

Vertical magnetic level switches

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

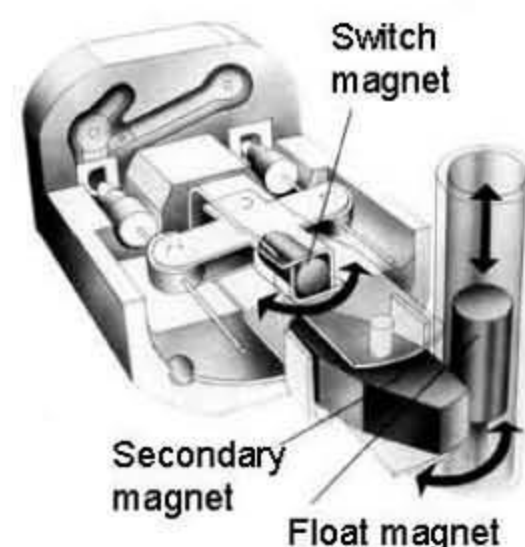
Operation

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.

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ATEX



Introduction

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

A choice of carbon steel chambers is available, or for more vigorous applications we supply a series of 316 stainless steel chambers. A variety of tank and process connections is available to make installation simple and economic. This gives you the choice to meet your application in keeping with your budget.

Intra vertical magnetic level switches for industrial and process control use have been available for over 20 years and have been steadily gaining a reputation for quality and reliability.

Based on the industry standard boiler water level controls these controls employ the same three magnet switch mechanism for snap-action latching 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 positive stable latching time after time after time.

There are two switching functions available :
2 x SPST (SPCO) switching or DPDT (DPCO) switching, and each comes in four 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 10A switching capability.
- Hermetically sealed for the ultimate in reliability - sealed for life.

When controls are required to operate in extreme conditions, the unique Intra 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.



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 & D
Class II, Div 1, Groups E, F & G

General Area, Weatherproof type NEMA 4X

Canadian Standards Association (CSA) Approval
Explosion Proof for Class 1, Groups B, C & D

General Area, Weatherproof to NEMA 4X

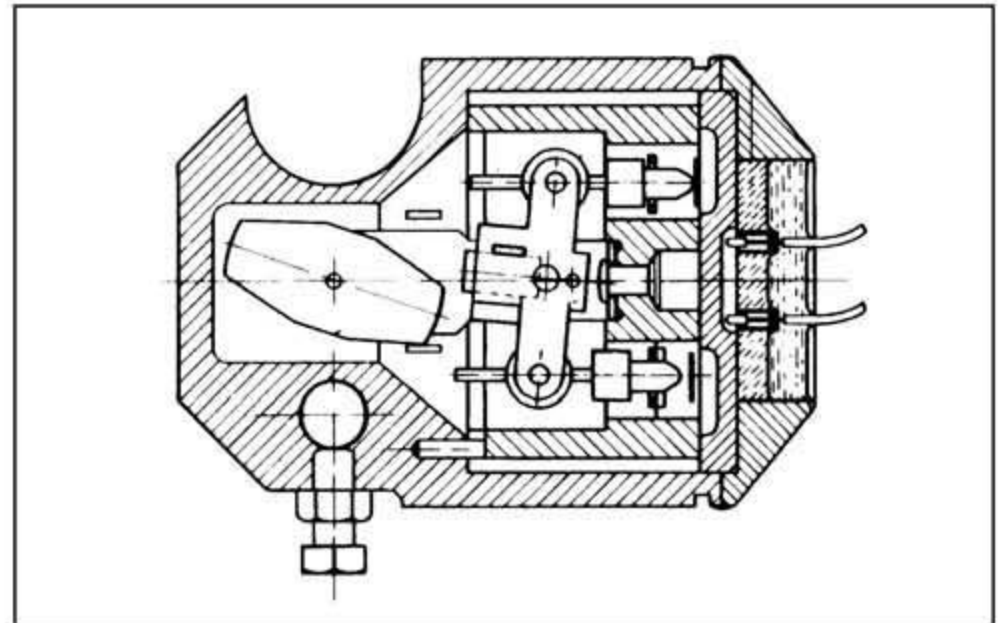
ATEX Approval
Flame Proof ATEX II 1/2G, EExd IIC T6
(-50°C ≤ Ta ≤ 60°C)

Intrinsically Safe Use

For use in intrinsically safe circuits, gold plated switch contacts are recommended (see page 4). Users are reminded that it is their responsibility to obtain the necessary system approval and licences for such circuits.

EN ISO 9001 : 2000

The manufacturer 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 instruments and systems for the measurement and indication of electrical signals, gas and liquid density, viscosity, pressure, level, flow and water/steam systems.



Section through type H4 switch mechanism

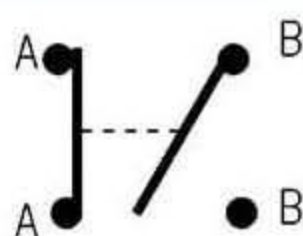


Hermetically sealed switch mechanism

Quality Assurance

With over 20 years worldwide experience in the major power, nuclear and petro-chemical industries, the manufacturer 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.

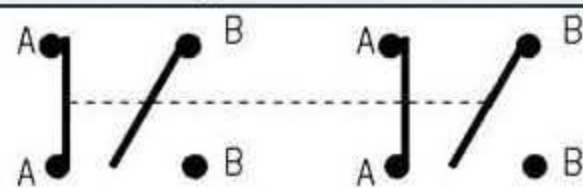
4 contact type: D4, X4, P4, H4



2 x independent SPST

AA make on rise: BB Make on fall

8 contact types: D8, X8, P8, H8



Double pole double throw
(4 x independent SPST)

AA make on rise, BB make on fall

Note: For DPDT operation, installer must common any one pair of A and B wires in the terminal block for each of the two ends of the switch mechanism.

Type D4, D8: General purpose switch mechanism.

Type D4U, D8U: General purpose switch mechanism for UL & CSA

Type X4, X8: High current switch mechanism.

Type P4, P8: Switch mechanism with gold plated contacts for use in low power or intrinsically safe circuits.

Type H4, H8: Hermetically sealed mechanism with gold plated contacts. All moving parts and contacts enclosed in an inert gas filled stainless steel enclosure. Suitable for use in low temperatures, contaminated atmospheres and intrinsically safe circuits.

Electrical rating

Type	Temp wetside °C	Low temp use	AC max. values			DC max. values			
			VA	Volts	Amps	Watts	Volts	Res amps	Ind 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°C	2000	440	5	50	250	5	0.5

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

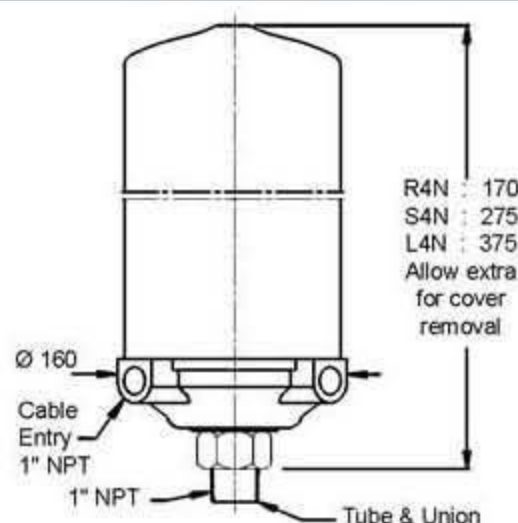
Warning

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.

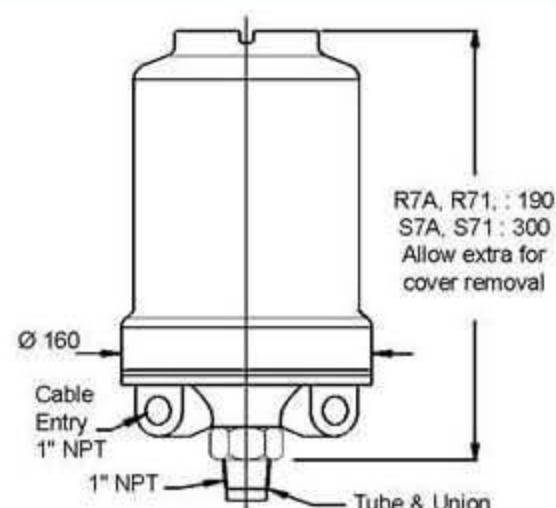
Switch enclosures

Enclosure modules R4N, S4N, L4N



Weatherproof industrial enclosure

Enclosure modules R7A, R71, S7A, S71



Hazardous area enclosure

Weatherproof NEMA 4X / IP66.

