

# External Cage Displacer Actuated

Installation and Operating Manual



*Liquid*

*Level*

*Switches*

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## Read this Manual Before Installing

This manual provides information on the External Cage Displacer Liquid Level Switch. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the Installation section of this manual.

## Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

### NOTES

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

### Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

### WARNINGS

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

### Safety Messages

Follow all standard industry procedures for servicing electrical equipment when working with or around high voltage. Always shut off the power supply before touching any components.

**WARNING!** Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

## Low Voltage Directive

For use in Installation Category II, Pollution Degree 2. If equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

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Performance specifications are effective with date of issue and are subject to change without notice. Magnetrol reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol makes no warranty with respect to the accuracy of the information in this manual.

## Warranty

All Magnetrol mechanical level and flow controls are warranted free of defects in materials or workmanship for five full years from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol products.

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Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.





# External Cage Displacer Actuated Liquid Level Switches

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## 1.0 Introduction

Displacer actuated external cage liquid level switches are designed for service pressures up to 5000 psig (345 bar) and liquids with specific gravities of 0.40 and above.

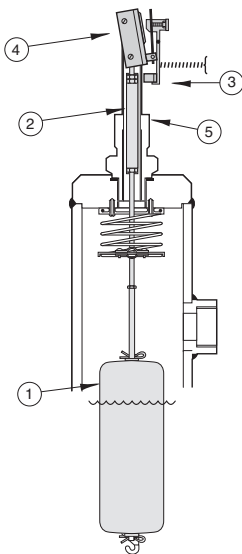


Figure 1

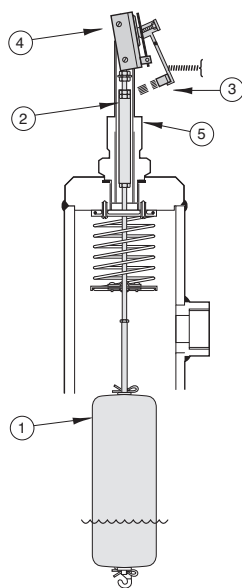


Figure 2

## 1.1 Principle of Operation

The design of displacer operated level switches is based upon the principle that a magnetic field will not be affected by non-magnetic materials such as 316 stainless steel. In this case, the displacer moves a magnetic attraction sleeve within a non-magnetic enclosing tube and actuates a magnetic switch mechanism. The enclosing tube provides a pressure seal to the chamber and therefore to the process.

## 1.2 Operating Cycle

The weight of the displacer ① is supported by the spring. Rising liquid level imparts buoyancy forces on the displacer allowing the spring to compress. The attraction sleeve ② attached to the spring, moves upward into the field of a permanent magnet ③. The movement of the magnet toward the sleeve causes the switch ④ to actuate. A non-magnetic barrier tube ⑤ provides a static pressure boundary between the switch mechanism and the displacer assembly. As the liquid level falls, the displacer lowers, moving the attraction sleeve out of the magnetic field of the switch mechanism. This allows the switch to again change position and to break or make. See Figures 1 and 2.

## 2.0 Installation

**Caution:** If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired

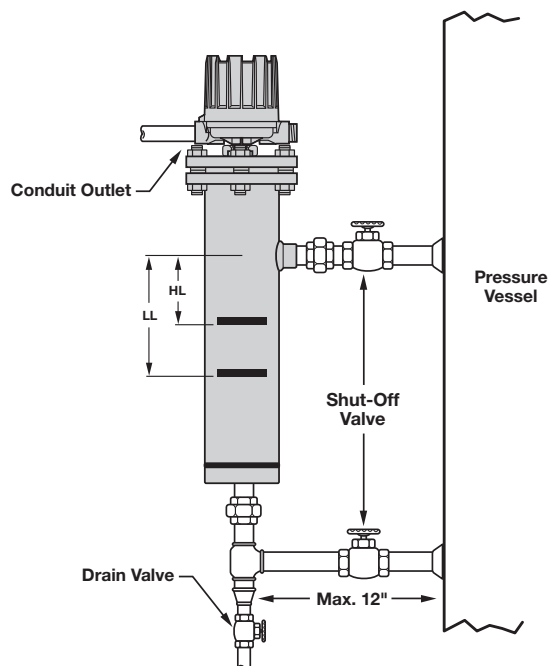
## 2.1 Unpacking

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

## 2.2 Critical alarm function

It is recommended that for critical alarm functions, an additional level switch be installed as a high-high or low-low level alarm for maximum protection.

## 2.3 Piping



**Figure 3**  
Typical Piping Arrangement

Figure 3 shows a typical piping installation of a displacer control to a pressure vessel. An instruction tag secured to the control gives dimensional data on switch actuating levels referenced from center line of upper side tank connection. Position control so that actuating levels correspond with the desired liquid level trip points in process vessel.

Use pipe of sufficient strength to support the control. If necessary, provide a stand or hanger to help support its weight. All piping should be straight and free of “low spots” or “pockets” so that lower liquid line will drain towards the vessel and upper vapor line will drain toward the control. Shut-off valves are recommended for installation between the vessel and the control. If control is to be used with a low temperature liquid (one which will “boil” in the float chamber if outside heat is absorbed), the chamber and piping should be insulated. Such boiling in the chamber will cause false level indications.

**DO NOT INSULATE SWITCH MECHANISM HOUSING.**

On controls equipped with pneumatic switch assemblies, consult bulletin on mechanism furnished for air (or gas) piping instructions.

| Switch Series Letter | Description                     | Bulletin No. |
|----------------------|---------------------------------|--------------|
| B, C, D              | Dry Contact Switch              | 42-683       |
| F, 8                 | Hermetically Sealed Snap Switch | 42-799       |
| HS                   | Hermetically Sealed Snap Switch | 42-694       |
| J                    | Bleed Type Pneumatic Switch     | 42-685       |
| K                    | Non-Bleed Type Pneumatic Switch | 42-686       |

## 2.4 Mounting

**Caution:** This instrument is intended for use in Installation Category II, Pollution Degree 2

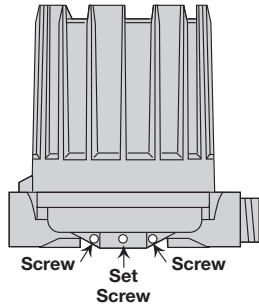
Adjust piping as required to bring control to a vertical position. Magnetrol controls must be mounted within three degrees of vertical in all directions. A three degree slant is noticeable by eye, but installation should be checked with a spirit level on top and/or sides of float chamber.

Controls should be mounted as close to the vessel as possible. This will result in a more responsive and accurate level change in the control. Liquid in a long line may be cooler and more dense than liquid in the vessel causing lower level indication in the control than actual level in the vessel.

## 2.5 Wiring

**Caution:** All displacer actuated units are shipped from the factory with the enclosing tube tightened and the switch housing set screw locked to the enclosing tube. Failure to loosen the set screw prior to repositioning the supply and output connections may cause the enclosing tube to loosen, resulting in possible leakage of the process liquid or vapor.

Displacer actuated controls are shipped with the conduit entry of the switch housing placed 180° opposite the tank connections to simplify installation in most cases. If this configuration is appropriate to the installation, proceed to Step 4 to begin wiring the unit. If another configuration is desired, the switch housing can be easily rotated by first following Steps 1, 2, and 3.



**Figure 4**  
**Housing Set Screws**

**NOTE:** A switch or circuit breaker shall be installed in close proximity to equipment and within easy reach of operator. It shall be marked as the disconnecting device for equipment.

1. Loosen set screw(s) at base of switch housing. Refer to Figure 4.
2. Switch housing may be rotated 360° to allow correct positioning of conduit outlet.
3. Tighten set screw(s) at base of switch housing.
4. Unscrew and remove switch housing cover. The threads have been lubricated to facilitate removal.

**NOTE:** For supply connections in installations with ambient temperature up to +70° C, use wire with a minimum rating of +75° C as required by the process conditions. Installations with ambient temperatures up to +80° C require wire with a minimum rating of +85° C as required by the process conditions. Use a minimum of 14 AWG wire for power and ground field wires.

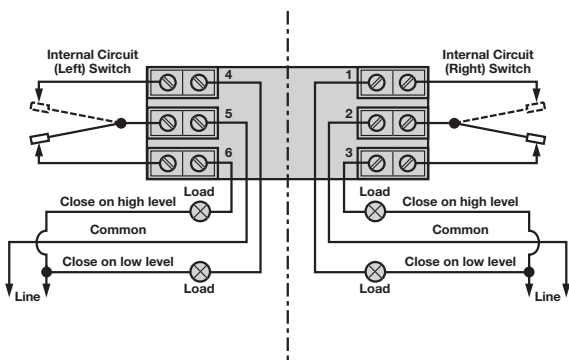
**NOTE:** On high temperature applications (above +250° F [+121° C] in float chamber), high temperature wire should be used between control and first junction box located in a cooler area.

**NOTE:** Housing must be grounded via protective ground screw in base of housing.

5. The switch terminals are located next to the conduit outlet to facilitate wiring. Bring supply wires through conduit outlet. Route extra wire around enclosing tube under the baffle plate, and connect them to the proper terminals. Refer to the wiring diagram, Figure 5, or your switch bulletin for this information.
6. Dress wiring to ensure no interference or contact with switch, or replacement of switch housing cover.

**OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.**

Prevent moisture seepage into the enclosure by installing approved seal-drain fittings in the conduit run leading into the unit.



**Figure 5**  
**Terminal Connections**  
**DPDT Switch Mechanism**  
**Series B, C, D, F and 8**

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**Caution:** In hazardous areas, do not power the unit until the conduit is sealed and the enclosure cover is screwed down securely.

7. Replace housing cover.
8. If control has been furnished with an explosion proof or moisture proof switch housing, it must be sealed at the conduit outlet with a suitable compound or non-hardening sealant to prevent entrance of air.
9. Test switch action by varying liquid level in float chamber.

**NOTE:** If switch mechanism fails to function properly, check vertical alignment of control housing and consult installation bulletin on switch mechanism furnished.

10. Check cover to base fit to be certain gasketed joint is tight. A positive seal is necessary to prevent infiltration of moisture laden air or corrosive gasses into switch housing.

