

MAGNE-TRAC™

Installation, Operation and Maintenance Instructions

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Magnetic Level Gages
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Section 2.1.0. - Description

2.1.1. INTRODUCTION

Quest-Tec Solutions, Inc. magnetic level gages (Magne-Trac™) are an indirect reading liquid level indicator. The magnetic level gage series utilize non-magnetic 2.00-inch, schedule 40 chambers (standard) manufactured to length specifications with process connections that match those of the vessel or tank. For some high pressure, low gravity applications, a 2.50 - 3.00-inch schedule 40 chamber is available. The process connections may be:

1. Side mounted, threaded, flanged or socket welded
2. Top and bottom flanged mounted
3. Tank top mounted
4. Combination

A variety of mounting styles are available to suit any vessel or piping requirements. Refer to the drawing depicting magnetic level gage mounting configurations.

2.1.2. COMPONENTS

The gage chamber contains a magnetic float and is completely isolated from the indicator housing attached to the outside of the gage chamber. External indicators are continuous flag/flipper models. The magnetic float maintains a magnetic bond with the external level indicator. As the level of the process medium fluctuates within the tank and gage chamber, the float reacts accordingly with the indicator recording the level of the fluid within the chamber.

2.1.3. CHAMBER MATERIAL

Gages are manufactured to meet exact specifications of the process media such as operating pressure, temperature, specific gravity, etc. Standard chamber materials are 316/304 stainless steel, however, any non-magnetic material may be used. Other chamber materials available include: Alloy 20, Hastelloy, Zirconium, Monel, Kynar and CPVC.

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Section 2.1.0. – Description

2.1.4. INTERNAL FLOAT

A magnetized float is contained inside the float chamber and is designed to the requirements of the process conditions. For this reason, floats are not interchangeable unless the process conditions and gage chambers are identical. The float moves freely inside the chamber reacting to fluctuating level changes within the adjoining vessel.

2.1.5. FLOAT SUBMERGENCE

Under normal operating conditions, the float should be submerged about 80% or more in the process fluid. It is important to note, however, that the position of the float in the media will vary with different process conditions. Float magnets are in the upper portion of the float.

2.1.6. GAGE RATINGS

Magnetic level gages can be designed for operating conditions from full vacuum service up to 2500 PSIG, 700 degrees F, and a minimum gravity of 0.40. All magnetic gages with alloy chambers will have full ANSI ratings based on flange classifications. Gages with Kynar CPVC, or Fiberglass shields will have 150 PSIG ratings only.

2.1.7. HYDROSTATIC TESTING

Gage chambers are hydrostatically tested to 150% of indicated gage rating **WITHOUT** floats installed. Floats are tested individually. Gages can be field hydrostatically tested after installation at the operator's discretion. **CAUTION:** Do not conduct hydrostatic testing of the magnetic gage chamber attached to a process vessel with the float installed. If a gage is field tested with the float installed, the float may crush and chamber may become damaged. This procedure will avoid the warranty.

2.2.1. INTRODUCTION

Quest-Tec Solutions offers the wide flag indicator (WF)(SWF) to meet your process level indications.

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Section 2.2.0. - Level Indication (cont.)

2.2.2. WIDE FLAG/FLIPPER INDICATION (WF)(SWF)

Quest-Tec Solutions offers a continuous Wide Flag or Flipper style indicator as an option to the Single Yellow Follower indicator. Flag indicators are industrial grade level indicators which consist of a series of Amodel flags, black on one side, yellow on the other. As the magnetic float reacts to level fluctuations, each flag or flipper will rotate 180 degrees to reveal the opposite color.

Quest-Tec Solutions flippers are housed in a rugged sealed housing with a recessed polycarbonate window and rotate on a HDPE surface. This eliminates the flippers from sticking or hanging up. The unique design prevents all flippers from rotating in excess of 180 degrees and each flag is magnetically locked to the next. Each flag indicator is 1.40 inches wide and is more visible than a single indicator. These are available with or without scales up to unlimited lengths.

2.2.3. WIDE FLAG/FLIPPER INDICATION - REFERENCE GUIDE

Yellow represents liquid column. **Black** represents vapor space. Other colors are available.

