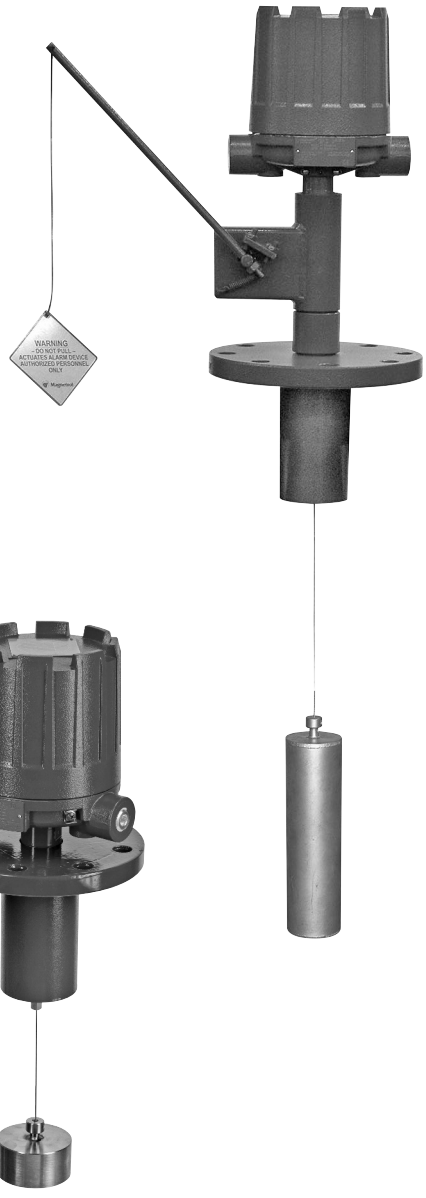
Displacer type liquid level switch

INSTRUCTION MANUAL AND PARTS LIST

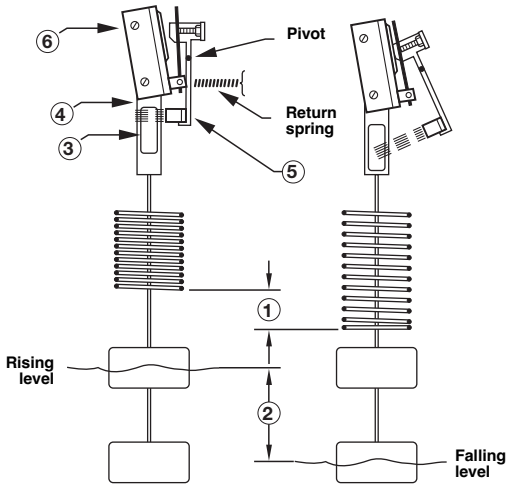
DESCRIPTION

Magnetrol's displacement type level switches offer the industrial user a wide choice of alarm and control configurations. Each unit utilizes a simple buoyancy principle and are well suited for simple or complex applications, such as foaming or surging liquids or agitated fluids, and usually cost less than other types of level switches.



OPERATING PRINCIPLE

Standard controls
Operation is based upon simple buoyancy, whereby a spring is loaded with weighted displacers which are heavier than the liquid. Immersion of the displacers in the liquid results in buoyancy force change, which moves the spring upward. Since the spring moves only when the level moves on a displacer, spring movement **(1)** is always a small fraction of the level travel between displacers **(2)**.
A magnetic sleeve **(3)** is connected to the spring and operates within a non-magnetic barrier tube **(4)**. Spring movement causes the magnetic sleeve to attract a pivoted magnet **(5)**, actuating a switch mechanism **(6)** located outside the barrier tube. Built-in limit stops, prevent over stroking of the spring under level surge conditions.



Proof-er controls
The purpose of the proof-er is to check the operation of a displacer control without having to raise the level in the tank. This is accomplished by pulling downward on the proof-er chain. This causes the spring loaded lever arm to lift the switch actuator, simulating a high or high high level condition. When the chain is released, the proof-er returns the actuator to its previous position to resume normal operation.

Proof-er floating roof controls
The proof-er roof top control is designed for installation on 'barrier' (floating roof) tanks. The control may be furnished with a lead displacer to prevent sparking. A stainless steel displacer is required if the control is to actuate in liquid as well as by the barrier.

MODEL IDENTIFICATION

A complete measuring system consists of:

1. Code for **standard** models (each unit is factory calibrated to operate on a given specific gravity within the min and the max values listed per model) or
2. Code for **floating roof** models.

1. Code for **standard** displacer switches

BASIC MODEL NUMBER

– units for ALARM use ONLY

A 1 5	One adjustable set point (fixed narrow differential)
B 1 5	Two adjustable set points (fixed narrow differentials)
C 1 5	Three adjustable set points (fixed narrow differentials), specify specific gravity of medium separately

– units for ALARM/PUMP control use

A 1 0	One adjustable wide differential
B 1 0	Two adjustable wide differentials, specify operating sequence and specific gravity separately (see p. 11 & 12)
C 1 0	Three adjustable wide differentials, specify operating sequence and specific gravity separately (see p. 11 & 12)

MATERIALS OF CONSTRUCTION (3 m (10') of suspension cable is standard supplied)

Code	*Spring*	*Trim*	*Process Connection*	*Displacer-clamps/ cable*	*Magnetic sleeve*	*Construction*
A	Inconel	316 SST (1.4401)	Carbon steel	316 SST (1.4401)	400 series SST	Standard
B					316 SST (1.4401)	
D		316 SST (1.4401)				
E		316 SST (1.4401)	Carbon steel	Monel (2.4360)	400 series SST	
F				Hastelloy C (2.4819)		
K		316 SST (1.4401)				NACE (not available with Proof-er® option)
L		316 SST (1.4401)	Carbon steel	316 SST (1.4401)	400 series SST	

PROCESS CONNECTION

– threaded

E 2	2 1/2" NPT

– ANSI flanges

G 3	3" 150 lbs ANSI RF
G 4	3" 300 lbs ANSI RF
H 3	4" 150 lbs ANSI RF
H 4	4" 300 lbs ANSI RF
K 3	6" 150 lbs ANSI RF
K 4	6" 300 lbs ANSI RF

– EN/DIN flanges

8 A	DN 80, PN 16	EN 1092-1 Type B1
8 B	DN 80, PN 25/40	EN 1092-1 Type B1
1 A	DN 100, PN 16	EN 1092-1 Type B1
1 B	DN 100, PN 25/40	EN 1092-1 Type B1

DISPLACER MATERIAL AND PROOF-ER® OPTION
(for pressure ratings, refer to physical specifications table)

– without Proof-er® *can be used for NACE models*

A	Porcelain
B	316 SST (1.4401)

– with low pressure Proof-er® ① *not for NACE & not for C10-C15 models*

D	Porcelain
E	316 SST (1.4401)

– with medium pressure Proof-er® ① *not for NACE & not for B10-B15, C10-C15 models*

G	Porcelain
H	316 SST (1.4401)

① Proof-er® is available in carbon steel only

SWITCH MECHANISM & ENCLOSURE

Refer to table selections per displacer type A10-A15 (p. 3-4), B10-B15 (p. 4) & C10-C15 (p. 4).