## **3.0 Preventive Maintenance**

Periodic inspections are a necessary means to keep your level control in good working order. This control is a safety device to protect the valuable equipment it serves. Therefore, a systematic program of “preventive maintenance” must be implemented when the control is placed into service. If the following sections on “what to do” and “what to avoid” are observed, your control will provide reliable protection of your equipment for many years.

### **3.1 What to do**

#### **3.1.1 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 or any seals become damaged or misplaced, obtain a replacement immediately.

#### **3.1.2 Inspect switch mechanisms, terminals, and connections monthly**

1. Switches should be inspected for excessive wear on actuating lever or misalignment of adjustment screw at point of contact between screw and lever. Such wear can cause false switch actuating levels. See switch mechanism bulletin supplied with control should switch adjustment or replacement be necessary.

- 
2. DO NOT operate your control with defective or mal-adjusted switch mechanisms (refer to bulletin on switch mechanisms furnished for service instructions.)
  3. Level controls may sometimes be exposed to excessive heat or moisture. Under such conditions, insulation on electrical wiring may become brittle, eventually breaking or peeling away. The resulting “bare” wires can cause short circuits.

Check wiring carefully and replace at the first sign of brittle insulation.

4. Vibration may sometimes cause terminal screws to work loose. Check all terminal connections to be certain that screws are tight.
5. On units with pneumatic switches, air (or gas) 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.

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

### 3.1.3 Inspect entire unit periodically

Isolate control from vessel. Raise and lower liquid level to check for switch contact and reset.

## 3.2 What to avoid

1. Never leave switch housing cover off the control longer than necessary to make routine inspections.
2. Never place a jumper wire across terminals to “cut-out” the control. If a “jumper” is necessary for test purposes, be certain it is removed before placing control into service.
3. Never attempt to make adjustments or replace switches without reading instructions carefully. Certain adjustments provided for in level controls should not be attempted in the field. When in doubt, consult the factory or your local representative.
4. Never use lubricants on pivots of switch mechanisms. A sufficient amount of lubricant has been applied at the factory to ensure a lifetime of service. Further oiling is unnecessary and will only tend to attract dust and dirt which can interfere with mechanism operation.



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## 4.0 Reference Information

### 4.1 Troubleshooting

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

- a. Fuses may be blown.
- b. Reset button(s) may need resetting.
- c. Power switch may be open.
- d. Controlled equipment may be faulty.
- e. Wiring 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.

#### 4.1.1 Check switch mechanism

1. Pull disconnect switch or otherwise disconnect power to the control.
2. Remove switch housing cover.
3. Disconnect power wiring from switch assembly.
4. Swing magnet assembly in and out by hand to check carefully for any sign of binding. Assembly should require minimal force to move it through its full swing.
5. If binding exists, magnet may be rubbing enclosing tube. If magnet is rubbing, loosen magnet clamp screw and shift magnet position. Retighten magnet clamp screw.
6. 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 degrees of vertical. Use spirit level on side of enclosing tube in two places, 90° apart. Refer to Figure 3 on page 5.
7. Check microswitch continuity with ohmmeter. If switch is damaged, replace it immediately
8. If switch mechanism is operating satisfactorily, proceed to check sensing unit.

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#### 4.1.2 Check sensing unit

1. Check to be certain liquid is entering float chamber. A valve may be closed or piping plugged.
2. With liquid in chamber, proceed to check level sensing action by removing switch housing assembly and enclosing tube.

**Caution:** Unit must be normalized to atmospheric pressure before removing enclosing tube.

3. Inspect attraction sleeve and inside of enclosing tube for excessive corrosion or solids build-up which could restrict movement, preventing sleeve from reaching field of magnet.
4. Never change the settings of the jam nuts which position the attraction sleeve.
5. If control has a flanged cage, remove parting flange. Check spring and displacer assembly for freedom of movement. Check for collapsed or liquid filled displacer. If displacer is determined to be filled or collapsed, contact the factory.

| Model    | Flange Bolting | Enclosing Tube |
|----------|----------------|----------------|
| C74      | 180–200 ft-lbs | 220–225 ft-lbs |
| H15      | 135–150 ft-lbs |                |
| H32, H52 | 285–320 ft-lbs |                |

#### 4.1.3 Check complete unit

Reassemble unit. Reconnect power supply and carefully actuate switch mechanism manually (using a non-conductive tool) to determine 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.

If all components in the control are in operating condition, the trouble must be (and should be) located external to the control. Repeat inspection of external conditions previously described.

**NOTE:** If difficulties are encountered which cannot be identified, consult the factory or your local representative for assistance. A complete description of the trouble should be provided along with information concerning your piping and mounting arrangement, plus a description of your operating sequence. Sketches or photographs showing the installation are also beneficial.

When communicating about your control, be certain to always specify the complete Model and Serial numbers.

## 4.2 Agency Approvals

| Agency  | Approved Model   | Area Classification   |
|---|--|---|
| <b>FM</b><br>              | All with an electric switch mechanism and a housing listed as TYPE 4X/7/9                          | Class I, Div 1, Groups C & D<br>Class II, Div 1, Groups E, F & G    |
|   | All with an electric switch mechanism and a housing listed as TYPE 4X/7/9 Class I, Div 1, Group B  | Class I, Div 1, Groups B, C & D<br>Class II, Div 1, Groups E, F & G |
| <b>CSA</b><br>             | All with a Series F, HS, or 8 electric switch mechanism and a housing listed as CSA TYPE 4X        | Class I, Div 2, Groups B, C & D                                     |
|   | All with an electric switch mechanism and a housing listed as TYPE 4X/7/9                          | Class I, Div 1, Groups C & D<br>Class II, Div 1, Groups E, F & G    |
|   | All with an electric switch mechanism and a housing listed as TYPE 4X/7/9 Class I, Div 1, Group B  | Class I, Div 1, Groups B, C & D<br>Class II, Div 1, Groups E, F & G |
| <b>ATEX / IEC Ex</b> ①<br> | All with an electric switch mechanism and an ATEX housing  | ATEX II 2 G EEx d IIC T6<br>94/9/EC<br>IEC Ex Ex d IIC T6<br>IP 66  |
| <b>CE</b><br>              | Low Voltage Directives 2006/95/EC<br>Per Harmonized Standard:<br>EN 61010-1/1993 & Amendment No. 1 | Installation Category II<br>Pollution Degree 2                      |

① IEC Installation Instructions:

The cable entry and closing devices shall be Ex d certified suitable for the conditions of use and correctly installed.

For ambient temperatures above +55° C or for process temperatures above +150° C, suitable heat resistant cables shall be used.

Heat extensions (between process connection and housing) shall never be insulated.

**Special conditions for safe use:**

When the equipment is installed in process temperatures higher than +85° C the temperature classification must be reduced according to the following table as per IEC60079-0.

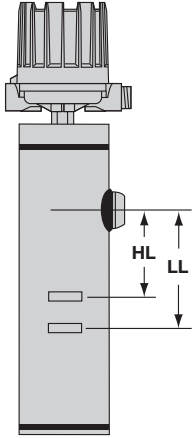
| Maximum Process Temperature | Temperature Classification |
|-----------------------------|----------------------------|
| < 85° C                     | T6                         |
| < 100° C                    | T5                         |
| < 135° C                    | T4                         |
| < 200° C                    | T3                         |
| < 300° C                    | T2                         |
| < 450° C                    | T1                         |

These units are in conformity with IECEx KEM 05.0020X  
Classification Ex d IIC T6  
T<sub>ambient</sub> -40° C to +70° C

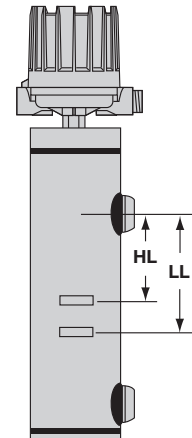
## 4.3 Specifications

### 4.3.1 Actuation Levels – Sealed Cage Design

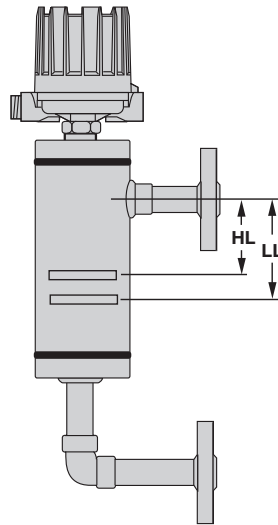
inches (mm)



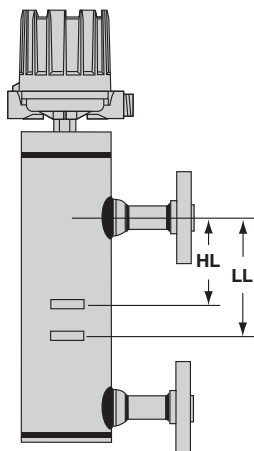
Sealed Chamber w/NPT or Socket weld  
Side/Bottom Connections  
(B74, H13, H31, H51)



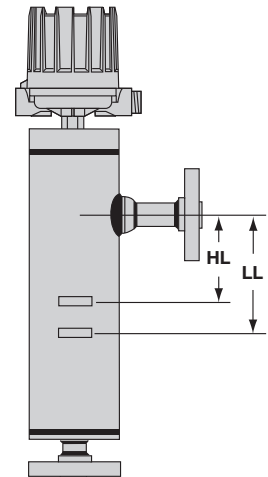
Sealed Chamber w/NPT or Socket weld  
Side/Side Connections  
(H13, H31, H51)



Sealed Chamber  
Side/Side Flange Connections  
(B74 only)



Sealed Chamber  
Side/Side Flange Connections  
(H13, H31, H51)



Sealed Chamber  
Side/Bottom Flange Connections  
(B74, H13, H31, H51)

## 4.3 Specifications

### 4.3.1 Actuation Levels – Sealed Cage Design

inches (mm)

