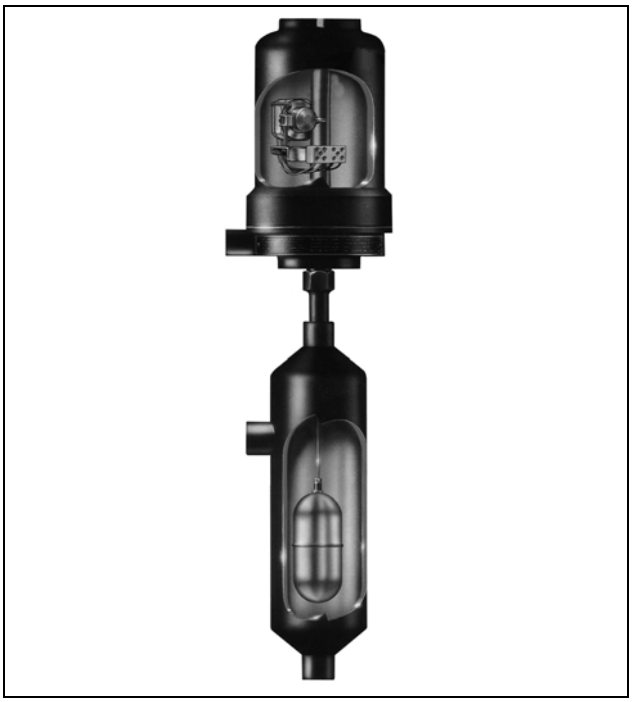
Mobrey Vertical Magnetic Level Switches

- *Unique 3 magnet latching switch mechanism*
- *No springs in switch mechanism*
- *Weatherproof*
- *Flameproof*
- *Direct mount*
- *Chamber mount*



Contents

Overview of Mobrey Vertical Magnetic Level Switches

INTRODUCTION

Whether you require a switch for **critical area applications** or just **general purpose control**, the extensive range of Mobrey switches ensures that we will always have a solution to your particular problem.

A choice of **displacer-type** or **float-type** operated level switch is available to order for direct vertical mounting (no chamber).
See Table 1 on page 4 or Table 2 on page 6 for ordering information.

These level switches can be optionally supplied mounted vertically in chambers, in a sealed or removable form.

A range of **carbon steel chambers** is available, or for more vigorous applications there are **316 stainless steel chambers**.
See Table 3 on page 8 or Table 4 on page 10 for ordering information.

There are a variety of tank and process connection options available to make installation simple and economic. This gives you the choice to meet your application in keeping with your budget.

Quality and Reliability

Mobrey vertical magnetic level switches for industrial and process control use have been available for over 20 years and have gained a reputation for **quality** and **reliability**.

Based on the industry-standard boiler water level controls, these controls use the same three-magnet switch mechanism for snap-action latching and switching. The design of this unique switch mechanism overcomes all the inherent problems of mercury tubes and micro switches. Even under severe vibration conditions, there are no springs to cause contact bounce, hover, or even failure. The snap-action magnets give a positive and stable latching, time after time after time.

Choice of Switching Mechanisms

There are **two switching functions** available: 2 x SPST (SPCO) or DPDT (DPCO) switching, and each comes in f**our variants**:

- General purpose use with silver cadmium oxide contacts for long life
- Low power circuit with gold-plated contacts for use in low current/voltage applications such as I.S. circuits
- High power circuits giving up to 10 Amps switching capability
- Hermetically sealed for the ultimate in reliability – *sealed for life*

Operation in Extreme Conditions

When controls are required to operate in extreme conditions, the unique Mobrey hermetically sealed switch provides dependable life long operation that you can rely on. With all its moving parts and contacts completely enclosed, this genuine hermetically sealed switch is suitable for use in corrosive atmospheres and low temperature environments.

Mobrey Vertical Level Switches

FEATURES

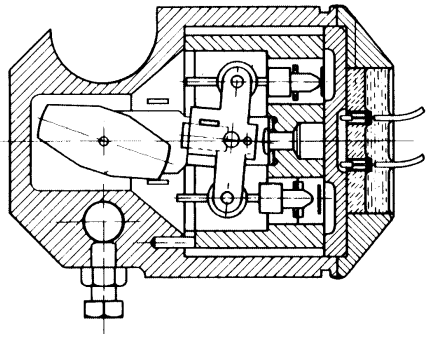
- Relevant chambers are supplied CE marked and fully compliant with the Pressure Equipment Directive (97/23/EC)
- Unique switching mechanism – *totally reliable*
- No springs in switch mechanism – *positive snap action switching*
- Vibration resistant – *eliminates spurious trips*
- Multi-switching models – *cost effective control*
- Genuine hermetically sealed switch option – *totally safe and secure*
- Extensive range of chambers – *suitable for most applications*
- Designed to ASME B31.3
- Weld procedures approved to EN ISO 15614-1 and ASME IX
- Welders approved to EN 287-1
- Material certification to EN 10204, 3.1
- Materials to ASTM and B.S. Standards

APPROVALS

- Underwriters Laboratories (UL) Approval
  Explosion-proof for Class I, Div 1, Groups B, C, and D
  Class II, Div 1, Groups E, F, and G
  General Area, Weatherproof type NEMA 4
- Canadian Standards Association (CSA) Approval
  Explosion Proof for Class 1, Groups B, C, and D
  General Area, Weatherproof to NEMA 4
- Flameproof ATEX II 1/2G, EExd IIC T6 (-50 °C ≤ Ta ≤ 60 °C)

Intrinsically Safe Use

For intrinsically safe circuits, gold-plated switch contacts are recommended. Users are reminded that it is their responsibility to obtain the necessary system approval and licences for such circuits.



Section through type H4 switch mechanism

EN ISO 9001: 2000

Mobrey Ltd. has been assessed and approved by Lloyds Register Quality Assurance against BS EN 9001: 2000 for the design, development, assembly and re-calibration of precision instructments and systems for the measurement and indication of electrical signals, gas and liquid density, viscosity, pressure, level, flow and water/steam systems.

QUALITY ASSURANCE

With over 20 years worldwide experience in the major power, nuclear and petro-chemical industries, Mobrey Measurement is able to accommodate testing, surveying and documentation requirements as specified at the time of order. Inspection by customers or nominated inspection agencies can be arranged.

