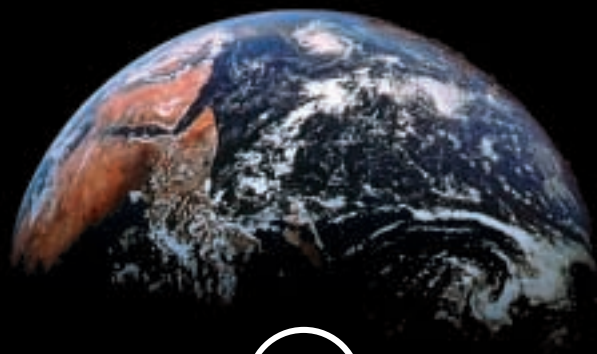




**B U O Y A N C Y      P R O D U C T S**

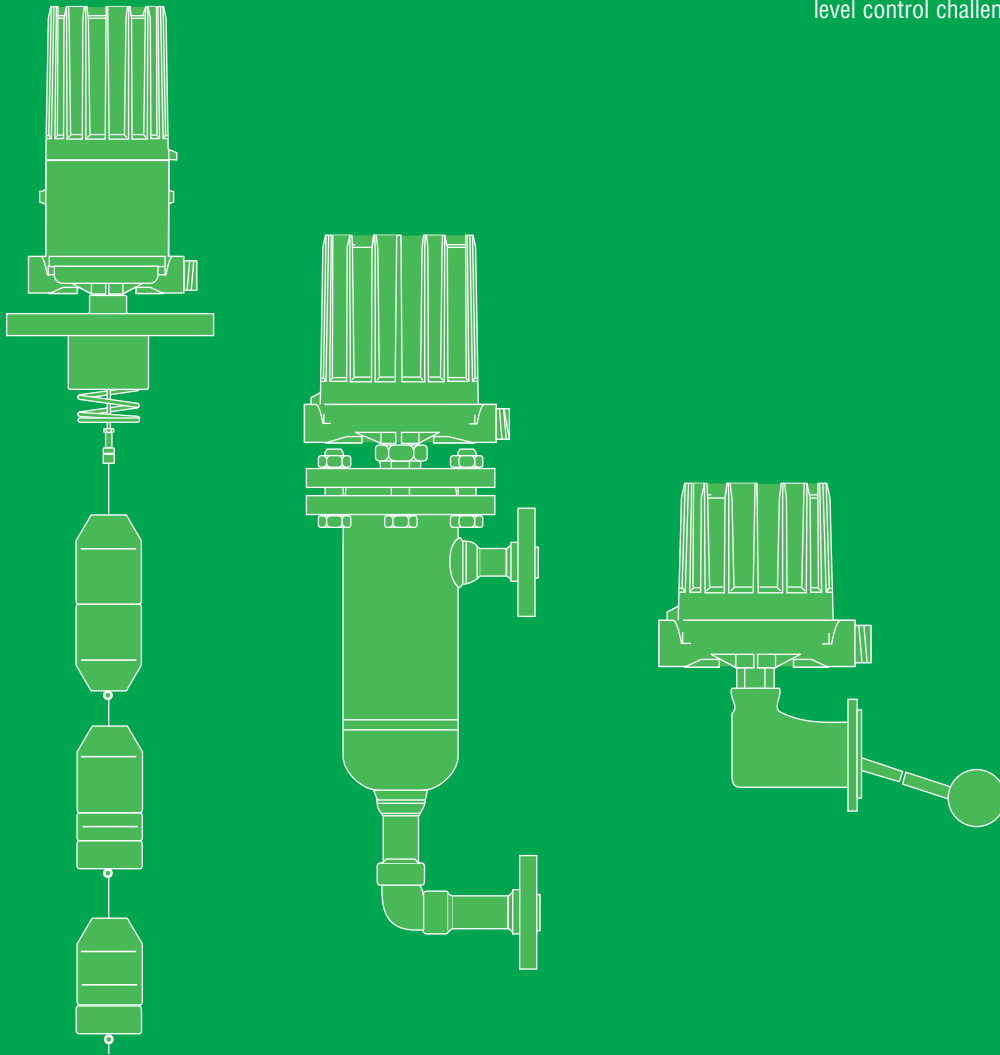


**Magnetrol®**

**Worldwide Level and Flow Solutions™**

## The Total Spectrum of Solutions ►

Magnetrol's products employ many technologies for the measurement and control of level and flow. Buoyancy technology, with its utilization of float and displacement principles, represents Magnetrol's most time-tested product group. To this day, buoyancy technology continues to provide optimum solutions for many of today's level control challenges.



BUOYANCY PRODUCTS  
**MAGNETROL**



**M**agnetrol International, Inc.—a world leader in level and flow control technology—designs, manufactures, markets and services level and flow instrumentation worldwide.