Aluminium alloy based/drawn steel cover.

Type R4N: Fixed switch

Type S4N: 94mm switch adjustment

Type L4N: 194mm switch adjustment

Flameproof & Explosion Proof (Weatherproof NEMA 4X / IP66)

Aluminium alloy base and cover "A"

Cast iron base and cover "I"

Type R7A/R71: Fixed switch

Type S7A/S71: 94mm switch adjustment

Conduit entries

Enclosures supplied with four contact switch mechanisms have a single 1" NPT conduit entry.

Enclosures supplied with eight contact switch mechanisms have 2 x 1" 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). 250 bar test is available on request.

Paint Finish: Black stove paint. Epoxy paint finishes available on request.

1.0 Direct mount displacer controls

Intra 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).

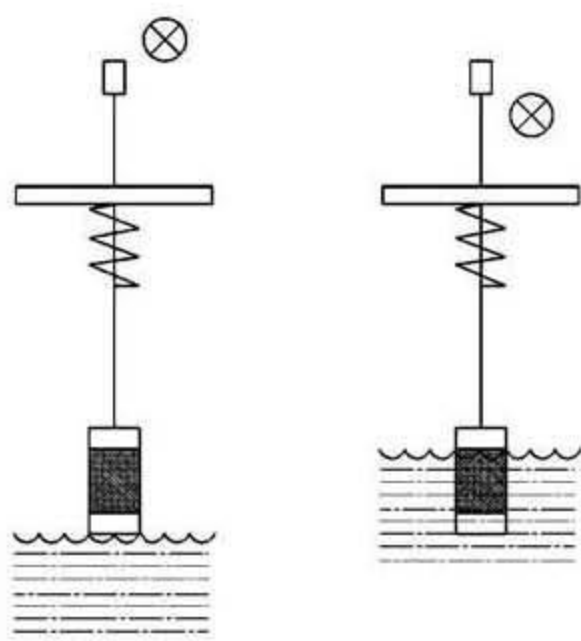
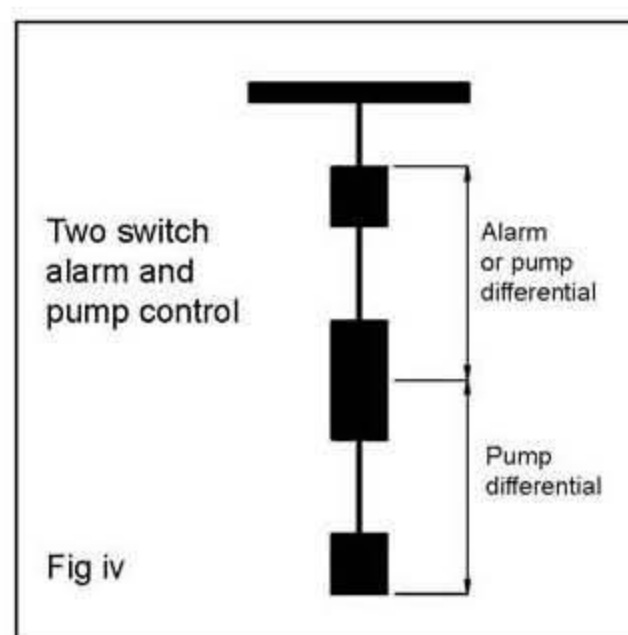
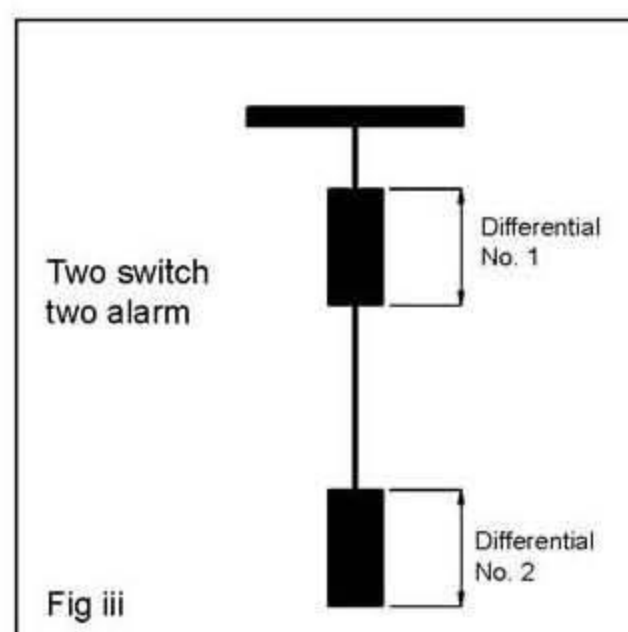
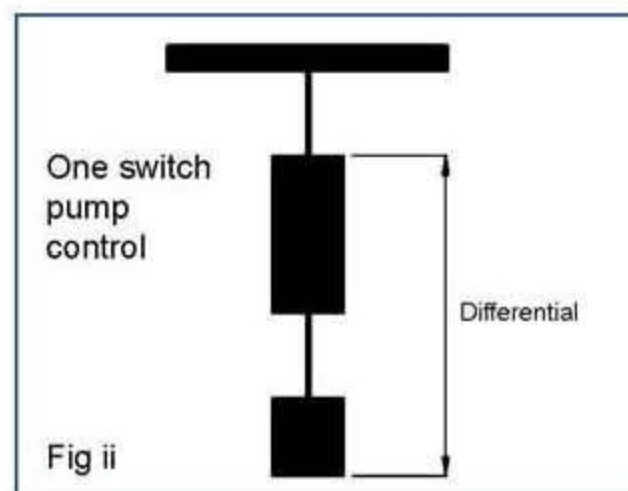
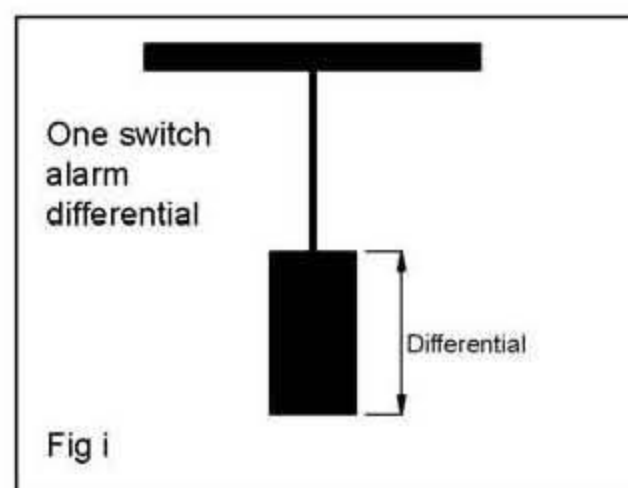


Fig v



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.