[ ] [1] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] **complete code for *standard* models**

→ X = product with a specific customer requirement

2. Code for **floating roof** models (not for NACE constructions)

BASIC MODEL NUMBER – units for ALARM use ONLY

A 1 5	One adjustable set point (fixed narrow differential)
B 1 5	Two adjustable set points (fixed narrow differentials)

MATERIAL OF CONSTRUCTION (3 m (10') of suspension cable is standard supplied)

Code	*Spring*	*Trim*	*Process Connections*	*Displacer clamps and cable*	*Magnetic sleeve*	*Construction*
A	Inconel	316 SST (1.4401)	Carbon steel	316 SST (1.4401)	400 series SST	Standard

PROCESS CONNECTION – size rating (consult factory for EN/DIN flanges)

– threaded

E 2	2 1/2" NPT

– ANSI flanges

G 3	3" 150 lbs ANSI RF
G 4	3" 300 lbs ANSI RF
H 3	4" 150 lbs ANSI RF
H 4	4" 300 lbs ANSI RF
K 3	6" 150 lbs ANSI RF
K 4	6" 300 lbs ANSI RF

DISPLACER MATERIAL AND PROOF-ER® OPTION (for pressure ratings, refer to physical specifications table)

– without Proof-er®

P	Brass
R	Hollow brass (roof and liquid)①
M	Stainless steel

– with low pressure Proof-er®②

Q	Brass
T	Hollow brass (roof and liquid)①
N	Stainless steel

SWITCH MECHANISM & ENCLOSURE

Refer to table selections per displacer type A10-A15 (below) & B10-B15 (p. 4)

1 5 — **complete code for *floating roof* models**

→ X = product with a specific customer requirement

① Available on model A15 only. Suitable for process liquids with SG ≥ 0,4 and a maximum pressure of 6,9 bar (100 psi)

② Proof-er® is available in carbon steel only

Select electric switch mechanism & enclosure: **A10 — A15 type displacer switches** (see page 4 for switch ratings)

qty and switch type		Switch and Housing codes for A10									Switch and Housing codes for A15								
		Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)	Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)
				II 2G Ex d IIC T6 Gb		II 1G EEx ia II C T6		II 2G Ex d IIC T6 Gb		NEMA 7/9			II 2G Ex d IIC T6 Gb		II 1G EEx ia II C T6		II 2G Ex d IIC T6 Gb		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.	cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
B	1 x SPDT	B2B	BAB	BK9	BC9	-	-	BK5	BU5	BKB	B2Q	BAQ	BH9	BA9	-	-	BK5	BU5	BKQ
	1 x DPDT	B8B	BDB	BN9	BF9	-	-	BD5	BW5	BNB	B8Q	BDQ	BJ9	BB9	-	-	BD5	BW5	BNQ
C	1 x SPDT	C2B	CAB	CK9	CC9	C2T	CAT	CK5	CU5	CKB	C2Q	CAQ	CH9	CA9	C2S	CAS	CK5	CU5	CKQ
	1 x DPDT	C8B	CDB	CN9	CF9	C8T	CDT	CD5	CW5	CNB	C8Q	CDQ	CJ9	CB9	C8S	CDS	CD5	CW5	CNQ
D	1 x SPDT	D2B	DAB	DK9	DC9	-	-	DK5	DU5	DKB	D2Q	DAQ	DH9	DA9	-	-	DK5	DU5	DKQ
	1 x DPDT	D8B	DDB	DN9	DF9	-	-	DD5	DW5	DNB	D8Q	DDQ	DJ9	DB9	-	-	DD5	DW5	DNQ
HS	1 x SPDT	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3
	1 x DPDT	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7
U	1 x SPDT	U2B	UAB	UK9	UC9	U2T	UAT	UK5	UU5	UKB	U2Q	UAQ	UH9	UA9	U2S	UAS	UK5	UU5	UKQ
	1 x DPDT	U8B	UDB	UN9	UF9	U8T	UDT	UD5	UW5	UNB	U8Q	UDQ	UJ9	UB9	U8S	UDS	UD5	UW5	UNQ
V	-	-	-	-	-	VCS	VES	-	-	-	-	-	-	-	V5S	VBS	-	-	-
W	1 x SPDT	W2B	WAB	WK9	WC9	W2T	WAT	WK5	WU5	WKB	W2Q	WAQ	WH9	WA9	W2S	WAS	WK5	WU5	WKQ
	1 x DPDT	W8B	WDB	WN9	WF9	W8T	WDT	WD5	WW5	WNB	W8Q	WDQ	WJ9	WB9	W8S	WDS	WD5	WW5	WNQ
X	1 x SPDT	X2B	XAB	XK9	XC9	X2T	XAT	XK5	XU5	XKB	X2Q	XAQ	XH9	XA9	X2S	XAS	XK5	XU5	XKQ
	1 x DPDT	X8B	XDB	XN9	XF9	X8T	XDT	XD5	XW5	XNB	X8Q	XDQ	XJ9	XB9	X8S	XDS	XD5	XW5	XNQ
F	1 x SPDT	FCB	FAB	FK9	FC9	-	-	FK5	FU5	FKB	F2Q	FAQ	FH9	FA9	-	-	FK5	FU5	FKQ
	1 x DPDT	FGB	FDB	FN9	FF9	-	-	FD5	FW5	FNB	F8Q	FDQ	FJ9	FB9	-	-	FD5	FW5	FNQ
8	1 x SPDT	82B	8AB	8K9	8C9	-	-	8K5	8U5	8KB	82Q	8AQ	8H9	8A9	-	-	8K5	8U5	8KQ
	1 x DPDT	88B	8DB	8N9	8F9	-	-	8D5	8W5	8NB	88Q	8DQ	8J9	8B9	-	-	8D5	8W5	8NQ

Select pneumatic switch mechanism & enclosure: **A10 — A15 type displacer switches**

Pneumatic switch type	Max supply pressure bar (psi)	Max process temperature °C (°F)	Bleed orifice ø mm (inches)	A10 codes	A15 codes
				NEMA 3R (IP 53)	NEMA 3R (IP 53)
Series J (open air)	6,9 (100)	200 (400)	1,60 (0.063)	JGF	JDE
	4,1 (60)	200 (400)	2,39 (0.094)	JHF	JEE
Series K (closed circuit)	6,9 (100)	200 (400)	–	KOF	KOE

Select electric switch mechanism & enclosure: **B10 — B15 type displacer switches** (see below for switch ratings)
(no pneumatic switch mechanisms available.)

Switch ① Type		Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)
				II 2G Ex d IIC T6 Gb		II 1G EEx ia IIC T6		II 2G Ex d IIC T6 Gb		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
B	SPDT	B4B	BBB	BL9	BD9	–	–	BL5	BV5	BLB
	DPDT	B1B	BEB	BP9	BG9	–	–	BO5	BY5	BOB
C	SPDT	C4B	CBB	CL9	CD9	C4T	CBT	CL5	CV5	CLB
	DPDT	C1B	CEB	CP9	CG9	C1T	CET	CO5	CY5	COB
D	SPDT	D4B	DBB	DL9	DD9	–	–	DL5	DV5	DLB
	DPDT	D1B	DEB	DP9	DG9	–	–	DO5	DY5	DOB
U	SPDT	U4B	UBB	UL9	UD9	U4T	UBT	UL5	UV5	ULB
	DPDT	U1B	UEB	UP9	UG9	U1T	UET	UO5	UY5	UOB
W	SPDT	W4B	WBB	WL9	WD9	W4T	WBT	WL5	WV5	WLB
	DPDT	W1B	WEB	WP9	WG9	W1T	WET	WO5	WY5	WOB
X	SPDT	X4B	XBB	XL9	XD9	X4T	XBT	XL5	XV5	XLB
	DPDT	X1B	XEB	XP9	XG9	X1T	XET	XO5	XY5	XOB
F	SPDT	FFB	FBB	FL9	FD9	–	–	FL5	FV5	FLB
	DPDT	FHB	FEB	FP9	FG9	–	–	FO5	FY5	FOB
8	SPDT	84B	8BB	8L9	8D9	–	–	8L5	8V5	8LB
	DPDT	81B	8EB	8P9	8G9	–	–	8O5	8Y5	8OB

① Proximity switches (switch type V) are available, consult factory for proper ordering information.