Magnetrol's product groups are based upon these technologies:

- Air Sonar
- Buoyancy
- Contact Ultrasound
- Guided Wave Radar
- RF Capacitance
- Thermal Dispersion
- Vibration
- Visual Indicators

The industries we serve include:

- Petroleum Production
- Petroleum Refining
- Power
- Petrochemical
- Chemical
- Water & Wastewater
- Pulp & Paper
- Food & Beverage
- Pharmaceutical

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# Buoyancy Level Controls

## A Time-Tested Solution

The application of buoyancy principles to the challenges of level measurement and control is one of the oldest and most reliable solutions available in the process control industry. The key to the success of buoyancy instruments is the means by which the motion of the liquid and, therefore, the float or displacer is converted into the desired level control action. Magnetrol incorporates the optimal features into its level switches while providing repeatable, dependable performance. The result of completely isolating the process environment from the switching mechanism and keeping all magnetic components out of the process environment, is a robust, versatile instrument suitable for a wide variety of control applications.

### Buoyancy Technology's Advantages:

- + Service pressures up to 5000 psig (345 bar)
- + Service temperatures to 1000° F
- + No calibration for float switches
- + Calibration of displacer switches without level change
- + Highly reliable, easily understood technology
- + Multiple stage control available
- + Narrow and/or wide differential displacer switches
- + Transmitters available for continuous output
- + Switches do not require power

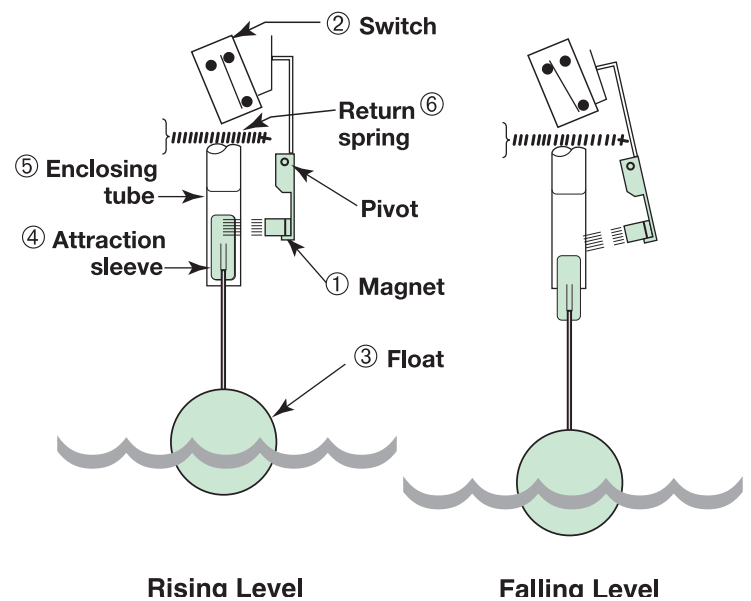
### Buoyancy Technology's Limitations:

- Build-up or dirty process may impede performance.
- Switch accuracy limited to  $\pm 0.25$  inches (6 mm).
- Not suitable for solids
- Moving parts in process

## Vertical Float

The float orientation utilized for top mounted switches and as the primary sensing method for external cage switches is the vertical float. The principle of operation is simple and provides a practical solution to narrow level differential requirements.

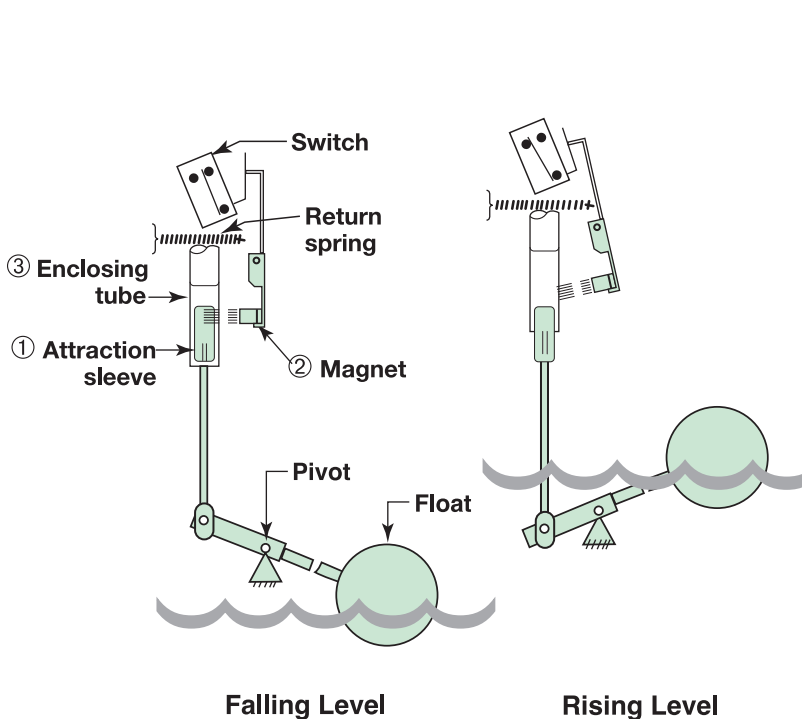
A rigid stem and attraction sleeve<sup>④</sup> assembly is affixed to the top of a spherical or oblong float.<sup>③</sup> The size of the float determines the buoyancy force of the process liquid against the float, stem and sleeve assembly. This buoyancy force must be greater than the weight of the assembly and is increased by enlarging the float. Because the buoyancy force is greater, the float assembly rises directly with the liquid level. As it does so, the attraction sleeve moves within a static pressure boundary, the enclosing tube.<sup>⑤</sup> A permanent magnet<sup>①</sup> is attached to the switch assembly<sup>②</sup> outside of the enclosing tube. When the attraction sleeve enters the field of the switch magnet, the magnet is pulled toward the sleeve, snapping against the enclosing tube and causing the switch to change state. As the liquid level falls, the float/stem/sleeve assembly follows it. When the attraction sleeve moves out of the field of the



switch magnet, a return spring<sup>⑥</sup> on the switch mechanism pulls the magnet away from the enclosing tube, returning the switch to its original state.

