



DISPLACER SWITCH- DS

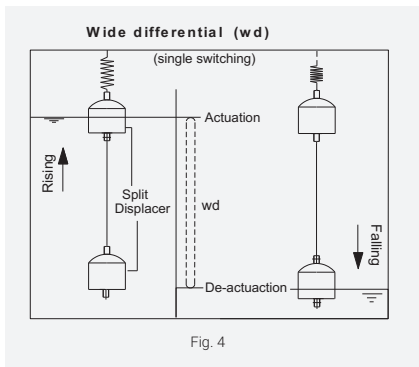
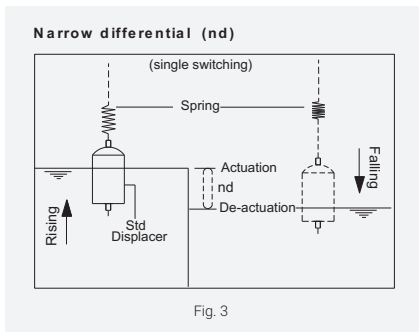
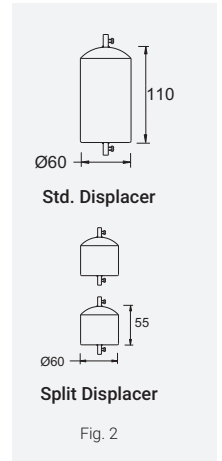
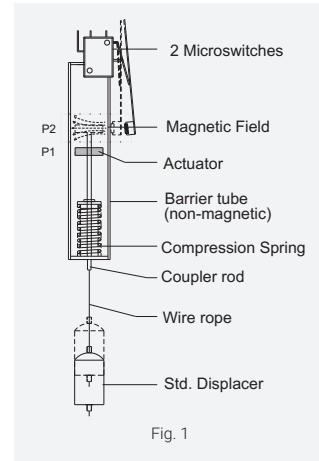
INSTALLATION AND MAINTENANCE MANUAL

Every Techtrol product should be installed properly, maintained regularly and used within its specified limits to ensure accurate & troublefree performance with extended working life.

1. CONSTRUCTION & OPERATION

A single standard or two split displacers are suspended from a wire rope and connected to a coupler rod, carrying an actuator moving within a nonmagnetic barrier tube via a compression spring (Fig1).

Initially when the displacer is not immersed in liquid, the spring is in compressed condition due to weight of the displacer so that the actuator is outside the magnetic field at position P1. During rising level, the displacer gets immersed in liquid, undergoes weight loss (Archimedes Principle) causing an upward motion of the coupler rod, which makes the spring assume its original status and move the actuator to position P2 within the magnetic field, resulting in actuation of micro switches, to provide change over contacts.



1.1 Switching Differential

It is defined as distance between actuation and deactuation point.

Narrow Differential (fig. 3) – is achieved by using standard displacer. It is 40 +-5mm approx. and cannot be changed.

Configuration A, C & E comes with narrow differential.

Wide Differential (fig. 4) – is achieved by using two split displacers. It can be changed as per the requirement. Configuration B & F comes with wide differential, while configuration D provides combination of narrow & wide differential.

1.2 Displacer Switch Configurations

Displacer switch is available in six different configurations with combination of switch carriage and displacers (standard or split) to achieve narrow and wide differential as well as combination of both for various applications.

Config. A

Single switching x one standard displacer with narrow diff. (nd).

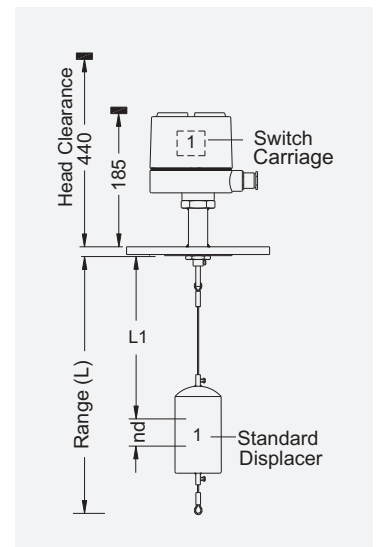
Rising Level: Switch actuates at L1 & remains actuated during further level rise.

Falling Level: Switch de-actuates at (L1+nd) & remains de-actuated during further level fall.

Narrow Diff (nd) is fixed.

L1 is adjustable.

Application: Point switching of one device i.e. Alarm or pump 'on or off' at L1 (SW1).



Config. B

Single switching x two split displacer with wide differential.