Select electric switch mechanism & enclosure: **C10 — C15 type displacer switches** (see below for switch ratings)
(no pneumatic switch mechanisms available.)

Switch Type		Weather proof (IP 66) cast Aluminium		FM (IP 66) NEMA 7/9 cast Aluminium
		M20 x 1,5	1" NPT	1" NPT
O	SPDT	O6B	OCB	OMB
	DPDT	O1B	OEB	OKB
Q	SPDT	Q6B	QCB	QMB
	DPDT	Q1B	QEB	QKB

AVAILABLE SWITCH MECHANISMS

Type of switch module ①	Max. Process Temp. ②	Switch ratings – A res. ③			Code
		24 V DC	240 V AC	120 V AC	
Micro switch	max 120 °C (250 °F)	6	15	15	B / Q ⑤
Micro switch	max 230 °C (450 °F)	10	15	15	C / O ⑤
Micro switch - DC current	max 120 °C (250 °F)	10	–	10	D
Micro switch with gold alloy contacts	max 120 °C (250 °F)	1	–	1	U
Hermetically sealed micro switch	max 260 °C (500 °F)	5	5	5	HS ④
Hermetically sealed micro switch with silver plated contacts	max 230 °C (450 °F)	3	1	1	W
Hermetically sealed micro switch with gold plated contacts	max 230 °C (450 °F)	0,5	0,5	0,5	X
Proximity switch - type SJ 3.5 SN	max 100 °C (210 °F)	NA	NA	NA	V
Pneumatic bleed type (open air)	max 200 °C (400 °F)	NA	NA	NA	J
Pneumatic non bleed type (closed circuit)	max 200 °C (400 °F)	NA	NA	NA	K
Hermetically sealed micro switch	max 260 °C (500 °F)	4	–	2,5	F
Hermetically sealed micro switch	max 260 °C (500 °F)	3	–	1	8

① For applications with heavy vibration, consult factory for suited switch modules.
② Max process temperature is specified at 40 °C (100 °F) ambient temperature and for non condensing applications.
③ For more details - see bulletin BE 42-120.
④ For condensing applications, max process temperature is down-rated to 200 °C (400 °F) @ 40 °C (100 °F) ambient.
⑤ Q and O are the equivalent switch modules for models C10/C15.

INSTALLATION

UNPACKING

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Inspect all components for damage. Report any concealed damage to the carrier withing 24 hours. Check the contents of the packing slip and report any discrepancies to the factory. Check the nameplate model number to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

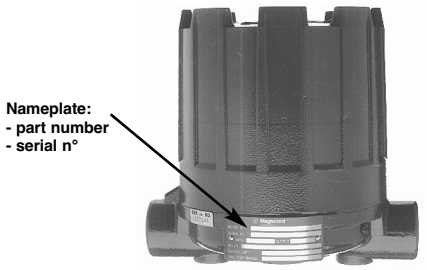
CAUTION: If re-shipping to another location, displacer assembly must again be secured using same strap and wire assembly.

After unpacking, inspect all components to see that no damage has occurred during shipment.

CE

These units are in conformity with the provisions of:

1. Directive 94/9/EC for Equipment or protective system for use in potentially explosive atmospheres. EC-type examination certificate number ISSeP01ATEX027X (intrinsic safe units) or ISSeP09ATEX024X (Ex d units).
2. The PED directive 97/23/EC (pressure equipment directive). Safety accessories per category IV module H1.



HANDLING

CAUTION: The threaded connection link protruding from the head assembly is extremely fragile. DO NOT handle or place in a position such that any amount of force is placed on the stem. Proper operation of the control requires that the stem is not damaged or bent.

MOUNTING

CAUTION: Displacer spring and stem are fragile. Do not drop displacers into tank. Hand feed cable into position to avoid bending stem.

Adjust the displacers on the displacer cable for the desired switch actuating levels. (Instruction tag attached to cable.) Screw displacer cable fitting to threaded connection link protruding from the underside of control.

Be sure there are no tubes, rods, or other obstacles in the tank or vessel to interfere with the operation of the displacers. No guides into the tank are necessary unless liquid turbulence is excessive, in which case a "guided pipe" or tube should be at least 25 mm larger than the displacer diameter, open at the bottom end and with several vent holes located above the maximum high level of the liquid.

Check installation of pipe or tube to be certain it is plumb.

***IMPORTANT:** Before attaching Magnetrol control to tank or vessel, check with level to see that tank mounting flange or spud is horizontal. Proper operation of the control depends on the switch housing being plumb.*

WIRING

NOTE: If control is equipped with pneumatic switch mechanism, disregard these instruction and refer to instruction bulletin on mechanism furnished for air (or gas) connections.

Most Magnetrol control switch housings are designed to provide 360° positioning of cable entry by loosening the set screw(s) located under the housing base. Diagrams of the control's internal electrical circuits (switching action between terminals) will be found in the switch mechanism instruction bulletin included.

On high temperature applications [above 120°C (250°F)] high temperature wire should be used between control and first junction box located in a cooler area. Supply wires (conductors) are brought into the switch housing, wrapped around the enclosing tube under the baffle plate and then brought up to the proper terminals. Excess wire should be positioned so as not to interfere with switch mechanism or housing cover.

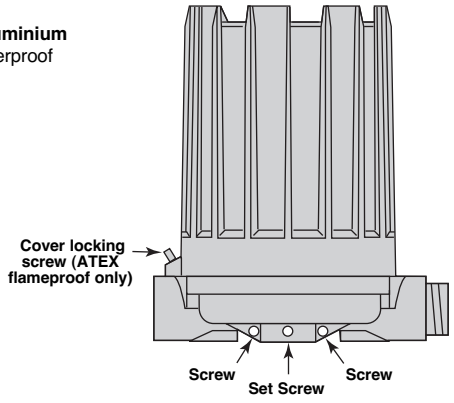
Some controls are furnished with an explosion proof (cast) switch housing or a vapor tight (gasketed) type. These housings are used in hazardous locations or when liquid temperature is so low that excessive condensation and frosting of switch parts is likely. After wiring connections have been completed, explosion proof housings must be "sealed" at the conduit outlet with suitable compound or "dope" to prevent entrance of air. Check cover to base fit on explosion proof and vapor tight housings to be certain gasketed joint is tight. A positive seal is necessary to prevent infiltration of moisture laden air or corrosive gases into switch housing.

Connect power supply to control and test switch action by varying liquid level. If switch mechanism fails to function, check vertical alignment of control and consult installation bulletin on mechanism furnished.

