Product Data Sheet
March 2019
IP101, Rev EC

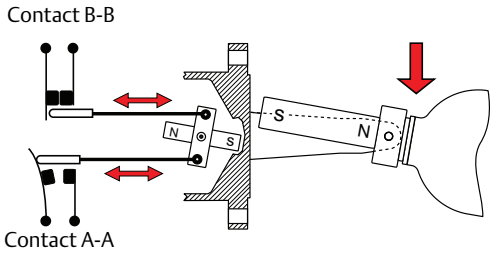
Mobrey™ Magnetic Horizontal Level Switches

For Liquid Level Alarm and Pump Control

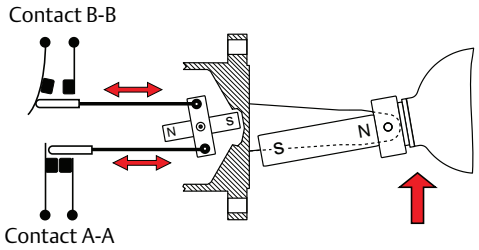
- Ideal for industrial applications such as pump control and high or low alarm duty on tanks and pressure vessels
- Simple, rugged, and reliable. Low cost of ownership
- Direct (side or top) or chamber mounting
- Operates in most liquids
- Variety of switch mechanisms for electrical or pneumatic switching
- ATEX and marine approvals

delta-mobrey

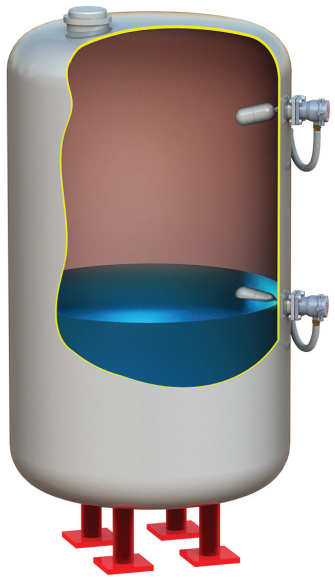
Magnetic Horizontal Float Switches



Level switch cross-section
– level below float



Level switch cross-section
– level passes float



High and low alarm application

Measurement principle

Mobrey magnetic horizontal float switches (“float switches”) are ideal for high and low liquid level alarm, and pump control duties.

The float switch is designed to open or close a circuit (“switch”) as a changing liquid level within a vessel passes the level of the float (the Switch Point).

When the process liquid level is below the Switch Point, contacts B-B are made (together) and contacts A-A are open.

When the process liquid level is above the Switch Point, contacts A-A are made (together) and contacts B-B are open.

Benefits of Delta Mobrey magnetic float switch technology

- Over 100 years of experience – a proven design
- “Fit and Forget”
  – simple, reliable, and cost effective level measurement technology
- Tough, rugged design for long life in aggressive environments
- Operates in almost any liquid at high pressures and temperatures
- Measurement is unaffected by changes in process temperature, dielectric, or the presence of vapors
- Wide range of mounting options and configurations to suit all types of liquid level application and meet site standards

Special features of the Mobrey design

- Magnetically coupled
- No glands or linkages that could cause leaks
- No springs means reduced maintenance
- Snap action switching
- No contact hover or bounce for clean make or break
- Hermetically sealed switch mechanism is available to eliminate freezing and corrosion of contacts and all moving parts

Contents

Selecting a float switch

Float switches for general purpose applications (aluminum bronze wetside) – *see Table 1 on page 4 for model codes*

- Ideal for industrial applications such as pump control, and high or low alarm duty
- Marine approvals: Lloyds Register of Shipping (LRS), GL, DNV, ABS, BV, RINA, and RMRS

Float switches for general purpose applications (stainless steel wetside) – *see Table 2 on page 5 for model codes*

- Marine approvals: Lloyds Register of Shipping (LRS), GL, DNV, ABS, and RMRS

Float switches for hazardous area applications – *see Table 3 on page 7 for model codes*

- ATEX/IECEx Zone 1 Gas Group IIC, CSA Class 1: Group CD, Technical Regulation Customs Union (EAC) Flameproof, and Lloyds Register of Shipping (LRS) approvals

Float switches for marine applications – *see Table 4 on page 9 for model codes*

- **Submersible** (S03, S163 and S195) or **hoseproof** (S179 and S181)
- **Hazardous Area Submersible/Hoseproof** (S183, S187, and S189), designed for submersion in vented tanks and mounting from the outside of a tank
- Aluminum bronze or stainless steel enclosure and wetside
- May be submerged to 100 ft. (30 m) head of water (IP68)
- Hazardous area ATEX approval for Zone 1, Gas Group IIC
- Marine approvals: Lloyds Register of Shipping (LRS), GL, DNV, ABS, BV, RINA, and RMRS

Float switches for general purpose applications

Aluminum bronze wetside

S440DA/F84

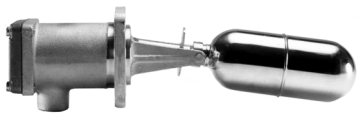
Stainless steel wetside

Float switches for hazardous area applications

S250DA/F84

Float switches for marine applications

Aluminum bronze



316 stainless steel

Hazardous area

Ordering Information

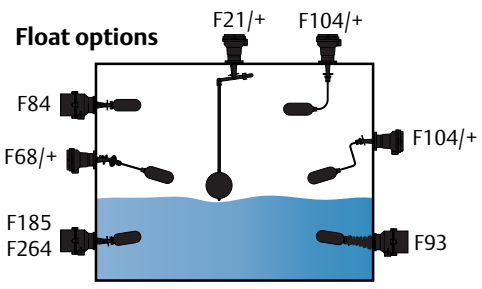
Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 13 for more information on Material Selection.