Hermetically sealed switch mechanism

Ordering Information

Table 1. Direct Mount: Vertical Displacer-type Level Switch Ordering Information

★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time

Product Description										
D[1][2]	Direct mount: vertical displacer-type level switch (no chamber)									
Mounting Flange Material										
Standard										**Standard**
C	Carbon steel. ASTM A105 (For use +300 to –10 ºC)									★
S	316L stainless steel. ASTM A182: F316L (For use +300 to –50 ºC)									★
Function and Specification[3]									**Maximum Pressure at 20º C**	
					S.G. Range		**Operating Temperature**			
		Elements	**Trim**	**Spring**	**4 Contact**	**8 Contact**				
Standard										**Standard**
11D	One switch narrow diff.	316 SST	316 SST	Nimonic 90	0.6 to 1.2	0.75 to 1.2	–50 to +300ºC		102 bar	★
12D	One switch wide diff.	316 SST			0.5 to 1.2	0.75 to 1.2	–50 to +300ºC			★
13D	Two switch 2 wide diff.	316 SST			0.6 to 1.2	0.8 to 1.2	–50 to +300ºC			★
18D	Two switch 2 normal diff.	316 SST			0.6 to 1.2	0.8 to 1.2	–50 to +300ºC			★
Switch Enclosure[4]								**Maximum Number of Switch Mechanisms**		
	Duty		**Base**		**Cover**		**Wetted Parts**			
Standard										**Standard**
S4N	Weatherproof IP66		Aluminium alloy [5]		Drawn steel		316 SST	2		★
S7A	Flameproof and explosion-proof		Aluminium alloy [5]		Aluminium alloy					★
S7I			Cast iron		Cast iron					★
Approvals										
Standard										**Standard**
U	UL Explosion-proof									★
C	CSA Explosion-proof									★
N	UL and CSA General Area, weatherproof type NEMA 4X									★
	ATEX Flameproof and weatherproof IP66 depending on switch enclosure (leave the code blank e.g. D****S7A 1)									★
Number of Switch Mechanisms										
Standard										**Standard**
1	Specify 1 for single-switch models 11D and 12D									★
2	Specify 2 for two-switch models 13D and 18D									★
Switch Mechanism Type and Duty[6]										
		Max. Wetside	**A.C. Maximum Values**			**D.C. Maximum Values**				
		Temperature	**Volt**	**Amps**	**VA**	**Volts**	**Res. I**	**Ind. I**	**Watts**	
Standard										**Standard**
4 Contact: 2 × SPST										★
D4	General purpose	300 ºC	440	5	2000	250	5	0.5	50	★
D4U	D4 + UL/CSA approved	300 ºC	400	5	2000	250	5	0.5	50	★
P4	Low power circuits	300 ºC	250	0.25	6	250	0.25	0.1	3.6	★
X4	High power circuits	250 ºC	440	10	2000	250	10	0.5	50	★
H4	Hermetically sealed	250 ºC	440	5	2000	250	5	0.5	50	★
8 Contact: DPDT										
D8	General purpose	300 ºC	400	5	2000	250	5	0.5	50	★
D8U	D8 + UL/CSA approved	300 ºC	440	5	2000	250	5	0.5	50	★
P8	Low power circuits	300 ºC	250	0.25	6	250	0.25	0.1	3.6	★
X8	High power circuits	250 ºC	440	10	2000	250	10	0.1	50	★
H8	Hermetically sealed	250 ºC	440	5	2000	250	5	0.5	50	★

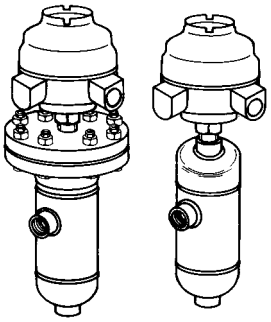
Mobrey Vertical Level Switches

Table 1. Direct Mount: Vertical Displacer-type Level Switch Ordering Information

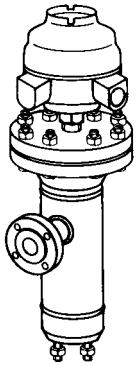
★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time

Mounting Arrangement			
0	1-in. NPT thread, 316 SST		★
60	ASME B16.5 3-in. Class 150 RF flange	These are our stocked flanges. Other flange sizes and ratings are available on request.	★
61	ASME B16.5 3-in. Class 300 RF flange		★
62	ASME B16.5 3-in. Class 600 RF flange		★
65	ASME B16.5 4-in. Class 150 RF flange		★
66	ASME B16.5 4-in. Class 300 RF flange		★
67	ASME B16.5 4-in. Class 600 RF flange		★
Typical Model Number: D C 13D S 7A U 2 D4 / 60			

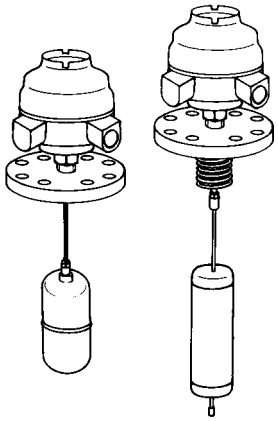
*(1) See "Direct mount displacer controls" on page 15 for information about how the displacer-type level switches (**D) operate.*
(2) Supplied with 3 m of 316 stainless steel displacer cable as standard. Other lengths are available on request.
(3) The switching-point is adjusted by moving the displacer elements on the cable. See "Direct mount displacer controls" on page 15 for information about this.
(4) See "Mobrey Switch Enclosures" on page 14 for information about these options.
(5) Base material will be cast iron whenever 8-contact switches are specified.
Customers must state operating pressure, temperature and specific gravity, together with function of each switch mechanism when ordering.
Due to component tolerances, dimensions DB, E and S given on page 17 are approximate and may vary on each level switch by up to 10 mm.
Setting the level switch to operate at the required level can be achieved on site by adjusting the element up or down on the cable as necessary.
(6) See "Mobrey Switch Mechanisms and Ratings" on page 13 for information about these options.



Medium pressures
ASME Class 150, 300 600
SG 0.4



High pressures
ASME Class 900, 1500, 2500
SG 0.40



Direct mounting
ASME Class 150, 300, 600
SG 0.4

Mobrey Vertical Level Switches

Table 2. Direct Mount: Vertical Float-type Level Switch Ordering Information

★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

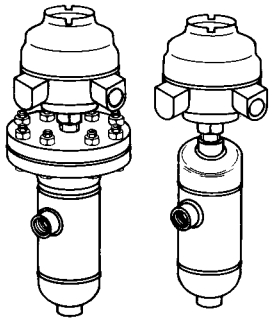
Product Description										
D	Direct mount: vertical float-type level switch (no chamber)									
Mounting flange material										
Standard										**Standard**
C	Carbon steel ASTM A105 (for use +400 to –10 °C)									★
S	316L stainless steel ASTM A182: F316L (for use +400 to –101 °C)									★
Function and Specification[1]										
		Pressure Rating (Bar)			**Float Diameter (mm)**	**Matching Enclosures**	**Matching Mounting Flanges**			
		20°C	**250°C**	**400°C**						
Standard										**Standard**
11F	Float Switch, minimum SG 0.80	34.5	22.5	20.2	67	All	3-in. NB or larger			★
12F	Float Switch, minimum SG 0.75	102.1	66.5	59.2	90					★
13F	Float Switch, minimum SG 0.65	51.1	33.2	29.6	88		4-in. NB minimum			★
14F	Float Switch, minimum SG 0.54	19.6	12.7	11.3	88					★
Switch Enclosure[2]										
	Duty	**Base**	**Cover**		**Wetted Parts**	**Switch Adjust.**	**Max. No. of Switches**			
							4 Contact	**8 Contact**		
Standard										**Standard**
R4N	Weatherproof IP66	Aluminium alloy[3]	Drawn steel		316 SST	None	1	1		★
S4N						94 mm	4	2		★
L4N						194 mm	6	3		★
R7A	Flameproof and Explosion-proof	Aluminium alloy[1]	Aluminium alloy			None	1	1		★
S7A						94 mm	4	2		★
R7I		Cast iron	Cast iron			None	1	1		★
S7I						94 mm	4	2		★
Approvals										
Standard										**Standard**
U	UL Explosion-proof									★
C	CSA Explosion-proof									★
N	UL and CSA General Area, weatherproof type NEMA 4									★
	ATEX Flameproof and weatherproof IP66 depending on switch enclosure (leave code blank e.g. D****R7A 1)									★
Number of Switch Mechanisms										
Standard										**Standard**
1 to 6	As required, and subject to the maximum number of switches allowed for the selected switch enclosure (see above)									★
Switch Mechanism Type and Duty[4]										
		Max. Wetside Temperature	**AC max values**			**DC max values**				
			Volts	**Amps**	**VA**	**Volts**	**Res. I**	**Ind. I**	**Watts**	
Standard										**Standard**
4 contact: 2 x SPST										
D4	General purpose	400 °C	440	5	2000	250	5	0.5	50	★
D4U	D4 + UL/CSA approved	400 °C	440	5	2000	250	5	0.5	50	★
P4	Low power circuits	400 °C	250	0.25	6	250	0.25	0.1	3.6	★
X4	High power circuits	250 °C	440	10	2000	250	10	0.5	50	★
H4	Hermetically sealed	250 °C	440	5	2000	250	5	0.5	50	★
8 contact: DPDT										
D8	8 contact: DPDT	400 °C	440	5	2000	250	5	0.5	50	★
D8U	D8 + UL/CSA approved	400 °C	440	10	2000	250	5	0.5	50	★
P8	Low power circuits	400 °C	250	0.25	6	250	0.25	0.1	3.6	★