Displacer control

Displacer controls: ordering information

Code	Displacer operated alarm and pump control switches										
D	Direct mount: Displacer controls ^{Note 1}										
	Code	Material of mounting flange									
	C	Carbon steel. ASTM A105 (For use +300°C to -10°C)									
	S	316L stainless steel. ASTM A182: F316L (For use +300°C to -50°C)									
	Code	Displacer function and specification									
		Function	Elements	Material of Trim	Spring	S.G. Range		Operating temp. range		Max. pres. 20°C	
						4 Contact	8 Contact				
	11D	One switch narrow diff.	316 S.S.	316 Stainless Steel	Nimonic 90	0.6 - 1.2	0.75 - 1.2	-50°C to +300°C		102 bar high pressure available on request up to 250bar	
	12D	One switch wide diff.	316 S.S.			0.5 - 1.2	0.75 - 1.2	-50°C to +300°C			
	13D	Two switch 2 wide diff.	316 S.S.			0.6 - 1.2	0.8 - 1.2	-50°C to +300°C			
	18D	Two switch 2 normal diff.	316 S.S.			0.6 - 1.2	0.8 - 1.2	-50°C to +300°C			
	Code	Switch enclosure									
		Duty	Material of		Material of		Switch		Max. no. of switch		
			Base	Cover	wetted parts		adjustment		mechanisms		
	S4N	Weather proof	Aluminium alloy ^{Note 2}	Drawn steel	316 stainless steel		Adjust switching point by moving displacer elements on cable		2		
	S7A	Flame proof &	Aluminium alloy ^{Note 2}	Aluminium alloy							
	S7I	Explosion proof	Cast iron	Cast iron							
	Code	Approvals									
	U	UL Explosion Proof									
	C	CSA Explosion Proof									
	N	UL & CSA General Area, Weatherproof type NEMA 4X ATEX Flameproof & Weatherproof IP66 depending on switch enclosure (leave blank)									
	Code	Number of switch mechanisms									
	1	Specify 1 for single switch models 11D, 12D									
	2	Specify 2 for two switch models 13D, 18D									
	Code	Type of switch mechanism									
		Switch mechanism duty			Max. wetside temperature	A.C. max. values			D.C. max. values		
						Volts	Amps	VA	Volts	Res. I	Ind. I Watts
		4 Contact: 2 × SPST									
	D4	General purpose			300°C	440	5	2000	250	5	0.5 50
	D4U	Gen. purpose for UL & CSA			300°C	400	5	2000	250	5	0.5 50
	P4	Low power circuits			300°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	General purpose			300°C	440	5	2000	250	5	0.5 50
	D8U	Gen. purpose for UL & CSA			300°C	440	5	2000	250	5	0.5 50
	P8	Low power circuits			300°C	250	0.25	6	250	0.25	0.1 3.6
	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
	Code	Mounting arrangement									
	0	1" N.P.T. Thread: 316 stainless steel standard									
	60	3" Class 150 RF									
	61	3" Class 300 RF									
	62	3" Class 600 RF									
	65	4" Class 150 RF									
	66	4" Class 300 RF									
	67	4" Class 600 RF									
		These are our stocked flanges. Other flange sizes and ratings: 1"-2" CL150 - 2500LB are available ob request									
D	C	13D	S7A	2	D4 /	60	Typical ordering information				

Notes:

1. Supplied with 3m 316 stainless steel displacer cable as standard. Other lengths available on request.

2. 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.

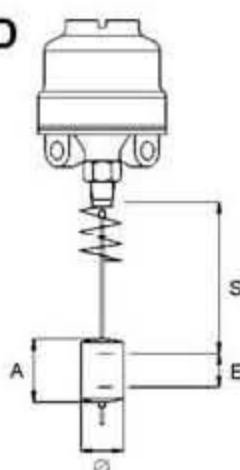
Due to component tolerances, dimensions DB, E and S given on page 7 are approximate and may vary on each control by up to 10mm. Setting the control to operate at the required level can be achieved on site by adjusting the element up or down on the cable as necessary.

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 $\varnothing$ = 60.3



Switch types	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 min	315	335	365	380	275	320	340	
E	90	70	60	55	135	105	90	

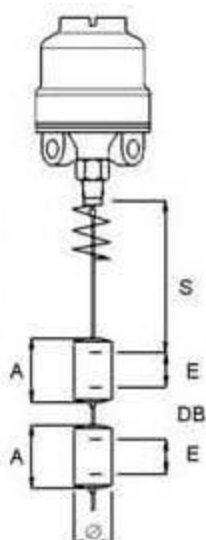
S min = Adjustable distance to upper switching level.

E min = Differential

DB = Minimum dead band

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.

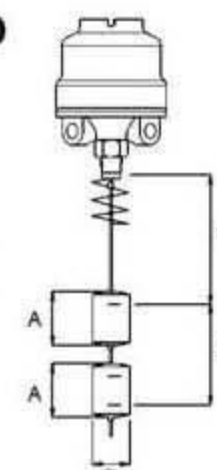


18D St. Steel: A = 216 $\varnothing$ = 60.3

Switch types	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	

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.

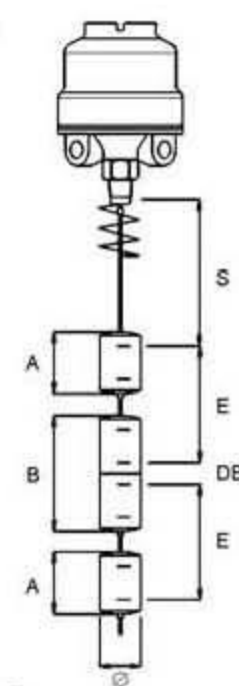


12D St. Steel: A = 216 $\varnothing$ = 60.3

Switch types	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 min	165	110	95	80	205	200	165	140

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 $\varnothing$ = 60.3

Switch types	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	

Switch mechanisms		Switch enclosures	
4 Contact: D4 D4U P4 X4 H4	8 Contact: D8 D8U P8 X8 H8	Weatherproof: S4N	Flameproof: S7A S7I
2 x independent SPST AA make on rise: BB Make on fall	Double pole double throw (4 x independent SPST) AA make on rise, BB make on fall	Ø 160 Cable Entry 1" NPT 1" NPT Tube & Union	Ø 180 Cable Entry 1" NPT 1" NPT Tube & Union

2.0 Direct Mounting Float Switches: Ordering Information

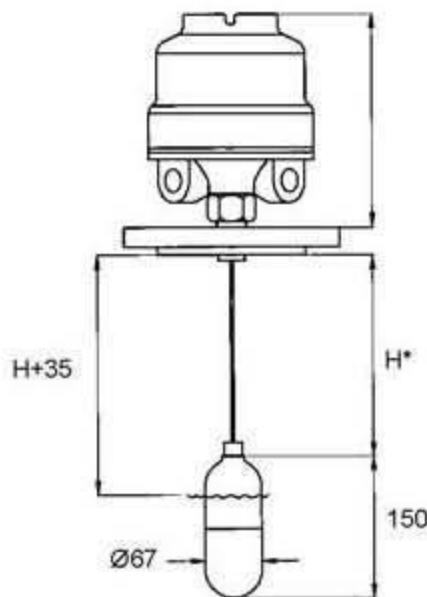
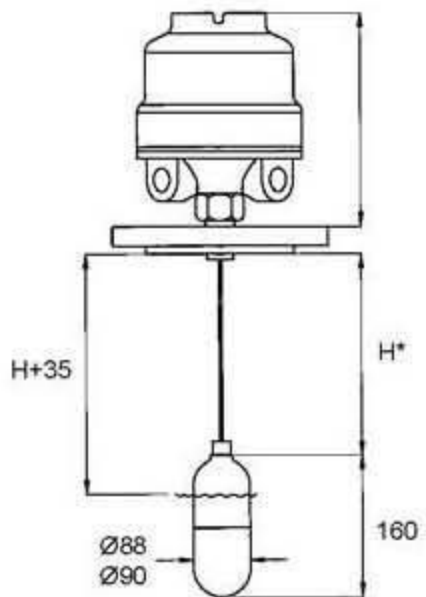
Code	Float operated alarm and pump control switches										
D	Direct mount: Float switches										
	Code	Material of mounting flange									
	C	Carbon steel ASTM A105 (for use + 400°C to -10°C)									
	S	316L stainless steel ASTM A182: F316L (for use + 400°C to -101°C)									
	Code	Floats									
		Minimum S.G.	Pressure rating (bar)			Float diameter	Matching enclosures	Matching mounting flanges			
			20°C	250°C	400°C			3" NB and larger			
	11F	0.80	34.5	22.5	20.0	67	All models				
	12F	0.75	102.1	66.3	59.2	90					
	13F	0.65	51.1	33.2	29.6	88		4" NB minimum			
	14F	0.54	19.6	12.7	11.3	88					
	Code	Switch Enclosure									
		Duty	Material of base	Material of cover	Material of wetted parts	Switch adjustment	Max. no. of switches				
							4 Contact	8 Contact			
	R4N	Weatherproof IP66	Aluminium alloy*	Drawn steel	316 stainless steel	None	1	1			
	S4N					94mm	4	2			
	L4N					194mm	6	3			
	R7A	Flameproof & Explosion-proof	Aluminium alloy*	Aluminium alloy		None	1	1			
	S7A					94mm	4	2			
	R7I					None	1	1			
	S7I					94mm	4	2			
	Code	Approvals									
	U	UL Explosion Proof									
	C	CSA Explosion Proof									
	N	UL & CSA General Area, Weatherproof type NEMA 4X									
		ATEX Flameproof & Weatherproof IP66 depending on switch enclosure (leave blank)									
	Code	Number of switch mechanisms									
	1-6	As required: see max. number allowable in switch enclosure data above									
	Code	Type of switch mechanism									
		Switch mechanism duty	Max. wetside temp.	AC max values			DC max values				
		4 contact: 2 x SPST		Volts	Amps	VA	Volts	Res. I	Ind. I	Watts	
	D4	General purpose	400°C	440	5	2000	250	5	0.5	50	
	D4U	Gen. purpose for UL & CSA	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	General purpose	400°C	440	5	2000	250	5	0.5	50	
	D8U	Gen. purpose for UL & CSA	400°C	440	5	2000	250	5	0.5	50	
	P8	Low power circuits	400°C	250	0.25	6	250	0.25	0.1	3.6	
	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	
	Code	Mounting arrangement									
	0	1" NPT thread: 316 stainless steel standard							These are our stocked flanges. Other flange sizes and ratings are available on request		
	60	3" Class 150RF									
	61	3" Class 300RF									
	62	3" Class 600RF									
	65	4" Class 150RF									
	66	4" Class 300RF									
	67	4" Class 600RF									
D	C	12F	L4N	4	D4 /	67	Typical ordering information				