Table 1. Ordering Information for General Purpose Float Switches (Aluminum Bronze Wetside)

★ The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	Product description		
S	Horizontal Float Switch		
Flange (head)(1)		**Max. $T_{Process}$(2)**	
01(3)	General purpose, aluminum bronze wetside, Mobrey 'A' flange, 261 psi (18 bar)	410 °F (210 °C)	★
Switch mechanism(4)			
D	Electrical: 2 independent Single Pole Single Throw (SPST) contact sets		★
P	As type D but with *gold plated contacts*		★
D6	Electrical: 2 independent circuits of Double Pole Double Throw (DPDT) contact sets		
P6	As type D6 but with *gold plated contacts*		
AP	Pneumatic: air pilot valve on/off for switching air circuits		
AM(5)	Pneumatic: air pilot valve for continuous modulating of air controlled circuits		
Enclosure		**Switch types**	
A	Aluminum alloy	AP or AM	★
B	Aluminum bronze	D, P, D6, or P6	★
Float (all ratings at T_{room})(6)		**Switch types**	
F84	General purpose high/low alarm, 316 SST, min. SG 0.65, 500 psi (34.5 bar)	All	★
F68/1(7)	Horizontal variable differential for pump control/alarm, 316 SST, min. SG 0.72, 500 psi (34.5 bar)	All except AM	★
F68/4(7)	Horizontal variable differential for pump control/alarm, 316 SST, min. SG 0.85, 500 psi (34.5 bar)	All except AM	★
F21/1(7)	Vertical pump control or alarm, 316 SST, rod length 1524 mm, 435 psi (30 bar)	All except AM	★
F21/2(7)	Vertical pump control or alarm, 316 SST, rod length 3048 mm, 435 psi (30 bar)	All except AM	★
F21/3(7)	Vertical pump control or alarm, 316 SST, rod length 4570 mm, 435 psi (30 bar)	All except AM	★
F104/1(7)	Straight arm, horizontal, 316 SST, rod length 750 mm, 500 psi (34.5 bar)	All	★
F104/2(7)	Cranked arm, horizontal, 316 SST, dimensions to be specified, 500 psi (34.5 bar)	All	★
F104/3(7)	Cranked arm, vertical, 316 SST, dimensions to be specified, 500 psi (34.5 bar)	All	★
F93(8)(9)	Shrouded for dirty liquids, 316 SST, min. SG 0.75, atmospheric	All	★
F185	General purpose high/low alarm, Alloy 400, min. SG 0.65, 500 psi (34.5 bar)	All	★
F264	Horizontal limited differential, Alloy 400, min. SG 0.85, 464 psi (32 bar)	All except AM	
Typical model number: S01DB/F84			

1. See page 23 for nozzle and stud lengths.
2. The maximum process temperature is dependent on the Flange (Head) and selected Float option.
3. See page 19 for Mobrey flange information.
4. See "Switch mechanism specifications" on page 17 for information about all switch mechanisms.
5. Switch mechanism type AM is not compatible with float types F68/*, F21/*, or F264.
6. See Table 13 on page 20 for a comparison of the float options listed here.
7. See pages 23, 24, and 25 for technical float details and length options.
8. A silicone rubber gaiter is supplied with the 316 SST shroud.
9. The maximum process temperature is 356 °F (180 °C).



1. The maximum process temperature is dependent on the flange (head), switch mechanism, cable (if fitted), and float options chosen. See Table 5 on page 10 for the IP rating and maximum process temperature.
2. See "Switch mechanism specifications" on page 17 for information about all switch mechanisms.
3. Not available for stainless steel enclosure and wetside models S163 and S181.
4. See Table 14 on page 21 for a detailed comparison of the float types listed here.
5. Refer to pages 23, 24, and 25 for technical float details and length options. See "Nozzle and stud lengths" on page -23 for stud lengths.
6. A silicone rubber gaiter is supplied with the 316 SST shroud.
7. Shrouded floats for stainless steel switches S163 and S181 are available on request (contact a Delta Mobrey representative for information).

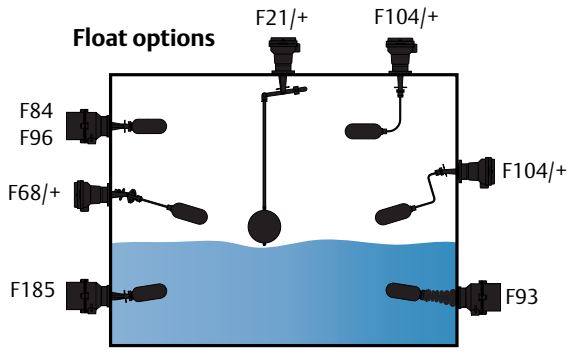


Table 5. Switch Types Comparison – *Marine Applications*

Type number	Maximum $T_{Process}$[1]		Head IP rating	Cable[2]
	Submersed	Non-submersed		
S03	176 °F (80 °C)	410 °F (210 °C)	66/68 (100 ft. / 30 m)	MICC
S179	212 °F (100 °C)	410 °F (210 °C)	66[3]	*None fitted*
S195	122 °F (50 °C)	410 °F (210 °C)	66/68 (100 ft. / 30 m)	CSP
S163	176 °F (80 °C)	410 °F (210 °C)	66/68 (100 ft. / 30 m)	MICC
S183	122 °F (50 °C)	410 °F (210 °C)	66/68 (100 ft. / 30 m)	CSP
S181	212 °F (100 °C)	410 °F (210 °C)	66[3]	*None fitted*
S187	122 °F (50 °C)[4]	410 °F (210 °C)	66/68 (100 ft. / 30 m)	MICC
S189	140 °F (60 °C)	410 °F (210 °C)	66[5]	*None fitted*