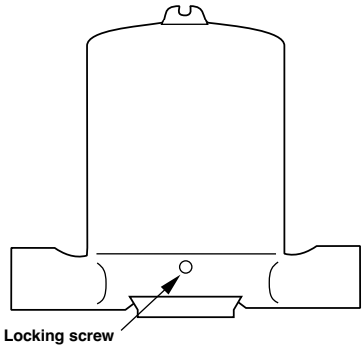
INSTALLATION

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES

Cast aluminium
- Weatherproof
- ATEX
- FM



Cast iron
- ATEX



CAUTION:
- *DO NOT attempt to reposition cast aluminium housings without loosening the set screws; cast iron ATEX housings MAY NOT BE REPOSITIONED. ALWAYS retighten the set screw(s) after repositioning.*
- *DO NOT attempt to unscrew the cover of ATEX flameproof housings before loosening the locking screw. ALWAYS retighten the locking screw after replacing the cover.*

PREVENTIVE MAINTENANCE

If the following sections on **"What to do"** and **"what to avoid"** are observed, your Magnetrol instrument will operate reliably.

WHAT TO DO

1. Keep control clean
Be sure the switch housing cover is always in place on the control. This cover is designed to keep dust and dirt from interfering with switch mechanism operation. In addition, it protects against damaging moisture and acts as a safety feature by keeping bare wires and terminals from being exposed. Should the housing cover become damaged or misplaced, order a replacement immediately.

2. Inspect switch mechanisms, terminals and connections monthly

– Dry contacts switches should be inspected for excessive wear on actuating lever or misalignment of adjustment screw at point of contact between screw and lever.

Such conditions can cause false switch actuating levels. Adjust switch mechanism to compensate (if possible) or replace switch.

DO NOT operate your control with defective or maladusted switch mechanisms (refer to bulletin on switch mechanism furnished for service instructions).

– Magnetrol controls may sometimes be exposed to excessive heat or moisture. Under such conditions, insulation on electrical wires may become brittle, eventually breaking or peeling away. The resulting "bare" wires can cause short circuits. Check wiring carefully and replace at first sign of brittle insulation.

– Vibration may sometimes cause terminal screws to work loose. Check all terminal connections to be certain that screws are tight. Air (or gas) operating medium lines, subjected to vibration, may eventually crack or become loose at connections causing leakage. Check lines and connections carefully and repair or replace, if necessary.

WHAT TO AVOID

1. **NEVER** leave switch housing cover of the control longer than necessary to make routing inspections.
2. **NEVER** use lubricants on pivots of switch mechanisms. A sufficient amount of lubricant has been applied at the factory to insure a lifetime of service. Further oiling is unnecessary and will only tend to attract dust and dirt which can interfere with mechanism operation.
3. **NEVER** attempt to make adjustments or replace switches without reading instructions carefully. Certain adjustments provided for in Magnetrol controls should not be attempted in the field. When in doubt, consult the factory or your local Magnetrol representative.
4. **NEVER** attempt to readjust magnetic attraction sleeves which are factory set. Tampering may cause failure of control while in service even though manual operation actuates switches.

TROUBLESHOOTING

Usually the first indication of improper operation is failure of the controlled equipment to function–pump will not start (or stop), signal lamps fail to light, etc. When these symptoms occur, whether at time of installation or during routing service thereafter, check the following external causes first.

– Fuses may be blown.
– Reset button(s) may need resetting.
– Power switch may be open.
– Controlled equipment may be faulty.
– Stem may be bent causing hang-up.
– Wiring (or medium lines) leading to control may be defective.

If a thorough inspection of these possible conditions fails to locate the trouble, proceed next to a check of the control's switch mechanism.

1. Pull disconnect switch or otherwise assure that electrical circuit(s) through the control is deactivated.
2. Remove switch housing cover.
3. Swing magnet assembly in and out by hand, checking carefully for any sign of binding. Assembly should require no force, however slight, to move it through its full swing.
4. If binding exists, magnet may be rubbing enclosing tube or pivot sockets may be overly tight. Readjust pivot sockets as required until a slight amount of side play is evident. If magnet is rubbing, loosen magnet clamp screw and shift magnet position.
5. If switch magnet assembly swings freely and mechanism still fails to actuate, check installation of control to be certain it is within the specified three (3°) degrees of vertical (use spirit level on side of enclosing tube in two places, 90° apart).

NOTE: As a matter of good practice, spare switches should be kept on hand at all times.

If switch mechanism is operating satisfactorily, a test of the complete control's performance is the next likely step.

1. Reconnect power supply and carefully actuate switch mechanism manually (using a non-conductive tool on electrical switch mechanism) to dertermine whether controlled equipment will operate.

CAUTION: With electrical power "on" care should be taken to avoid contact with switch leads and connections at terminal block

2. If controlled equipment responds to manual actuation test, trouble may be located in level sensing portion of the control (displacers, spring, stem and magnetic attracting sleeve.

NOTE: Check first to be certain liquid is entering tank or vessel. A valve may be closed or pipe line plugged.

3. With liquid in tank or vessel, proceed to check level sensing action by removing switch housing assembly.

CAUTION: Be certain to pull disconnect switch or otherwise assure that electrical circuit(s) through control is deactivated. Close operating medium supply valve on controls equipped with pneumatic switch mechanisms.

A. Disconnect wiring from supply side of switch mechanism(s) and remove electrical conduit or operating medium line connections to switch housing.

B. Relieve pressure from tank or vessel and allow unit to cool.

C. Remove switch housing assembly by loosening set screw located immediately below housing base.

4. With switch housing assembly removed, inspect attracting sleeve and inside of enclosing tube for excessive corrosion or solids build-up which could restrict movement, preventing sleeve from reaching field of switch magnet.

5. If trouble is still not located, proceed to remove the entire sensing unit from the tank or vessel by unbolting head flange or unscrewing mounting bushing. Inspect displacer assembly and all internal parts for any signs of damage. Check assembly for binding by supporting head flange or mounting bushing over the edge of a bench and move displacer assembly by hand.

NOTE: When in doubt about the condition or performance of a Magnetrol control, return it to the factory. See "Our Service Policy" on page 16.

AGENCY APPROVALS

Agency	*Approval*
ATEX	II 2G Ex d IIC T6 Gb, flameproof enclosure II 1G EEx ia IIC T6, intrinsically safe
CCE ①	Explosion proof and intrinsically safe
FM	Class I, Div. 1, Groups C & D Class II, Div. 1, Groups E, F & G, Type NEMA 7/9
FM/CSA ②	Non-Hazardous area
	Explosion proof area – Groups B, C, D, E, F & G Type NEMA 4X/7/9
IEC	Exd IIC T6
LRS	Lloyds Register of Shipping (marine applications)
Russian Authorisation Standards ②	
Other approvals are available, consult factory for more details	

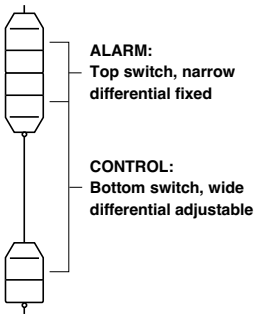
① For CCE approved units, use the ATEX model numbers.
② Consult factory for proper model numbers and classifications

OPERATING SEQUENCES

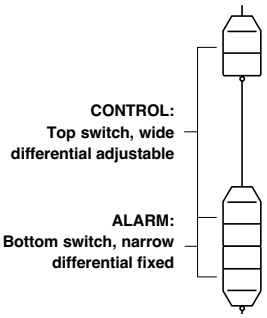
Series B10 units are factory calibrated with a choice of switch operating sequence.

When ordering B10 units, an operating sequence and specific gravity MUST be provided.