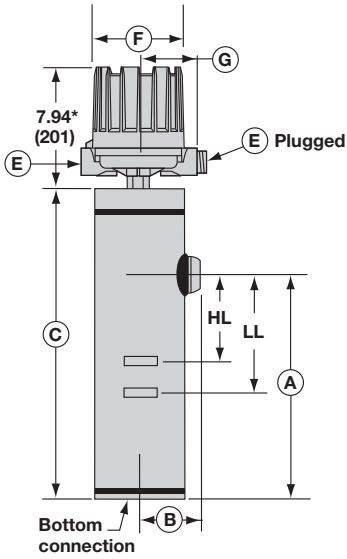
|            |                      | Specific Gravity |            |            |            |            |            |            |             |            |             |             |             |            |             |
|------------|----------------------|------------------|------------|------------|------------|------------|------------|------------|-------------|------------|-------------|-------------|-------------|------------|-------------|
|            |                      | 0.40             |            | 0.50       |            | 0.60       |            | 0.70       |             | 0.80       |             | 0.90        |             | 1.00       |             |
| Model Code | Process Temp °F (°C) | HL               | LL         | HL         | LL         | HL         | LL         | HL         | LL          | HL         | LL          | HL          | LL          | HL         | LL          |
| B74        | 100 (38)             | 1.30 (33)        | 4.77 (121) | 2.17 (55)  | 5.00 (127) | 2.73 (69)  | 5.16 (131) | 3.13 (80)  | 5.28 (134)  | 3.44 (87)  | 5.37 (136)  | 3.67 (93)   | 5.45 (138)  | 3.86 (98)  | 5.51 (140)  |
|            | 200 (93)             | 1.24 (31)        | 4.70 (119) | 2.13 (54)  | 4.95 (126) | 2.70 (69)  | 5.11 (130) | 3.11 (79)  | 5.24 (133)  | 3.42 (87)  | 5.34 (136)  | 3.66 (93)   | 5.41 (137)  | 3.85 (98)  | 5.48 (139)  |
|            | 300 (149)            | 1.18 (30)        | 4.62 (117) | 2.09 (53)  | 4.88 (124) | 2.67 (68)  | 5.06 (129) | 3.09 (78)  | 5.19 (132)  | 3.40 (86)  | 5.30 (135)  | 3.64 (92)   | 5.38 (137)  | 3.84 (98)  | 5.45 (138)  |
| H13        | 100 (38)             | 5.09 (129)       | 9.04 (230) | 6.26 (159) | 9.50 (241) | 7.04 (179) | 9.81 (249) | 7.59 (193) | 10.03 (255) | 8.01 (203) | 10.20 (259) | 8.33 (212)  | 10.33 (262) | 8.59 (218) | 10.43 (265) |
|            | 200 (93)             | 4.73 (120)       | 8.63 (219) | 5.97 (152) | 9.17 (233) | 6.79 (172) | 9.54 (242) | 7.38 (187) | 9.80 (249)  | 7.82 (199) | 9.99 (254)  | 8.17 (208)  | 10.14 (258) | 8.44 (214) | 10.27 (261) |
|            | 300 (149)            | 4.31 (109)       | 8.15 (207) | 5.63 (143) | 8.79 (223) | 6.51 (165) | 9.22 (234) | 7.14 (181) | 9.53 (242)  | 7.62 (194) | 9.76 (248)  | 7.98 (203)  | 9.93 (252)  | 8.28 (210) | 10.08 (256) |
|            | 400 (204)            | 4.06 (103)       | 7.69 (195) | 5.25 (133) | 8.31 (211) | 6.19 (157) | 8.81 (224) | 6.88 (175) | 9.19 (233)  | 7.38 (187) | 9.50 (241)  | 7.75 (197)  | 9.69 (246)  | 8.06 (205) | 9.88 (251)  |
|            | 500 (260)            | n/a              | n/a        | 4.81 (122) | 7.88 (200) | 5.81 (148) | 8.44 (214) | 6.56 (167) | 8.88 (226)  | 7.06 (179) | 9.19 (233)  | 7.50 (191)  | 9.44 (240)  | 7.88 (200) | 9.63 (245)  |
| H31        | 100 (38)             | 3.06 (78)        | 6.50 (165) | 4.63 (118) | 7.44 (189) | 5.69 (145) | 8.06 (205) | 6.44 (164) | 8.50 (216)  | 6.94 (176) | 8.88 (226)  | 7.38 (187)  | 9.13 (232)  | 7.75 (197) | 9.31 (236)  |
|            | 200 (93)             | n/a              | n/a        | 4.06 (109) | 6.81 (181) | 5.19 (138) | 7.56 (198) | 6.00 (157) | 8.06 (211)  | 6.56 (171) | 8.44 (219)  | 7.06 (1.83) | 8.75 (227)  | 7.44 (192) | 9.00 (232)  |
|            | 300 (149)            | n/a              | n/a        | 3.38 (86)  | 6.19 (157) | 4.63 (118) | 7.00 (178) | 5.50 (140) | 7.56 (192)  | 6.19 (157) | 8.06 (205)  | 6.69 (170)  | 8.38 (213)  | 7.13 (181) | 8.63 (219)  |
|            | 400 (204)            | n/a              | n/a        | n/a        | n/a        | 4.06 (103) | 6.38 (162) | 5.00 (127) | 7.06 (179)  | 5.75 (146) | 7.56 (192)  | 6.31 (160)  | 7.94 (202)  | 6.75 (171) | 8.25 (210)  |
|            | 500 (260)            | n/a              | n/a        | n/a        | n/a        | 3.38 (86)  | 5.69 (145) | 4.44 (113) | 6.44 (164)  | 5.25 (133) | 7.06 (179)  | 5.88 (149)  | 7.50 (191)  | 6.38 (162) | 7.88 (200)  |
| H51        | 100 (38)             | 2.75 (70)        | 6.25 (159) | 4.31 (109) | 7.19 (183) | 5.38 (137) | 7.75 (197) | 6.13 (156) | 8.19 (208)  | 6.63 (168) | 8.56 (217)  | 7.06 (179)  | 8.81 (224)  | 7.44 (189) | 9.00 (229)  |
|            | 200 (93)             | n/a              | n/a        | 3.75 (95)  | 6.56 (167) | 4.88 (124) | 7.25 (184) | 5.69 (145) | 7.81 (198)  | 6.31 (160) | 8.19 (208)  | 6.75 (171)  | 8.50 (216)  | 7.13 (181) | 8.69 (221)  |
|            | 300 (149)            | n/a              | n/a        | 3.13 (80)  | 5.88 (149) | 4.38 (111) | 6.69 (170) | 5.25 (133) | 7.31 (186)  | 5.88 (149) | 7.75 (197)  | 6.44 (164)  | 8.13 (207)  | 6.81 (173) | 8.38 (213)  |
|            | 400 (204)            | n/a              | n/a        | n/a        | n/a        | 3.75 (95)  | 6.06 (154) | 4.75 (121) | 6.75 (171)  | 5.44 (138) | 7.25 (184)  | 6.00 (152)  | 7.69 (195)  | 6.50 (165) | 8.00 (203)  |
|            | 500 (260)            | n/a              | n/a        | n/a        | n/a        | 3.13 (80)  | 5.38 (137) | 4.19 (106) | 6.19 (157)  | 4.94 (125) | 6.75 (171)  | 5.56 (141)  | 7.19 (183)  | 6.06 (154) | 7.56 (192)  |

Levels ±0.25" (6 mm)

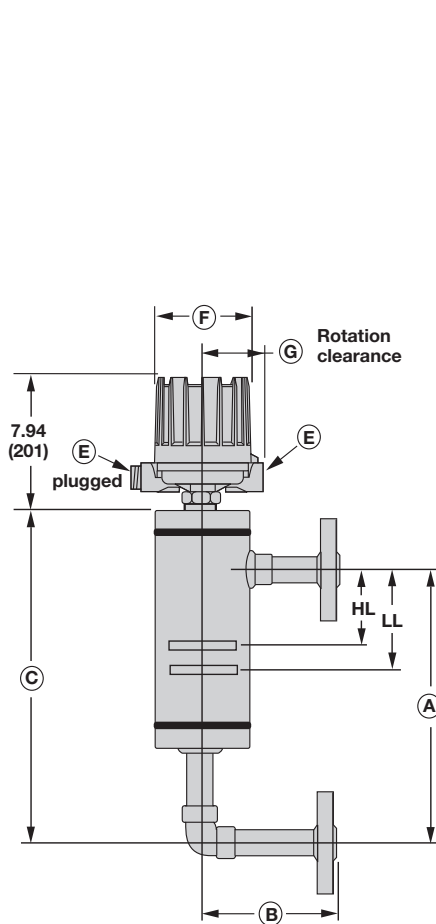
## 4.3 Specifications

### 4.3.2 Dimensions – Sealed Cage Design

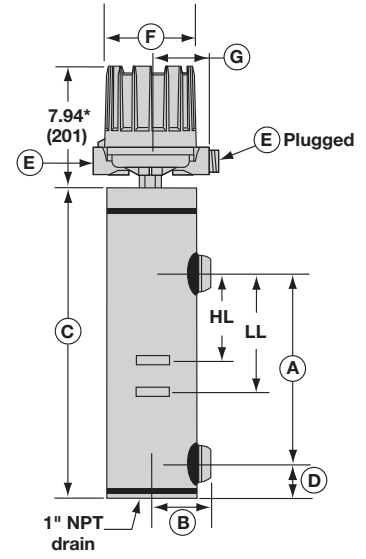
inches (mm)



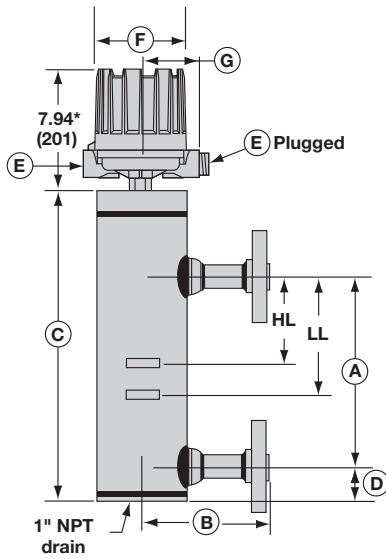
Sealed Chamber w/NPT or Socket weld Side/Bottom Connections (B74, H13, H31, H51)