Note :

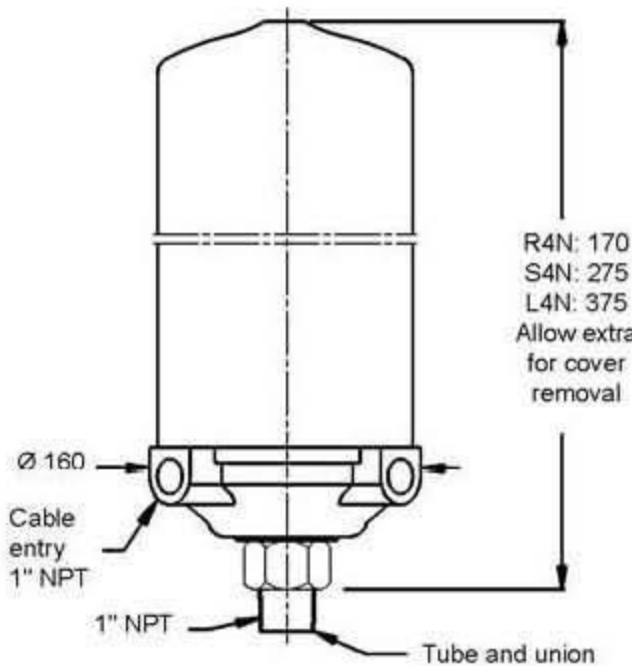
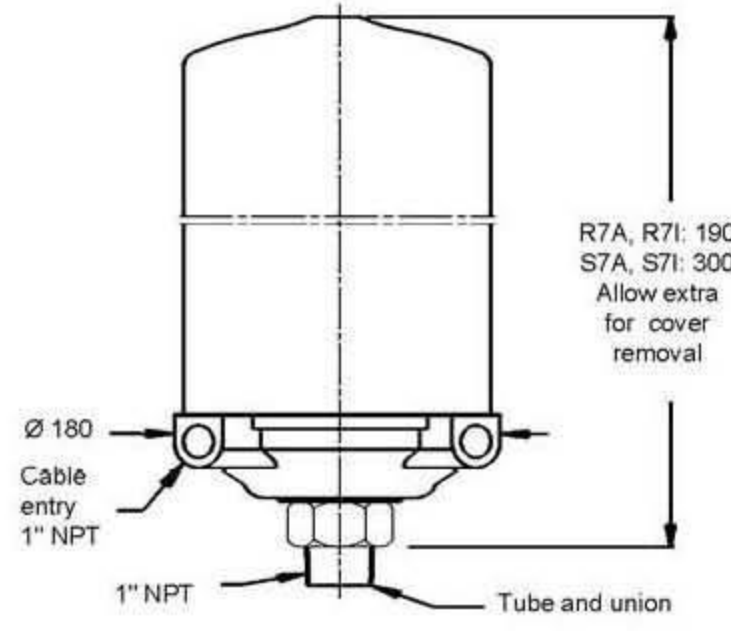
*Base material will be cast iron whenever 8 contact switches specified.

Instrument pressure rating is the lower of either the float or mounting flange

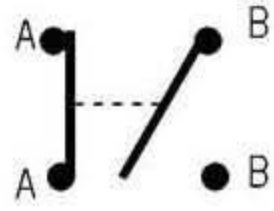
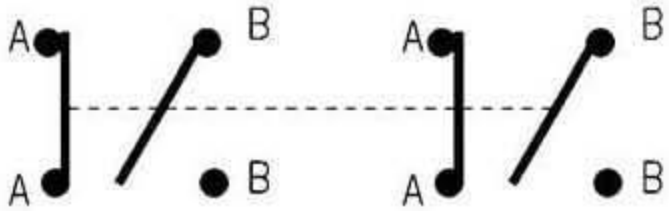
Direct Mounting Float Dimensions

Floats for 3" NB mounting: 11F					Floats for 4" NB mounting: 12F, 13F, 14F				
 11F *Float rod may be shortened to suit					 12F, 13F, 14F *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	20mm	155	415	None	20mm	
S4N S7A S7I	155	315	94mm	104mm max.	155	415	94mm	104mm max.	
L4N					155	415	194mm	214mm max.	

Switch Enclosures

Weatherproof: R4N S4N L4N	Flameproof: R7A R7I S7A S7I
 R4N: 170 S4N: 275 L4N: 375 Allow extra for cover removal Ø 160 Cable entry 1" NPT 1" NPT Tube and union	 R7A, R7I: 190 S7A, S7I: 300 Allow extra for cover removal Ø 180 Cable entry 1" NPT 1" NPT Tube and union

Switch Mechanisms

4 Contact D4, D4U, P4, X4, H4	8 Contact D8, D8U, P8, X8, H8
 2 x independent SPST AA make on rise: BB make on fall	 Double pole double throw (4 x independent SPST) AA make on rise: BB make on fall

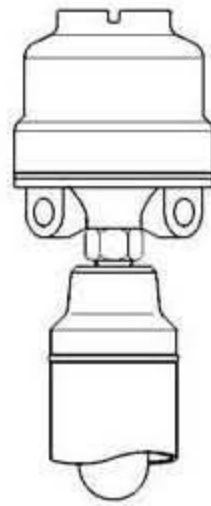
3.0 Carbon Steel Chamber Mounted Controls: Ordering Information

