuations. When the sensor is oriented at an angle of 10 degrees from horizontal, and the interface level is within the gap of the sensor, a small signal is received. The gain of the MCU200 control unit can be set to activate the relay when little signal is received.



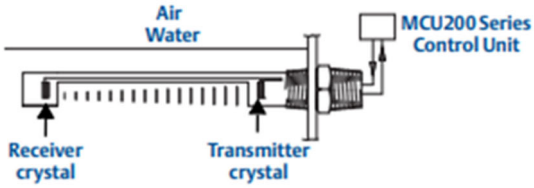


INTERFACE DETECTION BY ATTENUATION

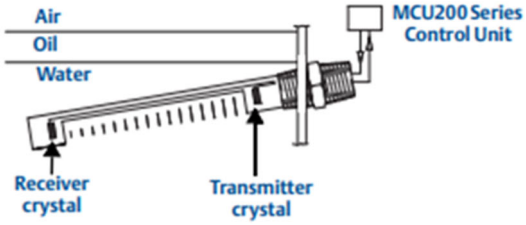
Sensor in oil:
The ultrasonic beam is attenuated and will not reach the receiver crystal

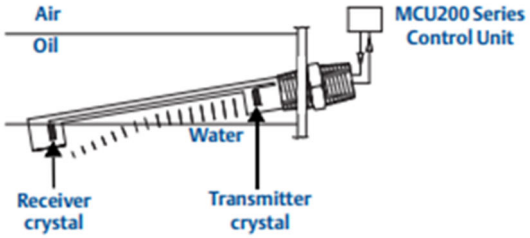


Sensor in water:
The ultrasonic beam reaches the receiver crystal



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

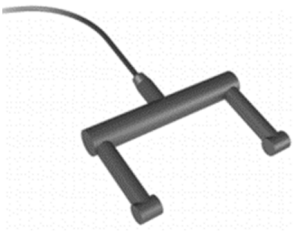
Power Supply	Code
MCU control unit. For use with all sensors. 220/110Vac (50/60 Hz). Safe area only.	1
MCU control unit. For use with all sensors. 24Vdc.	3

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



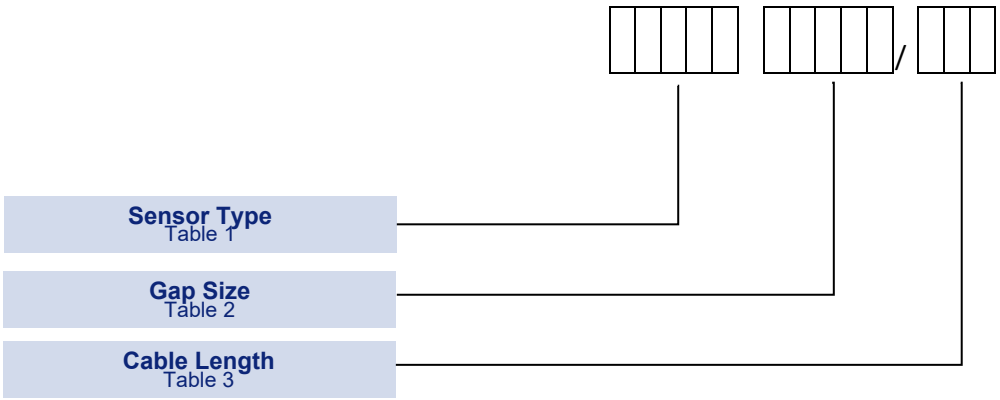
Gap Size Selection

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.



Tank mount sensors

TABLE 1 ☐☐☐☐☐ ☐☐☐☐☐/☐☐☐

Sensor Type	Code
Tank mount sensor for MCU200 series	433SD

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.	802M1
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

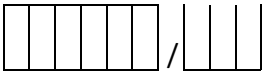
402SD interface sensors

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.

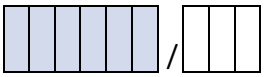
How to order interface and pipe mount sensors



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

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 4SD sensors are for non-hazardous area use only**