Table 2. Direct Mount: Vertical Float-type Level Switch Ordering Information

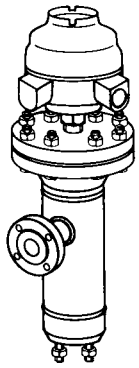
★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

X8	High power circuits	250 °C	440	10	2000	250	10	0.5	50	★
H8	Hermetically sealed	250 °C	440	5	2000	250	5	0.5	50	★
Mounting Arrangement										
0	1-in. NPT thread, 316 SST									★
60	ASME B16.5 3-in. Class 150 RF flange						These are our stocked flanges. Other flange sizes and ratings are available on request			★
61	ASME B16.5 3-in. Class 300 RF flange									★
62	ASME B16.5 3-in. Class 600 RF flange									★
65	ASME B16.5 4-in. Class 150 RF flange									★
66	ASME B16.5 4-in. Class 300 RF flange									★
67	ASME B16.5 4-in. Class 600 RF flange									★
Typical ordering information: D C 12F L4N U 4 D4 / 67										

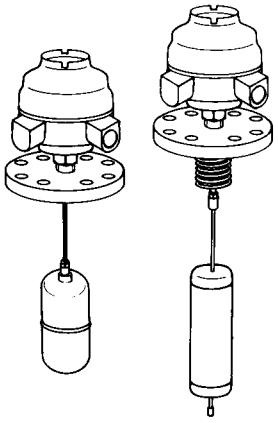
*(1) See "Direct mount Float Type" on page 16 for information on how the float-type level switches (**F) operate.*
(2) See "Mobrey Switch Enclosures" on page 14 for further information about these enclosure options.
(3) Base material will be cast iron whenever 8-contact switches are specified.
Customers must state operating pressure, temperature and specific gravity, together with function of each switch mechanism when ordering.
Due to component tolerances, dimensions DB, E and S given on page 18 are approximate and may vary on each level switch by up to 10 mm.
Setting the level switch to operate at the required level can be achieved on site by adjusting the element up or down on the cable as necessary.
(4) See "Mobrey Switch Mechanisms and Ratings" on page 13 for information about these options.



Medium pressures
ASME Class 150, 300 600
SG 0.4



High pressures
ASME Class 900, 1500, 2500
SG 0.40



Direct mounting
ASME Class 150, 300, 600
SG 0.4

Mobrey Vertical Level Switches

Table 3. Carbon Steel Chamber with Mounted Float-type Level Switch Ordering Information

★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

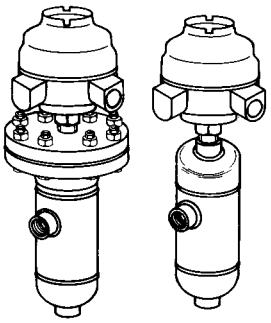
Product Description – *see "Chambers" on page 16*													
Standard													**Standard**
B	Bottle style chamber (including a float-type level switch sealed inside during manufacture)												★
X	Flanged style chamber (including a float-type level switch; removable from chamber for routine maintenance)												★
Chamber Material													
Standard													**Standard**
C	Carbon steel												★
Function and Specification[1][2]													
	Float and Trim	**Minimum SG**	**Flanged Style Chambers (X) Pressure Rating (bar)**			**Flanged Process Connection Pressure Rating (bar)**			**Threaded/Socket Process Connection Pressure Rating (bar)**			**Chamber Body Size**	
			20 ºC	**250 ºC**	**400 ºC**	**20 ºC**	**250 ºC**	**400 ºC**	**20 ºC**	**250 ºC**	**400 ºC**		
Standard													**Standard**
11F	316 SST	0.80	34.5	22.5	20.0	30.1	22.5	20.0	30.1	22.5	20.0	3-in. N.B.	★
12F		0.75	102.1	66.3	59.2	88.8	66.3	59.2	88.8	66.3	59.2	4-in. N.B.	★
13F		0.65	51.1	33.2	29.6	44.6	33.2	29.6	44.6	33.2	29.6		★
14F		0.54	19.6	12.1	6.5	17.1	12.7	6.5	17.1	12.7	6.5		★
17D		0.40	102.1	66.3	59.2	88.8	66.3	59.2	88.8	66.3	59.2		★
Switch Enclosure[3]													
				Base		**Cover**		**Wetted Parts**	**Switch Adjust.**	**Max. No. of Switches**			
										4 Contact	**8 Contact**		
Standard													**Standard**
R4N	Weatherproof IP66			Aluminium alloy[4]		Drawn steel		316 SST	None	1	1		★
S4N									94 mm	4	2		★
R7A	Flameproof and explosion-proof			Aluminium alloy[4]		Aluminium alloy			None	1	1		★
S7A									94 mm	4	2		★
R7I				Cast iron		Cast iron			None	1	1		★
S7I									94 mm	4	2		★
Approvals													
Standard													**Standard**
U	UL Explosion Proof												★
C	CSA Explosion Proof												★
N	UL and CSA General Area, weatherproof type NEMA 4												★
	ATEX Flameproof and weatherproof IP66 depending on switch enclosure (leave blank e.g. R4N 1)												★
Number of Switch Mechanisms													
Standard													**Standard**
1 to 6	As required, and subject to the maximum number of switches allowed for the selected switch enclosure (see above)												★
Type of Switch Mechanism[5]													
			Max. Wetside Temperature	**A.C. max. values**			**D.C. max. values**						
				Volts	**Amps**	**VA**	**Volts**	**Res. I**	**Ind. I**	**Watts**			
Standard													**Standard**
4 contact: 2 x SPST													
D4	General purpose		400 ºC	440	5	2000	250	5	0.5	50			★
D4U	D4 + UL/CSA approved		400 ºC	440	5	2000	250	5	0.5	50			★
P4	Low power circuits		400 ºC	250	0.25	6	250	0.25	0.1	3.6			★
X4	High power circuits		250 ºC	440	10	2000	250	10	0.5	50			★
H4	Hermetically sealed		250 ºC	440	5	2000	250	5	0.5	50			★
8 Contact: DPDT													
D8	General purpose		400 ºC	440	5	2000	250	5	0.5	50			★
D8U	D8 + UL/CSA approved		400 ºC	440	5	2000	250	5	0.5	50			★
P8	Low power circuits		400 ºC	250	0.25	6	250	0.25	0.1	3.6			★