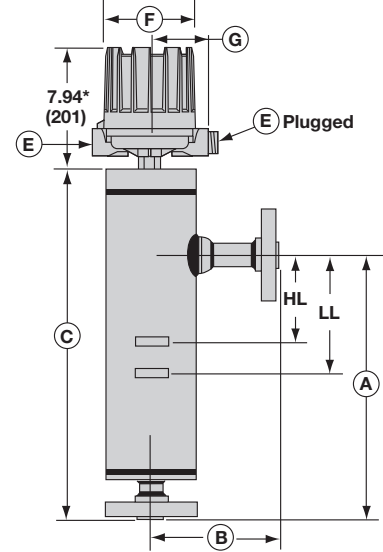
Sealed Chamber Side/Side Flange Connections (B74 only)



Sealed Chamber w/NPT or Socket weld Side/Side Connections (H13, H31, H51)



Sealed Chamber Side/Side Flange Connections (H13, H31, H51)



Sealed Chamber Side/Bottom Flange Connections (B74, H13, H31, H51)

#### Conduit Connections E

##### Electric Switches:

Type 4X/7/9: 1" NPT  
Group B: 1" NPT

##### Pneumatic Switches:

NEMA 1: ¼" NPT

| Housing              | F          | G          |
|----------------------|------------|------------|
| NEMA 1               | 4.69 (119) | 5.00 (127) |
| TYPE 4X/7/9*         | 5.93 (151) | 3.78 (96)  |
| TYPE 4X/7/9 Group B* |            |            |

\* These dimensions increase by 2.19 (56) when used with Series HS switches with terminal blocks.

## 4.3 Specifications

### 4.3.2 Dimensions – Sealed Cage Design

inches (mm)

#### Dimensions–Upper Side/Bottom

| Model Code | Connection Size | NPT or SW   |            |             | Flanges     |             |             |             |             |             |
|------------|-----------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |                 | A           | B          | C           | A           | B           | C           |             |             |             |
| B74        | 1"              | 8.32 (211)  | 3.27 (83)  | 10.56 (268) | 12.87 (327) | 6.38 (162)  | 15.12 (384) |             |             |             |
|            | 1-1/2"          |             | 3.69 (94)  |             |             |             |             | 12.56 (319) | 6.61 (168)  | 14.81 (376) |
|            | 2"              |             | 3.81 (97)  |             |             |             |             | 11.56 (295) | 12.43 (316) | 6.68 (170)  |
| H13        | 1"              | 14.25 (362) | 2.77 (70)  | 20.63 (524) | 17.75 (451) | 6.39 (162)  | 24.12 (613) |             |             |             |
|            | 1-1/2"          |             | 3.19 (81)  |             |             | 6.69 (170)  |             |             |             |             |
|            | 2"              |             | 3.31 (84)  |             |             | 6.81 (173)  |             |             |             |             |
| H31        | 1"              | 14.25 (362) | 4.40 (112) | 21.13 (537) | 17.50 (444) | 7.90 (201)  | 24.38 (619) |             |             |             |
|            | 1-1/2"          |             | 4.53 (115) |             |             | 7.84 (199)  |             |             |             |             |
|            | 2"              |             | 4.91 (125) |             |             | 10.00 (254) |             |             |             |             |
| H51        | 1"              | 15.60 (396) | 4.50 (114) | 23.01 (584) | 19.47 (495) | 8.00 (203)  | 26.89 (683) |             |             |             |
|            | 1-1/2"          |             | 4.63 (118) |             |             | 7.93 (201)  |             |             |             |             |
|            | 2"              |             | 5.00 (127) |             |             | 10.00 (254) |             |             |             |             |

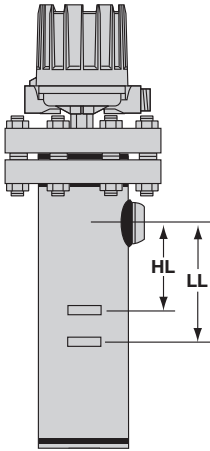
#### Dimensions–Side/Side

| Model Code | Connection Size | NPT or SW   |             |            |             |             |            | Flanges     |             |             |             |             |            |
|------------|-----------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|------------|
|            |                 | A           |             | B          | C           |             | D          | A           |             | B           | C           |             | D          |
|            |                 | Std.        | 14"         |            | Std.        | 14"         |            | Std.        | 14"         |             | Std.        | 14"         |            |
| B74        | 1"              | n/a         | n/a         | n/a        | n/a         | n/a         | n/a        | 13.62 (346) | n/a         | 6.38 (162)  | 15.88 (403) | n/a         | n/a        |
|            | 1-1/2"          |             |             |            |             |             |            | 13.31 (338) |             | 6.61 (168)  | 15.56 (395) |             |            |
|            | 2"              |             |             |            |             |             |            | 13.18 (335) |             | 6.68 (170)  | 15.44 (392) |             |            |
| H13        | 1"              | 11.50 (292) | 14.00 (356) | 2.77 (70)  | 20.63 (524) | 23.12 (587) | 2.75 (70)  | 11.50 (292) | 14.00 (356) | 6.39 (162)  | 20.63 (524) | 23.12 (587) | 2.75 (70)  |
|            | 1-1/2"          |             |             | 3.19 (81)  |             |             |            |             |             | 6.69 (170)  |             |             |            |
|            | 2"              |             |             | 3.31 (84)  |             |             |            |             |             | 6.81 (173)  |             |             |            |
| H31        | 1"              | 11.50 (292) | 14.00 (356) | 4.40 (112) | 21.13 (537) | 23.63 (600) | 2.75 (70)  | 11.50 (292) | 14.00 (356) | 7.90 (201)  | 21.13 (537) | 23.63 (600) | 2.75 (70)  |
|            | 1-1/2"          |             |             | 4.53 (115) |             |             |            |             |             | 7.84 (199)  |             |             |            |
|            | 2"              |             |             | 4.91 (125) |             |             |            |             |             | 10.00 (254) |             |             |            |
| H51        | 1"              | 11.64 (296) | 14.00 (356) | 4.50 (114) | 23.01 (584) | 23.57 (599) | 3.96 (101) | 11.64 (296) | 14.00 (356) | 8.00 (203)  | 23.01 (584) | 23.57 (599) | 3.96 (101) |
|            | 1-1/2"          |             |             | 4.63 (118) |             |             |            |             |             | 7.93 (201)  |             |             |            |
|            | 2"              |             |             | 5.00 (127) |             |             |            |             |             | 10.00 (254) |             |             |            |

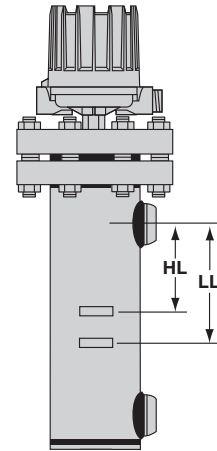
## 4.3 Specifications

### 4.3.3 Actuation Levels – Flanged Top Cage Design

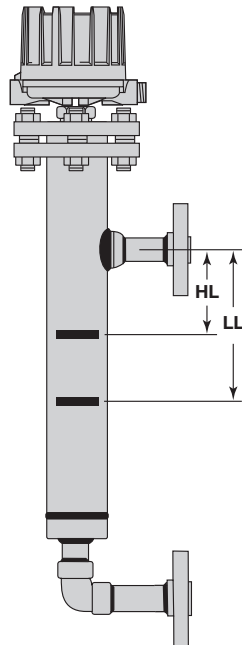
inches (mm)



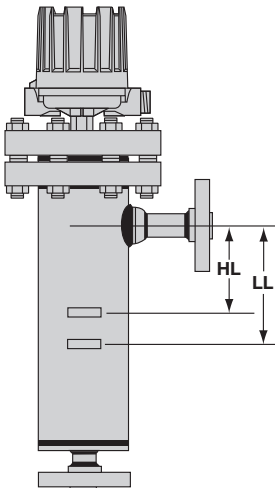
Flanged Top Chamber w/NPT or  
Socket weld Side/Bottom Connections  
(C74, H15, H32, H52)



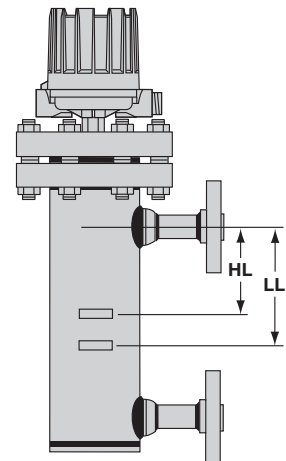
Flanged Top Chamber w/NPT or  
Socket weld Side/Side Connections  
(H15, H32, H52)



Flanged Top Chamber  
Side/Side Flange Connections  
(C74 only)



Flanged Top Chamber  
Side/Bottom Flange Connections  
(C74, H15, H32, H52)



Flanged Top Chamber  
Side/Side Flange Connections  
(H15, H32, H52)



## 4.3 Specifications

### 4.3.3 Actuation Levels – Flanged Top Cage Design

inches (mm)