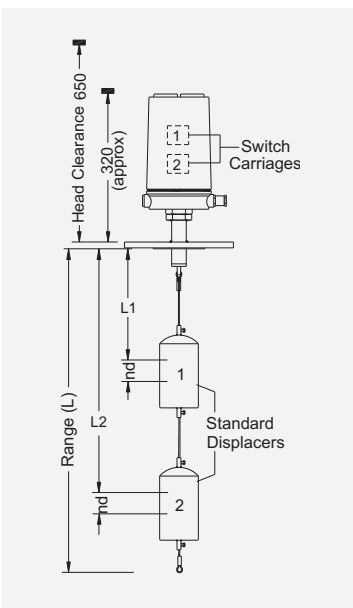
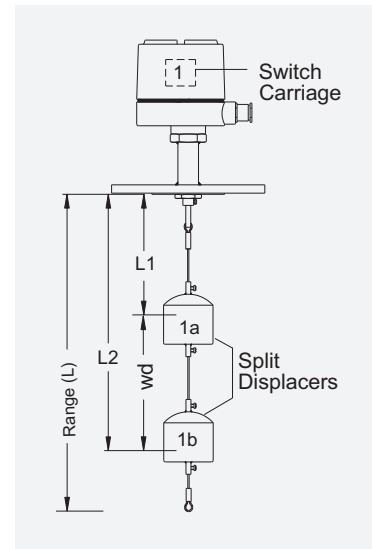
Rising Level: Switch actuates at L1 & remains actuated during further level rise.

Falling Level: Switch de-actuates at L2 & remains de-actuated during further level fall.

Wide diff. can be modified.

L1 & L2 are adjustable.

Application: Control action of one device i.e. pump 'on-off' between L1 & L2 (SW1).



Config. C

Dual switching x two standard displacers with narrow difference.

Rising Level: Switch 2 actuates at L2 & switch 1 at L1 and both remain actuated during further level rise.

Falling Level: Switch 1 de-actuates at $(L1+nd)$ & switch 2 at $(L2+nd)$ and both remain de-actuated during further level fall.

Narrow Diff (nd) is fixed.

L1 & L2 are adjustable.

Application: Point switching of two devices i.e. Alarm or Pump-1 'on or off' at L1 (SW1) & Alarm or Pump-2 'on or off' at L2 (SW2).

Config. D

Dual switching x two standard displacers with narrow difference.

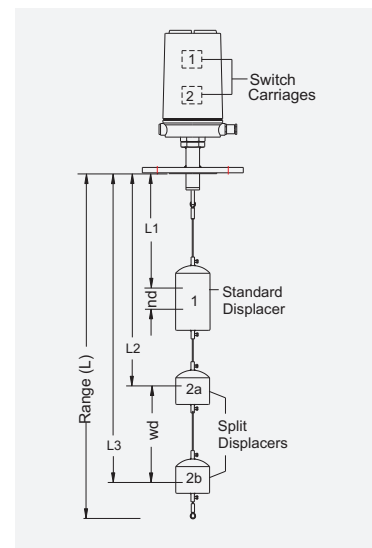
Rising Level: Switch 2 actuates at L2 & switch 1 at L1 and both remain actuated during further level rise.

Falling Level: Switch 1 de-actuates at $(L1+nd)$ & switch 2 at L3 and both remain de-actuated during further level fall.

Wide diff. can be modified.

L1, L2 & L3 are adjustable.

Application: Point switching & control action i.e. Alarm at L1 (SW1) and pump 'on-off' between L2 & L3 (SW2) or vice versa, by interchanging the position of standard & split displacers.



Config. E

Triple switching x three standard displacers with narrow differential.

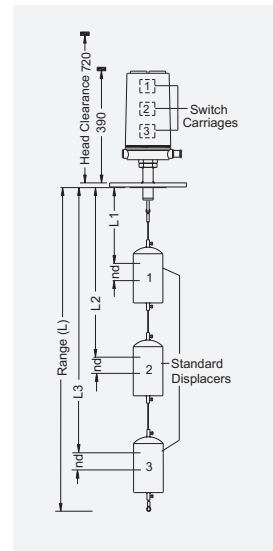
Rising Level: Switch 3 actuates L3, switch 2 at L2 & switch 1 at L1 and all remain actuated during further level rise.

Falling Level : Switch 1 actuates at (L1+nd), switch 2 at (L2+nd) & switch 3 at (L3+nd) and all remain de-actuated during further level fall.

Narrow Diff (nd) is fixed.