Table 3. Carbon Steel Chamber with Mounted Float-type Level Switch Ordering Information

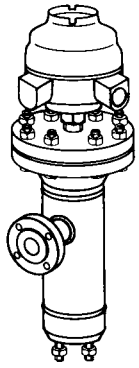
★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

X8	High power circuits	250 ºC	440	10	2000	250	10	0.5	50	★
H8	Hermetically sealed	250 ºC	440	5	2000	250	5	0.5	50	★
Process Connection Configuration(6)										
Standard										**Standard**
1	Side/bottom									★
2	Side/side with 1-in. NPT drain									★
Process Connection Size and Rating(7)										
Standard										**Standard**
Chamber: 3-in. and 4-in. N.B.										
01	1-in. NPT thread, 316 SST									★
11	1-in. Class 150 RF flange									★
12	1-in. Class 300 RF									★
13	1-in. Class 600 RF									★
15	DN25 PN16									★
16	DN25 PN25									★
17	DN25 PN40									★
18	DN25 PN64									★
19	DN25 PN100									★
Chamber: 4-in. N.B.only										
21	1½-in. ASME B16.5 Class 150 RF flange									★
22	1½-in. ASME B16.5 Class 300 RF flange									★
23	1½-in. ASME B16.5 Class 600 RF flange									★
25	DN40 PN16									★
31	2-in. ASME B16.5 Class 150 RF flange									★
32	2-in. ASME B16.5 Class 300 RF flange									★
33	2-in. ASME B16.5 Class 600 RF flange									★
35	DN50 PN16									★
36	DN50 PN25									★
37	DN50 PN40									★
Typical ordering information X C 14F S7A 2 D4 / 2 01										

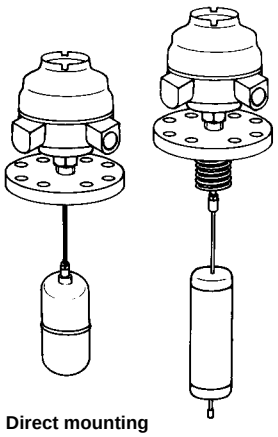
*(1) See "Direct mount Float Type" on page 16 for information on how the float-type level switches (**F) operate.*
*(2) See "Direct mount displacer controls" on page 15 for information how the displacer-type level switches (**D) operate.*
(3) See "Mobrey Switch Enclosures" on page 14 for further information about these enclosure options.
(4) The base material is cast iron whenever 8-contact switches are specified.
(5) See "Mobrey Switch Mechanisms and Ratings" on page 13 for information about these switch mechanism options.
(6) Customers must state process connection centres when ordering. See "Dimensional Drawings" on page 17.
(7) Other flange sizes and ratings are available on request. The instrument pressure rating is the lower of either the float or process flange.



Medium pressures
ASME Class 150, 300 600



High pressures
ASME Class 900, 1500, 2500



Direct mounting
ASME Class 150, 300, 600

Mobrey Vertical Level Switches

Table 4. Stainless Steel Chamber with Mounted Float-type Level Switch Ordering Information

★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

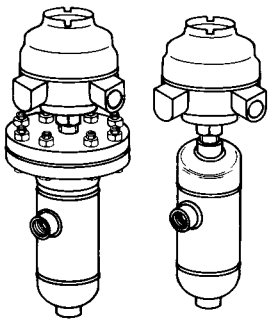
Product Description – *see "Chambers" on page 16*													
B	Bottle style chamber (including a float-type level switch sealed inside during manufacture)												
X	Flanged style chamber (including a float-type level switch; removable from chamber for routine maintenance)												
Chamber Material													
Standard													**Standard**
S	316L stainless steel												★
Function and Specification[1][2]													
	Float and Trim	**Minimum SG**	**Flanged Style Chambers (X) Pressure Rating (Bar)**			**Flanged Process Connection Pressure Rating (Bar)**			**Threaded/Socket Process Connection Pressure Rating (Bar)**			**Chamber Body Size**	
			20 ºC	**250 ºC**	**400 ºC**	**20 ºC**	**250 ºC**	**400 ºC**	**20 ºC**	**250 ºC**	**400 ºC**		
Standard													**Standard**
12F	316 SST	0.75	82.7	54.9	48.6	82.7	54.9	48.6	88.8	66.3	59.2	4-in. N.B.	★
13F		0.65	41.4	27.5	24.3	41.4	27.5	24.3	44.6	33.2	29.6		★
14F		0.54	15.9	10.5	6.5	15.9	10.5	6.5	17.1	12.7	11.3		★
17D		0.40	82.7	54.9	48.6	82.7	54.9	48.6	88.8	66.3	59.2		★
Switch Enclosure[3]													
				Base		**Cover**			**Wetted Parts**	**Switch Adjust.**	**Max. No. of Switches**		
Standard													**Standard**
R4N	Weatherproof IP66			Aluminium alloy[4]		Drawn steel			316 SST	None	1	1	★
S4N										94 mm	4	2	★
R7A	Flameproof and explosion-proof			Aluminium alloy[4]		Aluminium alloy				None	1	1	★
S7A										94 mm	4	2	★
R7I				Cast iron		Cast iron				None	1	1	★
S7I										94 mm	4	2	★
Approvals													
Standard													**Standard**
U	UL Explosion-proof												★
C	CSA Explosion-proof												★
N	UL and CSA General Area, weatherproof type NEMA 4												★
	ATEX Flameproof and weatherproof IP66 depending on switch enclosure (leave the code blank e.g. R4N 1)												★
Number of Switch Mechanisms													
Standard													**Standard**
1 - 4	As required, and subject to the maximum number of switches allowed for the selected switch enclosure (see above)												★
Switch Mechanism Type and Duty[5]													
		Max. Wetside Temperature	**A.C. Maximum Value**						**D.C. Maximum Values**				
			Volt	**Amps**	**VA**				**Volts**	**Res. I**	**Ind. I**	**Watts**	
Standard													**Standard**
4 Contact: 2 × SPST													
D4	General purpose	300 ºC	440	5	2000				250	5	0.5	50	★
D4U	D4 + UL/CSA approved	300 ºC	400	5	2000				250	5	0.5	50	★
P4	Low power circuits	300 ºC	250	0.25	6				250	0.25	0.1	3.6	★
X4	High power circuits	250 ºC	440	10	2000				250	10	0.5	50	★
H4	Hermetically sealed	250 ºC	440	5	2000				250	5	0.5	50	★
8 Contact: DPDT													
D8	General purpose	300 ºC	400	5	2000				250	5	0.5	50	★
D8U	D8 + UL/CSA approved	300 ºC	440	5	2000				250	5	0.5	50	★
P8	Low power circuits	300 ºC	250	0.25	6				250	0.25	0.1	3.6	★

Table 4. Stainless Steel Chamber with Mounted Float-type Level Switch Ordering Information

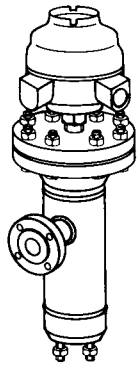
★The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