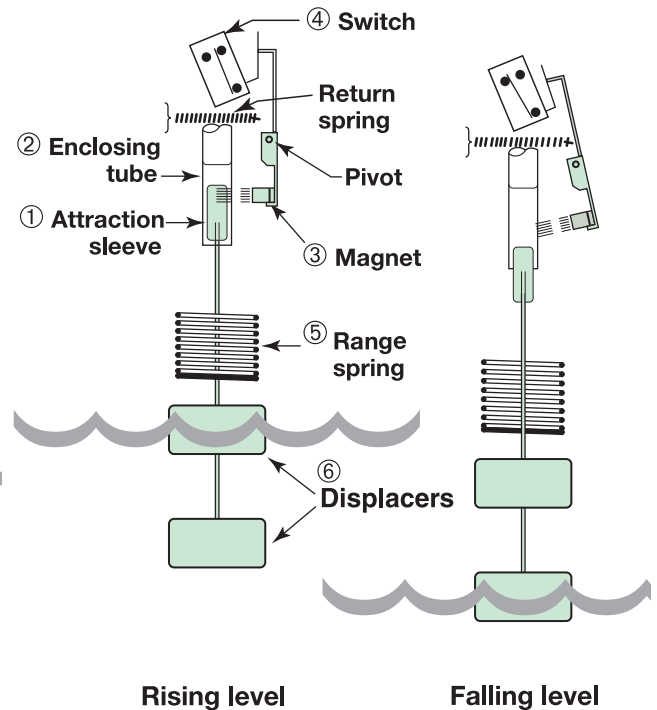
## Horizontal Float

A horizontal float switch, often called a side mounted unit, operates much like a vertical float. It utilizes the same components, float, stem, sleeve,<sup>①</sup> enclosing tube,<sup>③</sup> switch magnet<sup>②</sup> and mechanism, but functions in a slightly different manner. The lower float stem pivots on a fulcrum. This means that as the float rises, the attraction sleeve is pulled down out of the field of the switch magnet causing the magnet to be pulled away from the enclosing tube. Conversely, as the float falls, the sleeve moves upward causing the switch magnet to pull in. Side mounted controls may be used for wide level differential. By lengthening the float stem, the liquid level and float must move through a greater distance in order to change the state of the switch. Side mounted units offer the option of mounting toward the bottom of a vessel for use in low level service, something that may not be done with a top mounted vertical float.



## Displacer Switches

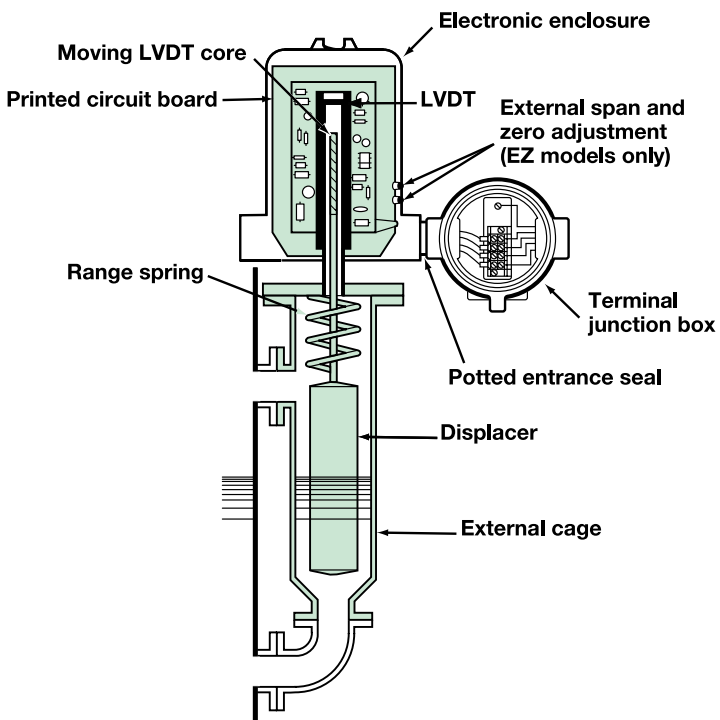
While taking advantage of the same buoyancy and magnetic coupling principles as float switches, displacer level switches utilize a precision range spring<sup>⑤</sup> to convert the change in buoyancy force to movement of an attraction sleeve.<sup>①</sup> Because the displacer<sup>⑥</sup> is weighted, it hangs into the liquid rather than floating on top. As the liquid level moves changing the volume of liquid displaced by the displacers, the buoyancy force on the displacers changes. This causes elongation or compression of the range spring which, in turn, moves the attraction sleeve into or out of the field of the switch magnet, changing the state of the switch.<sup>④</sup>



# Buoyancy Level Controls (continued)

## Displacer Transmitters

As with displacer switches, the change in buoyancy force on a range spring is converted to motion. This motion is used to produce an output proportional to the change in liquid level. The pneumatic Modulelevel has a sleeve that attracts a follower magnet, changing the position of a nozzle lever and the output from the controller head. Both the Digital ES II and the EZ Modulelevels employ a linear variable differential transformer (LVDT) to produce the proportional output. The core of the LVDT is affixed to the top of the displacer stem. As the spring compresses or elongates, the core moves within the LVDT windings, inducing currents in the secondary windings. This information is processed and output as a 4 to 20 mA proportional signal. In addition, the Digital ES II superimposes a HART compatible signal on the 4 to 20 mA allowing communications via the HART protocol.



