

LS Series Buoyancy Level Switch

Mechanical Level Switch K-TEK Products



Introduction

This operating instruction manual provides the following information:

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- Maintenance - see page 5
- Handling and storage requirements - see page 5
- Switching mechanisms and housings - see page 6
- Troubleshooting - see page 8

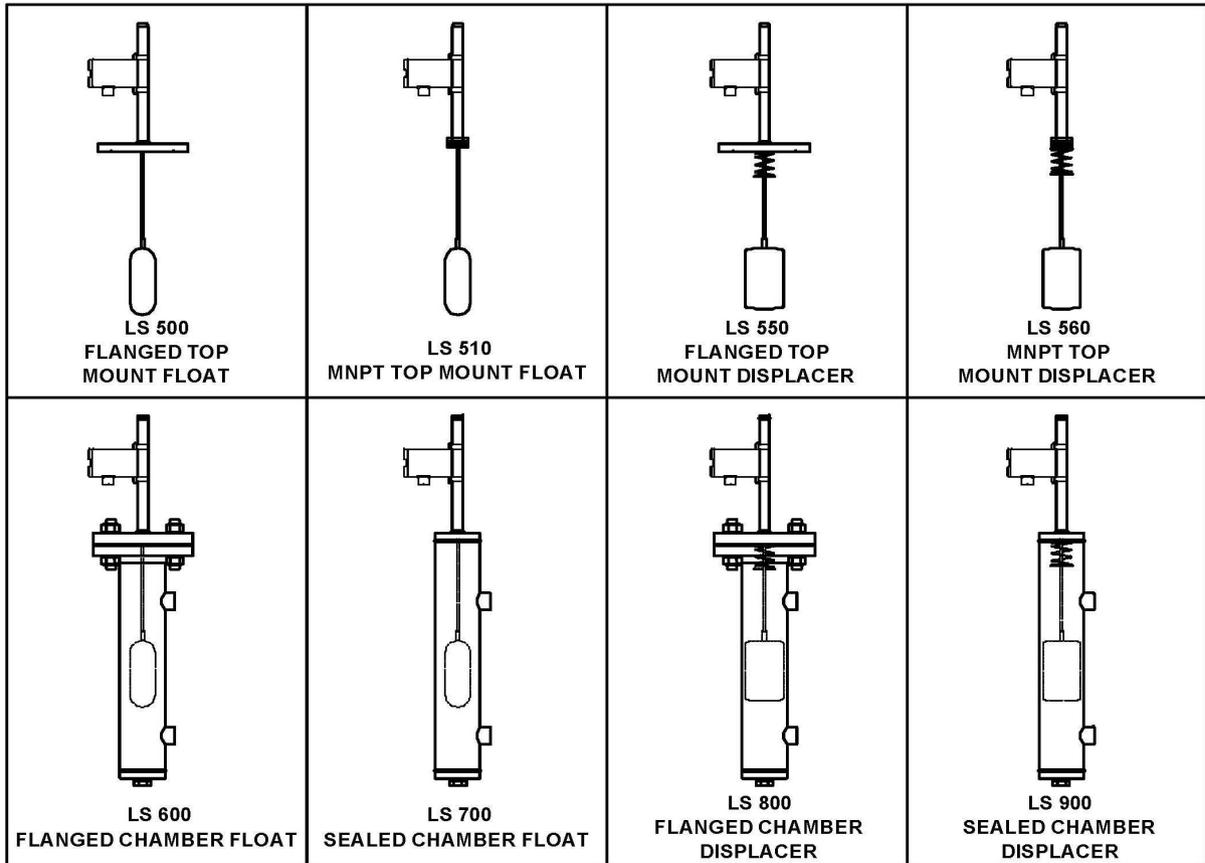
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1.0 Standard Available Designs

LS Series Mechanical Level Switches are available for a range of industrial applications. An ATEX certified option for potentially explosive atmospheres is offered if configured with the MS41 switching mechanism (See Section 7.0).

Design and specifications are subject to change without notice.



2.0 LS Series Description and Operation Basics

The LS Series is a single or multi point, fluid-level switch. The device consists of a float (or displacer) with an attached magnet and a switch post to house the moving magnet and to support the switch mechanism. The switch post is mounted on either a top entry process connection or to the top of a mechanical cage or chamber. Process connections are typically flanges, NPT, or socket weld connections. Chambers have connections on the side and/or bottom to attach to the side of a tank. Movement of the float (or displacer) is typically limited to the range required to activate the switch mechanism at a specified level.