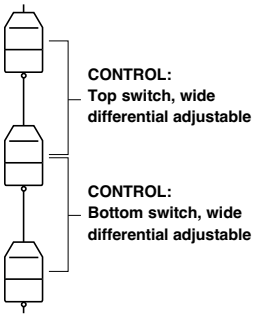
Series B 10



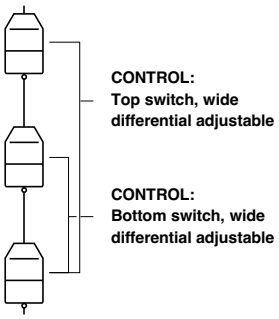
Arrangement N° 1



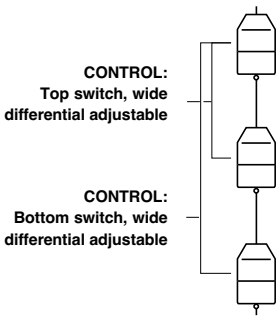
Arrangement N° 2



Arrangement N° 3

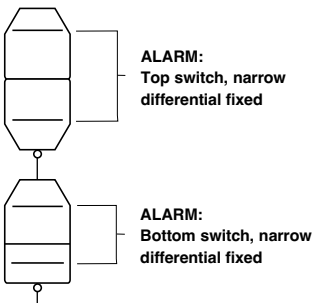


Arrangement N° 4



Arrangement N° 5

Series B 15

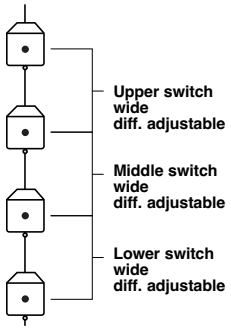


OPERATING SEQUENCES cont.

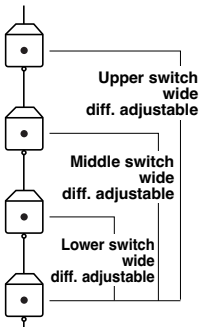
Series C10 units are factory calibrated with a choice of switch operating sequence.

When ordering C10 units, an operating sequence and specific gravity MUST be provided.

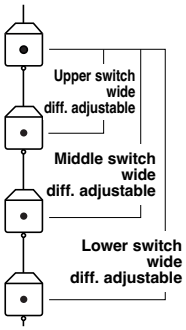
Series C 10



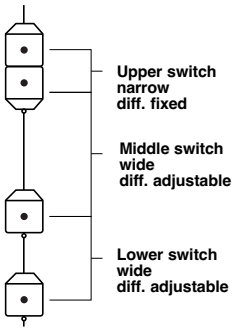
Arrangement A



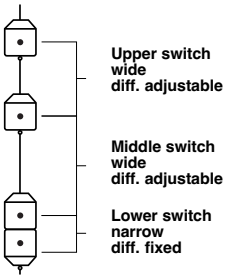
Arrangement B



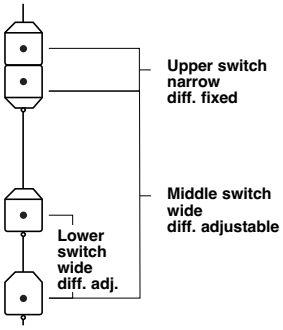
Arrangement C



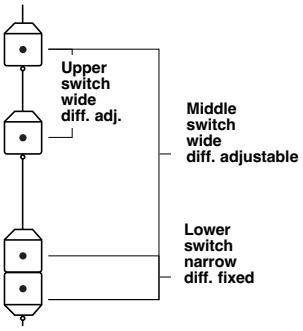
Arrangement D



Arrangement E

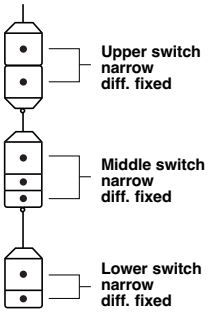


Arrangement F



Arrangement G

Series C 15

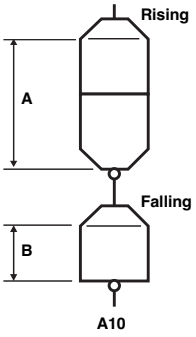


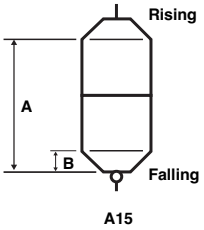
ACTUATING LEVELS

A10/A15

Standard actuating levels & liquid specific gravity – mm (divide by 25.4 for inch values).

Type	Liquid temp.		A10										A15											
			0.60		0.70		0.80		0.90		1.00		0.50		0.60		0.70		0.80		0.90		1.00	
	°C	°F	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Porcelain	40	100	135	38	104	30	81	28	64	25	51	23	–	–	130	53	114	43	99	43	89	38	81	36
	90	200	–	–	122	51	97	46	76	41	64	38	–	–	142	66	124	53	109	53	96	46	89	43
	150	300	–	–	–	–	109	61	86	53	74	48	–	–	–	–	132	61	114	58	104	53	94	48
	200	400	–	–	–	–	–	–	86	66	73	61	–	–	–	–	142	71	122	66	109	58	99	53
	260	500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	130	74	117	66	107	61
Stainless steel	40	100	178	61	135	51	104	46	79	41	61	36	137	51	114	41	99	36	86	30	76	28	69	25
	90	200	–	–	150	71	119	64	91	56	71	51	152	66	127	53	109	46	94	41	84	36	76	33
	150	300	–	–	–	–	130	79	102	69	81	61	163	76	135	61	117	53	102	46	91	43	81	38
	200	400	–	–	–	–	–	–	112	81	91	74	175	89	145	71	124	61	109	53	96	48	86	43
	260	500	–	–	–	–	–	–	–	–	99	84	–	–	155	81	132	71	117	61	104	56	94	50

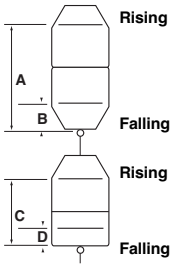




B15

Standard actuating levels & liquid specific gravity – mm (divide by 25.4 for inch values).

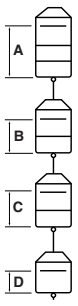
Type	Liquid temp.		B15															
			0.70				0.80				0.95				1.00			
	°C	°F	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
SST P.	40	100	–	–	–	–	–	–	–	–	140	50	94	25	127	43	89	20
SST	40	100	241	127	124	33	193	93	109	27	140	50	93	25	124	43	86	22
	90	200	–	–	–	–	208	109	127	45	152	68	107	38	137	55	102	38
	150	300	–	–	–	–	–	–	–	–	163	78	119	50	145	63	112	48
	200	400	–	–	–	–	–	–	–	–	–	–	–	–	155	73	124	60



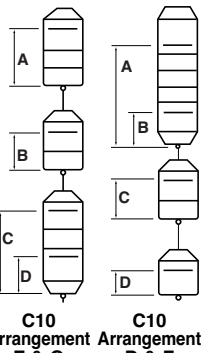
C10

Standard actuating levels & liquid specific gravity – mm (divide by 25.4 for inch values).

