

**INSTRUCTION MANUAL AND PARTS LIST**



**DESCRIPTION**

Tuffy liquid level switches are designed for horizontal mounting in a tank or vessel through threaded or flanged pipe connections. Standard models are equipped with a three-port/two-position valve, actuated by a magnetically actuated pivoted cam mechanism. This instruction manual covers Tuffy level controls which have pneumatic switches. For Tuffy controls with electric switches, please consult Bulletin BE 44-605.

**OPERATING PRINCIPLE**

Figures 1 and 2 illustrate the simple Magnetrol operating principle. Switching action is obtained through the use of a magnet attached to a float and a switching mechanism. These two basic component assemblies are separated by a non-magnetic, pressure tight barrier.

**APPLICATIONS**

Tuffy is recommended as a high or low alarm switch for clean liquid applications only.

**OPERATING CYCLE**

At a "low operating level" of liquid in a tank or vessel (refer to **Figure 1**), the float moves the magnet upward and into the field of the switch mechanism magnet. As a result, the magnets repel causing the pivot arm and valve plunger to move so that air is allowed to pass from air inlet A to air outlet C. As liquid level rises, for "High Operating Level" indication (refer to **Figure 2**), the float moves the magnet downward until the switch mechanism magnet reverses position, allowing the valve plunger to move so that air is allowed to pass from air inlet B to air outlet C.

For direct acting low level operation, air inlet A is closed off when liquid level increases. Conversely, for direct acting high level operation, air inlet B is closed off when liquid level recedes.

For reverse acting operation, air inlet A is used for high level and air inlet B is used for low level. The air inlet that is not in use should be plugged to prevent foreign materials from entering.

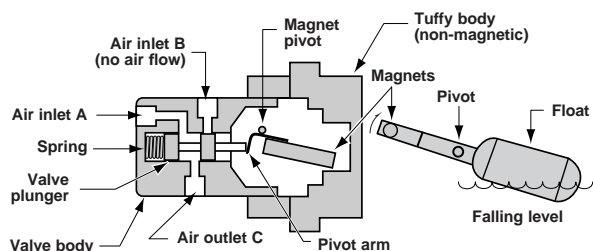


Figure 1: Low level operation – direct acting

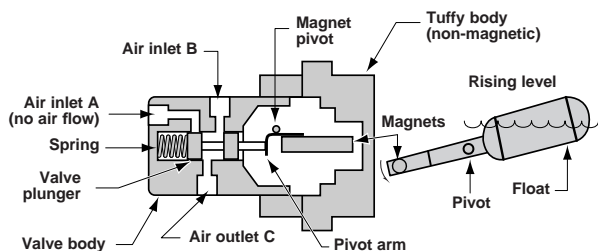
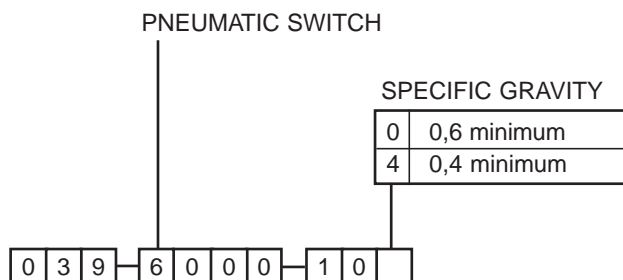


Figure 2: High level operation – direct acting

**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.

**MODEL IDENTIFICATION**



# INSTALLATION

## MOUNTING

- Before assembling Tuffy in a tank or vessel, check threaded or flanged mounting nozzle for the following:
  - Nozzle length and inside diameter must be sized correctly to allow for switch actuation at design levels. Refer to **Figure 3**.
  - Nozzle must be checked for horizontal alignment.
- Tuffy mounting does not differ for high level or low level operation. For proper operation, the serial number tag must be on top. Depending on whether direct or indirect action is required, air inlet A or air inlet B are used for supply air input. Air outlet C is always used for output. Table 1 summarizes the pneumatic valve action that takes place based on the inlets used.