2.2.4. WIDE FLAG/FLIPPER INDICATION - RETROFIT

When flag style indicators are purchased with a Quest-Tec Solutions magnetic level gage, no installation is necessary. If the indicator is removed or a retrofit kit is purchased for a gage already in service, the following steps should be noted:

1. The mounting clamps connecting the flipper assembly to the gage chamber are adjustable to most manufacturers' standard, (i.e. 2.00 inch to 3.00-inch pipe). If the gage is in service and there is liquid in the tank, only the flippers adjacent to the float will rotate to yellow when the indicator assembly is clamped on.
2. Run a magnet along the window of the indicator from zero to where yellow is showing as noted, or
3. Drain the gage to zero on the indicator, and re-fill again. As the float rises, the level indicator will react accordingly and will be reset properly.

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Section 2.3.0. – Installation

2.3.1. INSPECTION

All magnetic level indicators are securely packed in crates to provide maximum protection of the equipment during shipment. It is important to unpack and inspect each gage upon receipt to ensure the indicator and chamber were not damaged in shipment. If you should find damaged parts, contact Quest-Tec Solutions immediately. All Quest-Tec Solutions magnetic gages are fully insured against damage or loss unless specified by the customer otherwise. Claims must be filed within 5 days from the date of receipt of shipment.

2.3.2. CHAMBER ORIENTATION

The magnetic float is packaged separately in the shipment crate, which should be removed before installation. The float chamber should always be leveled vertically. If it is not leveled correctly, the float may be magnetically uncoupled from the level indicator during operations.

2.3.3. CONNECTION VALVES

Valves should be installed between the process vessel and level gage to allow for isolation, draining, and cleaning purposes. (See section 2.6.2. on Maintenance for more details on cleaning and maintenance procedures). Standard block valves can be ordered with the gage or separately from Quest-Tec Solutions. Ball check valves are not necessary for magnetic level gages. If certain valve specifications are required, please advise Quest-Tec Solutions accordingly.

2.3.4. FLOAT ORIENTATION

The internal magnetic float has a preferred orientation vertically which is inscribed at the top of the float. If the float is installed into the chamber inverted, it will not couple with the external indicator correctly, resulting in improper level indication. Floats that are installed in gages with inverted chamber construction will contain a loop at the top of the float for installation and removal purposes. **Internal floats should be installed after any hydrostatic field tests of the chamber and connecting vessel are complete.**

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Section 2.3.0. - Installation (cont.)

2.3.5. CHAMBER GASKETS

Standard magnetic level gages are supplied with 0.125-inch composition gaskets. If this type of gasket is not compatible with the process media, appropriate gaskets should be used in replacement of those shipped with the gage.

2.3.6. FLANGES AND CONNECTIONS

Process connections and vent/drain flanges are designed to meet each customer's specifications. All flange bolt holes straddle the centerline unless otherwise specified. Both male and female threaded connections and socket weld connections are available.

2.3.7. INTERFACE APPLICATIONS

Magnetic gages can be used to identify fluid interfaces only if the proper specific gravities have been identified at the maximum operating conditions. The float can be designed to float in one media while sinking in the other. Immiscible oil over water levels is an example. Care should be exercised, however, when using magnetic gages in interface applications because rag layers may exist which are difficult to identify.

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Section 2.4.0. - Operation

2.4.1. INTRODUCTION

It is important that all instructions pertaining to entering magnetic level gages into service be read thoroughly first before commencing with service operations. Failure to do so may void the warranty by subjecting the gage to a potential safety hazard.

2.4.2. PROCEDURES

1. Check that the operating conditions, (temperature, pressure and specific gravity) are within that maximum rating of the gage. Each gage has a permanent nameplate indicating process specifications, serial number, tag number, etc. It is critically important to check that the specific gravity of the process media is specified at the maximum operating conditions.
2. The gage chamber should be leveled vertically, empty, blocked in and isolated. Check to see that all drain and vent plugs are in place. Close all vent and drain valves if plugs are not used.
3. For standard gages, install the float by removing the bottom drain flange located at the base of the gage. The float is marked TOP to insure proper orientation. A spring is attached to the inside of the drain flange to cushion the float when the vessel is empty. Reinstall the bottom drain blind flange with a new flange gasket after the float is in place.
4. For inverted gages, remove the top vent blind flange from the gage chamber. Install the float by inserting a string through the float loop and lower the float into position slowly. Remove the string from the float and chamber after the float is resting on the bottom of the gage. An auxiliary magnet may be required to re-couple the indicators to the internal float.
5. Reinstall the blind flange with a new gasket. The gage chamber should be isolated with no opening to atmosphere. Check to see that all drain and vent plugs are securely in place and that any vent and drain connections are closed.