1. The maximum process temperature is dependent on the Flange (Head), Switch mechanism, and Float options chosen.
2. See page 16 for cable specification.
3. S179 and S181 may be submersed to 100 ft. (30 m) head of water with temperatures between 34 and 212 °F (1 and 100 °C). Fitting and testing of customer supplied cable and cable gland is the customer's responsibility. The cable and cable gland may limit the temperature further.
4. The maximum process temperature for submersed S187 is 176 °F/80 °C (for non-approved) or 122 °F/50 °C (for ATEX approved).
5. S189 may be submersed to 100 ft. (30 m) head of water with temperatures between 34 and 140 °F (1 and 60 °C). Fitting and testing of customer supplied cable and cable gland is the customer's responsibility. The cable and cable gland may limit the temperature further.

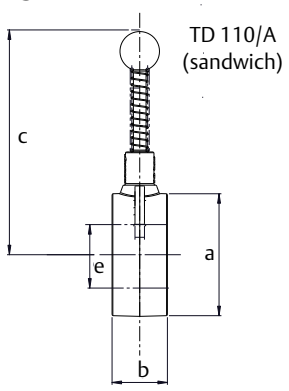
Ordering Accessories

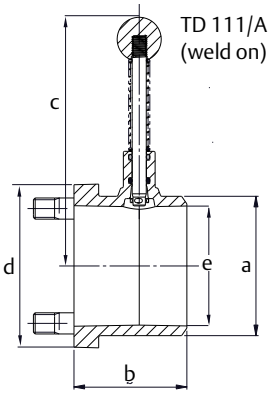
Table 6. Ordering Information for Accessories

Accessories	Note: See page 19 for dimensions of Mobrey flanges	
TD 110/A	316 stainless steel **test device** for Mobrey 'A' flanged switches, sandwich (see Figure on page 11)	★
TD 111/A	Carbon steel **test device** for Mobrey 'A' flanged switches, weld on (see Figure on page 11)	★
71020/107	316 stainless steel **welding pad** for Mobrey 'A' flanged switches (see Figure 2 on page 12)	
J184	Carbon steel **welding pad** for Mobrey 'A' flanged switches (see Figure 2 on page 12)	
J786	Carbon steel **welding nozzle** for Mobrey 'A' flanged switches (see Figure 2 on page 12)	
71030/900	316 stainless steel **backing flange** for Mobrey 'A' flanged switches (see Figure 2 on page 12)	
J863	Carbon steel **backing flange** for Mobrey 'A' flanged switches (see Figure 2 on page 12)	
J800	Carbon steel **welding pad** for Mobrey 'G' flanged switches (see Figure 3 on page 12)	
71020/111	316 stainless steel **welding pad** for Mobrey 'G' flanged switches (see Figure 3 on page 12)	
J799	Carbon steel **welding nozzle** for Mobrey 'G' flanged switches (see Figure 3 on page 12)	

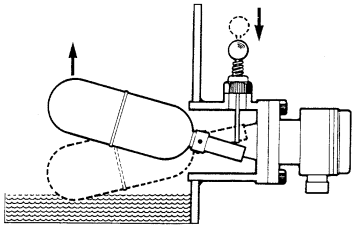
Test devices

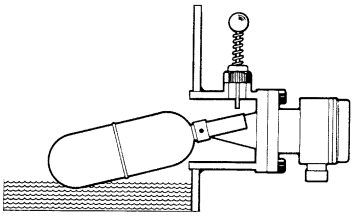
Figure 1. Test Devices for Mobrey 'A' Flanged Switches





Test devices allow mechanical testing of an electrical circuit





Materials

TD110/A:
316 stainless steel.
Fluorocarbon elastomer plunger seal.

TD111/A:
Carbon steel ASTM A216 WCA.
Fluorocarbon elastomer plunger seal.

Table 7. Test Device Specifications and Dimensions

Type	Vessel flange	Maximum pressure[1]	Maximum $T_{Process}$	øa in. (mm)	b in. (mm)	c in. (mm)	d in. (mm)	øe in. (mm)
TD 110/A	Mobrey 'A'	261 psi (18 bar)	410 °F (210 °C)	3.02 (77)	1.38 (35)	5.59 (142)	N/A	2.64 (67)
TD 111/A	Weld on	261 psi (18 bar)	410 °F (210 °C)	3.11 (79)	2.52 (64)	5.59 (142)	3.62 (92) [2]	2.64 (67)

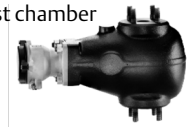
1. 182 psi (12.6 bar) at maximum temperature of 410 °F (210 °C).
2. See Mobrey 'A' flange dimension 3.62 x 3.62 in, (92 x 92 mm) on page 19.

Float chambers

Float chambers are used to facilitate the external mounting of the float switch onto a tank or pressure vessel, particularly where space inside the vessel is restricted or where the control must be isolated for routine maintenance whilst the plant is in operation. A wide range of **cast** or **fabricated** chambers is available. Exotic materials are also available. Process connections may be specified as top-and-bottom or side-and-side, and can be flanged, screwed or butt welded in a choice of sizes to suit most plant installations. Please contact Delta Mobrey for further information.