## Advantages (+) and Limitations (-)

### Vertical Float :

- + Highly reliable and repeatable
- + Broad product offering
- + High temperature capability
- + Many modifications and options available
- Low S.G. means a low pressure rating
- Narrow differential only
- External cage units are expensive when large floats (and therefore cages) are required

### Horizontal Float:

- + Highly reliable and repeatable
- + Wide differential possible
- + Low S.G. possible on counterweighted units
- Invasive mounting; can't be isolated
- Moving parts (pivots) in the process

### Displacer Switches:

- + Highly reliable and repeatable
- + Wide and narrow differentials
- + High pressure capability with low S.G.
- + Not affected by turbulence
- Temperature limited by range spring
- Multiple stage units can be complex

### Displacer Transmitters:

- + High pressure/temperature capabilities
- + Stable signal in turbulent applications
- + No flexure of pressure boundary parts
- + HART compatible
- Affected by shifting S.G.

# At-A-Glance: Magnetrol's Buoyancy Products

The chart below summarizes the principle features of Magnetrol's leading buoyancy products. A green dot (●) indicates a standard feature; a red

triangle (▲) indicates an optional feature. Tuffy®, Modulevel®, and Magnetel® are registered trademarks of Magnetrol International, Inc.



	Modulevel Digital ES II	Modulevel Analog EZ	Modulevel Pneumatic	Aurora Level Gauge	Series 3 Switches	External Cage Float Switches	Top Mount Displacer Switches	Top Mount Displacer Switches	Side Mount Displacer Switches	Side Mount Float Switches	Top Mount Float Switches	Tuffy II Switches	TK1 Switches	Flow Switches	Boiler Switches
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	Modulevel Digital ES II	Modulevel Analog EZ	Modulevel Pneumatic	Aurora Level Gauge	Series 3 Switches	External Cage Float Switches	Top Mount Displacer Switches	Top Mount Displacer Switches	Side Mount Displacer Switches	Side Mount Float Switches	Top Mount Float Switches	Tuffy II Switches	TK1 Switches	Flow Switches	Boiler Switches
<b>Sensor Type</b>															
Float				●	●	●				●	●	●	●	●	●
Displacer	●	●	●		●		●	●							
<b>Control Action/Output</b>															
Single Switch				▲	●	●	●	●	●	●	●	●	●	●	●
Multiple Switch			▲	▲	●	●		●	●	●					●
Controller			●												
Transmitter	●	●	●	▲											
Narrow Switch Differential			▲	▲	●	●	●	●	●	●	●	●	●	●	●
Wide Switch Differential									●		●	●			
Indicator	▲	▲	●	●											
HART	●			●											
<b>Configurations</b>															
External Cage	●	●	●	●	●	●	●	●	▲			▲	▲		●
Top Mount	●	●	●	▲						●	●				●
Side Mount			▲									●	●	●	●
Integral Mount	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Remote Mount	▲	▲	▲	▲											
<b>Construction to Code</b>															
NACE Construction	▲	▲	▲	▲	●					▲	▲	▲	●		▲
ASME B31.1	▲	▲	▲	▲	●	▲									
ASME B31.3	▲	▲	▲	▲	●	▲			▲	▲	▲	●			

# MODULEVEL® Electronic Transmitter

Advanced Level Control in Digital or Analog Versions.

## Description:

The electronic Modulevel level transmitter is available in two versions: the HART® compatible Digital ESII and the Analog EZ. Both are advanced, intrinsically-safe, two-wire instruments that convert liquid level changes into a stable 4-20 mA output signal.

## Features of ESII and EZ:

- Robust potted-module electronics prevent damage or corrosion.
- Intrinsically-safe circuitry is housed in an explosion-proof, flame-proof, NEMA 4X/7/9 cast iron housing for ultimate protection.
- Heads rotate 360° for ease of installation and positioning.
- Displacer may be modified for reliable interface level control.
- An isolated junction box is standard with all units.
- Range spring/LVDT technology ensures a stable output.

## Features of Digital ESII:

- Continuous self-diagnostics with selectable fault output signal provide reliable instrument performance.
- HART® output allows remote calibration and communication.
- Local push-button calibration capability is standard.
- One-point field calibration allows quick start-up.
- Plug-in digital & analog meters provide local indication and easy wiring access.

## Model Selection:

- Refer to Magnetrol Sales Bulletin 48-105 for model numbers, options and complete specification information.