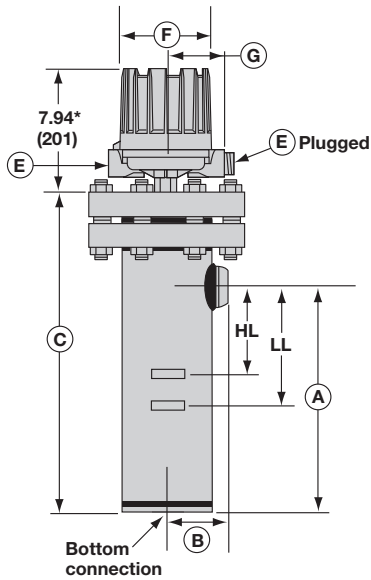
|            |                      | Specific Gravity |            |            |            |            |            |            |            |            |            |            |            |            |            |
|------------|----------------------|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|            |                      | 0.40             |            | 0.50       |            | 0.60       |            | 0.70       |            | 0.80       |            | 0.90       |            | 1.00       |            |
| Model Code | Process Temp °F (°C) | HL               | LL         | HL         | LL         | HL         | LL         | HL         | LL         | HL         | LL         | HL         | LL         | HL         | LL         |
| C74        | 100 (38)             | 4.38 (111)       | 8.24 (209) | 5.56 (141) | 8.74 (222) | 6.35 (161) | 9.07 (230) | 6.92 (176) | 9.31 (236) | 7.34 (186) | 9.49 (241) | 7.67 (195) | 9.63 (245) | 7.94 (202) | 9.74 (247) |
|            | 200 (93)             | 4.01 (102)       | 7.83 (199) | 5.27 (134) | 8.41 (214) | 6.11 (155) | 8.80 (224) | 6.71 (170) | 9.08 (231) | 7.16 (182) | 9.28 (236) | 7.51 (191) | 9.44 (240) | 7.79 (198) | 9.57 (243) |
|            | 300 (149)            | 3.59 (91)        | 7.44 (189) | 5.00 (127) | 8.04 (204) | 5.83 (148) | 8.49 (216) | 6.47 (164) | 8.81 (224) | 6.95 (177) | 9.05 (230) | 7.32 (186) | 9.24 (235) | 7.62 (194) | 9.39 (239) |
|            | 400 (204)            | n/a              | n/a        | 4.63 (118) | 7.62 (194) | 5.52 (140) | 8.14 (207) | 6.25 (159) | 8.51 (216) | 6.72 (171) | 8.79 (223) | 7.12 (181) | 9.00 (229) | 7.50 (191) | 9.18 (233) |
|            | 500 (260)            | n/a              | n/a        | 4.15 (105) | 7.15 (182) | 5.18 (132) | 7.75 (197) | 5.91 (150) | 8.18 (208) | 6.46 (164) | 8.50 (216) | 6.89 (175) | 8.75 (222) | 7.23 (184) | 8.94 (227) |
| H15        | 100 (38)             | 2.47 (63)        | 5.93 (151) | 3.90 (99)  | 6.74 (171) | 4.86 (123) | 7.29 (185) | 5.54 (141) | 7.67 (195) | 6.05 (154) | 7.96 (202) | 6.44 (164) | 8.19 (208) | 6.76 (172) | 8.37 (213) |
|            | 200 (93)             | 2.12 (54)        | 5.54 (141) | 3.62 (92)  | 6.43 (163) | 4.62 (117) | 7.02 (178) | 8.34 (136) | 7.45 (189) | 5.87 (149) | 7.77 (197) | 6.29 (160) | 8.02 (204) | 6.62 (168) | 8.21 (209) |
|            | 300 (149)            | n/a              | n/a        | 3.30 (84)  | 6.07 (154) | 4.36 (111) | 6.73 (171) | 5.11 (130) | 7.19 (183) | 5.67 (144) | 7.55 (192) | 6.11 (155) | 7.82 (199) | 6.46 (164) | 8.04 (204) |
|            | 400 (204)            | n/a              | n/a        | 2.94 (133) | 5.63 (211) | 4.00 (157) | 6.38 (224) | 4.81 (175) | 6.88 (233) | 5.44 (187) | 7.25 (241) | 5.88 (197) | 7.56 (246) | 6.25 (205) | 7.81 (251) |
|            | 500 (260)            | n/a              | n/a        | 2.50 (64)  | 5.19 (132) | 3.69 (94)  | 6.00 (152) | 4.56 (116) | 6.56 (167) | 5.19 (132) | 7.00 (178) | 5.69 (145) | 7.31 (186) | 6.06 (154) | 7.63 (194) |
| H32        | 100 (38)             | 2.75 (70)        | 6.25 (159) | 4.31 (109) | 7.19 (183) | 5.38 (137) | 7.75 (197) | 6.13 (156) | 8.19 (208) | 6.63 (168) | 8.56 (217) | 7.06 (179) | 8.81 (224) | 7.44 (189) | 9.00 (229) |
|            | 200 (93)             | n/a              | n/a        | 3.75 (95)  | 6.56 (167) | 4.88 (124) | 7.25 (184) | 5.69 (145) | 7.81 (198) | 6.31 (160) | 8.19 (208) | 6.75 (171) | 8.50 (216) | 7.13 (181) | 8.69 (221) |
|            | 300 (149)            | n/a              | n/a        | 3.13 (80)  | 5.88 (149) | 4.38 (111) | 6.69 (170) | 5.25 (133) | 7.31 (186) | 5.88 (149) | 7.75 (197) | 6.44 (164) | 8.13 (207) | 6.81 (173) | 8.38 (213) |
|            | 400 (204)            | n/a              | n/a        | n/a        | n/a        | 3.75 (95)  | 6.06 (154) | 4.75 (121) | 6.75 (171) | 5.44 (138) | 7.25 (184) | 6.00 (152) | 7.69 (195) | 6.50 (165) | 8.00 (203) |
|            | 500 (260)            | n/a              | n/a        | n/a        | n/a        | 3.13 (80)  | 5.38 (137) | 4.19 (106) | 6.19 (157) | 4.94 (125) | 6.75 (171) | 5.56 (141) | 7.19 (183) | 6.06 (154) | 7.56 (192) |
| H52        | 100 (38)             | 2.75 (70)        | 6.25 (159) | 4.31 (109) | 7.19 (183) | 5.38 (137) | 7.75 (197) | 6.13 (156) | 8.19 (208) | 6.63 (168) | 8.56 (217) | 7.06 (179) | 8.81 (224) | 7.44 (189) | 9.00 (229) |
|            | 200 (93)             | n/a              | n/a        | 3.75 (95)  | 6.56 (167) | 4.88 (124) | 7.25 (184) | 5.69 (145) | 7.81 (198) | 6.31 (160) | 8.19 (208) | 6.75 (171) | 8.50 (216) | 7.13 (181) | 8.69 (221) |
|            | 300 (149)            | n/a              | n/a        | 3.13 (80)  | 5.88 (149) | 4.38 (111) | 6.69 (170) | 5.25 (133) | 7.31 (186) | 5.88 (149) | 7.75 (197) | 6.44 (164) | 8.13 (207) | 6.81 (173) | 8.38 (213) |
|            | 400 (204)            | n/a              | n/a        | n/a        | n/a        | 3.75 (95)  | 6.06 (154) | 4.75 (121) | 6.75 (171) | 5.44 (138) | 7.25 (184) | 6.00 (152) | 7.69 (195) | 6.50 (165) | 8.00 (203) |
|            | 500 (260)            | n/a              | n/a        | n/a        | n/a        | 3.13 (80)  | 5.38 (137) | 4.19 (106) | 6.19 (157) | 4.94 (125) | 6.75 (171) | 5.56 (141) | 7.19 (183) | 6.06 (154) | 7.56 (192) |

Levels ±0.25" (6 mm)

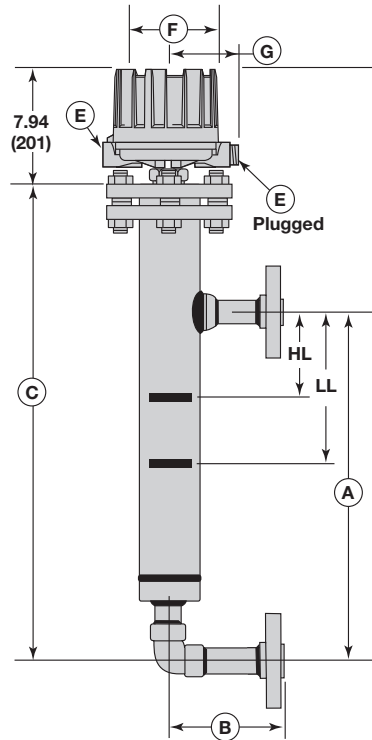
## 4.3 Specifications

### 4.3.4 Dimensions – Flanged Top Cage Design

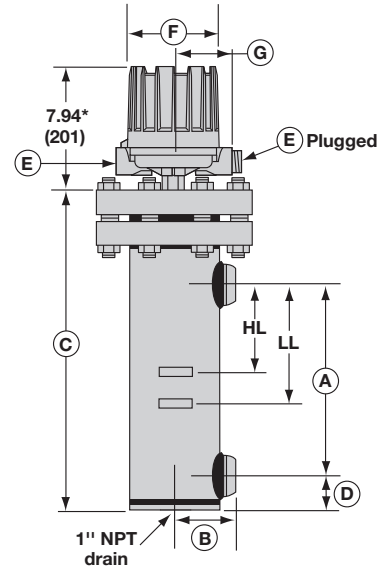
inches (mm)



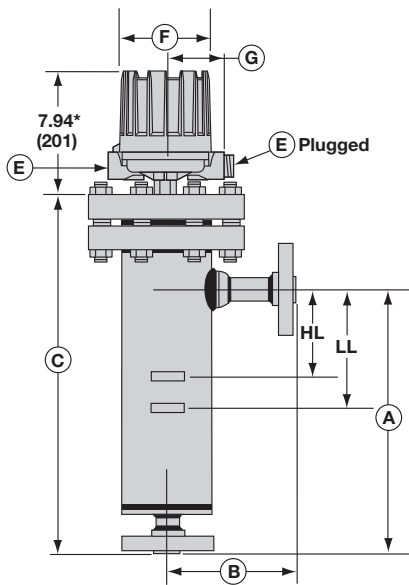
Flanged Top Chamber w/NPT or Socket weld Side/Bottom Connections (C74, H15, H32, H52)



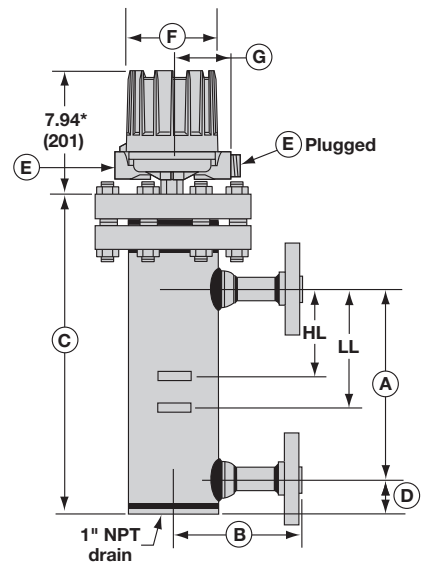
Flanged Top Chamber Side/Side Flange Connections (C74 only)



Flanged Top Chamber w/NPT or Socket weld Side/Side Connections (H15, H32, H52)



Flanged Top Chamber Side/Bottom Flange Connections (C74, H15, H32, H52)



Flanged Top Chamber Side/Side Flange Connections (H15, H32, H52)

| Conduit Connections E      |
|----------------------------|
| <b>Electric Switches:</b>  |
| Type 4X/7/9: 1" NPT        |
| Group B: 1" NPT            |
| <b>Pneumatic Switches:</b> |
| NEMA 1: ½" NPT             |

| Housing              | F          | G          |
|----------------------|------------|------------|
| NEMA 1               | 4.69 (119) | 5.00 (127) |
| TYPE 4X/7/9*         | 5.93 (151) | 3.78 (96)  |
| TYPE 4X/7/9 Group B* |            |            |

\* These dimensions increase by 2.19 (56) when used with Series HS switches with terminal blocks.