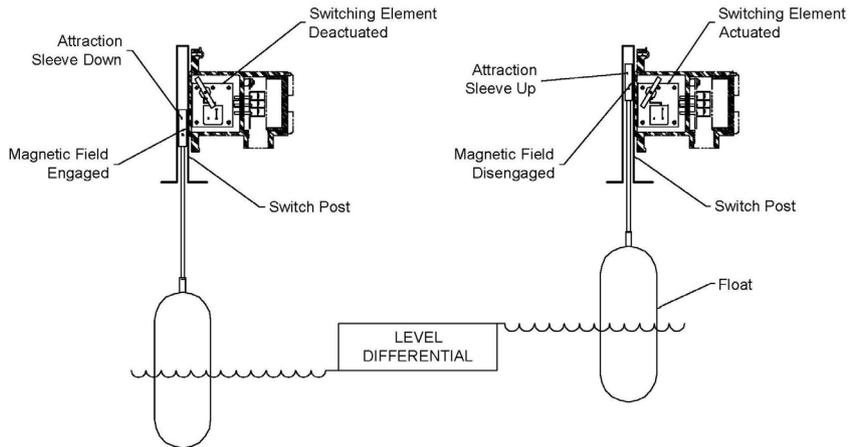
The LS Series can be a float or displacer operated, magnetically coupled level switch. As the fluid level in the vessel rises or falls, the position of the float or displacer changes with it. Magnets inside the switch post, attached to the float or displacer, move with the changing level as well. A switch mechanism, attached to the exterior of the switch post, detects movement of the magnet past its location, and transfers the contact positions. Use of the LS Series instead of the conventional “bulky housing” cage switch allows easy access to the switch mechanism and there are no seals or diaphragms to wear out. Installation of isolation valves on the inlet and outlet of the chamber allows removal of the entire unit without draining the vessel.

3.0 Fundamentals

Float Operated Level Switches Model Series 500, 510, 600, 700

The float rides on the process fluid and tracks with the liquid level movement. As the fluid level in the vessel (or external cage) rises or falls, the position of the float changes. Magnets attached to a float guide rod (located inside the sensing tube) also move with the changing level. A switch mechanism (electrical or pneumatic) attached to the exterior of the sensing tube is actuated by a rising level and de-actuated by a falling level.

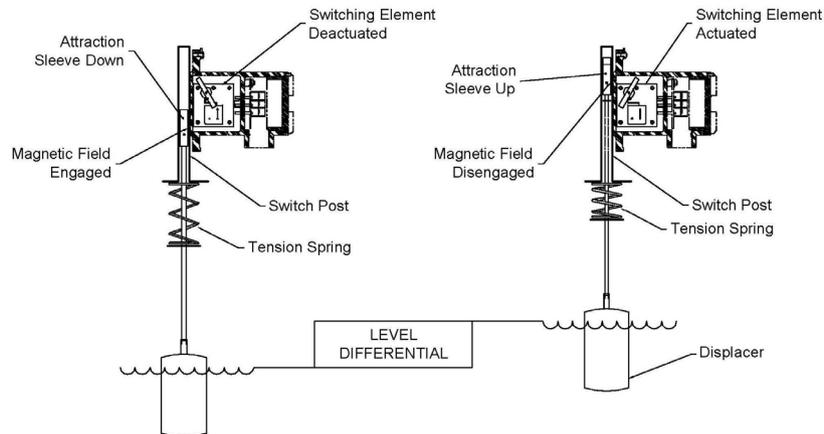
Floats can utilize multiple switching mechanisms. Consult the factory for special float switching arrangements.



Displacer Operated Level Switches Model Series 550, 560, 800, 900

Displacer switches offer an alternative means of fluid level measurement different from the traditional float device. While a float follows the liquid level, a displacer remains partially or completely submerged. The buoyancy of the displacer is increased as it becomes covered by more liquid. Therefore, when the displacer weight drops below the spring tension (rising level), the switch mechanism is actuated. Hence, when the displacer weight increases to that greater than the spring tension (falling level), the switch mechanism is de-actuated.

Displacer switches can be utilized in some high pressure and low specific gravity applications where float designs are cost prohibitive or impossible to implement.



4.0 Installation

The LS Series is mounted to the process vessel via the process connections provided on the device. When installing top mounted units, care should be used when lowering the float into the tank to avoid bending the rod that connects the magnet to the float. Bolting, sealants, and gaskets are provided by the customer. The LS Series is designed for a single-point level of operation and is factory set to the proper range of motion. The switching mechanism mounted on the switch post can be adjusted slightly up or down the post to account for specific gravity changes, but the immersion depth of the float must be known in order to accurately move the switch. Please refer to the Switching Mechanisms and Housings in Section 7.0 for more details. Any adjustment of switch position should be accompanied with a functional test to verify that the magnet can move sufficiently past the switch to cause it to transfer. Connections to the switch are provided in the manual for the switch that is specified.