Code	Chamber mounted controls									
B	Bottle Style: Float sealed inside chamber during manufacture									
X	Flanged Style: Float may be removed from chamber for routine maintenance									
Code	Material of construction of chamber									
C	Carbon steel: See page 15									
Code	Floats									
	Float & trim material	Minimum S.G	Flanged Style chambers (X) Pressure rating (bar)			Bottle Style chambers (B) Pressure rating (bar)			Higher operation pressure chamber style ia available on request, up to 250bar	Chamber body size
			20°C	250°C	400°C	20°C	250°C	400°C		3" N.B.
11F	316 stainless steel	0.80	34.5	22.5	20.0	30.1	22.5	20.0	Refer to page 15 for process connection ratings Note: single switch only	4" N.B.
12F		0.75	102.1	66.3	59.2	88.8	66.3	59.2		
13F		0.65	51.1	33.2	29.6	44.6	33.2	29.6		
14F		0.54	19.6	12.7	11.3	17.1	12.7	11.3		
17D		0.40	102.1	66.3	59.2	88.8	66.3	59.2		
Code	Switch Enclosure									
	Duty	Material of		Material of		Switch adjustment		Max. no. of switches		
		Base	Cover	wetted parts				4 Contact	8 Contact	
R4N	Weatherproof IP66	Aluminium	Drawn steel	316 stainless steel		None		1	1	
S4N		alloy*	steel			94mm		4	2	
R7A		Aluminium	Aluminium			None		1	1	
S7A	Flameproof & Explosionproof	alloy*	alloy			94mm		4	2	
R71		Cast	Cast			None		1	1	
S71		iron	iron			94mm		4	2	
Code	Approvals									
U	UL Explosion Proof									
C	CSA Explosion Proof									
N	UL & CSA General Area, Weatherproof type NEMA 4X									
	ATEX Flameproof & Weatherproof IP66 depending on switch enclosure (leave blank)									
Code	Number of switch mechanisms									
1 - 4	As required: see max. number allowable in switch enclosure and float data above									
Code	Type of switch mechanism									
	Switch mechanism duty		Max. wetside temperature		A.C. max. values			D.C. max. values		
					Volts	Amps	VA	Volts	Res. I	Ind. I Watts
	4 Contact: 2 × SPST									
D4	General purpose		400°C		440	5	2000	250	5	0.5 50
D4U	Gen. purpose for UL & CSA		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	General purpose		400°C		440	5	2000	250	5	0.5 50
D8U	Gen. purpose for UL & CSA		400°C		440	5	2000	250	5	0.5 50
P8	Low power circuits		400°C		250	0.25	6	250	0.25	0.1 3.6
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
Code	Process connection configuration									
1	Side/bottom									
2	Side/side with 1" NPT drain									
Code	Process connection size & rating									
	Chamber : 3" & 4" N.B.				Code	Chamber : 4" N.B. only				These are our stocked sizes. Other flange sizes and ratings are available on request. Instrument pressure rating is the lower of either the float or process flange.
01	1" N.P.T.: 316 s/s Std.				21	1½" Class 150 RF				
11	1" Class 150 RF				22	1½" Class 300 RF				
12	1" Class 300 RF				23	1½" Class 600 RF				
13	1" Class 600 RF				25	DN40 PN16				
15	DN25 PN16				31	2" Class 150 RF				
16	DN25 PN25				32	2" Class 300 RF				
17	DN25 PN40				33	2" Class 600 RF				
18	DN25 PN64				35	DN50 PN16				
19	DN25 PN100				36	DN50 PN25				
					37	DN50 PN40				
X	C	14F	S7A	2	D4 / 2	10	Typical ordering information			

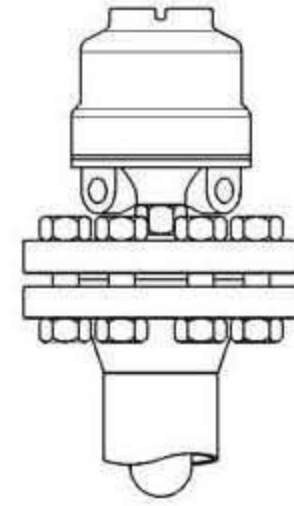
Note:
 * Base material will be cast iron whenever 8 contact switches are specified.
 State process connection centres when ordering. See page 14 for standard dimensions. Instrument pressure rating is the lower of either the float or the process flange.

Chamber Type and Material of Construction

Carbon steel: Bottle construction BC	Carbon steel: Flanged construction XC
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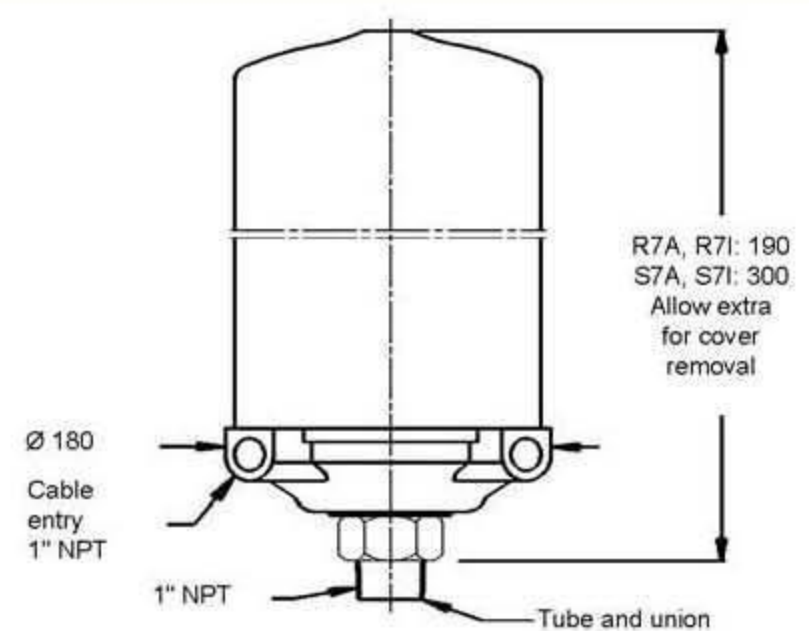
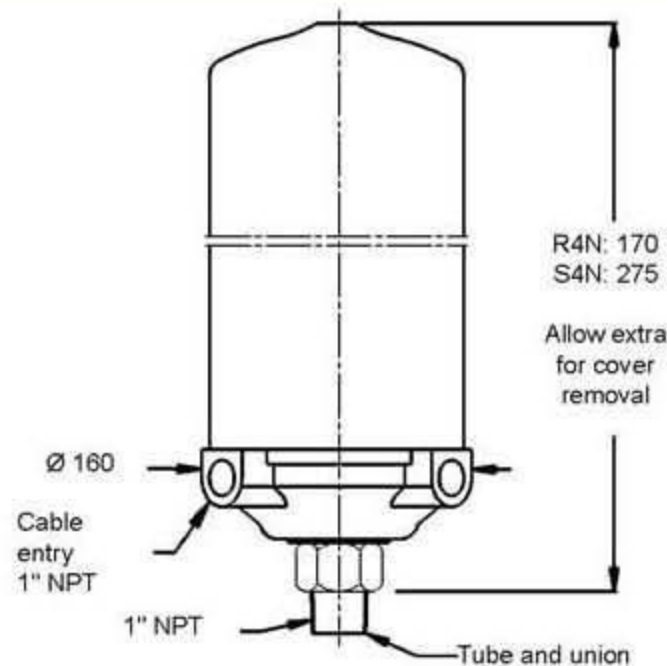
Float is sealed inside chamber during manufacture



Float may be removed from chamber for routine maintenance, cleaning or inspection

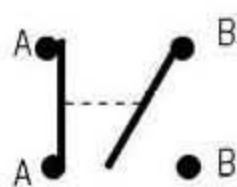
Switch Enclosures

Weatherproof: R4N S4N	Flameproof: R7A S7A R71 S71
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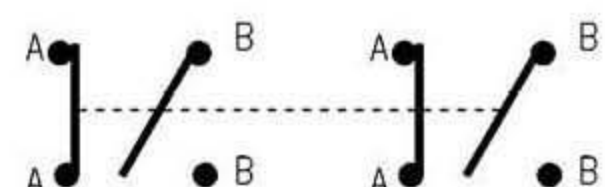


Switch Mechanisms

4 contact: D4 D4U P4 X4 H4	8 contact: D8 D8U P8 X8 H8
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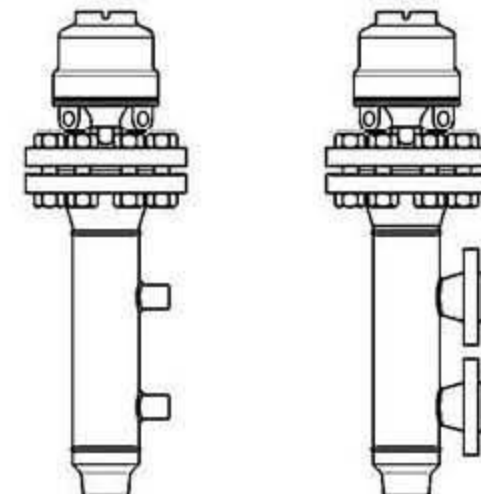
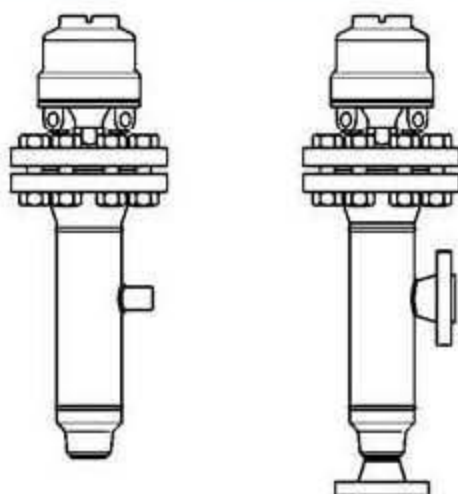
2 × independent SPST
AA make on rise: BB make on fall