## 4.3 Specifications

### 4.3.4 Dimensions – Flanged Top Cage Design

inches (mm)

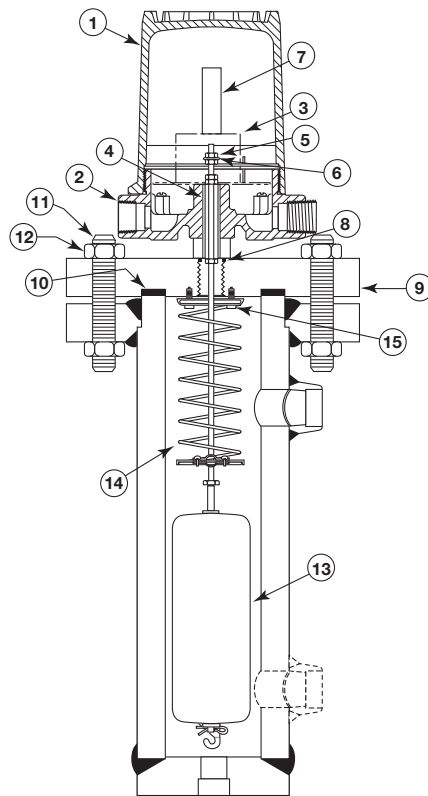
#### Dimensions–Upper Side/Bottom

| Model Code  | Connection Size | NPT or SW   |            |             | Flanges     |             |             |
|-------------|-----------------|-------------|------------|-------------|-------------|-------------|-------------|
|             |                 | A           | B          | C           | A           | B           | C           |
| C74<br>300# | 1"              | 15.65 (398) | 2.77 (70)  | 22.69 (576) | 18.33 (466) | 5.45 (138)  | 25.38 (645) |
|             | 1-1/2"          | 15.77 (401) | 3.19 (81)  | 22.81 (579) |             | 6.19 (157)  |             |
|             | 2"              | 15.90 (404) | 3.31 (84)  | 22.94 (583) |             | 6.25 (159)  |             |
| C74<br>600# | 1"              | 15.65 (398) | 2.77 (70)  | 23.06 (586) | 18.33 (466) | 5.45 (138)  | 26.38 (670) |
|             | 1-1/2"          | 15.77 (401) | 3.19 (81)  | 23.19 (589) |             | 6.19 (157)  |             |
|             | 2"              | 15.90 (404) | 3.31 (84)  | 23.31 (592) |             | 6.25 (159)  |             |
| H15         | 1"              | 14.85 (377) | 3.62 (92)  | 23.12 (587) | 18.33 (466) | 9.50 (241)  | 26.63 (676) |
|             | 1-1/2"          |             | 3.69 (94)  |             |             |             |             |
|             | 2"              |             | 3.81 (97)  |             |             |             |             |
| H32         | 1"              | 14.25 (362) | 4.40 (112) | 21.38 (543) | 17.50 (444) | 10.00 (254) | 24.63 (626) |
|             | 1-1/2"          |             | 4.53 (115) |             |             |             |             |
|             | 2"              |             | 4.91 (125) |             |             |             |             |
| H52         | 1"              | 15.60 (396) | 4.50 (114) | 23.88 (607) | 19.21 (488) | 10.00 (254) | 27.50 (698) |
|             | 1-1/2"          |             | 4.63 (118) |             |             |             |             |
|             | 2"              |             | 5.00 (127) |             |             |             |             |

#### Dimensions–Side/Side

| Model Code  | Connection Size | NPT or SW   |             |            |             |             |            | Flanges     |             |             |             |             |            |
|-------------|-----------------|-------------|-------------|------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|------------|
|             |                 | A           |             | B          | C           |             | D          | A           |             | B           | C           |             | D          |
|             |                 | Std.        | 14"         |            | Std.        | 14"         |            | Std.        | 14"         |             | Std.        | 14"         |            |
| C74<br>300# | 1"              |             |             |            |             |             |            |             |             | 5.45 (138)  |             |             |            |
|             | 1-1/2"          | n/a         | n/a         | n/a        | n/a         | n/a         | n/a        | 18.97 (482) | n/a         | 6.19 (157)  | 26.00 (660) | n/a         | n/a        |
|             | 2"              |             |             |            |             |             |            |             |             | 6.25 (159)  |             |             |            |
| C74<br>600# | 1"              |             |             |            |             |             |            |             |             | 5.45 (138)  |             |             |            |
|             | 1-1/2"          | n/a         | n/a         | n/a        | n/a         | n/a         | n/a        | 18.97 (482) | n/a         | 6.19 (157)  | 26.38 (670) | n/a         | n/a        |
|             | 2"              |             |             |            |             |             |            |             |             | 6.25 (159)  |             |             |            |
| H15         | 1"              |             |             | 3.62 (92)  |             |             |            |             |             |             |             |             |            |
|             | 1-1/2"          | 11.50 (292) | 14.00 (356) | 3.69 (94)  | 23.12 (587) | 25.63 (651) | 3.35 (85)  | 11.50 (292) | 14.00 (356) | 9.50 (241)  | 23.12 (587) | 25.63 (651) | 3.35 (85)  |
|             | 2"              |             |             | 3.81 (97)  |             |             |            |             |             |             |             |             |            |
| H32         | 1"              |             |             | 4.40 (112) |             |             |            |             |             |             |             |             |            |
|             | 1-1/2"          | 11.50 (292) | 14.00 (356) | 4.53 (115) | 21.38 (543) | 23.88 (607) | 2.75 (70)  | 11.50 (292) | 14.00 (356) | 10.00 (254) | 21.38 (543) | 23.88 (607) | 2.75 (70)  |
|             | 2"              |             |             | 4.91 (125) |             |             |            |             |             |             |             |             |            |
| OH52        | 1"              |             |             | 4.50 (114) |             |             |            |             |             |             |             |             |            |
|             | 1-1/2"          | 11.64 (296) | 14.00 (356) | 4.63 (115) | 23.88 (607) | 26.25 (667) | 3.96 (101) | 11.64 (296) | 14.00 (356) | 10.00 (254) | 23.88 (607) | 26.25 (667) | 3.96 (101) |
|             | 2"              |             |             | 5.00 (127) |             |             |            |             |             |             |             |             |            |

## 4.4 Replacement Parts



### 4.4.1 Flanged Cage Parts Identification

| Item | Description          |
|------|----------------------|
| 1    | Housing cover        |
| 2    | Housing base         |
| 3    | Switch mechanism     |
| 4    | Attraction sleeve    |
| 5    | Jam nuts             |
| 6    | Lock washer          |
| 7    | Enclosing tube       |
| 8    | E-Tube gasket        |
| 9    | Flange               |
| 10   | Flange gasket        |
| 11   | Studs                |
| 12   | Nuts                 |
| 13   | Displacer            |
| 14   | Spring/stem assembly |
| 15   | Screw                |

#### 4.4.1.1 Model C74

|  | 300# C74     | 600# C74     |
|--|--------------|--------------|
| Housing cover  | See below    |              |
| Housing base   | See below    |              |
| Switch mechanism   | See below    |              |
| E-tube kit: includes items 7 & 8                                 | 089-5933-002 | 089-5956-001 |
| E-tube gasket  | 012-1204-001 | 012-1204-001 |
| Flange gasket  | 012-1204-019 | 012-1204-019 |
| Displacer assembly   | 089-6137-001 | 089-6138-001 |
| Inconel® spring/stem kit: includes items 4, 5, 6, 8, 10, 14 & 15 | 089-5321-001 | 089-5322-001 |
| 316 SS spring/stem kit: includes items 4, 5, 6, 8, 10, 14 & 15   | 089-5323-001 | 089-5324-001 |

#### 4.4.1.2 Models H15, H32 & H52

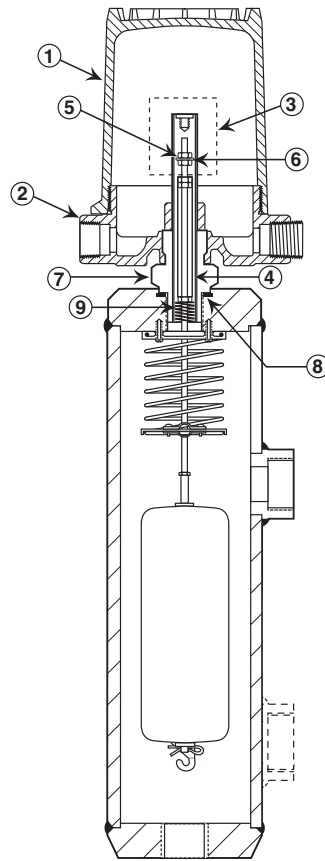
| Flanged cage   | H15          | H32             | H52             |
|--|--------------|-----------------|-----------------|
| Housing cover  | See below    |                 |                 |
| Housing base   | See below    |                 |                 |
| Switch mechanism   | See below    |                 |                 |
| Attraction sleeve kit (standard sleeve):<br>includes items 4, 5, 6 & 8 | 089-3403-001 | 089-3403-001    | 089-3403-002    |
| Attraction sleeve kit (sheathed sleeve):<br>includes items 4, 5, 6 & 8 | 089-3403-003 | 089-3403-003    | n/a             |
| E-tube kit: includes items 7 & 8                                       | 089-5956-001 | 089-5956-001    | 089-5956-002    |
| E-tube gasket:   | 012-1204-001 | 012-1204-001    | 012-1204-001    |
| Head flange kit: includes items 8, 9, 10, 11 & 12                      | 089-4240-001 | 089-4240-002    | 089-4240-003    |
| Flange gasket  | 012-1204-003 | 012-1204-004    | 012-1204-005    |
| Displacer kit*: includes items 10 & 13                                 | 089-6135-001 | 089-6135-004    | 089-6135-005    |
| Inconel spring/stem kit*:<br>includes items 4, 5, 6, 8, 10, 14 & 15    | 089-5338-001 | Consult Factory | Consult Factory |
| 316 SS spring/stem kit*:<br>includes items 4, 5, 6, 8, 10, 14 & 15     | 089-5338-004 | n/a             | n/a             |

\* Removal of displacer from stem can result in damage to one or both parts. It is recommended that both the displacer and the spring and stem kits be purchased if one or the other require replacement.