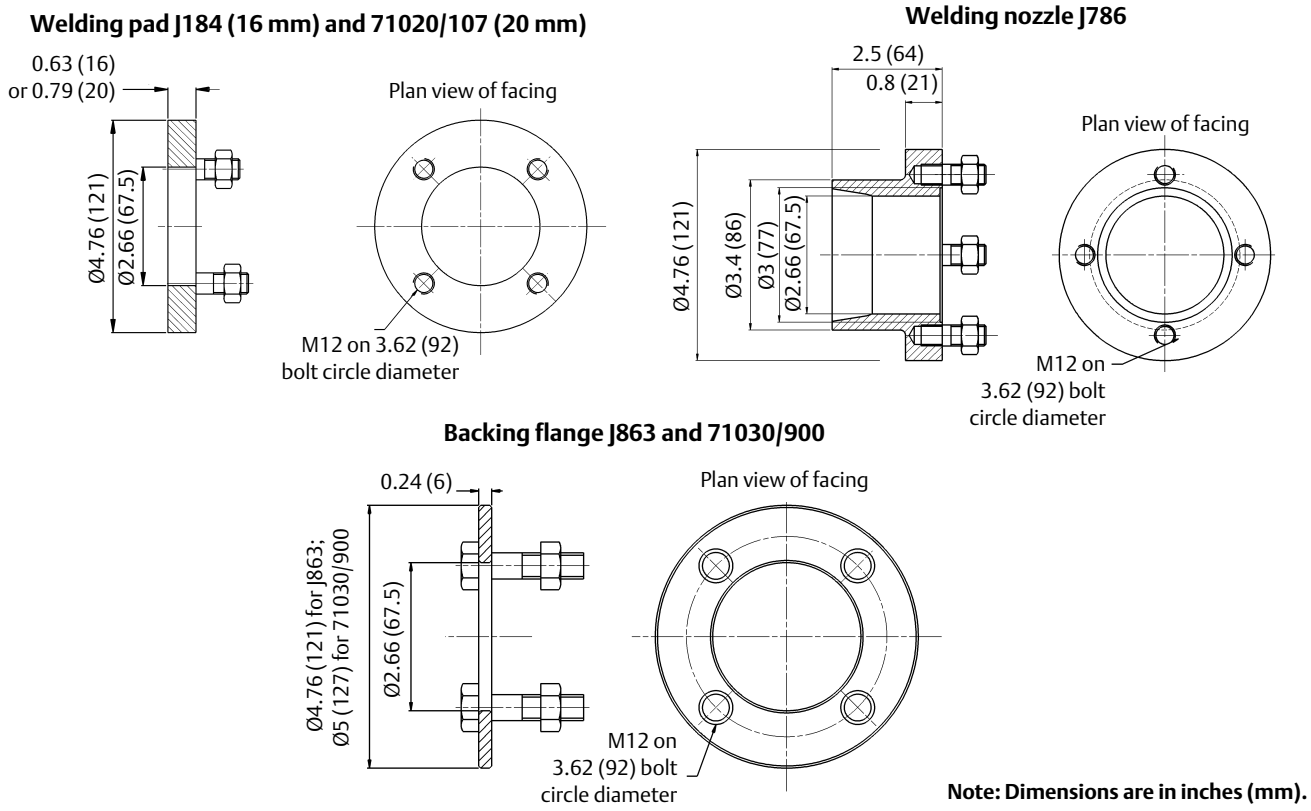
Fabricated chamber

Cast chamber



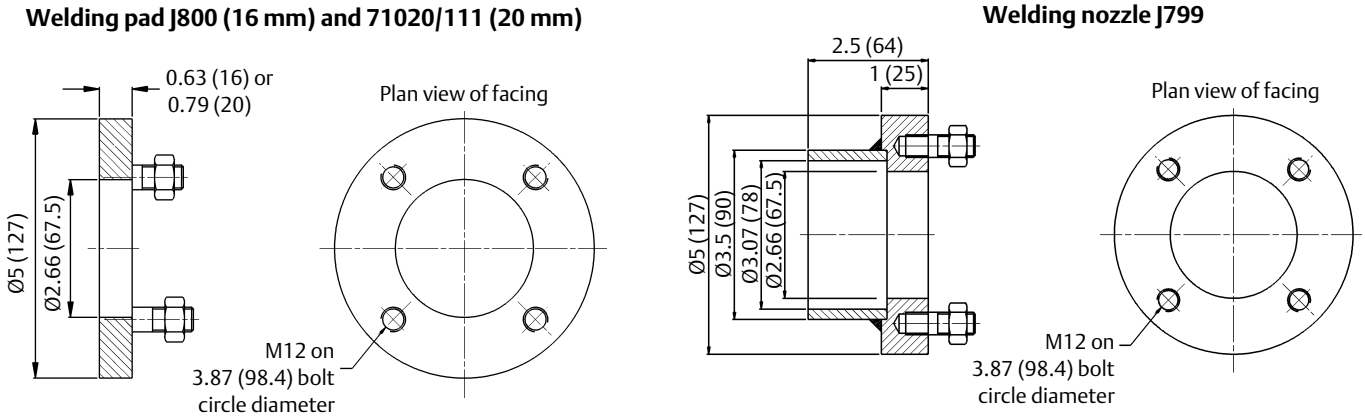
Companion flanges

Figure 2. Companion Flanges for Mobrey 'A' Flanged Switches



Note: Dimensions are in inches (mm).

Figure 3. Companion flanges for Mobrey 'G' flanged float switches



Note: Dimensions are in inches (mm).

Note

- Backing flange J863 is zinc-plated and passivated.
- Welding types supplied complete with studs and nuts.
- Backing type supplied complete with bolts, sealing washers, and full face gasket.
- Other materials available upon request.