Double pole double throw (4 × independent SPST)
AA make on rise: BB make on fall

Process Connection Configuration

Side and Bottom - 1	Side and Side with Drain - 2
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Chamber dimensions, operating levels and technical data are given on page 14

4.0 316L Stainless Steel Chamber Mounted Controls: Ordering Information

Code	Chamber mounted controls										
B	Bottle Style: Float sealed inside chamber during manufacture										
X	Flanged Style: Float may be removed from chamber for routine maintenance										
Code	Material of construction of chamber										
S	316L stainless steel: see page 15										
Code	Floats										
	Float and trim material	Minimum S.G	Flanged Style chambers (X) Pressure rating (bar)			Bottle Style chambers (B) Pressure rating (bar) 20°C 250°C 400°C			Higher operation pressure chamber style is available on request, up to 250bar	Chamber body size	
12F	316 stainless steel	0.75	102.1	66.3	59.2	88.8	66.3	59.2	Refer to page 15 for process connection ratings Note: single switch only	4" N.B.	
13F		0.65	51.1	33.2	29.6	44.6	33.2	29.6			
14F		0.54	19.6	12.7	11.3	17.1	12.7	11.3			
17D		0.40	102.1	66.3	59.2	88.8	66.3	59.2			
Code	Switch Enclosure										
	Duty	Material of Base Cover		Material of wetted parts		Switch adjustment		Max. no. of switches 4 Contact 8 Contact			
R4N	Weatherproof IP66	Aluminium alloy*	Drawn steel	316 stainless steel	None		1	1			
S4N					94mm		4	2			
R7A	Flameproof & Explosionproof	Aluminium alloy*	Aluminium alloy		None		1	1			
S7A					94mm		4	2			
R7I		Cast iron	Cast iron		None		1	1			
S7I					94mm		4	2			
Code	Approvals										
U	UL Explosion Proof										
C	CSA Explosion Proof										
N	UL & CSA General Area, Weatherproof type NEMA 4X										
	ATEX Flameproof & Weatherproof IP66 depending on switch enclosure (leave blank)										
Code	Number of switch mechanisms										
1 - 4	As required: see max. number allowable in switch enclosure and float data above										
Code	Type of switch mechanism										
	Switch mechanism duty		Max. wet side temperature		A.C. max. values Volts Amps VA			D.C. max. values Volts Res. I Ind. I Watts			
	4 Contact: 2 × SPST										
D4	General purpose		400°C		440	5	2000	250	5	0.5	50
D4U			400°C		440	5	2000	250	5	0.5	50
P4	Low power circuits		400°C		440	0.25	6	250	0.25	0.1	3.6
X4	High power circuits		250°C		250	10	2000	250	10	0.5	50
H4	Hermetically sealed		250°C		440	5	2000	250	5	0.5	50
	8 Contact: DPDT										
D8	General purpose		400°C		440	5	2000	250	5	0.5	50
D8U			400°C		440	5	2000	250	5	0.5	50
P8	Low power circuits		400°C		250	0.25	6	250	0.25	0.1	3.6
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
Code	Process connection configuration										
1	Side/bottom										
2	Side/side with 1" NPT drain										
Code	Process connection size & rating										
01	1" N.P.T. 316 stainless steel standard						22	1½" Class 300 RF			
11	1" Class 150 RF						23	1½" Class 600 RF			
12	1" Class 300 RF						31	2" Class 150 RF			
13	1" Class 600 RF						32	2" Class 300 RF			
21	1½" Class 150 RF						33	2" Class 600 RF			

Other flange size and ratings are available on request.

B	S	17D	4N	1	X8	/	2	33	Typical ordering information	
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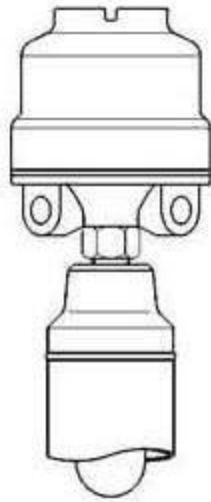
Note:

* Base material will be cast iron whenever 8 contact switches are specified

State process connection centres when ordering. See page 14 for standard dimensions. Instrument pressure rating is the lower of either the float or the process flange.

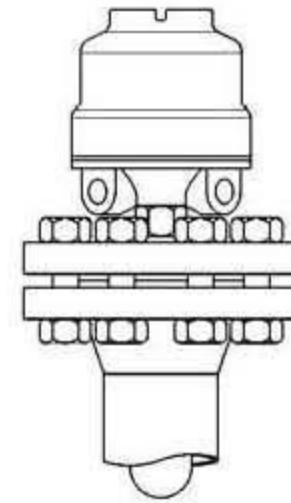
Chamber Type and Material of Construction

Carbon steel: Bottle construction
BS



Float is sealed inside chamber during manufacture

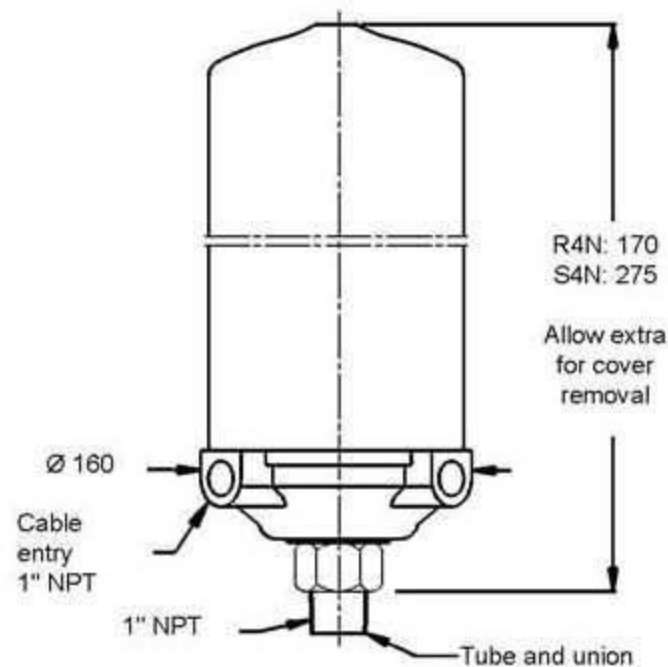
Carbon steel: Flanged construction
XS



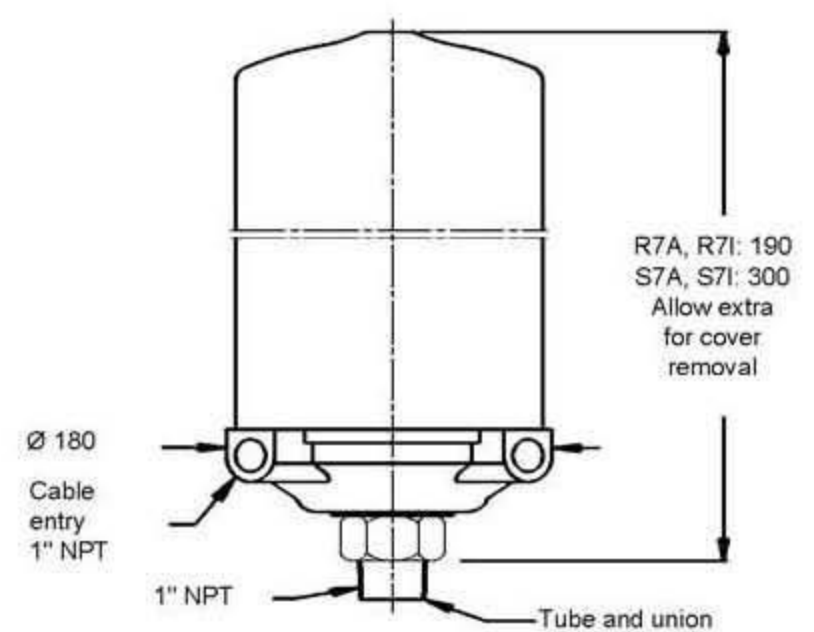
Float may be removed from chamber for routine maintenance, cleaning or inspection