WARNING!! Hydrostatic testing of the tank should be performed with the chamber blocked off or with the float removed. The floats are designed for the maximum pressure in operation, and hydrostatic testing usually exceeds the limits of the float. Damage to floats due to over pressurization is not covered in the warranty.

5.0 Maintenance

The LS Series does not require any routine maintenance in normal day to day operation

WARNING!! If there is a need to take the switch out of service or disconnect it for any reason, then make sure the circuit is de-energized, or insure that the area is known to be non-hazardous!

6.0 Handling and Storage Requirements

There are no special handling and storage requirements associated with this device.

7.0 Switching Mechanisms & Housings

The switch point of LS Series level switches is dependent upon the specific gravity of the process fluid and other factors. As specific gravity decreases, the distance between the centerline of the upper process connection and the fluid level at which the switch transfers decreases. This is due to the additional amount of fluid required to make the float buoyant at the lower specific gravity. This means that actual fluid levels at the switch transfer point vary with specific gravity.

The function of the LS Series level switch depends upon the movement of a magnet assembly within the switch post to activate an external switch. In order to begin moving up with rising fluid level, a small amount of static friction must be overcome. To facilitate this additional force, the floats are designed with reserve buoyancy to provide force for movement and to provide buoyancy with decreases in specific gravity. This reserve buoyancy is in the form of the amount of float that is above the fluid level. In order for the reserve buoyancy to be useful, it must be located where fluid may actually reach it. As a standard, we design the floats so that the top is even with the centerline of the upper process connection when the magnet assembly is all the way to the top of the sensor tube. This allows standardization of all chambers for manufacturing. The fluid level at switching is then a function of the specific gravity and the float selected.

Dead-band of a magnetically operated switch is the distance a magnet must travel to transfer from one state to another. Switch transfer dead-band is a function of the type of switch selected and the strength of the magnetic field. The reed switch variety have only a small dead-band, while the cam actuated switches have larger dead-bands. Because the dead-band is different for each switch type, we set LS Series switches to either the High (rising fluid (standard)) or the Low (falling fluid) reference point on the LS Series sensor tube per the customer's requirements. The operation of the switch in the opposite direction is the dead-band distance. The location of the on/off points for each type of switch is consistent for that type, and is therefore known and placed on the sensor tube at the reference point on the sensor tube.

The LS Series is constructed such that sufficient over-travel past the switch point occurs to ensure proper operation no matter what switch type is used. This allowed over-travel increases the distance from the centerline of the upper process connection to the fluid level at the high switch point. This value is fixed at 11/16" for existing switch requirements. A difference of 13/16" between the high and low reference points has also been established due to existing switch requirements. Therefore, the high switch point is determined by the 11/16" over-travel plus the length of the float above the fluid level at the specific gravity specified. The low switch point is determined by the 11/16" over-travel plus the 13/16" difference between the reference points and the length of the float above the fluid level at the specific gravity specified.

The following "magnetically activated" switching mechanisms in Table 1 are available and ready for use with the LS Series Switches. This Table provides details on specific switching mechanism applicability. All switching mechanisms are available with the European CE mark. In high corrosive applications, ABB recommends the use of stainless steel housings over aluminum enclosures. Consult the KTEK factory for certification/documentation. Please see product data sheets on the KTEK website at www.ktekcorp.com for the latest specifications and approvals.

Table 1



Model #	Agency Approvals	Enclosure			Switching Mechanism						Application		
		Type	Ratings	Electrical Connection	Type	Ratings	Max Process Temp	Dead-band	Contacts	High Temp	Vibration	High Corrosion	
MS30	FM, CSA	Hermetically Sealed	NEMA 4x	1/2" MNPT	Reed	AC/DC 1amp	300°F (149°C) 600°F (316°C) with IP option	1/8"	SPDT	●			
MS30/EX	FM, CSA	Hermetically Sealed, Explosion Proof	NEMA 4x	1/2" FNPT	Reed	AC/DC 1amp	300°F (149°C) 600°F (316°C) with IP option	1/8"	SPDT	●			
MS40	FM, CSA	Stainless Steel	NEMA 4x	1/2" FNPT	Cam Driven, Snap Action	AC: 10amp DC: 2.6 amp	300°F (149°C) 600°F (316°C) with IP option	7/8"	DPDT	●	●	●	
MS40/EX	FM, CSA	Stainless Steel, Explosion Proof	NEMA 4x	3/4" FNPT	Cam Driven, Snap Action	AC: 10amp DC: 1/2 amp	300°F (149°C) 600°F (316°C) with IP option	13/16"	DPDT	●	●	●	
MS41	FM, CSA, ATEX	Stainless Steel, Dual Compartment, Hermetically Sealed, Explosion Proof	NEMA 4x	1/2" FNPT	Cam Driven, Snap Action	AC: 10amp DC: 2.6 amp	300°F (149°C) 1000°F (538°C) with IP option	15/16"	DPDT	●	●	●	
PS35	Non-electric	Stainless Steel	NEMA 4x	1/8" MNPT port	Pneumatic	15 to 100 psig	180°F (82°C) 450°F (232°C) with IP option	1"	Pneumatic Signal			●	
PS45	Non-electric	Stainless Steel	NEMA 4x	1/8" MNPT port	Pneumatic	1 to 100 psig	180°F (82°C) 450°F (232°C) with IP option	15/16"	Pneumatic Signal			●	

8.0 Troubleshooting

ABB switches are designed for long life and trouble-free operation. However, should you suspect a malfunction, conduct the following inspection.