Specifications

Material selection

Delta Mobrey provides a variety of products with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Delta Mobrey is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

Float switch specifications

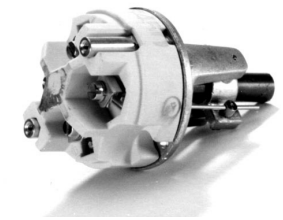
Table 8. Float Switch Specification – General Applications (Aluminum Bronze Wetside)

Electrical models	
Enclosure and wetside	Aluminum bronze to BS1400 – AB1 maximum iron content 2.5%
IP rating	Weatherproof to IEC60529 (IP66)
End cap	Short (4 contacts) e.g. S01DB, Aluminum to BS1490 – grade LM24
	Long (6 contacts) e.g. S01D6B, Brass to BS1400 – DCB3
Maximum process temperature	410 °F (210 °C). *If shrouded float F93 used, maximum is 356 °F (180 °C)*
Gasket material	Non-asbestos sheet material gaskets to BS 7531 Grade X, which has upper temperature limits of 482 °F (250 °C) for gas, vapor, and steam, and 824 °F (440 °C) for liquids
Dimensions	See page 19 for dimensional drawings
Air pilot valve models	
Enclosure	Aluminum Alloy to BS 1490: Grade LM24
Valve block	Aluminum Alloy to BS 1490: Grade LM25
Finish	All external aluminum surfaces are chromate phosphate treated, and then externally painted
Maximum process temperature	410 °F (210 °C). *If shrouded float F93 used, maximum is 356 °F (180 °C)*
Gasket material	Non-asbestos sheet material gaskets to BS 7531 Grade X, which has upper temperature limits of 482 °F (250 °C) for gas, vapor, and steam, and 824 °F (440 °C) for liquids
Dimensions	See page 19 for dimensional drawings
Approvals[1]	
Marine	Lloyds Register of Shipping (LRS)
	GL
	ABS
	BV
	RINA
	RMRS
	DNV
EAC	Technical Regulation Customs Union (EAC) Ordinary Location Mark
CSA	Canadian Standards Association (Special order, contact factory)

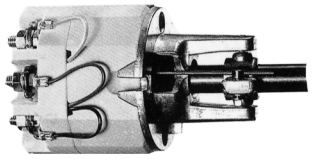
1. Other approvals may be available. Please contact a Delta Mobrey representative for additional information.

Switch mechanism specifications

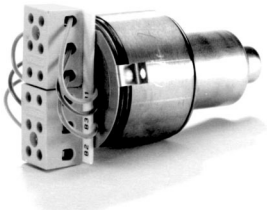
Electrical Types D and P



Electrical Types D6 and P6



Electrical Types H6 and B6



Pneumatic Types AP and AM

Electrical switch mechanisms

Type D

- For alternative make and break circuits
- Function: 2 independent single pole single throw contact sets and “Snap-Action”
- May be wired S.P.C.O. on site

Type D6

- For switching two independent circuits.
- Function: Double pole change over (2 independent circuits) and “Snap-Action”

Types P and P6

- As types D and D6, but with gold-plated contacts for switching low power (e.g. intrinsically safe) electrical circuits

Type H6

- For use in corrosive area and/or low temperature applications
- As type D6, but with gold-plated contacts and all moving parts are housed in an inert gas-filled hermetically sealed enclosure

Type B6

- For use in Zone 2 Hazardous Areas
- As type H6, but coded ATEX II 3 G, EExnC IIC T6 –76 °F (–60 °C) <Ta < 140 °F (60 °C)
- For Technical Regulation Customs Union (EAC) approvals, contact a Delta Mobrey representative for the latest information

Pneumatic switch mechanisms

Type AP

- For switching air circuits
- Function: Change over
- Air pressure:

  Maximum air pressure through valve: 100 psi (7 bar).

  Maximum air flow through valve: 66 litres/minute at 100 psi (7 bar). Air must be clean and dry
- Nominal leakage rate of 0.2%
- Connections: Brass compression couplings to suit 0.24-in. (6 mm) copper or nylon pipe, coupling thread ¼-in. BSP.

Type AM

- For modulating air controlled circuits
- Function: Continuous modulation
- Air pressure

  Max. air pressure through valve: 20 psi (1.4 bar).

  Modulation: linear: 0 to 20 psi (0 to 1.4 bar).
  2.9 psi (0.2 bar) to 20 psi (1.4 bar) available on request
- Temperature:

  Medium: 34 to 752 °F (1 to 400 °C)
  Ambient: 34 to 140 °F (1 to 60 °C)