L1,L2 & L3 are adjustable.

Application: Point switching of three devices.



Config. F

Dual switching x four split displacers with narrow differential.

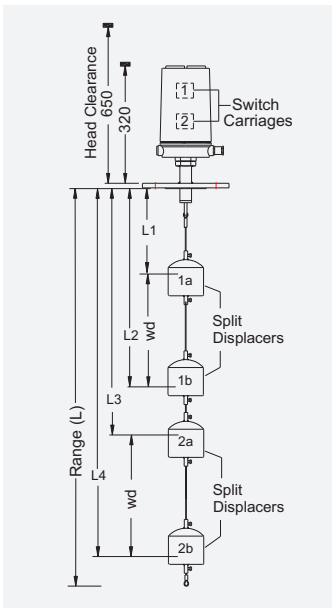
Rising Level: Switch 2 actuates at L3 & switch 1 at L1 & both remain actuated during further level rise.

Falling Level: Switch 1 de-actuates at L2 & switch 2 at L4 and both remain de-actuated during further level fall.

L1, L2, L3 & L4 are adjustable.

Wide diff. can be modified.

Application: Control action of two devices i.e. Pump 1 'on-off' bet L1 & L2 (SW1) & pump 2 'on-off' bet L3 & L4 (SW2).



2. PRE-INSTALLATION CHECK (Fig. 5)

- Ensure that the switch has been supplied in accordance to specifications in your purchase order.
- Ensure that the instrument has not been damaged.
- Take note of the model and serial no. indicated on name plate for future reference/spares.
- Ensure that the length of wire rope provided with switch is as per measuring range in purchase order.
- Ensure that switch carriage and no. of displacers as per configuration in purchase order
- Ensure that, spring housing base has not been loosened. Tighten if required.
- Hold the displacer switch in upright position. Manually move the coupler rod in upward & downward direction and ensure the 'changeover' of contacts between P & NO and P & NC terminals by using continuity tester/ multimeter.
- Switch is now ready for installation.

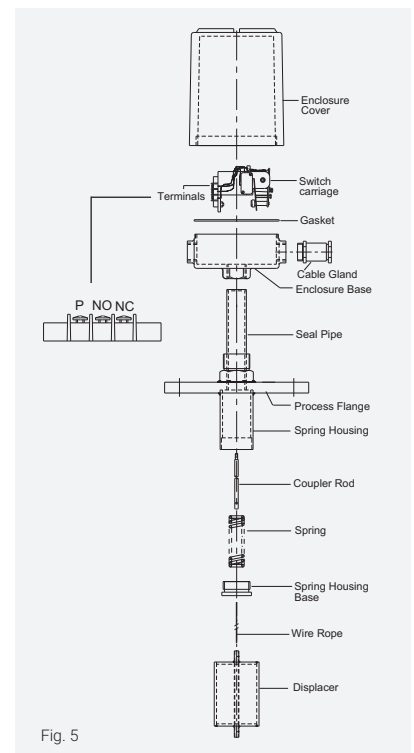


Fig. 5

3. INSTALLATION

During shipment, all the displacers are positioned at top and wire rope is wound on a displacer. While installing, unwind the wire rope and relocate the displacers at appropriate set points as per procedure. 3.3 given below.

3.1 Precautions During Installation:

Ensure proper location

a) away from inlet flow

b) away from out flow/suction.

c) away from tank internals.

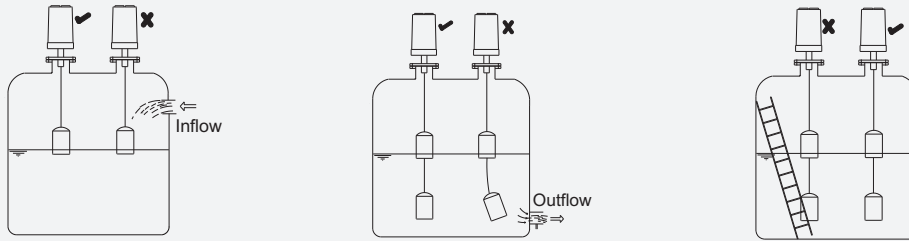


Fig. 7

- Ensure vibration devices like pump, generator are located far away from the tank.
- Ensure that tank nozzle is perpendicular to tank top so that installed switch is in plumb.
- Ensure that PCD of process and nozzle flange match.
- Provide suitable gasket between the flanges to ensure zero leakage through joints.
- Ensure that the lowest displacer does not touch the tank bottom (40 to 50mm above)
- The excess wire rope should always be wound on the lowest displacer. (fig 6)

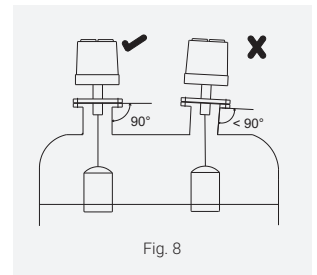


Fig. 8

3.2 Types Of Installation

Please identify the type of installation at your factory and proceed as under.