## SPECIFICATIONS



## Supply Voltage:

12 to 36 Vdc  
120 Vac, 50/60 Hz (Analog EZ only) 240 Vac, 50/60 Hz (Analog EZ only)

## Ambient Temp Range:

-40° F to +160° F (-40° C to +71° C)

## Process Temp Range:

Steam Applications: -20° F to +500° F (-29° C to +260° C)  
Non-Steam Applications: -20° F to +600° F (-29° C to +315° C) with carbon steel chambers; stainless steel chambers available for lower process temperatures

## Process Pressure:

Up to 4265 psig @ +100° F (294 Bar @ +38° C)

## Accuracy:

<±1 %

## Repeatability:

±0.20 %

## Linearity:

Mechanical/electrical = ±0.25 %, LVDT = ±0.25 %

## Temperature Effect:

Max 0.031 %/° F (0.056 %/° C) from 0° F to +160° F (-18° C to +71° C)

## Operator Interface:

Digital ESII: HART® Hand Held Communicator or Push Button and LED's on PCB  
Analog EZ: Zero and span pots

## Output:

Digital ESII: 4-20 mA (reversible) with HART®; max loop resistance 545 Ω @ 24 Vdc  
Analog EZ: 4-20 mA (reversible); max loop resistance 480 Ω @ 24 Vdc

## Specific Gravity:

0.23 to 2.20 SG

## Materials of Construction:

Chambers: carbon steel or 316/316L stainless steel  
Wetted Components: 304/304L or 316/316L and Inconel® (spring)

# MODULELEVEL<sup>®</sup> Pneumatic Controller

High Reliability in Temperature and Pressure Extremes.

**Description:** The pneumatic Modulelevel is a highly reliable liquid level controller using continuous displacement technology. The output signals are in direct proportion to changes in liquid level. The pneumatic Modulelevel uses Magnetrol's proven magnetic coupling design for optimum performance at extreme temperature and pressure.

- Features:**
- Range spring design provides stable output signal even on turbulent level, reducing valve wear.
  - Head rotates 360° for ease of installation and positioning.
  - NEMA 3R controller head is removable without depressurizing the process, reducing downtime and maintenance costs.
  - Instrument shop calibration allows quick start-up or change out.
  - Visual indicator is actuated by magnetic coupling which allows visual level indication even upon loss of air supply.
  - Turndown, midpoint change, and specific gravity correction are all adjusted by dedicated calibrators making start-up quick and easy.
  - Suitable for interface level with modified displacer.
  - Dual head, receiver/controllers are standard selection.

**Model Selection:** Refer to Magnetrol Sales Bulletin 48-110 for model numbers, options and complete specification information.



## SPECIFICATIONS

- Supply Pressure:** Regulated instrument quality air (clean & dry)
- Air Consumption:** 3 SCFH @ 9 psig output  
6 SCFH @ 15 psig output
- Process Temp Range:** -20° F to +700° F (-29° C to +371° C) with carbon steel chambers (stainless steel chambers are available for lower process temperatures)
- Process Pressure:** Up to 4265 psig @ +100° F (294 Bar @ +38° C)
- Accuracy:** <math>\pm 2\%</math>
- Repeatability:**  $\pm 0.5\%$
- Linearity:**  $\pm 1.0\%$
- Output:** Proportional, proportional plus reset, and transmitter: 3-15 psig or 6-30 psig (direct or reverse acting)  
Differential Gap: 0-20 psig or 0-35 psig (direct or reverse acting)
- Specific Gravity:** 0.23 to 2.20 SG
- Materials of Construction:** Chambers: carbon steel or 316/316L stainless steel  
Wetted Components: 304/304L or 316/316L and Inconel<sup>®</sup> (spring)

# Aurora Magnetic Level Gauge with Guided Wave Radar Transmitter

Achieve True Redundancy with this State of the Art MLI

**Description:** Magnetrol's unique marriage of magnetic level indication with guided wave radar has resulted in a truly redundant level control instrument. Also, available are clamp-on reed, dry contact and pneumatic switches to augment the transmitter output.

**Measurement Principle:** Float and magnetic coupling and micropower impulse radar

- Features:**
- Large selection of materials of construction
  - Unique "flux ring" within the float produces a strong, consistent magnetic field for reliable magnetic coupling
  - Flag or shuttle type indicators available
  - Broad range of process connection types and sizes
  - Built to ASME B31.1 and B31.3 construction codes
  - Choice of scale units of measure
  - High temperature and cryogenic insulation available

**Model Selection:** Refer to Magnetrol Sales Bulletin 46-138 for model numbers, options and complete specification information.

## SPECIFICATIONS

- Process Temp Range:** -40° F (-40° C) to +750° F (+399° C)
- Process Pressure:** Up to 4500 psig
- Specific Gravity:** Down to 0.25
- Dielectric:** Down to 1.4
- Chamber Material:** MLI materials of construction include 304/304L SS, 316/316L SS, monel, hastelloy C, titanium, hastelloy B, 321 SS, Alloy 20, Inconel 625, etc.
- Measuring Range:** 12 to 600 inches
- Transmitter:** 24 Vdc supply, 4 to 20 mA output, HART or LCD optional
- Indicators:** Shuttle type follower or flags, visible from 100 feet
- Scale:** Available in units of height (inches, centimeters), volume (gallons, liters), percentage of span or other custom units
- Options:** Remote mounted electronics, additional materials of construction, Custom span, process connections, etc.