  A lower ambient temperature can be tolerated if the air supply is 100% dry

Figure 4. Electrical and Pneumatic Switching

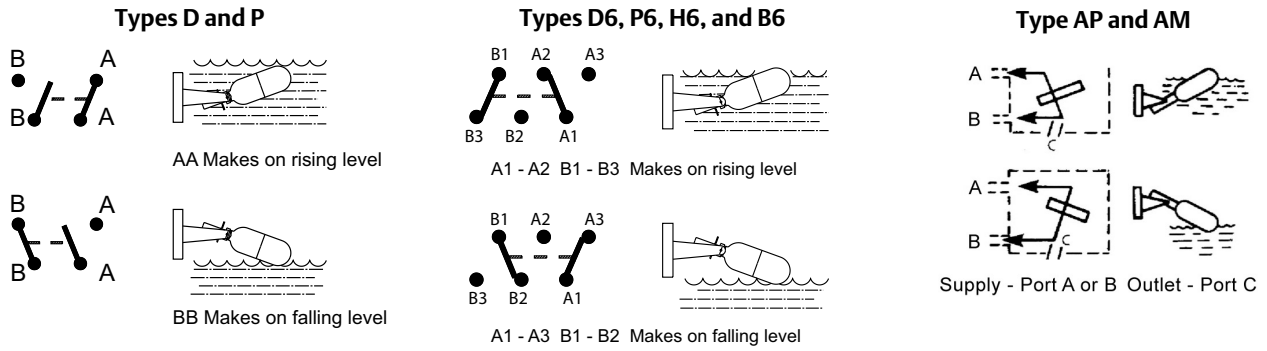


Figure 5. Glandless Magnetic Snap-action Switching

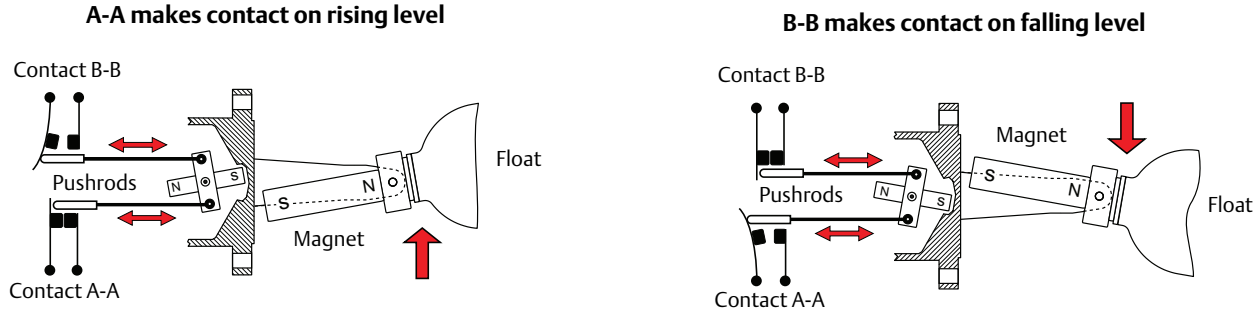


Table 12. Electrical switch mechanism specifications

Electrical switch specification	D and D6	P and P6	H6 and B6
Contact material	Fine silver	Gold plated	Gold plated
Process temperature	–22 to 752 °F (–30 to 400 °C)	–22 to 752 °F (–30 to 400 °C)	–148 to 482 °F (–100 to 250 °C)
Ambient temperature	–22 to 158 °F (–30 to 70 °C)	–22 to 158 °F (–30 to 70 °C)	–76 to 158 °F (–60 to 70 °C)
Insulation value	(live to earth) > 100 MEG OHM		
Terminals	D and P: M4 screws with non-rotational clamp plates.		
	D6, P6, H6, and B6: 6-way terminal block with pressure plates		
Electrical specification	**AC**	**DC inductive**	**DC resistive**
Maximum voltage V	440	240	240
Maximum current A	5.0 (1)	1.0	2.0
Maximum power	2000VA	35 Watts	70 Watts
	Power factor 0.4, minimum	Time constant 40 ms, maximum	

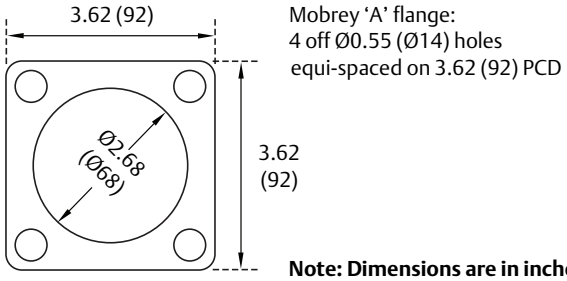
1. Maximum current for Type D is 8 A up to 410 °F (210 °C).

Warning
The plating of gold contacts may be permanently damaged when used to switch circuits above the following limits:
300 V: 12 mA Resistive
24 V: 2 mH/200 mA Inductive
24 V: 250 mA Resistive
24 V: 750 mH/10 mA Inductive

Note
LVD (Low Voltage Directive) standards applied:
EN60947 Parts 1 and 5.1

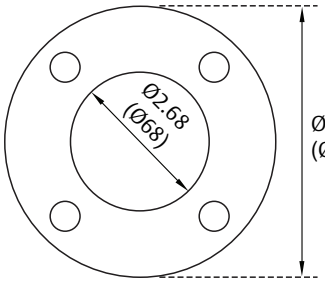
Dimensional Drawings

Mobrey 'A' and 'G' flanges



Mobrey 'A' flange:
4 off Ø0.55 (Ø14) holes
equi-spaced on 3.62 (92) PCD

Note: Dimensions are in inches (mm).

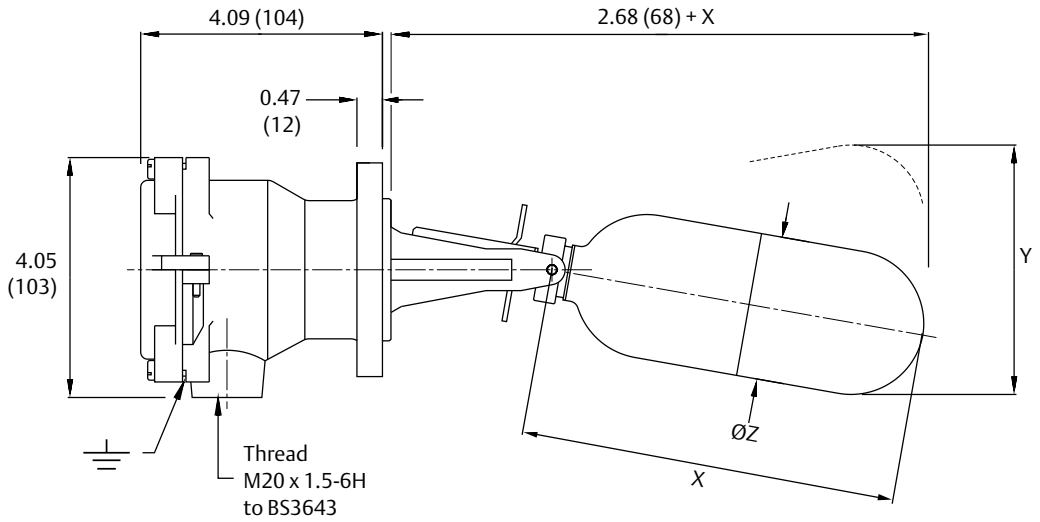


Mobrey 'G' flange:
4 off Ø0.55 (Ø14) holes
equi-spaced on 3.97 (98.4) PCD

General purpose float switches (aluminum bronze wetside)