#### 4.4.1.3 Switch and housing reference

|                          | Series Type | Bulletin# |
|--------------------------|-------------|-----------|
| Dry contact              | B, C, D     | 42-683    |
| Hermetically sealed      | F, 8        | 42-799    |
| Hermetically sealed      | HS          | 42-694    |
| Bleed type pneumatic     | J           | 42-685    |
| Non-bleed type pneumatic | K           | 42-486    |

## 4.4 Replacement Parts



### 4.4.2 Sealed Cage Parts Identification

| Item | Description              |
|------|--------------------------|
| 1    | Housing cover            |
| 2    | Housing base             |
| 3    | Switch mechanism         |
| 4    | Attraction sleeve        |
| 5    | Jam nuts                 |
| 6    | Lock washer              |
| 7    | Enclosing tube           |
| 8    | E-Tube gasket            |
| 9    | Assist spring (B74 only) |

#### 4.4.2.1 Model B74

|   |              |
|---|--------------|
| Housing cover   | See below    |
| Housing base  | See below    |
| Switch mechanism  | See below    |
| Attraction sleeve (standard)  | 032-4202-002 |
| Attraction sleeve (sheathed and 304 or 316 stainless steel materials) | 032-4502-001 |
| Jam nuts (5 required)   | 010-2107-001 |
| Lock washer   | 010-3359-001 |
| Washer (2 required) (not required with standard attraction sleeve)    | 010-3359-009 |
| Enclosing tube (standard or sheathed)                                 | Z32-6302-001 |
| Enclosing tube (304 or 316 stainless steel materials)                 | Z32-6325-002 |
| E-Tube gasket   | 012-1204-001 |

#### 4.4.2.2 Models H13, H31 & H51

|  | Model H13    | Model H31    | Model H51    |
|--|--------------|--------------|--------------|
| Housing cover  |              | See below    |              |
| Housing base   |              | See below    |              |
| Switch mechanism   |              | See below    |              |
| Attraction sleeve kit (standard sleeve):<br>includes items 4, 5, 6 & 8 | 089-3403-001 | 089-3403-001 | 089-3403-002 |
| Attraction sleeve kit (sheathed sleeve):<br>includes items 4, 5, 6 & 8 | 089-3403-003 | 089-3403-003 | n/a          |
| E-tube kit: includes items 7 & 8                                       | 089-5956-001 | 089-5956-001 | 089-5956-002 |
| E-tube gasket  | 012-1204-001 | 012-1204-001 | 012-1204-001 |

#### 4.4.2.3 Switch and housing reference

|                          | Series Type | Bulletin# |
|--------------------------|-------------|-----------|
| Dry contact              | B, C, D     | 42-683    |
| Hermetically sealed      | F, 8        | 42-799    |
| Hermetically sealed      | HS          | 42-694    |
| Bleed type pneumatic     | J           | 42-685    |
| Non-bleed type pneumatic | K           | 42-486    |

## 4.5 Model Numbers

### 4.5.1 Standard Pressure

#### SPECIFIC GRAVITY AND PRESSURE RATING CODE

| Model      | Cage Style   | Cage Material       | Minimum S.G.    | Pressure Rating at given Temperature – psi (bar) |                   |                     |
|------------|--------------|---------------------|-----------------|--|-------------------|---------------------|
|            |              |                     |                 | +100° F (+38° C)                                 | +300° F (+149° C) | +500° F (+260° C) ① |
| B74        | Sealed       | Carbon Steel        | 0.40            | 1480 (102)                                       | 1315 (91)         | n/a                 |
| B74        |              | 304 Stainless Steel |                 | 1440 (99)  | 1200 (83)         | n/a                 |
| B74        |              | 316 Stainless Steel |                 | 1440 (99)  | 1240 (85)         | n/a                 |
| H13        | Flanged      | Carbon Steel        | See Chart Below | 1500 (103)                                       | 1500 (103)        | 1350 (93)           |
| C74 (300#) |              | 300# Carbon steel   | See Chart Below | 740 (51)   | 740 (51)          | 740 (51)            |
| C74 (600#) |              | 600# Carbon steel   |                 | 1480 (102)                                       | 1400 (97)         | 1190 (82)           |
| H15        | Carbon steel | 1500 (103)          |                 | 1500 (103)                                       | 1350 (93)         |                     |

| Model | Minimum Specific Gravity Up to Temperature Shown |                  |                   |                   |                   |
|-------|--|------------------|-------------------|-------------------|-------------------|
|       | +100° F (+38° C)                                 | +200° F (+93° C) | +300° F (+149° C) | +400° F (+204° C) | +500° F (+260° C) |
| H13   | 0.40   | 0.40             | 0.40              | 0.41              | 0.44              |
| H15   | 0.40   | 0.43             | 0.46              | 0.48              | 0.50              |
| C74   | 0.40   | 0.40             | 0.40              | 0.42              | 0.44              |

#### MATERIALS OF CONSTRUCTION

| Code | Applicable Models  | Cage                | Sleeve | Spring Trim      |
|------|--------------------|---------------------|--------|------------------|
| 1    | B74, C74, H13, H15 | Carbon Steel        | 400 SS | Inconel & 316 SS |
| 2 ②  | H13, H15           | Carbon Steel        | 400 SS | 316 SS           |
| 2    | B74, C74           | Carbon Steel        | 316 SS | Inconel & 316 SS |
| 3    | B74                | 304 Stainless Steel | 316 SS | Inconel & 316 SS |
| 4    | B74                | 316 Stainless Steel | 316 SS | Inconel & 316 SS |

#### TANK CONNECTION TYPE AND SIZE

| B74 |     |     | C74 300 lb |     |     | C74 600 lb |     |     | H13 & H15 |     |     | Connection Type     | C/C | Location    |
|-----|-----|-----|------------|-----|-----|------------|-----|-----|-----------|-----|-----|---------------------|-----|-------------|
| 1"  | 1½" | 2"  | 1"         | 1½" | 2"  | 1"         | 1½" | 2"  | 1"        | 1½" | 2"  |                     |     |             |
| B20 | C20 | D20 | B70        | C70 | D70 | B90        | C90 | D90 | B20       | C20 | D20 | NPT                 | Std | side/bottom |
| B30 | C30 | D30 | B80        | C80 | D80 | B01        | C01 | D01 | B30       | C30 | D30 | Socketweld          |     |             |
| N30 | P30 | Q30 | —          | —   | —   | —          | —   | —   | N30       | P30 | Q30 | 150 lb ANSI flanges |     |             |
| N40 | P40 | Q40 | N40        | P40 | Q40 | —          | —   | —   | N40       | P40 | Q40 | 300 lb ANSI flanges | Std | side/side   |
| N50 | P50 | Q50 | —          | —   | —   | N50        | P50 | Q50 | N50       | P50 | Q50 | 600 lb ANSI flanges |     |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | B40       | C40 | D40 | NPT                 | Std | 14"         |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | B44       | C44 | D44 | Socketweld          | Std |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | B50       | C50 | D50 |                     |     |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | B54       | C54 | D54 | 150 lb ANSI flanges | Std | side/side   |
| S30 | T30 | V30 | —          | —   | —   | —          | —   | —   | S30       | T30 | V30 |                     |     |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | S34       | T34 | V34 | 300 lb ANSI flanges | Std |             |
| S40 | T40 | V40 | S40        | T40 | V40 | —          | —   | —   | S40       | T40 | V40 |                     |     |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | S44       | T44 | V44 | 600 lb ANSI flanges | Std |             |
| S50 | T50 | V50 | —          | —   | —   | S50        | T50 | V50 | S50       | T50 | V50 |                     |     |             |
| —   | —   | —   | —          | —   | —   | —          | —   | —   | S54       | T54 | V54 | 14"                 |     |             |





## 4.5 Model Numbers

### 4.5.1 Standard Pressure (continued)

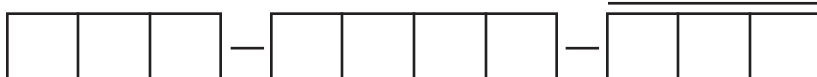
#### ELECTRIC SWITCH MECHANISM AND ENCLOSURE ②

| Switch Description ④   | Maximum Process Temperature ° F (° C) ⑤ | One Set Point | TYPE 4X/7/9 Aluminum Enclosure |                          |                            |
|--|---|---------------|--------------------------------|--------------------------|----------------------------|
|  |   |               | Class I, Div. 1, Groups C & D  | Class I, Div. 1, Group B | ATEX Ex II 2G EEx d IIC T6 |
| Series B Snap Switch   | 250 (121)                               | SPDT<br>DPDT  | BKQ<br>BNQ                     | BKS<br>BNS               | BA9<br>BB9                 |
| Series C Snap Switch   | 450 (232)                               | SPDT<br>DPDT  | CKQ<br>CNQ                     | CKS<br>CNS               | CA9<br>CB9                 |
| Series D Snap Switch for DC Current Application                    | 250 (121)                               | SPDT<br>DPDT  | DKQ<br>DNQ                     | DKS<br>DNS               | DA9<br>DB9                 |
| Series F Hermetically Sealed Snap Switch                           | 500 (260)                               | SPDT<br>DPDT  | FKQ<br>FNQ                     | FKS<br>FNS               | FA9<br>FB9                 |
| Series HS 5 Amp Hermetically Sealed Snap Switch w/Wiring Leads ⑥   | 500 ⑦ (260)                             | SPDT<br>DPDT  | HMC<br>HMF                     | HEK ⑧<br>HET ⑧           | N/A                        |
| Series HS 5 Amp Hermetically Sealed Snap Switch w/Terminal Block ⑥ | 500 ⑦ (260)                             | SPDT<br>DPDT  | HM3<br>HM7                     | HM4<br>HM8               | HA9<br>HB9                 |
| Series 8 Hermetically Sealed Snap Switch                           | 500 (260)                               | SPDT<br>DPDT  | 8KQ<br>8NQ                     | 8KS<br>8NS               | 8A9<br>8B9                 |