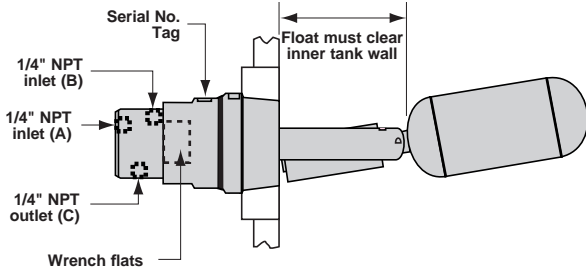


Figure 3

- Inlet air should be filtered with a 5 micron or finer filter. This will extend the life of the valve mechanism.
- Connect the inlet air line to the 1/4" NPT connection for either air inlet A or air inlet B, depending on the valve action desired (refer to Table 1). Inlet air pressure should be between 0–13.8 bar (0–200 PSIG). Refer to Figure 3 for location of air inlets.
- Connect outlet air line to the 1/4" NPT connection on the bottom of the valve. This air outlet is designated with a "C". Refer to **Figure 3** for location.
- If 3-way function is used, attach the exhaust air line to the appropriate 1/4" NPT connection based on valve action described in **Table 1**.

Float Position	Port	2-Way N.O. (direct)	2-Way N.C. (reverse)	3-Way N.O. (direct)	3-Way N.C. (reverse)	Diverter	Selector
Down (Low)	A	Inlet	Plug	Inlet	Exhaust	Outlet	Outlet
Up (High)	B	Plug	Inlet	Exhaust	Inlet	Outlet	Inlet
—	C	Outlet	Outlet	Outlet	Outlet	Inlet	Outlet

N.O.—Direct Acting: Air supply on switch condition.  
 N.C.—Reverse Acting: Air cut-off on switch condition.

Table 1

## EXTERNAL CAGE INSTALLATION

**Figure 4** shows a typical piping installation of a Tuffy External Cage Assembly. Switch actuates within 19 mm (0.75") above the cage-Tuffy centerline for rising level and within 19 mm (0.75") below the centerline on falling level.

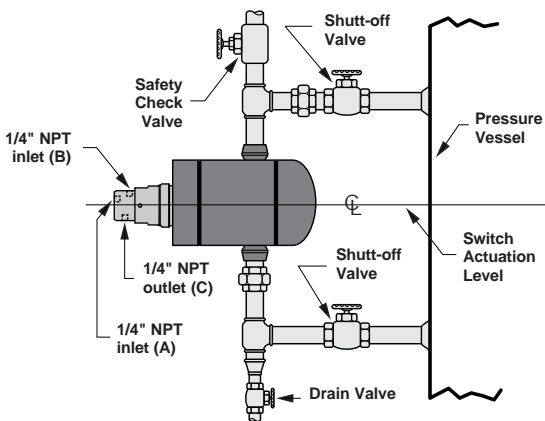


Figure 4

The external cage must be installed so that the tappings are vertical. Installation should be checked with a spirit level on top and/or sides of the cage.

Controls should be mounted as close to the vessel as possible. This will result in a more responsive and accurate level change in the cage. Liquid in a long pipeline may be cooler and more dense than liquid in a vessel causing lower level indication in the control than actual level in the 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 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 cage assembly. If a 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 indicators. In this case, **DO NOT** insulate the switch mechanism housing.

# PREVENTIVE MAINTENANCE

Periodic inspections are a necessary means to keep your Magnetrol level control in good working order. This control is a safety device to protect the valuable equipment it serves. A systematic program of preventive maintenance should be implemented when the control is placed into service. Based on utilizing a preventative maintenance program and observing the following section on "what to avoid", your Tuffy will provide reliable protection of your capital equipment for many years.

## WHAT TO AVOID

1. Use only the 2" wrench flats to install or remove the unit. Refer to **Figure 3**. Use of any other surface could change the calibration. The valve body is calibrated at the factory and locked in place.
2. **NEVER** attempt to make adjustments without reading the instructions carefully. When in doubt, consult the factory or your local representative.
3. **NEVER** use in systems which have excess iron particles in the solution. The magnet at the counterweight end of the float can attract the particles which could cause the float rod to jam.