Switch Enclosures

Weatherproof: R4N S4N

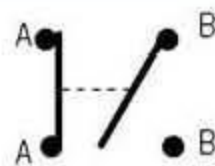


Flameproof: R7A S7A R71 S71



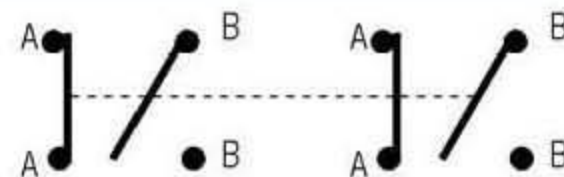
Switch Mechanisms

4 contact: D4 D4U P4 X4 H4



2 × independent SPST
AA make on rise: BB make on fall

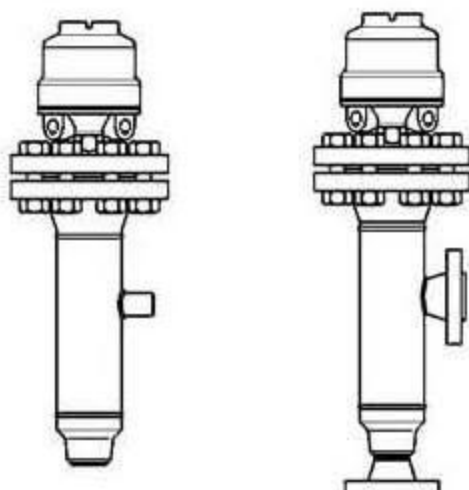
8 contact: D8 D8U P8 X8 H8



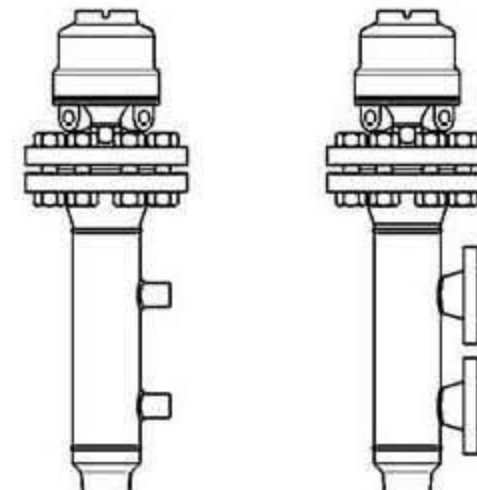
Double pole double throw (4 × independent SPST)
AA make on rise: BB make on fall

Process Connection Configuration

Side and Bottom - 1



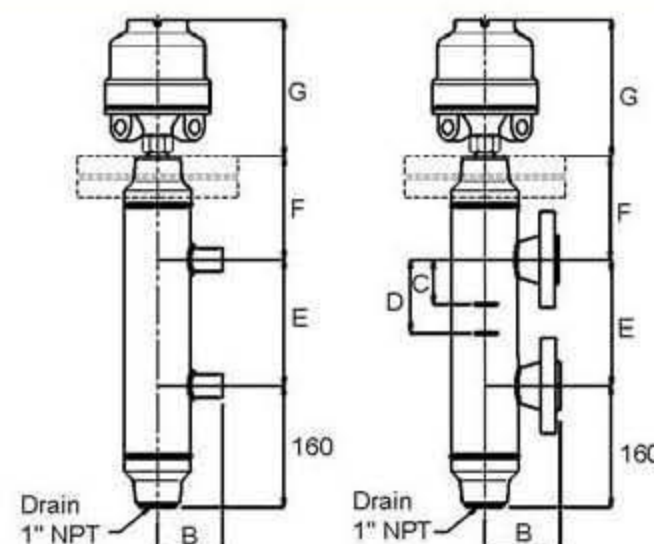
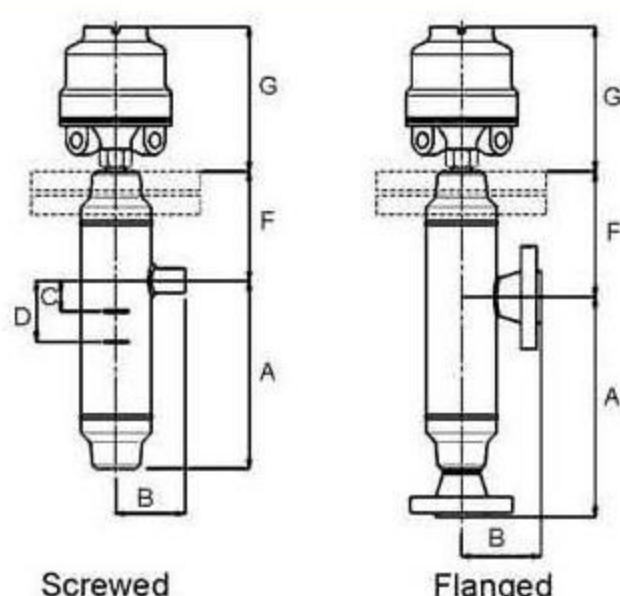
Side and Side with Drain - 2



Chamber dimensions, operating levels and technical data are given on page 14

Dimensional and Operating Level Data

Style 1: Side and Bottom	Style 2: Side and Side
--------------------------	------------------------



Process connections	A		B*	C	D		E		F	
	Single switch 'R' head	Multi-type 'S' head	Chamber type BC/others		Single switch 'R' head	Multi-switch 'S' head	Single switch 'R' head	Multi-switch 'S' head	Chamber type	
									BC/BS	XC/XS
1" NPT (side/bottom)	300	385	76/95	50	70	155	-	-	48/160	225
1" NPT (side/side)	-	-	95	50	70	155	271	356	160	225
1" 150	356	441	110	50	70	155	271	356	160	225
1" 300	356	441	117	50	70	155	271	356	160	225
1" 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" 150	356	441	115	50	70	155	271	356	160	225
1½" 300	356	441	121	50	70	155	271	356	160	225
1½" 600	356	441	126	50	70	155	271	356	160	225
DN40 PN16	356	441	97	50	70	155	271	356	160	225
2" 150	356	441	112	50	70	155	271	356	160	225
2" 300	356	441	118	50	70	155	271	356	160	225
2" 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
B* Dimension given is for 4" NB chamber (12F, 13F, 14F & 17D Floats). For 3" NB chamber (11F Float) subtract 13mm.										
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	

Notes: C = Highest operating liquid level

D (Single switch) = Reset level

All dimensions in mm.

D (Multi switch) = Lowest operating liquid level

D-C = Wet switching differential (max)

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

Dimensional data: enclosures	Duty	Height G	Conduit thread*	Switch adjustment	Weatherproof rating
Type					
R7A, R7I	Flameproof & Explosion proof	190	1" NPT	None	IP66 to IEC60529 (NEMA 4)
S7A, S7I		300		94	
R4N	Weatherproof	170	1" NPT	None	IP66 to IEC60529 (NEMA 4)
S4N		275		94	
L4N		375		194	

*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.

Technical Data

Intra vertical level controls are manufactured to the highest standards of quality with only certified materials: BS EN 10204 : 2004-3.1. Design of the 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 $1.43 \times$ 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 the manufacturer employs 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. Intra will produce these QC plans for customer approval if agreed at order entry.