# SERIES 3 Liquid Level Switches

## ASME B31.1 and B31.3 Conformance-Certified Switches

**Description:** Magnetrol Series 3 float/displacer-actuated external cage level switches are designed, constructed, tested and certified to ASME B31.1 (for boiler and power plant use) or ASME B31.3 (for refineries and petrochemical use).

**Measurement Principle:** Vertical float or displacer actuated level switch.

- Features:**
- Construction to NACE MRO175 optional
  - Sealed and flanged top external chambers
  - Broad selection of switch types
  - Single or multiple switch points
  - Exotic materials of construction available
  - Can be modified for interface service
  - Available with many sizes, types and configurations of process connections, including optional weld neck, RTJ or DIN flanges.
  - All switch enclosures rotate through 360° for ease of conduit entry positioning

**Model Selection:** For model numbers, options and specification information on Series 3 refer to Magnetrol Sales Bulletin 46-127.



Series 3 Flanged Cage Design

### SPECIFICATIONS



**Process Temp Range:** -20° F (-29° C) to +750° F (+399° C) with carbon steel chamber  
Lower temperatures possible with stainless steel chambers

**Process Pressure:** Up to 1410 psig (97.1 bar) for ASME B31.1  
Up to 1480 psig (102 bar) for ASME B31.3

**Specific Gravity:** Down to 0.41 for ASME B31.1  
Down to 0.33 for ASME B31.3

**Chamber Material:** Standard is carbon steel  
Options include 304/304L SS, 316/316L SS, monel, hastelloy® C, duplex SS, etc.

**Trim Parts:** 300 and 400 series stainless steels

**Quality Assurance:** Full penetration welds done by qualified welders per ASME Section IX procedures. Certificate of Conformance on all pressure boundary materials, certified ten minute hydrostatic test, post weld heat treatment (NACE units only) and 5% radiographic examination (ASME B31.3 only).

**Switch Enclosures:** NEMA 4X/7/9 aluminum for Class I, Div. 1, Group B, C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic.



Series 3 Sealed Cage Design

# EXTERNAL CAGE Liquid Level Switches

## Reliability in Sealed or Flanged Top External Chambers

**Description:** Magnetrol's external cage float and displacer actuated level switches have been industry standards for decades. With 28 basic models from which to choose, these self-contained instruments provide time-proven solutions to a wide range of level control applications.

**Measurement Principle:** Vertical float or displacer actuated level switch.

- Features:**
- Sealed and flanged top external chambers
  - Broad selection of switch types
  - Single or multiple switch points
  - Exotic materials of construction available
  - Can be modified for interface service
  - Available with many sizes, types and configurations of process connections, including optional weld neck, RTJ or DIN flanges.
  - All switch enclosures rotate through 360° for ease of conduit entry positioning.

**Model Selection:** Refer to Magnetrol Sales bulletins 46-115, 46-116 and 46-121 for model numbers, options and complete specification information.



### SPECIFICATIONS



**Process Temp Range:** -50° F (-29° C) to +750° F (+399° C)

**Process Pressure:** Float controls up to 1500 psig (103 bar)  
Displacer controls up to 5000 psig (345 bar)

**Specific Gravity:** Down to 0.32

**Chamber Material:** Standard is carbon steel. Sealed cage models available in stainless steel. Options include 304/304L SS, 316/316L SS, monel, hastelloy C, duplex SS, etc.

**Float and Trim Parts:** 300 and 400 series SS or all 316/316L SS

**Switch Enclosures:** Polymer power coat finished aluminum NEMA 4X/7/9 for Class I, Div. 1, Group B or Groups C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic

**Options:** Interface service, high and low temperature modifications, customized installation dimensions, vents and drains, customized actuation levels, special finishes, etc.



# TOP MOUNT DISPLACER TYPE Level Switches

Narrow or Wide Range; for Simple or Complex Applications.

**Description:** Magnetrol's displacement type level switches offer the user a wide selection of alarm and control configurations. These switches are well suited for simple or complex applications from single alarms points to overlapping three stage pump control.

**Measurement Principle:** Vertical displacer actuated level switch.

- Features:**
- Reliable, maintenance-free operation
  - Single, dual or triple stage models
  - 16 standard displacer arrangements plus specials
  - Field-adjustable set points and deadband
  - Verify switch operation with the optional Proofer ground checker
  - Models available for floating roof detection
  - Range spring design allows for reliable performance even in turbulent or surging applications.
  - Models built to NACE MR0175 available
  - Available with a variety of electric and pneumatic switch mechanisms

**Model Selection:** Refer to Magnetrol Sales Bulletin 45-115 for model numbers, options and complete specification information.



## SPECIFICATIONS



**Process Temp Range:** -50° F (-46° C) to +500° F (+260° C)

**Process Pressure:** Up to 800 psig (55 bar)

**Specific Gravity Range:** 0.40 to 2.40

**Wetted Parts:** Mounting connection in carbon steel, cast iron or 316/316L SS  
Displacers in 316/316L SS, porcelain, Karbate or lead  
Trim in 300 and 400 series SS or, all 316/316L SS  
Displacer cable and clamps in 316/316L SS, monel or hastelloy C

**Actuation Levels:** One to three narrow and wide differential set points, field adjustable.

**Switch Enclosures:** Polymer powder coat finished aluminum NEMA 4X/7/9 for Class I Div. 1 Group B or Groups C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic

**Options:** Modification per customer requirements include extended displacer cable, interface service, low specific gravity displacers, customized displacer arrangements, etc.