Model	Type	Liquid temp.		C10 – arrangements A, B, C, E, G, D & F																	
				0.58				0.60				0.70				0.80					
		°C	°F	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D		
C10 Arrgmt. A, B, C, E & G	Porc.	40	100	–	–	–	–	–	–	–	–	64	56	56	51	58	51	48	43		
		90	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
	SST	40	100	114	94	81	58	96	81	76	56	107	97	53	48	46	56	33	43		
		90	200	–	–	–	–	–	–	–	–	–	–	–	–	81	74	64	58		
		150	300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
C10 Arrgmt. D & F	Porc.	40	100	–	–	–	–	–	–	–	–	190	66	56	51	175	61	48	43		
		90	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
	SST	40	100	251	94	81	58	233	81	76	56	226	97	53	48	170	55	33	43		
		90	200	–	–	–	–	–	–	–	–	–	–	–	–	188	74	64	58		
		150	300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
				0.90				1.00				1.10				1.20					
				A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D		
C10 Arrgmt. A, B, C, E & G	Porc.	40	100	76	61	69	38	36	36	53	36	76	66	64	30	43	43	53	28		
		90	200	–	–	–	–	81	69	71	43	43	43	58	41	–	–	–	–		
	SST	40	100	79	81	64	38	33	48	46	33	79	81	64	33	41	56	48	30		
		90	200	91	91	43	51	43	58	28	46	–	–	–	–	–	–	–	–		
		150	300	86	76	61	69	41	46	43	61	–	–	–	–	–	–	–	–		
C10 Arrgmt. D & F	Porc.	40	100	168	71	69	38	132	46	53	36	155	76	64	30	127	53	53	28		
		90	200	–	–	–	–	157	79	71	43	132	53	58	41	–	–	–	–		
	SST	40	100	183	81	64	38	140	48	46	33	163	81	64	33	132	56	48	30		
		90	200	193	91	43	51	150	58	28	46	–	–	–	–	–	–	–	–		
		150	300	178	76	61	69	137	46	43	61	–	–	–	–	–	–	–	–		



C10 Arrangement A, B & C



C10 Arrangement E & G

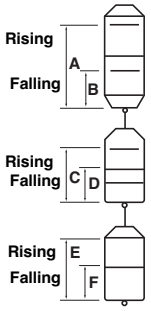
C10 Arrangement D & F

ACTUATING LEVELS cont.

C15

Standard actuating levels & liquid specific gravity – mm (divide by 25.4 for inch values).

Type	Liquid temp. °C (°F)	C15																	
		0.65						0.70						0.80					
		A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Porc.	-18°C to 54°C (0° to 130°F)	–	–	–	–	–	–	–	–	–	–	–	–	157	36	135	25	97	23
SST		196	56	155	51	124	36	170	41	140	41	117	33	165	50	132	41	109	28
		0.90						1.00						1.10					
Porc.		157	48	127	36	91	25	117	18	102	20	84	23	107	28	97	25	79	23
SST		168	66	132	46	102	30	117	25	102	25	91	28	–	–	–	–	–	–
		1.20						1.25											
Porc.		114	41	94	28	74	23	99	27	84	23	71	20						



C15

SPECIFIC GRAFITY LIMITS

A10/A15

Not for floating roof models.

P.N. code	Liquid temp. °C	Liquid temp. °F	Series A thru E, J & K switches Porcelain	Series A thru E, J & K switches SST
A10	40	100	0.60 to 1.20	0.60 to 1.20
	90	200	0.70 to 1.20	0.70 to 1.20
	150	300	0.80 to 1.20	0.80 to 1.20
	200	400	1.00 to 1.20	0.90 to 1.20
	260	500	1.10 to 1.20	1.00 to 1.20
A15	40	100	0.60 to 2.40	0.40 to 1.65
	90	200	0.62 to 2.40	0.40 to 1.65
	150	300	0.65 to 2.40	0.50 to 1.65
	200	400	0.70 to 2.40	0.55 to 1.65
	260	500	0.75 to 2.40	0.60 to 1.65

B10/B15

Not for floating roof models.

Part no. code	Liquid temp. °C	Liquid temp. °F	Series A thru E switches Porcelain	Series A thru E switches SST
B10	40	100	0.60 to 1.50	0.50 to 1.00
	90	200	0.64 to 1.50	0.50 to 1.00
	150	300	0.80 to 1.50	0.60 to 1.00
	200	400	1.00 to 1.50	0.72 to 1.00
	260	500	1.10 to 1.50	0.84 to 1.00
B15	40	100	0.95 to 1.20	0.70 to 1.20
	90	200	1.10 to 1.20	0.80 to 1.20
	150	300	–	0.90 to 1.20
	200	400	–	1.00 to 1.20
	260	500	–	1.04 to 1.20

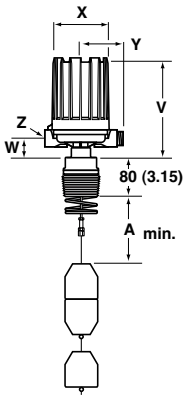
C10/C15

Part no. code	Liquid temp. °C	Liquid temp. °F	Series A thru E switches Porcelain	Series A thru E switches SST
C10	40	100	0.65 to 1.20	0.58 to 1.20
	90	200	0.95 to 1.10	0.76 to 1.00
	150	300	–	0.82 to 1.00
C15 ①	55	130	0.80 to 1.25	0.65 to 1.00

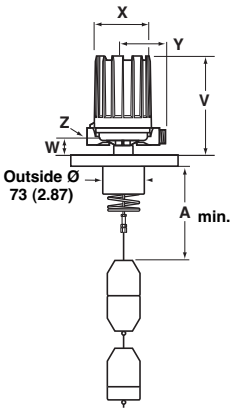
① Consult factory for high temperatures.

DIMENSIONS IN mm (inches)

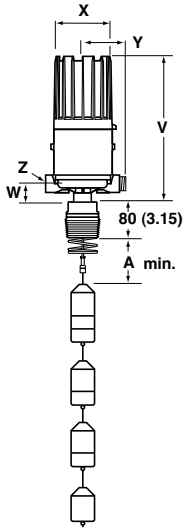
Models A10/A15/B10/B15
Threaded mounting



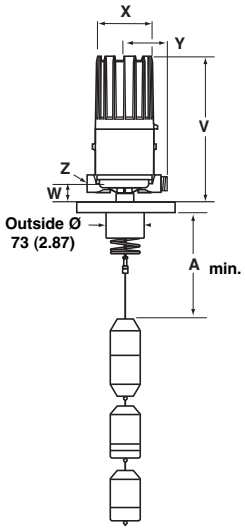
Models A10/A15/B10/B15
Flanged mounting



Models C10/C15
Threaded mounting



Models C10/C15
Flanged mounting



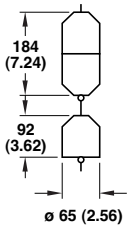
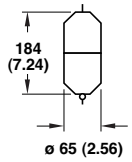
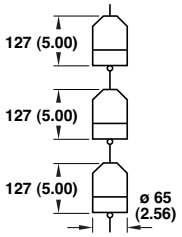
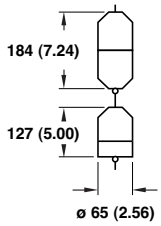
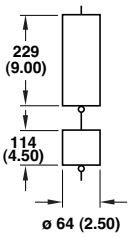
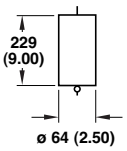
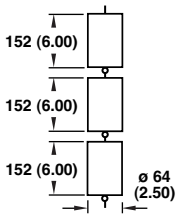
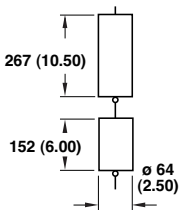
Housing type	Models	V		W		ø X		Y		Z
		mm	inches	mm	inches	mm	inches	mm	inches	
Weatherproof - FM (NEMA 7/9) - ATEX (Cast Alu)	A10	257	10.12	45	1.77	151	5.93	109	4.29	M20 x 1,5 (*) or 1" NPT (2 entries - 1 plugged) (*) not for FM (NEMA 7/9)
	A15 with HS-switch									
	B10									
	B15									
	A15 excl. HS-switch	202	7.94							
Weatherproof	C10 / C15	376	14.81							
ATEX (Cast Iron)	A10 / A15 / B10 / B15	249	9.80			143	5.63	110	4.33	M20 x 1,5 or 3/4" NPT (single entry - 2 entries at request)
Pneumatics Switch Module J	A10	216	8.50	39	1.54	118	4.65	110	4.33	1/4" NPT (1 entry)
	A15	165	6.50							
Pneumatics Switch Module K	A10	216	8.50					130	5.12	1/4" NPT (2 entries)
	A15	165	6.50							