X8	High power circuits	250 ºC	440	10	2000	250	10	0.1	50	★
H8	Hermetically sealed	250 ºC	440	5	2000	250	5	0.5	50	★
Process Connection Configuration(6)										
Standard										**Standard**
1	Side/bottom									★
2	Side/side with 1-in. NPT drain									★
Process Connection Size and Rating(7)										
Standard										**Standard**
01	1-in. NPT 316 stainless steel standard									★
11	1-in. ASME B16.5 Class 150 RF flange									★
12	1-in. ASME B16.5 Class 300 RF flange									★
13	1-in. ASME B16.5 Class 600 RF flange									★
21	1½-in. ASME B16.5 Class 150 RF flange									★
22	1½-in. ASME B16.5 Class 300 RF flange									★
23	1½-in. ASME B16.5 Class 600 RF flange									★
31	2-in. ASME B16.5 Class 150 RF flange									★
32	2-in. ASME B16.5 Class 300 RF flange									★
33	2-in. ASME B16.5 Class 600 RF flange									★
Typical ordering information: B S 17D R4N U 1 X8 / 2 33										

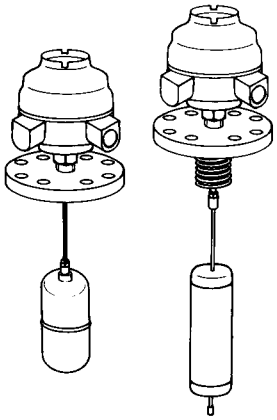
*(1) See "Direct mount Float Type" on page 16 for information on how float-type level switches (**F) operates.*
*(2) See "Direct mount displacer controls" on page 15 for information about how displacer-type level switches (**D) operates.*
(3) See "Mobrey Switch Enclosures" on page 14 for further information about these enclosure options.
(4) The base material is cast iron whenever 8-contact switches are specified.
(5) See "Mobrey Switch Mechanisms and Ratings" on page 13 for information about these switch mechanism options.
(6) Customers must state process connection centres when ordering. See page X for dimension drawings.
(7) Other flange sizes and ratings are available on request. The instrument pressure rating is the lower of either the float or process flange.



Medium pressures
ASME Class 150, 300 600

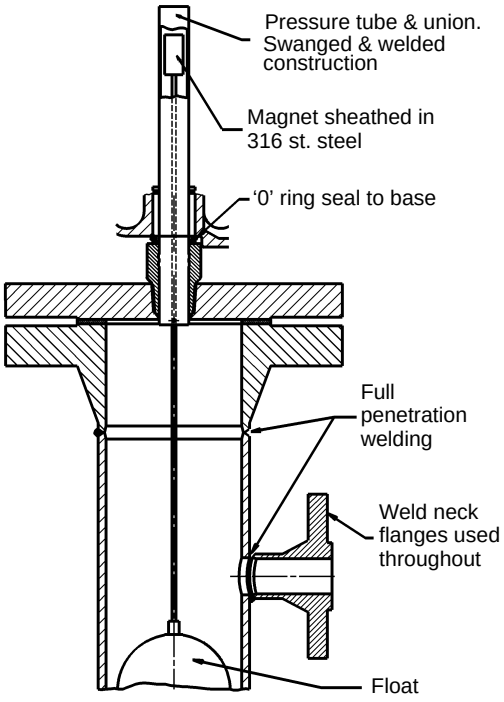


High pressures
ASME Class 900, 1500, 2500



Direct mounting
ASME Class 150, 300, 600

Technical Specifications



QUALITY STANDARDS

Mobrey vertical level controls are manufactured to the highest standards of quality with only certified materials: BS EN 10204: 2004-3.1. Design of Mobrey chambers is in accordance with ASME B31.3. Relevant chambers are supplied CE marked and fully compliant with the Pressure Equipment Directive (97/23/EC).

Weld procedures approved to EN ISO 15614-1 and ASME IX, welders approved to BSEN 287-1. Circumferential and set-on branch welds are full penetration welds, with visual inspection in accordance with ASME B31.3 "normal service" requirements and our company standard 417.

All pressure retaining assemblies are hydrostatically pressure tested to a minimum of 1.43 × maximum working pressure or to flange standard requirements.

Radiography or other NDT techniques can be accommodated provided that they are specified at time of order entry.

Inspection

Whilst Mobrey employ inspectors in house, unconnected with production, customers frequently ask for outside inspection. We are happy to accommodate nominated inspectors if agreed at order entry.

Some specifications require a quality control plan detailing inspection points and hold points. Mobrey will produce these QC plans for customer approval if agreed at order entry.

Table 5. Pressure Ratings (bar)

Material	Carbon steel: A105			Stainless steel: 316L		
	20 ºC	250 ºC	400 ºC	20 ºC	250 ºC	400 ºC
ASME B16.5 Class 150	19.6	12.1	6.5	15.9	10.5	6.5
ASME B16.5 Class 300	51.1	41.9	34.7	41.4	27.5	24.3
ASME B16.5 Class 600	102.1	83.9	69.4	82.7	54.9	48.6
EN1092-1 PN16	16	14.4	10.8	12.3	7.9	6.8
EN1092-1 PN25	25	22.5	16.9	19.2	12.4	10.7
EN1092-1 PN40	40	36	27	30.6	19.8	17.1

Table 6. Construction Materials

	Carbon steel chamber	Stainless steel chamber
Chamber tube	ASTM A106 grade B	ASTM A312 TP316L
Top casting	ASTM A216	-
Top/bottom caps	ASTM A105	ASTM A182 F316L / A403 WP316L
Top cover	ASTM A105	ASTM A182 F316L
Flanges/fittings	ASTM A105	ASTM A182 F316
Studs	ASTM A193-B7	ASTM A320-L7
Nuts	ASTM A194-2H	ASTM A194 Grade 7+S3
Standard carbon steel chambers +400ºC to -10ºC. Stainless steel chambers +400°C to -101°C		

Options

- Low temperature carbon steel
- Process connections to specification
- Duplex UNS31803
- Ratings up to ASME Class 2500
- Cr. mo. steels
- 3.1 identifiable certification
- N.A.C.E. requirements
- N.D.T. to your specifications
- Vent and drain connections

MOBREY SWITCH MECHANISMS AND RATINGS

Each switch mechanism has flying leads which are factory wired to ceramic terminal blocks fixed in the switch enclosure.

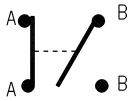
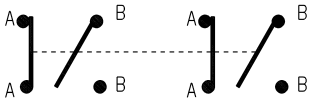
⚠WARNING

Gold plating on the contacts of P4 and P8 switch mechanisms may be permanently damaged if the mechanisms are used to switch circuits with values greater than those shown above.

Switches must not be used for the direct starting of motors.

Contacts should be wired in series with the operating coils of relays, contactor starters or solenoid valves and fused separately.

Table 7. Mobrey Switch Mechanisms

Mobrey Switch Mechanisms		
4 contact type: D4, X4, P4, H4  2 × independent SPST AA make on rise: BB Make on fall	Type D4, D8: Type D4U, D8U: Type X4, X8: Type P4, P8: Type H4, H8:	General purpose switch mechanism. General purpose switch mechanism with UL and CSA approvals. High current switch mechanism. Switch mechanism with gold plated contacts for use in low power or intrinsically safe circuits. Hermetically sealed mechanism with gold plated contacts. All moving parts and contacts enclosed is an inert gas filled stainless steel enclosure. Suitable for use in low temperatures, contaminated atmospheres and intrinsically safe circuits.
8 contact types: D8, X8, P8, H8  Double pole double throw (1) (4 × independent SPST) AA make on rise, BB make on fall		

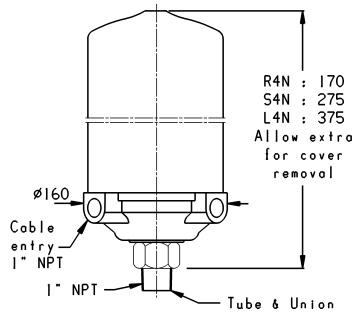
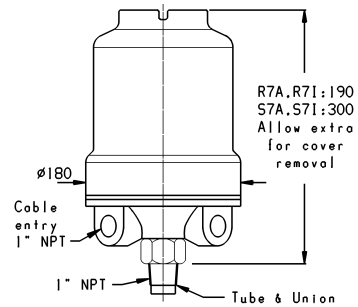
(1) For DPDT operation, installer must common any one pair of A and B wires in the terminal block for each of the two sets.