1. Is the control being operated within the nameplate limitations?
2. Is power connected to the control? Is the power "On"?
3. Is the controlled equipment functional and wired properly? Is the level control wired properly?
4. Is the control piped properly? Ensure that all process piping is free of foreign material and that isolation valves are fully open. Pneumatic lines must be free of liquid and foreign matter
5. Has the factory-set position of the switching element (s) changed?
6. Is the control damaged? Inspect for cracks, terminal corrosion or lead wire damage. Replace the control if any damage is discovered.
7. Make sure that the interior of the switch is free of dirt corrosion and scale. Check the
 - A. Inside of the enclosing tube
 - B. Attraction sleeve and stem
 - C. Float or Displacer
 - D. Interior of the chamber and process connections
8. Call the ABB factory if inspection does not reveal the problem.

9.0 Warranty Statement

5 YEAR WARRANTY FOR:

KM26 Magnetic Liquid Level Gauges; MagWave Dual Chamber System; LS Series Mechanical Level Switches (LS500, LS550, LS600, LS700, LS800 & LS900) (does NOT include switching mechanisms, ie. MS30, MS40, MS41, PS35 & PS45); EC External Chambers, STW Stilling Wells and ST95 Seal Pots.

3 YEAR WARRANTY FOR:

KCAP300 & KCAP400 capacitance switches.

2 YEAR WARRANTY FOR:

AT100, AT100S and AT200 series transmitters; RS80 and RS85 liquid vibrating fork switches; RLT100 and RLT200 reed switch level transmitters; TX, TS, TQ, IX and IM thermal dispersion switches; IR10 and PP10 External Relays; MT2000, MT5000, MT5100 and MT5200 radar level transmitters; RI100 Repeat Indicators; KP paddle switches; A02, A75 & A77 RF capacitance level switches and A38 RF capacitance level transmitters; Buoyancy Level Switches (MS50, MS10, MS8D & MS8F); Magnetic Level Switches (MS30, MS40, MS41, PS35 & PS45).

1 YEAR WARRANTY FOR:

KM50 gauging device; AT500 and AT600 series transmitters; LaserMeter and SureShot series laser transmitters; LPM200 digital indicator; DPM100 digital indicators; APM100 analog indicators; KVIEW series digital indicators and controllers; GRANUPOINT and SLUDGEPOINT vibrating fork switches, SOLITRAK Electro-Mechanical Continuous Measuring Devices, KSONIK ultrasonic level switches, transmitters & transducers, ChuteMaster Microwave Transmitter / Receiver and TiltMaster Switches.

SPECIAL WARRANTY CONSIDERATIONS:

ABB does not honor OEM warranties for items not manufactured by ABB (i.e. Palm Pilots). These claims should be handled directly with the OEM.

ABB will repair or replace, at ABB's election, defective items which are returned to ABB by the original purchaser within the period specified above from the shipment date of the item and which is found, upon examination by ABB, to its satisfaction, to contain defects in materials or workmanship which arose only under normal use and service and which were not the result of either alterations, misuse, abuse, improper or inadequate adjustments, applications or servicing of the product. ABB's warranty does not cover the repair or replacement of units that fail from the effects of excessive vibration unless the units are originally designed for vibration application. In addition, ABB's warranty does not include on-site repair or services. Field service rates can be supplied on request.

If a product is believed to be defective, the original purchaser shall notify ABB and request a Returned Material Authorization before returning the material to ABB, with transportation prepaid by the purchaser. (To expedite all returns/repairs from outside of the United States, consult ABB's customer service team (service@ktekcorp.com) to determine an optimal solution for shipping method and turnaround time.) The product, with repaired or replaced parts, shall be returned to the purchaser at any point in the world with transportation prepaid by ABB for best-way transportation only. ABB is not responsible for expedited shipping charges. If the product is shipped to ABB freight collect, then it will be returned to the customer freight collect.

If inspection by ABB does not disclose any defects in material or workmanship, ABB's normal charges for repair and shipment shall apply (minimum 250.00 USD).

The materials of construction for all ABB products are clearly specified and it is the responsibility of the purchaser to determine the compatibility of the materials for the application.

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