Allow 200 mm (7.87") overhead clearance / All housings are 360 ° rotatable

Min. distance between mounting connection and top of displacer		A			
		Threaded		Flanged	
Models	Displacer Type	mm	inches	mm	inches
A10	Porcelain	127	5.00	178	7.00
	Stainless steel	121	4.75	171	6.75
A15	Porcelain	143	5.62	194	7.62
	Stainless steel	143	5.62	194	7.62
B10	Porcelain	124	4.88	175	6.88
	Stainless steel	121	4.75	171	6.75
B15	Porcelain	140	5.50	191	7.50
	Stainless steel	149	5.88	200	7.88
C10	Porcelain	162	6.38	213	8.38
	Stainless steel	146	5.75	197	7.75
C15	Porcelain	197	7.75	248	9.75
	Stainless steel	184	7.25	235	9.25

DIMENSIONS IN mm (inches) cont.

Models A10/A15/B10/B15 - Standard models

	A10	A15	B10	B15
Porcelain				
Stainless steel				

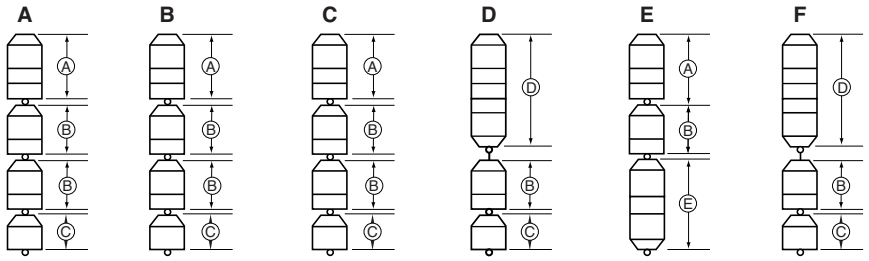
Models C10 & C15 - Standard models

C10 operating sequence

C15 operating sequence

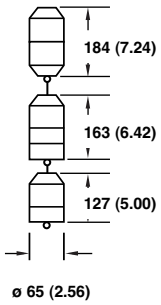
Porcelain

Arrangements (see page 9)



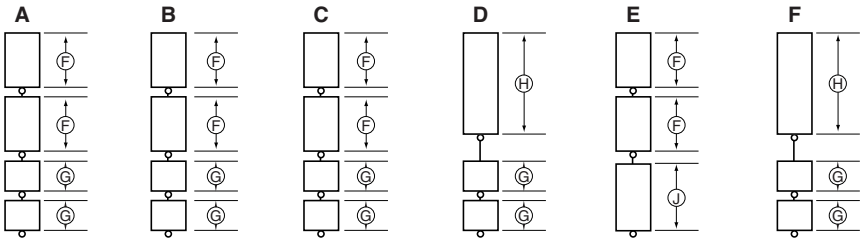
Ⓐ 163 (6.42) Ⓑ 127 (5.00) Ⓒ 92 (3.62) Ⓓ 291 (11.44) Ⓔ 219 (8.64)

Note: All displacers ø 65 (2.56).



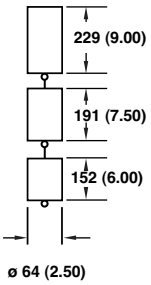
Stainless steel

Arrangements (see page 9)



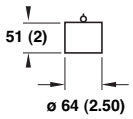
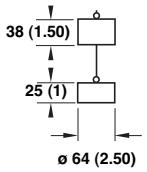
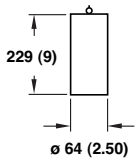
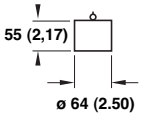
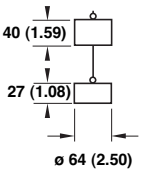
Ⓕ 152 (6.00) Ⓖ 114 (4.50) Ⓗ 305 (12.00) Ⓙ 229 (9.00)

Note: All displacers ø 64 (2.50).



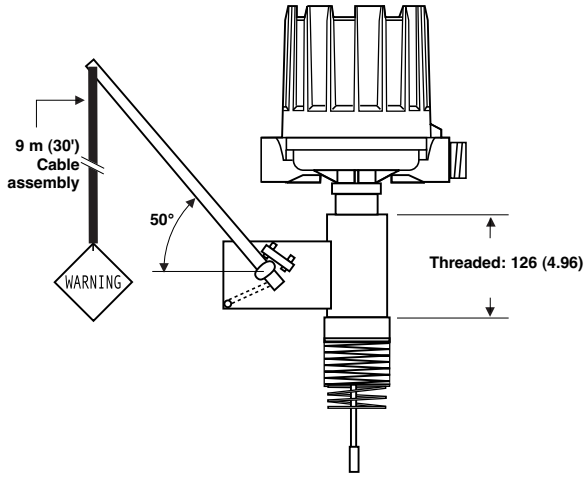
DIMENSIONS IN mm (inches) cont.

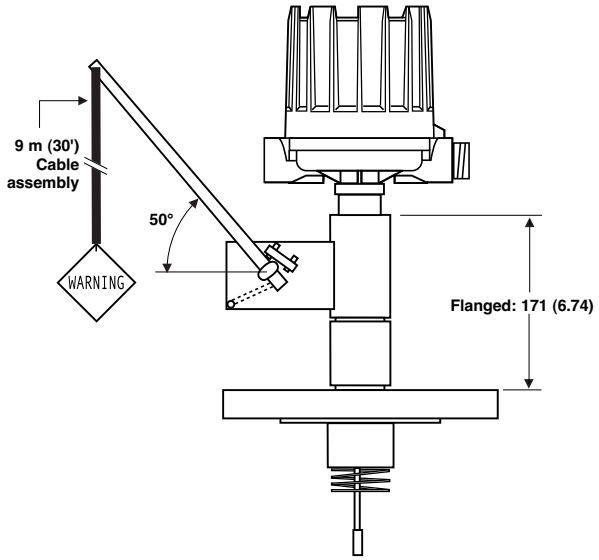
Models A15/B15 - Floating roof models

	A15	B15
Brass		
Hollow Brass		
Stainless steel		

DIMENSIONS IN mm (inches) cont.

Proof-er®





REPLACEMENT PARTS

Partn°: | | | | | | | | | | |

Serial n°: | | | | | | | | | | |

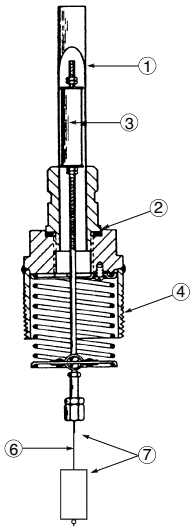
Digit in partn°: | X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

X = product with a specific customer requirement

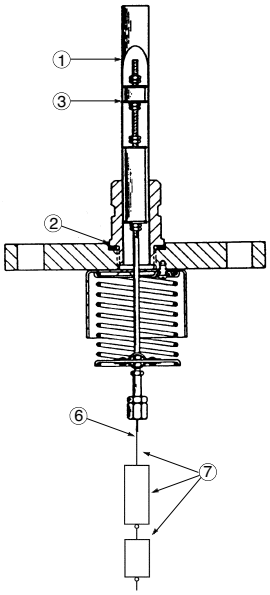
See nameplate, always provide complete partn° and serial n° when ordering spares.