Table 8. Electrical Ratings for Mobrey Switch Mechanisms

Electrical Ratings									
			AC Maximum Values			**DC Maximum Values**			
Type	**Maximum Temperature Wetside ºC**	**Low Temperature Use**	**VA**	**Volts**	**Amps**	**Watts**	**Volts**	**Residual Amps**	**Inductive Amps**
D4, D8	400	No	2000	440	5	50	250	5	0.5
D4U, D8U	400	No	2000	440	5	50	250	5	0.5
X4, X8	250	No	2000	440	10	50	250	10	0.5
P4, P8	400	No	6	250	0.25	3.6	250	0.25	0.1
H4, H8	250	-50 ºC	2000	440	5	50	250	5	0.5

MOBREY SWITCH ENCLOSURES

Table 9. Mobrey Switch Enclosures

Mobrey Switch Enclosures	
Enclosure modules R4N, S4N, L4N  Weatherproof industrial enclosure	**Weatherproof NEMA 4 / IP66.** Aluminium alloy based/drawn steel cover. Type R4N: Fixed switch Type S4N: 94 mm switch adjustment Type L4N: 194 mm switch adjustment **Flameproof and explosion-proof (weatherproof NEMA 4 / IP66)** Aluminium alloy base and cover “A” Cast iron base and cover “I” Type R7A/R7I: Fixed switch Type S7A/S7I: 94mm switch adjustment **Conduit entries** Enclosures supplied with four contact switch mechanisms have a single 1-in. NPT conduit entry. Enclosures supplied with eight contact switch mechanisms have 2 × 1-in. NPT conduit entries. **Tube and unions:** 316 stainless steel throughout. Welded construction with additional swaging technique to ensure maximum integrity. Individually pressure tested to 150 bar (operating pressure will be limited by float or flange specified). **Paint finish:** Black stove paint. Epoxy paint finishes available on request.
Enclosure modules R7A, R7I, S7A, S7I  Hazardous area enclosure	

DIRECT MOUNT DISPLACER CONTROLS

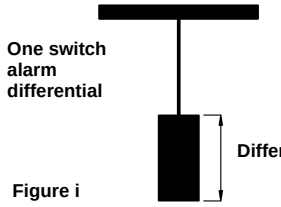


Figure i

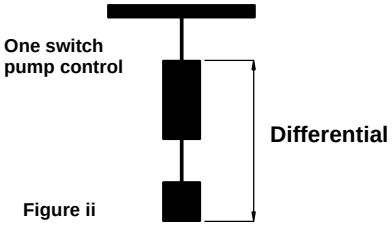


Figure ii

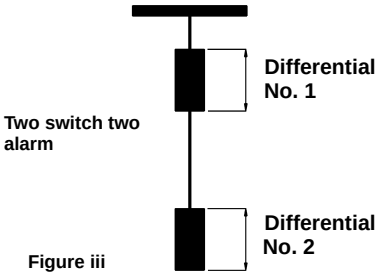


Figure iii

Mobrey displacer operated controls are ideal for sump application and other top mounting duties such as low level alarm in deep tanks. Their principle of operation also makes them suitable, in a modified form, for very high pressure or low S.G. applications.

The four most popular displacer arrangements are shown in this schematic diagram, which covers most of the likely applications. However, should you have a different requirement, we would be pleased to quote a model for your particular application.

Principle of operation

The displacer element, made of 316 stainless steel, is suspended on a stainless steel cable from a spring. The element is always heavier than its equivalent volume of the liquid in which it is to operate, and so will extend the tension spring at all times. In free air, the spring will be extended to a known length, controlled by a mechanical stop to prevent overstressing. Fixed to the spring is the float rod and magnet assembly, free to move up and down as the spring extends or contracts, and outside the pressure tube in the usual manner is the switch mechanism.

As liquid rises to cover the displacer element, a buoyancy force is created equal to the weight of the liquid displaced. This force in effect is seen by the spring as a reduction in weight, causing the spring to contract, hence moving the magnet upwards inside the pressure tube and actuating the switch mechanism. On a falling liquid level, the displacer element is uncovered and the spring sees an increasing effective weight, causing the spring to extend and move the magnet to re-set the switch mechanism (Fig i and v).

This simple principle can be refined to operate a single switch over a very wide differential by providing the buoyancy force from two elements instead of just one (Fig ii).

Two switch models are available for either two alarm duty with two narrow differentials (Fig iii) or for pump control/alarm duty with appropriate differentials (Fig iv).

In all cases, because the elements are suspended on a cable, switching or control levels can be several metres below the mounting flange, and are fully field adjustable by re-setting the elements on the cable.

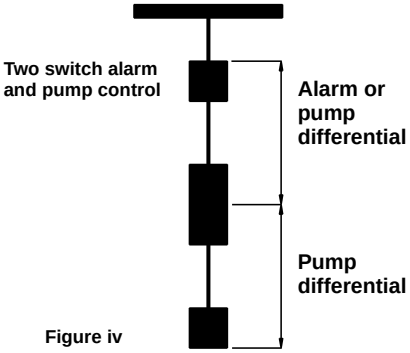
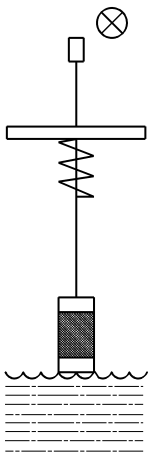


Figure iv


Displacer Control



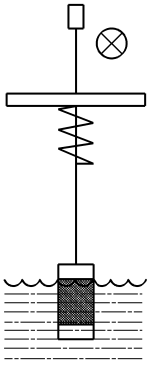


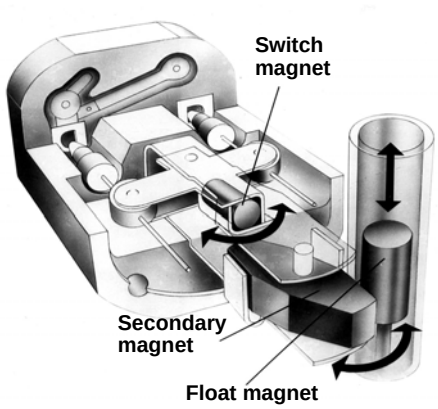
Figure v

Mobrey Vertical Level Switches

DIRECT MOUNT FLOAT TYPE

The float carries a stainless steel sheathed permanent magnet which rises and falls in the glandless pressure tube with changing liquid level. A switch mechanism is mounted inside the enclosure adjacent to the pressure tube. Switching is achieved with the unique Mobrey 'three-magnet' system, giving snap-action 'latch-on' switching.