#### PNEUMATIC SWITCH MECHANISM AND ENCLOSURE

| Switch Description     | Maximum Supply Pressure | Maximum Process Temperature | Bleed Orifice Diameter | NEMA 1                 |          |            |
|------------------------|-------------------------|-----------------------------|------------------------|------------------------|----------|------------|
|                        |                         |                             |                        | B74, C74-1, 300# C74-2 | H13, H15 | 600# C74-2 |
| Series J<br>Bleed Type | 100 psig (7 bar)        | +400° F (+204° C)           | .063 (1.6 mm)          | JDE                    | JKE      | JKE        |
|                        | 60 psig (4 bar)         |                             | .094 (2.4 mm)          | JEE                    | JLE      | JLE        |
| Series k<br>Non-Bleed  | 100 psig (7 bar)        | +400° F (+204° C)           | —                      | KOE                    | KOE      | KPE        |

- ① Consult factory for temperatures up to +750° F (+399° C).  
 ② Maximum temperature rating +200° F (+93° C) with type 316 SS spring.  
 ③ Consult factory for TYPE 4X/7/9 cast iron housings.  
 ④ Uncontrolled housing heater or drain available in TYPE 4X/7/9 enclosures. Consult factory for switch codes.  
 ⑤ Process temperature based on +100° F (+38° C) ambient.  
 ⑥ HS switch not available on 600# C74 model with materials of construction code -2.  
 ⑦ On condensing applications, temperature down-rated to +400° F (204° C) process at +100° F (+38° C) ambient.  
 ⑧ CSA approval does not apply to Series HE switches.



## 4.5 Model Numbers

### 4.5.2 High Pressure

| Model | Cage Style | Cage Material | Minimum S.G.    | Pressure Rating at given Temperature - psi (bar) |                   |                     |
|-------|------------|---------------|-----------------|--|-------------------|---------------------|
|       |            |               |                 | +100° F (+38° C)                                 | +300° F (+149° C) | +500° F ① (+260° C) |
| H31   | Sealed     | Carbon Steel  | See Chart Below | 4150<br>(286)                                    | —                 | 3920<br>(270)       |
| H51   |            |               |                 | 5000<br>(345)                                    | 5000<br>(345)     | 4475<br>(309)       |
| H32   | Flanged    |               |                 | 4150<br>(286)                                    | —                 | 3920<br>(270)       |
| H52   |            |               |                 | 5000<br>(345)                                    | 5000<br>(345)     | 4475<br>(309)       |

| Minimum Specific Gravity Up to Temperature Shown |                  |                   |                   |                   |
|--|------------------|-------------------|-------------------|-------------------|
| +100° F (+38° C)                                 | +200° F (+93° C) | +300° F (+149° C) | +400° F (+204° C) | +500° F (+260° C) |
| 0.40   | 0.44             | 0.47              | 0.51              | 0.56              |

#### MATERIALS OF CONSTRUCTION

| No. | Cage         | Sleeve | Spring Trim      |
|-----|--------------|--------|------------------|
| 1   | Carbon Steel | 400 SS | Inconel & 316 SS |

#### TANK CONNECTION TYPE AND SIZE

| H31 & H32 |     |     | H51 & H52 |     |     | Connection Type      | C/C | Location    |
|-----------|-----|-----|-----------|-----|-----|----------------------|-----|-------------|
| 1"        | 1½" | 2"  | 1"        | 1½" | 2"  |                      |     |             |
| B20       | C20 | D20 | B20       | C20 | D20 | NPT                  | Std | side/bottom |
| B30       | C30 | D30 | B30       | C30 | D30 | Socketweld           |     |             |
| N50       | P50 | Q50 | —         | —   | —   | 600 lb ANSI flanges  |     |             |
| N60       | P60 | Q60 | N60       | P60 | Q60 | 900 lb ANSI flanges  |     |             |
| N70       | P70 | Q70 | N70       | P70 | Q70 | 1500 lb ANSI flanges |     |             |
| —         | —   | —   | N80       | P80 | Q80 | 2500 lb ANSI flanges |     |             |
| B40       | C40 | D40 | B40       | C40 | D40 | NPT                  | Std | side/side   |
| B44       | C44 | D44 | B44       | C44 | D44 |                      | 14" |             |
| B50       | C50 | D50 | B50       | C50 | D50 | Socketweld           | Std |             |
| B54       | C54 | D54 | B54       | C54 | D54 |                      | 14" |             |
| S50       | T50 | V50 | —         | —   | —   | 600 lb ANSI flanges  | Std |             |
| S54       | T54 | V54 | —         | —   | —   |                      | 14" |             |
| S60       | T60 | V60 | S60       | T60 | V60 | 900 lb ANSI flanges  | Std |             |
| S64       | T64 | V64 | S64       | T64 | V64 |                      | 14" |             |
| S70       | T70 | V70 | S70       | T70 | V70 | 1500 lb ANSI flanges | Std |             |
| S74       | T74 | V74 | S74       | T74 | V74 |                      | 14" |             |
| —         | —   | —   | S80       | T80 | V80 | 2500 lb ANSI flanges | Std |             |
| —         | —   | —   | S84       | T84 | V84 |                      | 14" |             |



## 4.5 Model Numbers

### 4.5.2 High Pressure (continued)

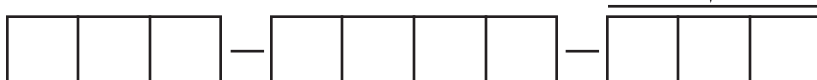
#### ELECTRIC SWITCH MECHANISM AND ENCLOSURE ②

| Switch Description ③   | Maximum Process ④<br>Temperature ° F (° C) | One<br>Set Point | Type 4X/7/9 Aluminum Enclosure   |                             |                                  |
|--|--|------------------|----------------------------------|-----------------------------|----------------------------------|
|  |  |                  | Class I, Div. 1,<br>Groups C & D | Class I, Div. 1,<br>Group B | ATEX<br>Ex II 2G<br>EEx d IIC T6 |
| Series B Snap Switch   | 250<br>(121)                               | SPDT<br>DPDT     | BKQ<br>BNQ                       | BKS<br>BNS                  | BA9<br>BB9                       |
| Series C Snap Switch   | 450<br>(232)                               | SPDT<br>DPDT     | CKQ<br>CNQ                       | CKS<br>CNS                  | CA9<br>CB9                       |
| Series D Snap Switch for<br>DC Current Application                     | 250<br>(121)                               | SPDT<br>DPDT     | DKQ<br>DNQ                       | DKS<br>DNS                  | DA9<br>DB9                       |
| Series F Hermetically Sealed<br>Snap Switch                            | 500<br>(260)                               | SPDT<br>DPDT     | FKQ<br>FNQ                       | FKS<br>FNS                  | FA9<br>FB9                       |
| Series HS 5 Amp Hermetically ⑤⑥<br>Sealed Snap Switch w/Wiring Leads   | 500<br>(260)                               | SPDT<br>DPDT     | HMC<br>HMF                       | HEK ⑦<br>HET ⑦              | N/A                              |
| Series HS 5 Amp Hermetically ⑤⑥<br>Sealed Snap Switch w/Terminal Block | 500<br>(260)                               | SPDT<br>DPDT     | HM3<br>HM7                       | HM4<br>HM8                  | HA9<br>HB9                       |
| Series 8 Hermetically Sealed<br>Snap Switch                            | 500<br>(260)                               | SPDT<br>DPDT     | 8KQ<br>8NQ                       | 8KS<br>8NS                  | 8A9<br>8B9                       |

#### PNEUMATIC SWITCH MECHANISM AND ENCLOSURE

| Switch<br>Description  | Maximum<br>Supply<br>Pressure | Maximum<br>Process<br>Temperature | Bleed<br>Orifice<br>Diameter | NEMA 1   |          |
|------------------------|-------------------------------|-----------------------------------|------------------------------|----------|----------|
|                        |                               |                                   |                              | H31, H32 | H51, H52 |
| Series J<br>Bleed Type | 100 psig<br>(7 bar)           | +400° F<br>(+204° C)              | .063<br>(1.6 mm)             | JKE      | JKE      |
|                        | 60 psig<br>(4 bar)            |                                   | .094<br>(2.4 mm)             | JLE      | JLE      |
| Series k<br>Non-Bleed  | 100 psig<br>(7 bar)           | +400° F<br>(+204° C)              | —                            | KOE      | KPE      |

- ① Consult factory for temperatures up to +750° F (+399° C).
- ② Consult factory for TYPE 4X/7/9 cast iron housings.
- ③ Uncontrolled housing heater or drain available in TYPE 4X/7/9 enclosures. Consult factory for switch codes.
- ④ Process temperature based on +100° F (+38° C) ambient
- ⑤ HS switch not available on models H51 or H52.
- ⑥ On condensing applications, temperature down-rated to +400° F (204° C) process at +100° F (+38° C) ambient.
- ⑦ CSA approval does not apply to Series HE switches.



### Service Policy

Owners of Magnetrol controls 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. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor 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, labor, direct or consequential damage will be allowed.

### Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.



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