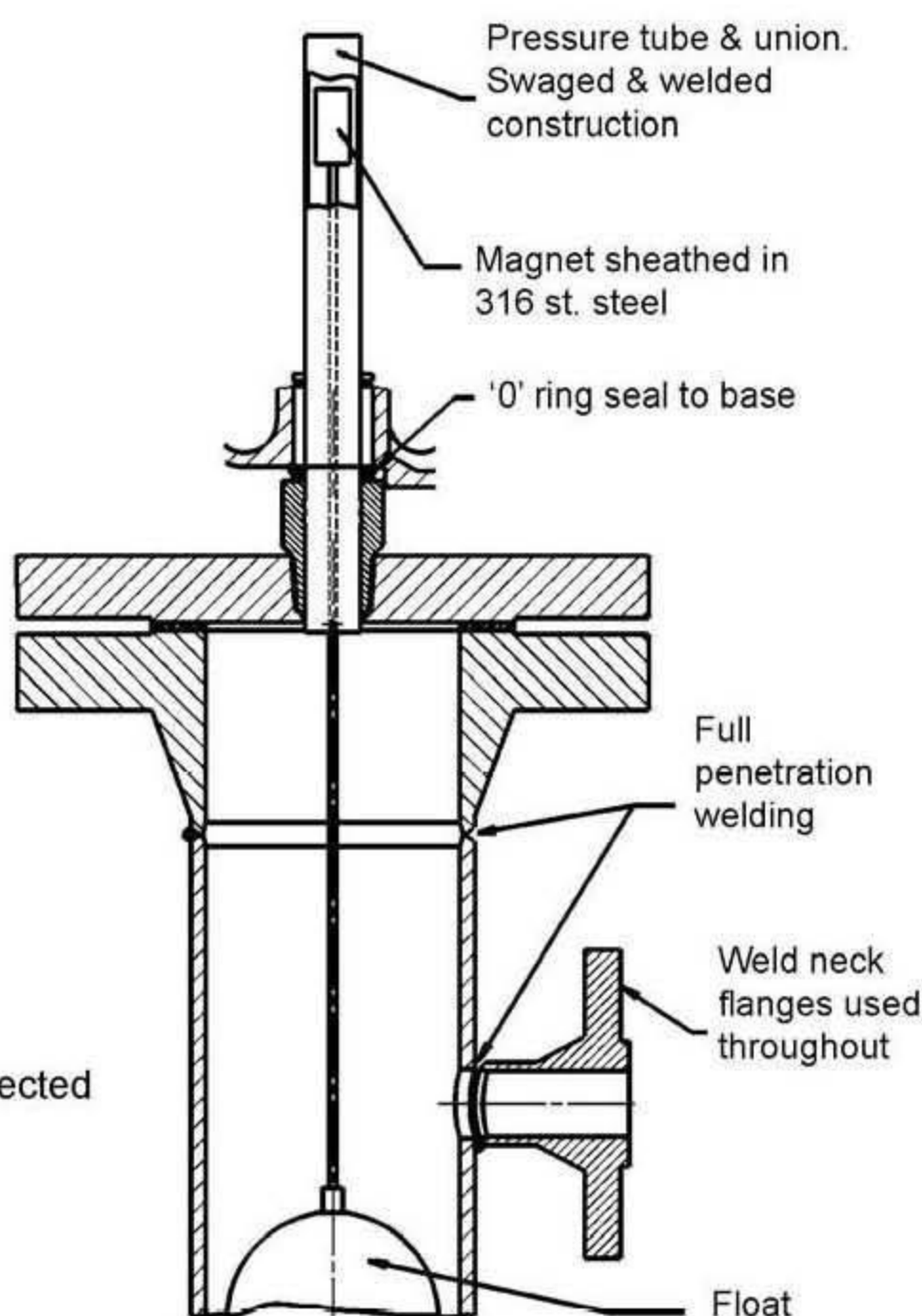
Pressure Ratings (bar)

Material	Carbon steel: A105			Stainless steel: 316L		
	20°C	250°C	400°C	20°C	250°C	400°C
ASME B16.5 Class 150	19.6	12.1	6.5	15.8	10.1	6.5
ASME B16.5 Class 300	51	41.7	34.5	41.3	26.6	23
ASME B16.5 Class 600	102	83.6	69	82.7	53.4	46.1
BS EN 1092-1 PN16	16	14.4	10.8	12.3	7.9	6.8
BS EN 1092-1 PN25	25	22.5	16.9	19.2	12.4	10.7
BS EN 1092-1 PN40	40	36	27	30.6	19.8	17.1

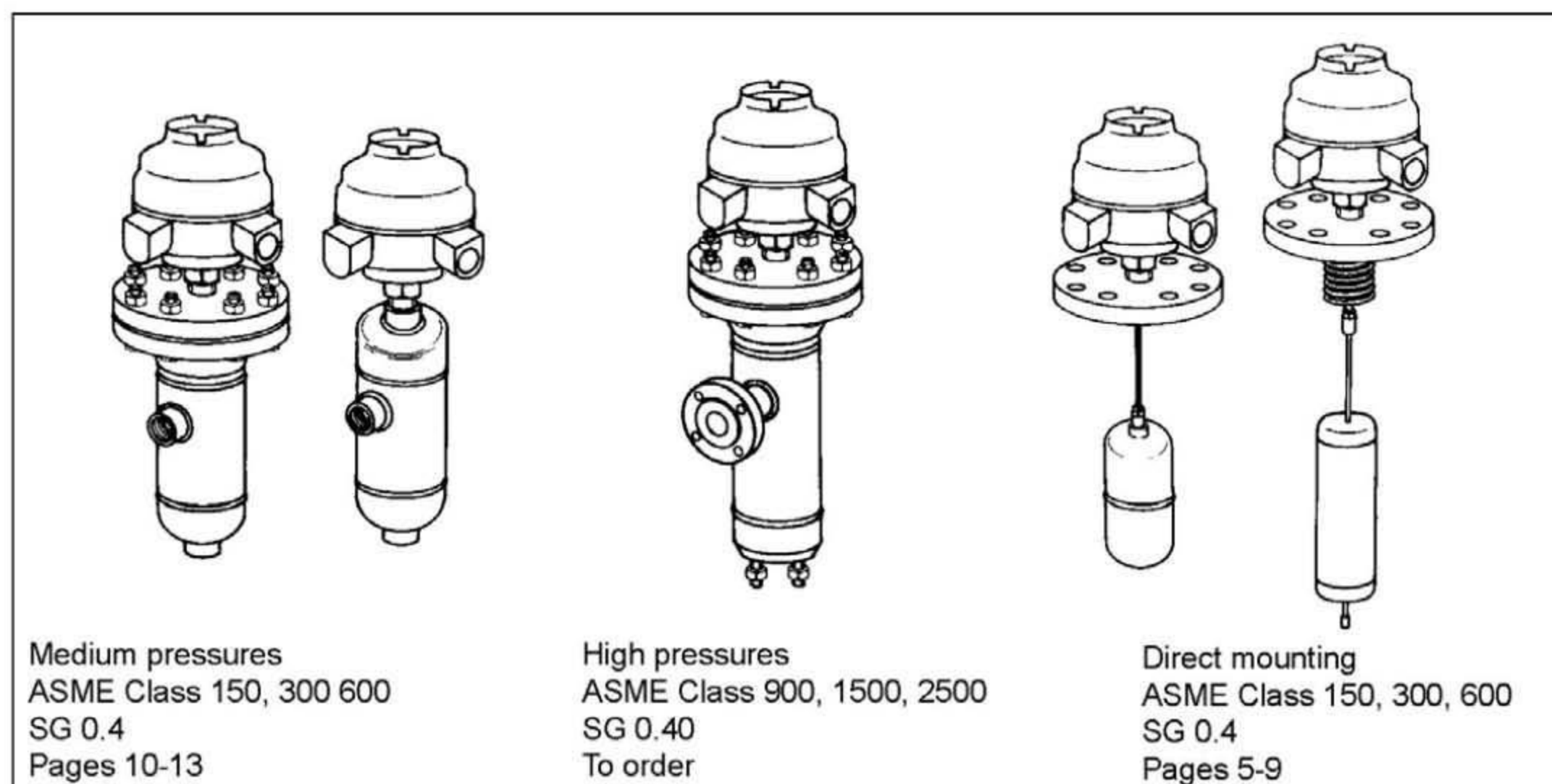
Technical specification		
Materials of construction	Carbon steel chamber	Stainless steel chamber
Chamber tube	ASTM A106 grade B	ASTM A312 TP316L
Top casting	ASTM A216	-
Top/bottom caps	ASTM A105	ASTM A182 F316L / A403 WP316L
Top cover	ASTM A105	ASTM A182 F316L
Flanges/fittings	ASTM A105	ASTM A182 F316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



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De-aerators	Process Vessels
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Service Tanks	Drainpots
Header Tanks	Accumulators
Effluent Sumps & Tanks	Fuel Tanks
Heat Exchangers	Feedwater Heaters
Lude Oil Tanks	Surge Drums

Our level switches are used for the control of liquids by companies all over the world.

Shell	Bechtel
Exxon	Bellili
Amoco	Ontario Hydro
Fluos	Nissaei-Sangyo
Hyundai	Foster Wheeler
British Petroleum	Siemens
Mobil	Mannesmann-Demag
Texaco	Catalytic
Ingersoll Rand	Techni
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