Vertical movement of the float magnet in the pressure tube simultaneously actuates the secondary and tertiary magnets in the switch mechanism to operate the contacts. This 'three magnet' system enables the float magnet to pass on and actuate switch mechanisms at other levels. Switch mechanisms already actuated cannot re-set until the return of the primary magnet actuates the magnet system once again.



CHAMBERS

Table 10. Chamber Types and Construction Materials

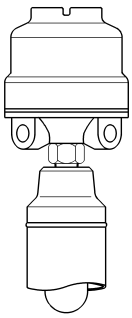
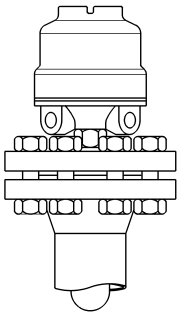
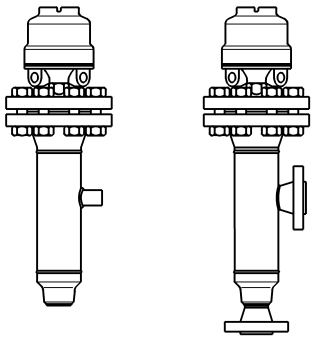
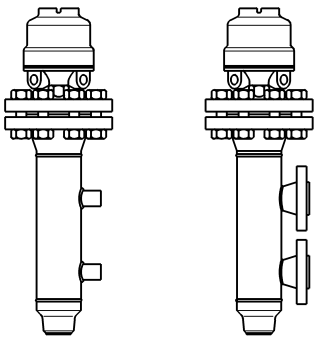
Carbon steel: Bottle construction BC	Carbon steel: Flanged construction XC
 Float is sealed inside chamber during manufacture	 Float may be removed from chamber for routine maintenance, cleaning or inspection

Table 11. Process Connection Configuration

Side and Bottom - 1	Side and Side with Drain - 2
	

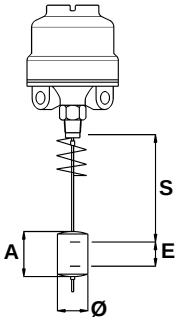
Chamber dimensions, operating levels and technical data are given on page 19

Dimensional Drawings

DISPLACER TYPES AND DIMENSIONAL DETAILS

Table 12. Displacer Types and Dimensional Details

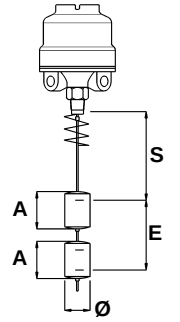
Displacer Types and Dimensional Details



Single switch narrow differential: 11D
Specify for alarm duty.
Switching level can be changed by simply moving the displacer up or down the cable.
11D St. Steel: A = 216 Ø = 60.3

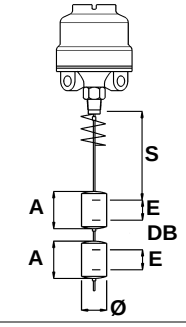
Switch type	D4/D4U	P4	X4	H4	D8/D8U	P8	X8	H8
S.G.	0.6	0.75	1.0	1.2	0.75	1.0		1.2
S minimum	315	335	365	380	275	320		340
E	90	70	60	55	135	105		90

S min. = Adjustable distance to upper switching level.
E min. = Differential
DB = Minimum dead band



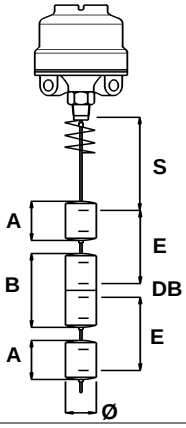
Single switch wide differential: 12D
The two displacer elements are positioned at any point on the cable to correspond to the switching levels required. When the liquid level drops to the lower displacer the switch is actuated and starts (or stops) a pump; when the liquid rises to the upper displacer the switch is again actuated to stop (or start) the pump.
12D St. Steel: A = 216 Ø = 60.3

Switch type	D4/D4U	P4	X4	H4	D8/D8U	P8	X8	H8
S.G.	0.5	0.8	1.0	1.2	0.75	0.8	1.0	1.2
S min.	415	430	430	425	390	390	400	400
E	165	110	95	80	205	200	165	140



Two switch 2 narrow differentials: 18D
The displacers are positioned to form two elements of similar lengths, such that two alarm points may be given. This arrangement is typical of sump application.
18D St. Steel: A = 216 Ø = 60.3

Switch type	D4/D4U	P4	X4	H4	D8/D8U	P8	X8	H8
S.G.	0.6	0.8	1.0	1.2	0.8	1.0		1.2
S min.	390	385	375	365	355	350		345
E min.	90	70	60	55	135	105		90
Dead band	200	230	255	310	165	215		250

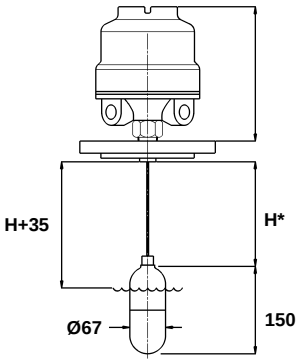
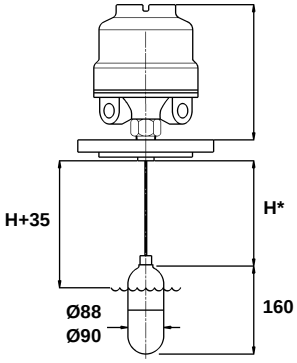


Two switch 2 wide differentials: 13D
A pump is controlled between the middle and the lower pump displacers positioned on the cable at the required levels. Should the level rise to the upper displacer this actuates the upper alarm switch which remains actuated until the level drops to the middle displacer. Alternatively, the upper switch could control a second pump.
13D St. Steel: A = 152 B = 304 Ø = 60.3

Switch type	D4/D4U	P4	X4	H4	D8/D8U	P8	X8	H8
S.G.	0.6	0.8	1.0	1.2	0.8	1.0		1.2
S min.	390	385	375	365	355	350		345
E min.	135	110	95	80	200	145		140
Dead band	220	255	285	310	165	215		250

DIRECT MOUNTING FLOAT TYPE DIMENSIONS

Table 13. Direct Mounting Float Type Dimensions

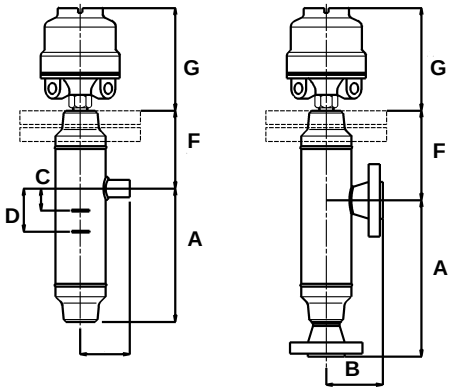
Float Types for 3-in. NB Mounting: 11F	**Floats Types for 4-in. NB Mounting: 12F, 13F, 14F**
 ***Float rod may be shortened to suit**	 ***Float rod may be shortened to suit**

H dimension when used with	**11F**		**Switch adjustment**	**Wet switching differential**	**12F 13F 14F**		**Switch adjustment**	**Wet switching differential**
	min. H	**max H**			**min. H**	**max H**		
R4N R7A R7I	155	315	None	20 mm	155	415	None	20 mm
S4N S7A S7I	155	315	94 mm	104 mm max.	155	415	94 mm	104 mm max.
S7A S7I L4N					155	415	194 mm	214 mm max.