Approvals

EUROPEAN DIRECTIVES

Electromagnetic Compatibility Directive (EMC) 2014/30/EU

Compliant to EMC directive

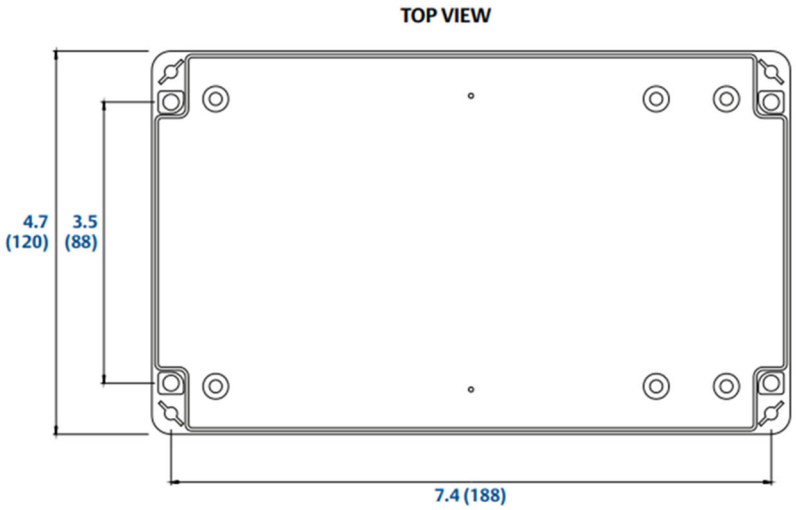
Low Voltage Directive (LVD) 2014/35/EU

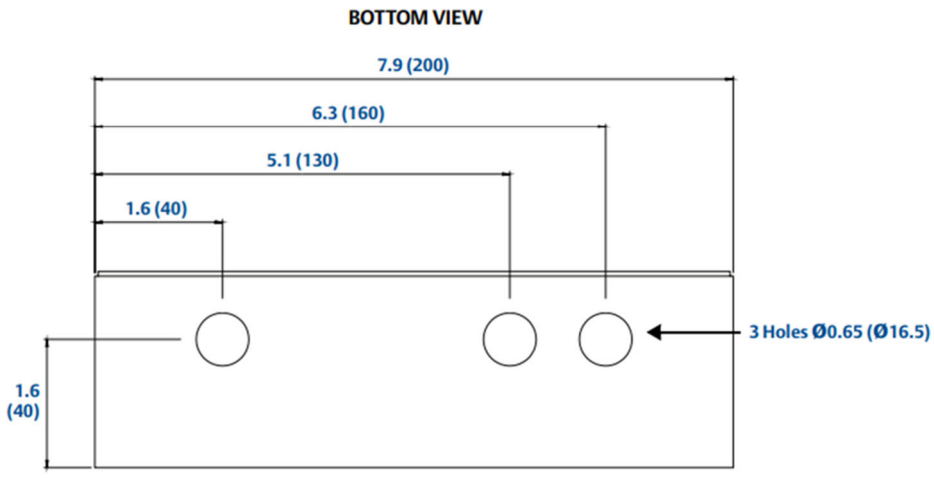
Compliant to LVD directive

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

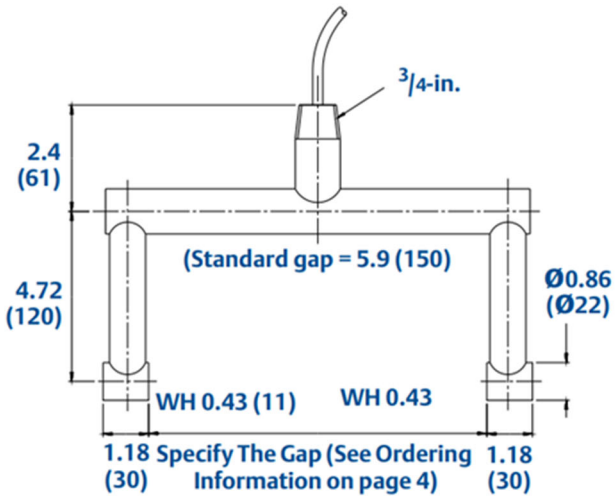
This product is out of the scope of the PED directive

Technical Specification





Dimensional drawings



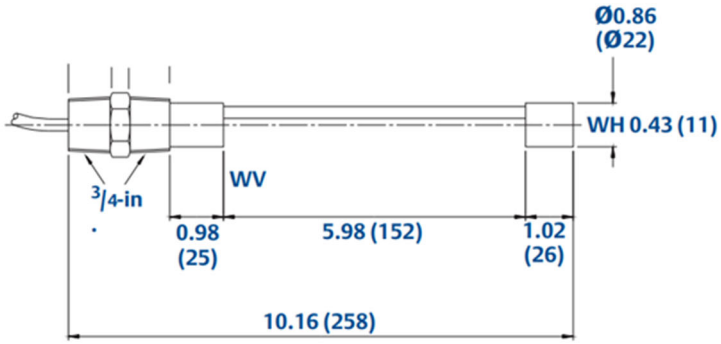
Sensor type 433SD

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



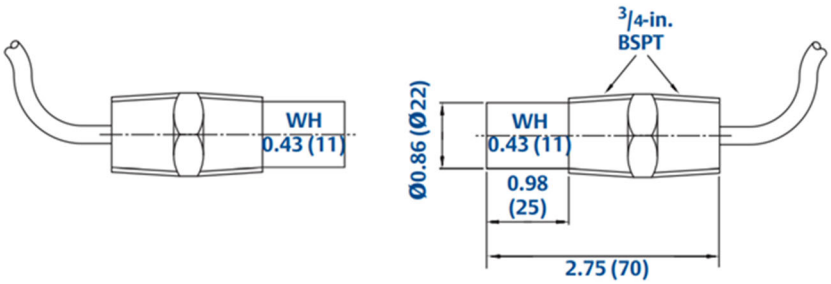
Sensor type 402SD

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 442SD

Across Pipe

Duty: Pipelines

Liquid type: Clean or sludge density

See Table 5 on page 7 for the full specification

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия +7(495)268-04-70 **Казахстан** +7(7172)727-132 **Киргизия** +996(312)96-26-47

www.delta-mobrey.nt-rt.ru | | dye@nt-rt.ru