# TOP MOUNT Liquid Level Switches

Simple and Reliable Float Actuated Switches for Top Mount Installations

**Description:** Top mounted, float actuated models T20 and T21 provide time-tested reliability in a single or dual stage liquid level switch. These simple vertical float switches are easy to install and require virtually no maintenance making them cost effective process control instruments.

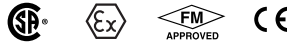
**Measurement Principle:** Vertical float actuated level switch.

- Features:**
- Reliable, maintenance-free operation
  - Single or dual stage models
  - Actuating levels as low as 48" below mounting connection
  - Choice of floats allows application flexibility
  - Threaded or flanged process connections available
  - Available with a variety of electric and pneumatic switch mechanisms

**Model Selection:** Refer to Magnetrol Sales Bulletin 44-117 for model numbers, options and complete specification information.



## SPECIFICATIONS



**Process Temp Range:** -50° F (-46° C) to +750° F (+399° C)

**Process Pressure:** Up to 600 psig (41 bar)

**Specific Gravity:** Down to 0.56

**Wetted Parts:** Mounting connection in carbon steel, cast iron or 316/316L SS  
Float and trim in 300 and 400 series SS or all 316/316L SS

**Actuation Levels:** Each unit built and calibrated for customer specified actuation level(s) from 4" to 48" from mounting connection. Minimum distance between trip points on dual stage units is 8".

**Switch Enclosures:** Polymer powder coat finished aluminum NEMA 4X/7/9 for Class I Div. 1 Group B or Groups C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic

**Guide Cage:** Optional guide cage prevents damage to float or stem in turbulent installations or on long insertion length models.

**Options:** Modification per customer requirements include interface service, low specific gravity floats, other process connections, etc.

# SIDE MOUNT Liquid Level Switches

## Reliable Float Actuated Switches for Side Mount Installations

**Description:** Single and dual stage side mounted float level switches are available with a wide choice of mounting connections, stem lengths, floats and switch options to provide reliable solutions to a broad range of level control applications.

**Measurement Principle:** Horizontal float actuated level switch.

**Features:**

- Single or dual stage models
- Narrow to wide differential for a variety of control needs
- Choice of six float and four stem sizes allows application flexibility
- Threaded or flanged process connections available
- Available with a variety of electric and pneumatic switch mechanisms.

**Model Selection:** Refer to Magnetrol Sales Bulletin 44-116 for model numbers, options and complete specification information.



### SPECIFICATIONS



**Process Temp Range:** -50° F (-46° C) to +750° F (+399° C)

**Process Pressure:** Up to 1200 psig (83 bar)

**Specific Gravity:** Down to 0.40

**Wetted Parts:** Body in carbon steel, 304 SS or 316 SS.  
Float and trim in 300 and 400 series SS or all 316/316L SS.

**Actuation Levels:** Level differential from as narrow as 1.00" to as wide as 16.12" is available on single stage models.

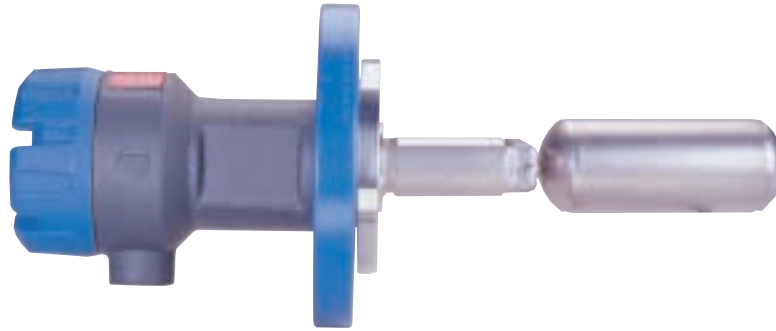
**Switch Enclosures:** Polymer powder coat finished aluminum NEMA 4X/7/9 for Class I Div. 1 Group B or Groups C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic

**Options:** Modification per customer requirements include interface service, exotic materials of construction, etc.

# TUFFY® II Liquid Level Switches

## A Compact Horizontal Mount Float Switch



**Description:** A single stage, compact float level switch for horizontal mounting into a tank or vessel through threaded or flanged pipe connections.

**Measurement Principle:** Horizontal float actuated level switch.

- Features:**
- Enlarged switch housing for ease of wiring
  - Narrow, wide and adjustable differential models to suit any application
  - Unique models for interface and offset levels
  - Available built to ASME B31.3, NACE or both specifications
  - Choice of cast iron or aluminum switch enclosure materials
  - Selection of switch types, both gold and silver contacts
  - Model available with all hastelloy C wetted components
  - Clad flange design includes 3" to 6" sizes up to 900# ANSI

**Model Selection:** Refer to Magnetrol Sales Bulletin 44-106 for model numbers, options and complete specification information.