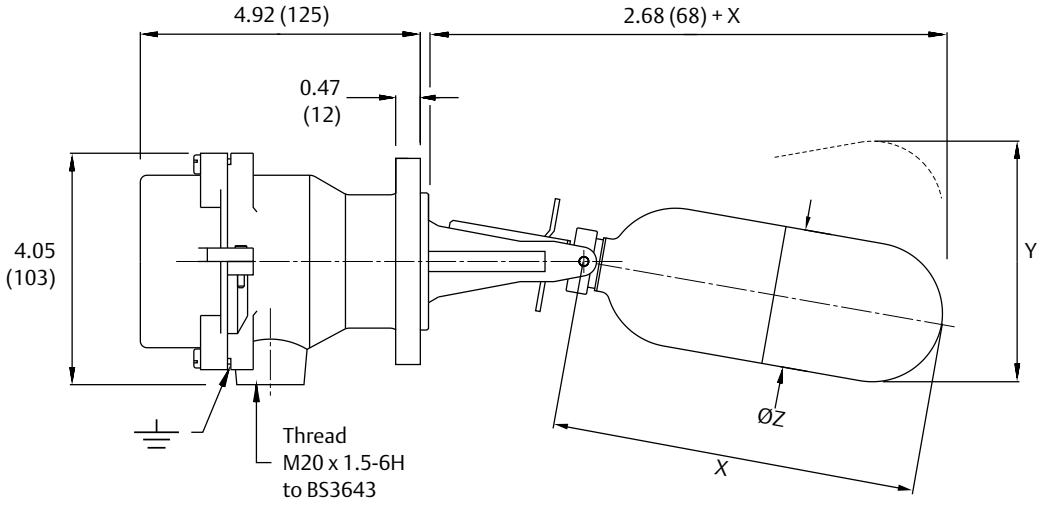
Switch mechanism types DB and PB

Note: See Table 13 for dimensions X, Y, and Z.



Switch mechanism types D6B and P6B

Note: See Table 13 for dimensions X, Y, and Z.



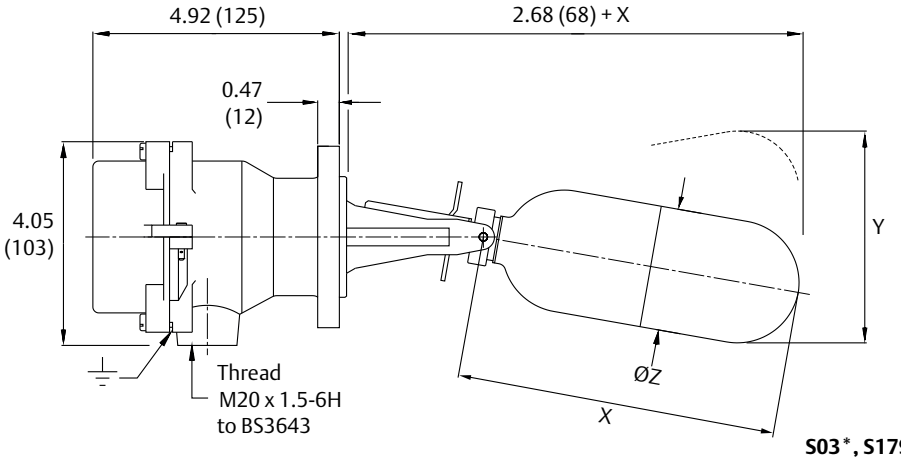
Note: Dimensions are in inches (mm).

Marine float switches

Note: See Table 14 on page 21 for dimensions X, Y, and Z.

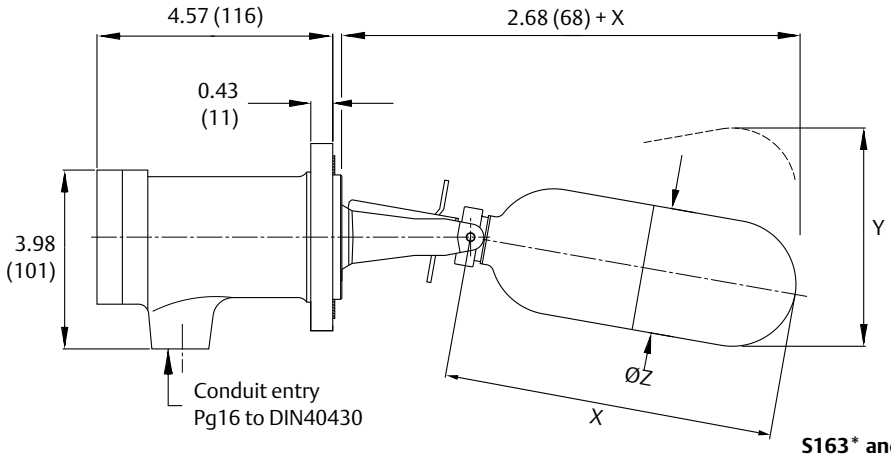
Note: Dimensions are in inches (mm).