CAUTION:

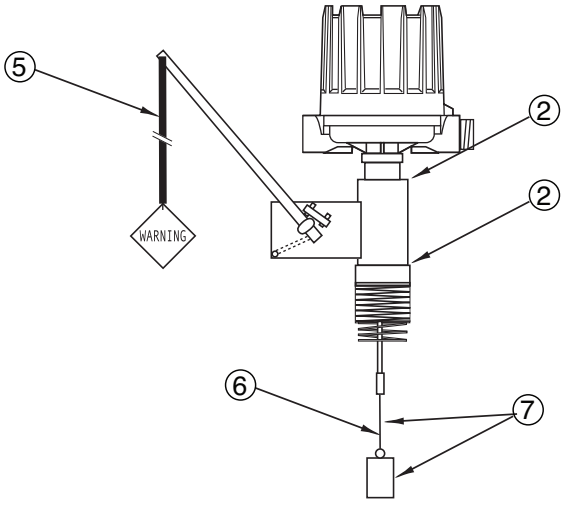
Location of magnetic sleeve(s) must be maintained for proper switch actuation. Do NOT attempt to alter differential of control by repositioning jam nuts.



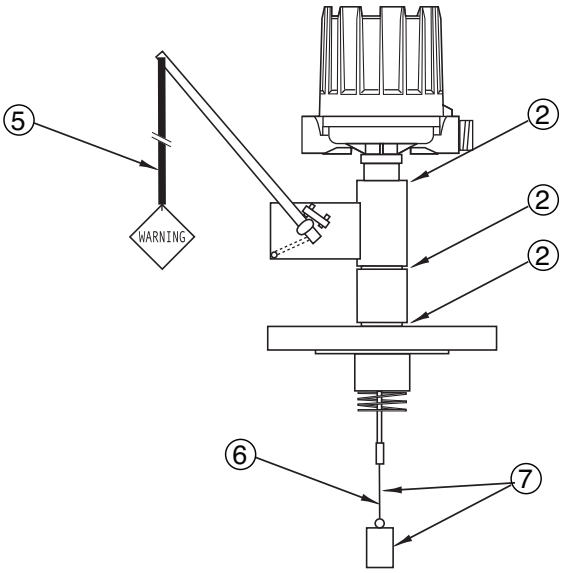
Typical single switch model
(threaded connection)



Typical dual switch model
(flanged connection)



Typical model with Proof-er and floating roof displacer
(threaded connection)



Typical model with Proof-er and floating roof displacer
(flanged connection)

REPLACEMENT PARTS cont.

Switch and housing reference

Switch type	Bulletin
B, C, D, U, F, O, Q, W, X	BE 42-783
HS	BE 42-794
J	BE 42-685
K	BE 42-686

Housing	BE 42-780

(1) Enclosing tube				
Housing type	Replacement part			
	Model (digits 1, 2 & 3)			
	A10	A15	B10 or B15	C10 or C15
Cast aluminium housing for electric switch	032-6302-037	032-6302-036	032-6302-037	032-6302-039
Cast iron housing for electric switch	032-6344-001			not applicable
Pneumatic switch housing	032-6302-037	032-6302-036	not applicable	

	Replacement part
(2) Enclosing tube gasket	012-1301-002
(4) Mounting bushing	consult factory
(5) Proof-er cable kit [cable length = 9 m (30 ft)]	089-5807-001

(3) Spring, stem and attraction sleeve kit					
Digit 4	Digit 7	Replacement part			
		Model (digits 1, 2 & 3)			
		A10	A15	B10 or B15	C10 or C15
A, E, F or L	A or B	089-5327-001	089-5325-001	consult factory	
B, D or K		089-5328-001	089-5326-001		
all	all except A and B	consult factory			

(6) Cable kit [cable length = 3 m (10 ft)]						
Digit 4	Replacement part					
	Model (digits 1, 2 & 3)					
	A10	A15	B10	B15	C10	C15
A, B, D, K or L	089-5802-002	089-5802-001	089-5802-003	089-5802-002	089-5802-004	089-5802-003
E	089-5804-002	089-5804-001	089-5804-003	089-5804-002	089-5804-004	089-5804-003
F	089-5803-002	089-5803-001	089-5803-003	089-5803-002	089-5803-004	089-5803-003

(7) Displacer + cable kit [cable length = 3 m (10 ft)]							
Digit 4	Digit 7	Replacement part					
		Model (digits 1, 2 & 3)					
		A10	A15	B10	B15	C10	C15
A, B, D, K or L	A, D or G	089-6141-001	089-6142-001	089-6143-001	089-6144-001	089-6153-001	089-6156-001
	B, E or H	089-6149-001	089-6150-001	089-6151-001	089-6152-001	089-6155-001	089-6158-001
	M or N	not applicable	consult factory	not applicable	consult factory	not applicable	
	P or Q		089-6177-004		089-6177-005		
	R or T		089-6177-001		not applicable		
E or F	all	consult factory					

IMPORTANT

SERVICE POLICY

Owners of Magnetrol products may request the return of a control; or, any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) ***other than transportation cost*** if:

a. Returned within the warranty period; and,
b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.
In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.
No claims for misapplication, labour, direct or consequential damage will be allowed.

RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a “Return Material Authorisation” (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol’s local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number and Ref Number
4. Desired Action
5. Reason for Return
6. Process details

Any unit that was used in a process must be properly cleaned in accordance with the proper health and safety standards applicable by the owner, before it is returned to the factory.
A material Safety Data Sheet (MSDS) must be attached at the outside of the transport crate or box.
All shipments returned to the factory must be by prepaid transportation. Magnetrol ***will not accept*** collect shipments.
All replacements will be shipped Ex Works.

BULLETIN N°: BE 45-610.12
EFFECTIVE: APRIL 2012
SUPERSEDES: May 2005

Magnetrol®

www.magnetrol.com

BENELUX FRANCE	Heikensstraat 6, 9240 Zele, België -Belgique Tel. +32 (0)52.45.11.11 • Fax. +32 (0)52.45.09.93 • E-Mail: info@magnetrol.be
DEUTSCHLAND	Alte Ziegelei 2-4, D-51491 Overath Tel. +49 (0)2204 / 9536-0 • Fax. +49 (0)2204 / 9536-53 • E-Mail: vertrieb@magnetrol.de
INDIA	C-20 Community Centre, Janakpuri, New Delhi - 110 058 Tel. +91 (11) 41661840 • Fax +91 (11) 41661843 • E-Mail: info@magnetrolindia.com
ITALIA	Via Arese 12, I-20159 Milano Tel. +39 02 607.22.98 • Fax. +39 02 668.66.52 • E-Mail: mit.gen@magnetrol.it
U.A.E.	DAFZA Office 5EA 722 • PO Box 293671 • Dubai Tel. +971-4-6091735 • Fax +971-4-6091736 • E-Mail: info@magnetrol.ae
UNITED KINGDOM	Unit 1 Regent Business Centre, Jubilee Road Burgess Hill West Sussex RH 15 9TL Tel. +44 (0)1444 871313 • Fax +44 (0)1444 871317 • E-Mail: sales@magnetrol.co.uk