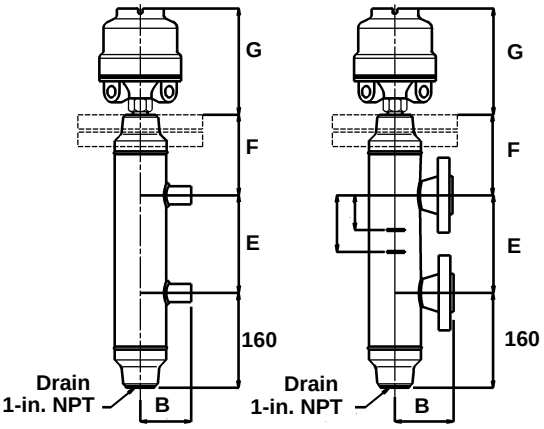
CHAMBERS WITH VERTICAL LEVEL SWITCHES FITTED

Table 14. Chamber Dimensional and Operating Level Data

Style 1: Side and Bottom



Style 2: Side and Side



	A		B* (1)	C (2)(3)	D (3)		E		F	
									Chamber type	
Process connections	Single switch 'R' head	Multi-type 'S' head	Chamber type BC/others		Single switch 'R' head (4)	Multi switch 'S' head (5)	Single switch 'R' head	Multi switch 'S' head	BC/BS	XC/XS
1-in. NPT (side/bottom)	300	385	76/95	50	70	155	–	–	48/160	225
1-in. NPT (side/side)	–	–	95	50	70	155	271	356	160	225
1-in. 150	356	441	110	50	70	155	271	356	160	225
1-in. 300	356	441	117	50	70	155	271	356	160	225
1-in. 600	356	441	123	50	70	155	271	356	160	225
DN25 PN16	356	441	94	50	70	155	271	356	160	225
DN25 PN25	356	441	96	50	70	155	271	356	160	225
DN25 PN40	356	441	96	50	70	155	271	356	160	225
DN25 PN64	356	441	114	50	70	155	271	356	160	225
DN25 PN100	356	441	114	50	70	155	271	356	160	225
1½-in. 150	356	441	115	50	70	155	271	356	160	225
1½-in. 300	356	441	121	50	70	155	271	356	160	225
1½-in. 600	356	441	126	50	70	155	271	356	160	225
DN40 PN16	356	441	97	50	70	155	271	356	160	225
2-in. 150	356	441	112	50	70	155	271	356	160	225
2-in. 300	356	441	118	50	70	155	271	356	160	225
2-in. 600	356	441	129	50	70	155	271	356	160	225
DN50 PN16	356	441	98	50	70	155	271	356	160	225
DN50 PN25	356	441	101	50	70	155	271	356	160	225
Operating levels: Type 17D float in any chamber										
Operating S.G.	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	
Dimension C	65	73	82	91	100	109	118	127	136	
Dimension D	118	122	127	132	137	141	147	152	156	

Note: All dimensions in mm.

Mobrey Vertical Level Switches

(1) B Dimension given is for 4-in.NB chamber (12F, 13F, 14F, and 17D floats). For 3-in. NB chamber (11F float), subtract 13 mm.*
(2) C = Highest operating liquid level
(3) D-C = Wet switching differential (max)
(4) D (Single switch) = Reset level
(5) D (Multi switch) = Lowest operating liquid level

NOTE: Dimensions given are for reference only, and must be certified on order.

Dimensional data: enclosures

Type	Duty	Height G	Conduit thread (1)	Switch adjustment	Weatherproof rating
R7A, R7I	Flameproof and Explosion-proof	190	1-in. NPT	None	IP66 to IEC60529 (NEMA 4)
S7A, S7I		300		94	
R4N	Weatherproof	170	1-in. NPT	None	IP66 to IEC60529 (NEMA 4)
S4N		275		94	
L4N		375		194	

(1) Enclosures for use with 8 contact switch mechanisms have both conduit entries threaded, whilst those for use with 4 contact switch mechanisms have only one conduit entry.

Mobrey Vertical Level Switches

Product Data Sheet
IP107, Rev BB
September 2012

Mobrey Level Solutions

Emerson provides a wide range of Mobrey products for level measurement applications.

POINT LEVEL DETECTION

Vibrating Fork Liquid Level Switches

For high and low alarms, overfill protection, pump control, including wide pressure and temperature requirements, and hygienic applications. Flexible mounting. Immune to changing process conditions and suitable for most liquids.

- Mobrey Mini-Squing (Compact)
- Mobrey Squing 2 (Full-featured)

Ultrasonic Gap Sensor Liquid Level Switches

For use in non-hazardous industrial processes to detect high or low liquid levels and liquid interface. Immune to changing density, and wide dielectric and pH variations. Suitable for use in most clean and non-aerated liquids, with options for sludges and slurries.

Float and Displacer Liquid Level Switches

Mobrey electromechanical float and displacer level switches are ideal for alarm and pump control duties, especially in critical applications or hazardous areas.

- Mobrey Horizontal Level Switches
- Mobrey Vertical Level Switches

Chambers are available for external mounting of these level switches on process vessels.

Dry Products Level Switches

For high and low level alarms. Including threaded mounting connections, extended lengths, high temperature capability, and multiple detection techniques. Suitable for a wide variety of powders, granules, and free flowing solids with wide variations in bulk densities.

- Mobrey VLS Series – Vibrating Rod Level Switch
- Mobrey PLS Series – Paddle Level Switch

CONTINUOUS MEASUREMENT

Ultrasonic Continuous Level Transmitters and Controllers

Top mounted, non-contacting for simple tank and open-air process level measurements. Unaffected by fluid properties such as density, viscosity, dirty coating, and corrosiveness. Intrinsically Safe versions are available for operating in hazardous areas.

- Mobrey MSP Series Ultrasonic Level and Flow Transmitters
- Mobrey MCU900 Series Universal Controllers

Ultrasonic Sludge Density Blanket Monitoring and Control

Ultrasonic in-line pipe or tank mounted sensors for sludge density measurement and control, and top mounted ultrasonic sensors for continuous measurement of sludge blanket level in Industrial and Municipal effluent treatment processes.

- Mobrey MSM400 – Sludge Density Monitor
- Mobrey MSL600 – Sludge Blanket Level Monitor

Displacer Continuous Level Measurement

Top mounted in a vessel or externally mounted in a vertical chamber. For use in hazardous areas.

- Mobrey MLT100 – Displacer Level Transmitter

Hydrostatic Continuous Level Transmitter

For level measurements in non-pressurized tanks where in-tank problems such as foaming, vapor layers, and temperature gradients prohibit the use of other instrumentation.

- Mobrey 9700 Series hydrostatic electronic level transmitters

SPECIALIZED CONDUCTIVITY

Conductivity Water and Steam Interface Monitoring

Steam/water interface level gauges using specialized, high performance conductivity probes in external columns and manifolds, ideal for steam plants where reliable and redundant indication of boiler water level and turbine protection is critical.

- Hydratect 2462 – Water/Steam detection Systems
- Hydrastep 2468 – Water/Steam Monitoring Systems

International:
Emerson Process Management
Mobrey Ltd.
158 Edinburgh Avenue
Slough, Berks, SL1 4UE, UK
T +44 (0)1753 756600
F +44 (0)1753 823589
www.mobrey.com

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

EMERSON
Process Management