3.2A Internal installation

- Place suitable gasket on tank nozzle and carefully insert the displacer along with wire rope through the tank nozzle inside the tank.
- Bolt both the flanges (process & nozzle flange) and tighten adequately.

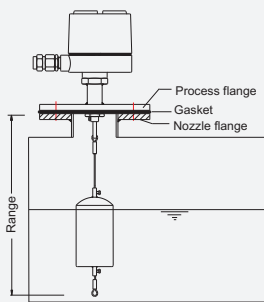


Fig. 9

3.2B Internal installation with stillwell

This arrangement is adopted for turbulent liquid.

- First insert stillwell through the nozzle.
- Place suitable gasket on the stillwell flange.
- Carefully insert the displacer along with & wire rope through the tank nozzle inside the tank and bolt all three flanges and tighten adequately.

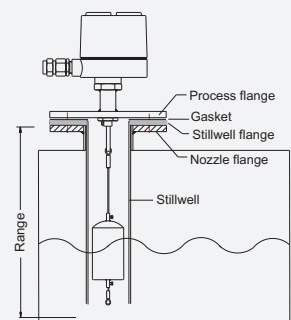


Fig. 10

3.2C External installation with external chamber

This method is recommended for tanks having limited internal space or agitator inside the tanks.

- Ensure CC distance between external chamber nozzle & tank nozzle are matching.
- Ensure process flange of external chamber match with tank nozzle flange.
- Use suitable gaskets while bolting the process flanges to tank flange.
- Insert switch inside the external chamber and bolt the flanges.

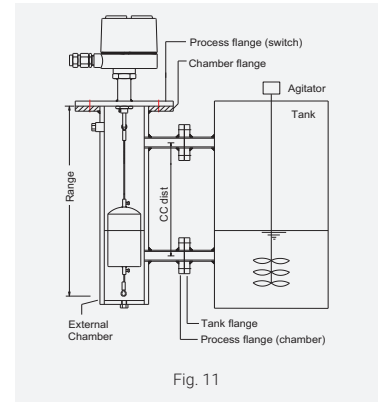


Fig. 11

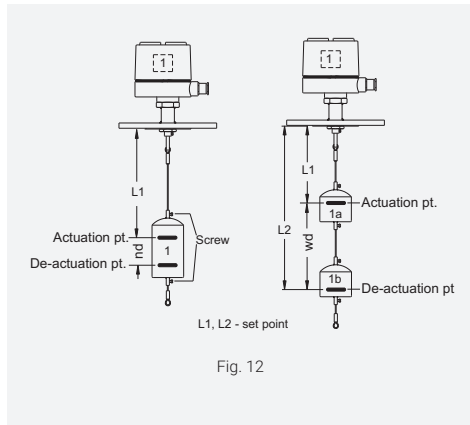


Fig. 12

3.3 Locating Displacer at Set Points

- 'Set point' is the distance from flange bottom to actuation and de-actuation point marked on displacer according to specific gravity of liquid specified in your purchase order.
- Loosen the top & bottom screws of displacer and move the displacer to required set point on the wire rope and tighten the screws to locate the displacer at that point.
- The minimum distance between flange bottom to highest set point is 200mm for metallic displacers and 350mm for PP/PTFE displacers
- The minimum distance between two set points is 200mm for all displacers

3.4 Modifying Wide Differential

- Wide differential is increased or decreased by changing the set point of upper & lower split displacers.
- Refer 3.3 to relocate the split displacers to new set points.