### SPECIFICATIONS



**Process Temp Range:** -65° F (-54° C) to +750° F (+399° C)

**Process Pressure:** Up to 2160 psig (149 bar)

**Specific Gravity:** Down to 0.40

**Wetted Parts:** Models available with 316/316L SS or hastelloy C wetted parts

**Level Differential:** Models available with narrow (0.5") to wide differential (up to 18.26")

**Switch Enclosures:** Polymer powder coat finished cast iron or aluminum NEMA 4X/7/9 for Class I Div. 1 Group B, C & D, and CENELEC Ex d IIC T6.

**Switch Mechanisms:** SPDT and DPDT dry contact gold or silver, or SPDT hermetically sealed gold or silver

**Interface Level:** Minimum specific gravity difference of 0.10 and minimum lower liquid specific gravity of 0.81

**External Cage:** Optional cage in carbon steel or 316 SS for use when unit cannot be mounted directly into tank or vessel

**Pneumatic Tuffy:** See bulletin 44-109 for models and specifications

# MODEL TK1 Liquid Level Switches

## A Compact Horizontal Mount Float Switch

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**Description:**

A single stage, compact float level switch for horizontal mounting into a tank or vessel through threaded or flanged pipe connections.



**Measurement Principle:**

Horizontal float actuated level switch.

**Features:**

- Sealed reed switches or DPDT relays available
- Choice of flying leads or junction box
- All 316 SS wetted parts
- Explosion proof with or without a junction box
- Extended stem model for deep mountings
- A selection of threaded and flanged process connections available

**Model Selection:**

Refer to Magnetrol Sales Bulletin 44-108 for model numbers, options and complete specification information



### SPECIFICATIONS



**Process Temp Range:**

-40° F (-40° C) to +300° F (+149° C)

**Process Pressure:**

Up to 1500 psig (103 bar)

**Specific Gravity:**

Down to 0.40

**Wetted Parts:**

316/316L SS

**Switch Enclosures:**

316/316L SS body and cast aluminum/iron junction box

**Switch Mechanisms:**

SPST or SPDT reed switches and 24 Vdc or 120 Vac DPDT powered relays

# SPECIAL PURPOSE Liquid Level Switches

## Model B40 LIQUID LEVEL SWITCH

- Description:** The B40 is a float actuated liquid level switch designed for high pressure and temperature service. The sealed external cage houses a horizontally oriented float assembly for use in single stage applications.
- Measurement Principle:** Horizontal float actuated level switch.
- Features:**
- Chambers in carbon steel, 316 SS, 304 SS and chrome moly
  - Optional construction to ASME B31.1 for use in power plants
- Process Temp Range:** -50° F (-29° C) to +1000° F (+537° C)
- Pressure Pressure:** Up to 3300 psig (228 Bar)
- Model Selection:** Refer to Magnetrol Sales Bulletin 46-120 for model numbers, options and complete specification information



## Models F10 and F50 FLOW SWITCHES

- Description:** The F10 and F50 are mechanical flow switches designed for use in horizontal flow lines. The F10 is a vane actuated flow switch for use in lines 2" and greater in diameter. The F50 is a disc actuated flow switch for use in lines 2" and smaller in diameter.
- Measurement Principle:** Vane and disc actuated flow switches.
- Features:**
- F10 mounting available threaded or flanged, carbon steel, 304 SS or 316 SS
  - F50 body available in bronze or 316 SS
  - F10 actuation flow rate is field adjustable
  - F50 requires no calibration
- Process Temp Range:** -50° F (-29° C) to +450° F (+232° C) for F10  
-50° F (-29° C) to +750° F (+399° C) for F50
- Process Pressure:** Up to 1000 psig (69 Bar) for F10  
Up to 1150 psig (79 Bar) for F50
- Model Selection:** Refer to Magnetrol Sales Bulletin 47-116 for model numbers, options and complete specification information.



# BOILER Level Switches

Providing Reliable Boiler Controls Since 1932

**Description:** Magnetrol boiler level switches are the first choice of the largest boiler manufacturers. Single stage units provide reliable low water cut off while multiple stage water column style units provide boiler water level control.

**Measurement Principle:** Vertical float actuated level switch.

- Features:**
- Reliable operation
  - Single or multiple switch points
  - Both fabricated and cast chambers available
  - Water columns with try-cock and gauge glass connections
  - Left hand and right hand water column mountings
  - Pressures up to 600 pounds working steam pressure
  - Available with a variety of electric and pneumatic switch mechanisms

**Model Selection:** Refer to Magnetrol Sales Bulletin 46-118 for model numbers, options and complete specification information



## SPECIFICATIONS



**Process Temp Range:** -20° F (-29° C) to +750° F (+399° C)

**Process Pressure:** Up to 900 psig (62 bar)

**Specific Gravity:** Down to 0.75

**Chamber Material:** Cast iron or fabricated carbon steel chambers

**Float and Trim Parts:** Brass chamber liners  
Trim in 300 and 400 series SS or all 316/316L SS

**Actuation Levels:** One to three narrow differential set points

**Switch Enclosures:** Polymer powder coat finished aluminum NEMA 4X/7/9 for Class I Div. 1 Group B or Groups C & D areas and SAA Ex d IIC T6 IP65 areas. Cast iron CENELEC enclosures for EExd IIC T6.

**Switch Mechanisms:** Dry contact, hermetically sealed, mercury and pneumatic





# Magnetrol<sup>®</sup>

**Worldwide Level and Flow Solutions<sup>SM</sup>**

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