# TROUBLESHOOTING

## FAILURE TO SHUT OFF OR TURN ON INLET AIR

1. Check float for full range of travel; clicking of mechanism should be heard.
2. If the complete Tuffy mechanism operates properly when removed from service, check to be certain that liquid is entering the storage tank or vessel. A valve may be closed or a pipe line clogged.
3. If the float is determined to be filled with liquid or is collapsed, the entire level switch must be replaced. Do not attempt to repair the float.
4. The factory calibration setting should not require any adjustment in the field. Check to see that the unit is installed properly with the serial number tag positioned on the top of the unit. If the unit is still not operating correctly, please contact the factory.

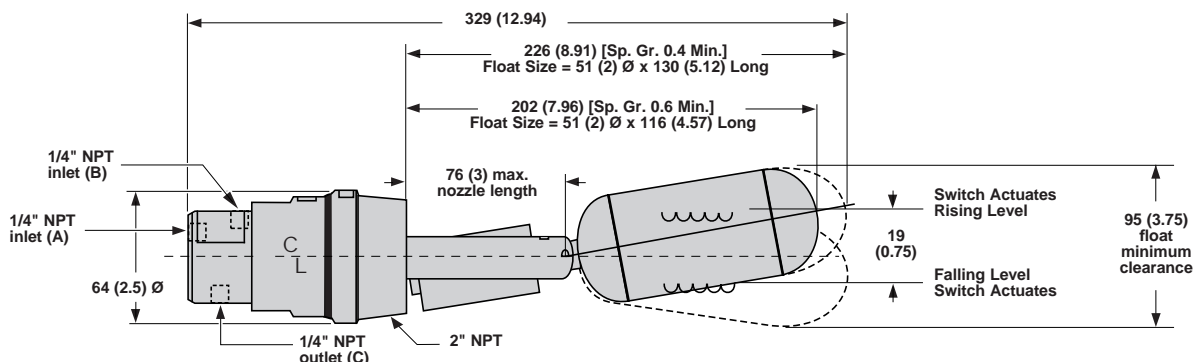
**NOTE:** When in doubt about the condition or performance of a control, please contact the factory for assistance.

# SPECIFICATIONS

## MECHANICAL SPECIFICATIONS

Description	Specification
Max. design pressure	0,6 SG: 103 bar @ 40°C (1500 PSIG @ 100°F) 0,4 SG: 34 bar @ 40°C ( 500 PSIG @ 100°F)
Max. process temperature	-40°C to 200°C (-40°F to 400°F)
Pneumatic switch supply pressure	Vacuum - max 13.8 bar (200 PSIG)
Max. leakage rate	14.16 l/h (0.5 SCFH)
Max. air flow	2.55 m³/h (1.5 SCFM)
Specific gravity	0.6 minimum or 0.4 minimum
Materials of construction	316/316 SS wetted components including ANSI B 31.3/NACE
Housing	316/316 L SST
Cage (optional)	Carbon steel or 316 /316L stainless steel
Cage rating	103 bar @ 260°C (1500 PSIG @ 500°F)
Square flange (optional) rating	17 bar @ 204°C ( 250 PSIG @ 400°F)

## DIMENSIONAL SPECIFICATIONS in mm (inches)



# REPLACEMENT PARTS

The pneumatic Tuffy is designed for years of trouble free use. Due to the nature of the valve design and the factory calibration required for proper operation, no specific replacement parts are offered.

## Optional accessories

For selection of cages and flanges please refer to bulletin BE 44-118.

# IMPORTANT

## SERVICE POLICY

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

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

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.

In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labour, direct or consequential damage will be allowed.

## RETURNED MATERIAL PROCEDURE

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

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

All shipments returned to the factory must be by prepaid transportation. Magnetrol **will not accept** collect shipments.

All replacements will be shipped FOB factory.

BULLETIN N°: BE 44-606.3  
EFFECTIVE: JANUARY 1998  
SUPERSEDES: March 1991

UNDER RESERVE OF MODIFICATIONS



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