4. TERMINATIONS AND WIRING

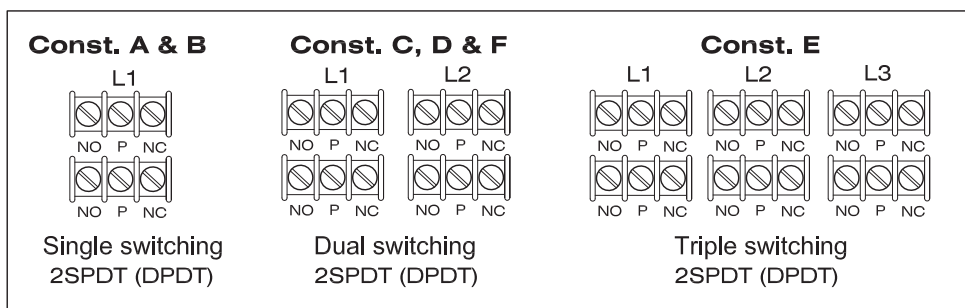


Fig. 13

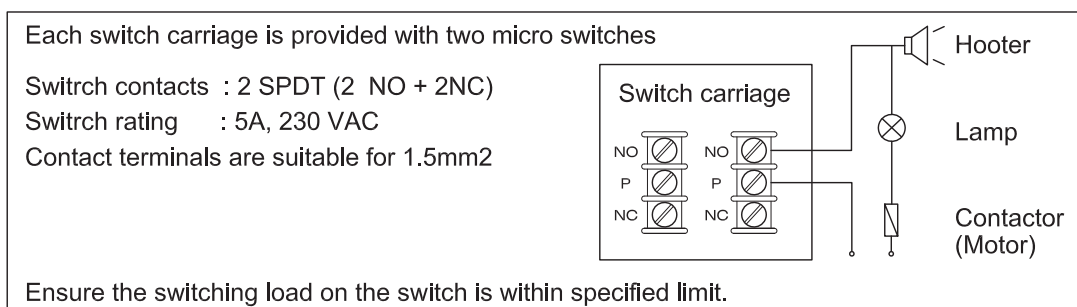
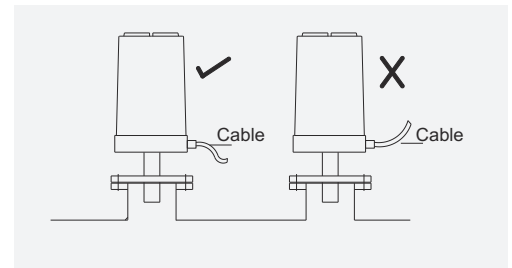


Fig. 14

- Ensure that the switch is duly earthed.
- Ensure wiring cable is suitable for the contact terminals and cable gland size so that there is no gap between 'cable OD' and 'cable gland ID'.
- Ensure that terminal contacts are properly tightened.
- Ensure cable termination is routed downwards before cable gland to prevent water seepage in the enclosure (fig 14).
- After completion of wiring, ensure that enclosure cover is screwed back with its gasket for weather proofness
- After installation, check the operations of switching contact by filling & draining of service liquid in the tank.
- To ensure safety & extended life, the operating temperature and pressure should not exceed the specified limit.



5. MAINTENANCE

- Switch off power supply, before commencing maintenance/repair.
- Dismount the switch and clean the displacers to remove deposits/scaling formed on its surface.
- Ensure all terminal connections are properly tightened.
- Ensure that contact terminals are not pitted/oxidized.
- Check wiring cable insulation for any brittleness or breakage and replace if necessary.
- In **hazardous locations**, open enclosure only after disconnecting switch from supply to prevent explosion.
- After maintenance, ensure that enclosure cover is screwed back with its gasket for weather proofness.

6. TROUBLESHOOTING

SL	PROBLEM	CAUSE	SOLUTION
1	Switch does not operate	<ul style="list-style-type: none"> a. Wrong mounting location near inlet or outlet of tank b. Switch mounting is not vertically in plumb c. Displacer movement stuck due to tank internals d. Improper or loose wiring connection. e. Switch faulty f. Specific gravity of liquid is low. 	<ul style="list-style-type: none"> a. Mount switch on proper location b. Mount switch vertically in plumb. c. Check and remove tank internal or change mounting location of switch. d. Refer fig 12 for wiring and tighten e. Replace switch carriage f. Consult Pune Techtrol
2	Switch does not operate at particular level	<ul style="list-style-type: none"> a. Refer pt.1 - a, b, c b. Displacer position on rope is wrong c. Switching point disturbed due to excessive deposition/ dirt on displacer. 	<ul style="list-style-type: none"> a. Refer pt.1- a, b, c b. Relocate and tighten displacer at correct position c. Clean the displacer
3	Switch chattering	<ul style="list-style-type: none"> a. Loose wiring b. Turbulence in liquid 	<ul style="list-style-type: none"> a. Tighten loose connections b. Use Stillwell or external cage to isolate turbulence.

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