Aluminum bronze wetside



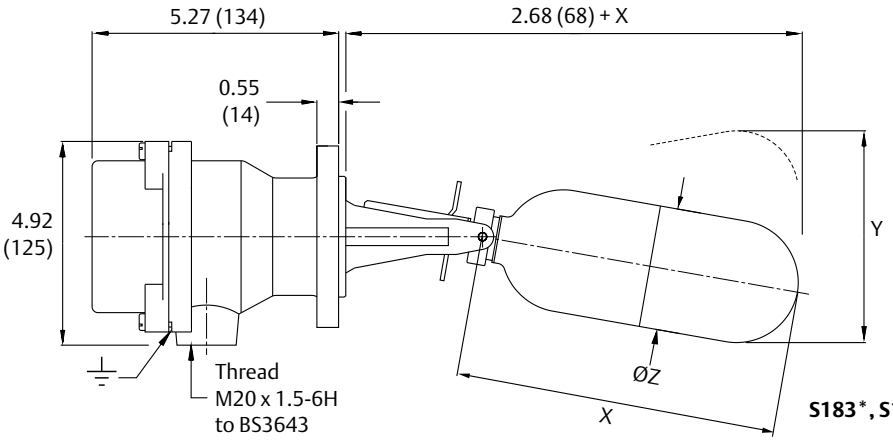
S03*, S179*, and S195*

Stainless Steel wetside



S163* and S181*

Hazardous submersible / hoseproof



S183*, S187*, and S189*

Nozzle and stud lengths

Table 15. Maximum Length in mm (Dimension L)

	F68/*	F84	F185	F88	F93	F96	F98	F107	F106	F264
Mobrey A	65	75	75	135	75	75	90	-	92	75
DN65	65	75	75	135	-	75	90	-	92	75
DN80	70	80	80	170	-	75	90	-	98	90
DN100	95	105	105	200	-	105	105	-	110	100
DN125	105	140	140	200	-	140	140	-	140	140
DN150	224	180	180	200	-	180	170	-	200	190
3 in. 300/150	70	80	80	170	-	80	90	-	98	90
4 in. 300/150	95	105	105	200	-	105	105	-	110	100
3 in. 600	62	70	70	130	-	70	85	80	89	70
3 in. 900	-	-	-	-	-	70	-	80	-	-
Mobrey A	65	75	75	135	-	75	90	-	92	75
6 in. 150	224	180	180	200	-	180	170	-	200	190

Note
See Table 6 on page 11 for companion flanges and accessories.

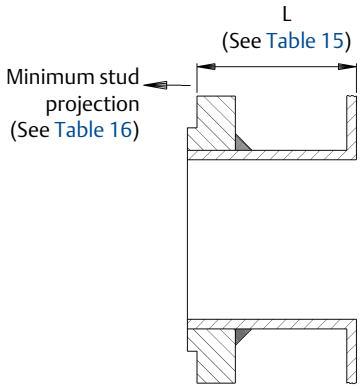
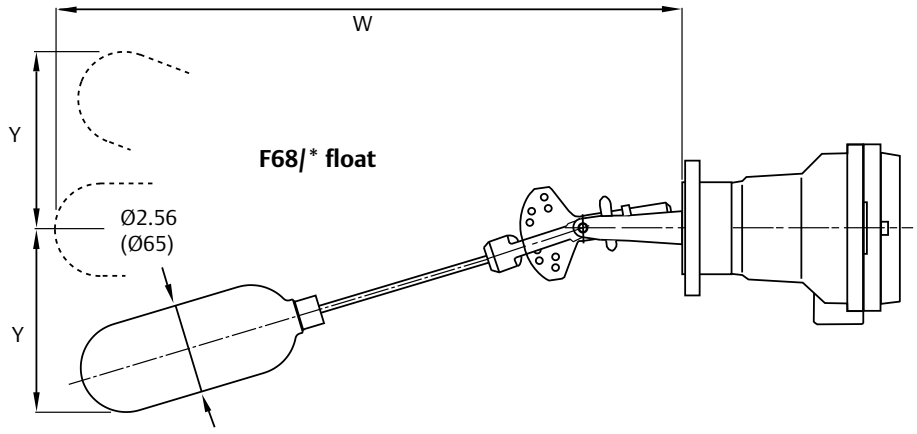


Table 16. Minimum stud projection (in mm)

Rating	G	A	PN 16					PN 40					PN 63				150		300		600	900
Size	-	-	65	80	100	125	150	65	80	100	125	150	80	100	125	150	3 in.	4 in.	3 in.	4 in.	3 in.	3 in.
Stud	35	30	40	40	40	40	44	42	42	46	52	54	52	55	62	67	46	46	54	56	64	73

Horizontal F68 pump control and alarm float

Note: Dimensions are in inches (mm).



Note
Switches fitted with the F68/+ type float may be adjusted on site to meet pump control differentials. The float is available as F68/1 or F68/4. The F68/4 has pre-drilled holes along the rod to allow the user to achieve the /2 and /3 differentials in Table 17.
Full details of the operating levels and differentials are in the product manual (Document Number M310).

Table 17. Dimensions and specifications for F68/*

Maximum Intrusions[1]	F68/1	F68/2	F68/3	F68/4
Wetside in. (mm) 'W'	14.2 (360)	18.5 (470)	23.2 (590)	25.3 (643)
Minimum tank dimension above/below centre line (mm) 'Y'	8.5 (216)	11.5 (292)	14.5 (368)	16.0 (406)
Minimum Specific Gravity (S.G.)	0.72	0.8	0.82	0.85
Maximum differential (mm)	9.72 (247)	14.2 (360)	19.0 (483)	21.9 (555)

1. These dimensions in inches (mm) are approximate for cold water and will vary for liquids with a different specific gravity (SG.)

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