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Section 2.4.0. - Operation

2.4.2. PROCEDURES (cont.)

6. When the gage is mounted and ready for placement into service, **PARTIALLY OPEN THE TOP PROCESS CONNECTION VALVE FIRST** and very slowly to allow initial pressure and temperature equalization between the vessel and the level gage. This allows the process conditions of the vessel to equalize with the gage slowly and reach operating conditions at a slow, even, and reasonable rate.

7. **CAUTION.** DO NOT OPEN THE **BOTTOM** PROCESS CONNECTION VALVE FIRST. IF THE BOTTOM VALVE IS OPENED FIRST WITH THE TOP VALVE CLOSED AND THE VESSEL IS UNDER PRESSURE, THE INTERNAL FLOAT WILL RISE INSTANTLY AND LODGE ITSELF INTO THE TOP OF THE CHAMBER CAUSING SEVERE DAMAGE TO THE FLOAT AND CHAMBER.

8. After the float chamber has reached process conditions, continue to open the **TOP** process connection valve slowly, allowing any liquid or condensate to enter the gage slowly. This procedure is critically important for high pressure and temperature applications. The float and indicator may react or rise to condensate accumulation migrating through the top valve with the bottom valve closed.

9. When the gage chamber has attained normal operating conditions, open the **BOTTOM** process valve connection slowly. This will allow proper fluid entry into the gage chamber under normal operating conditions. The level indicator should rise vertically, thus rendering a fluid level. Flag or flipper indication will result in black to yellow rotation of the flippers as the fluid rises. At this point, installation should be complete. Allow at least 30 minutes for both top and bottom valve procedures.

10. Please note, under elevated operating conditions, the indicator may record a significant level from condensate influx through the top valve *before* the bottom valve is opened. If this is the Magnetic Level condition, it is possible the indicator (and float) may readjust and fall slightly from the effects of final process equalization after the bottom valve is completely opened.

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Section 2.5.0. - Removal from Service

2.5.1. INTRODUCTION

To remove the gage from service, the next steps should be followed to prevent danger to personnel and damage to the gage when the vessel is pressurized.

2.5.2. PROCEDURES

1. Close the bottom process connection valve first.
2. Completely close the top process connection valve to isolate the gage.
3. Attach proper vapor collection equipment to the gage vent connection.
4. Open the vent valve slowly to relieve gage pressure.
5. Attach the proper liquid collection equipment to the drain connection.
6. Open the drain valve slowly to remove remaining gage liquid.
7. CAUTION: **Never** use the vent or drain on a gage as a pressure relief mechanism for the process system. Doing so may permanently damage parts of the gage as well as inducing a safety hazard.

Magnetic Level Gages and Accessories
Installation, Operation and Maintenance
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Section 2.6.0. - Maintenance

2.6.1. INTRODUCTION

Quest-Tec Solutions magnetic level gages contain a standard 0.50 inch vent and drain plug in the top and bottom of the gage chamber to allow cleaning and removal of the process fluid if required. Socket weld vent and drain valve connections are available. Some gages are connected to a solvent or steam line that allows **empty gages without floats** to be decontaminated or *blown down* periodically without removing the gage from the vessel location. Quest-Tec Solutions magnetic gages should be maintained and inspected on at least an annual basis, or more frequently depending on the process system.

2.6.2. PROCEDURES

1. Block in the gage chamber with the process connection valves or wait until the vessel is empty and out of service.
2. Close the bottom valve first and the top valve second.
3. Open the vent valve slowly to depressurize the gage especially if the gage has been under pressure.
4. Open the drain valve slowly or remove the drain plug carefully to allow any remaining fluid to drain from the chamber.
5. When all of the gage fluid has been drained, carefully remove the drain flange and float from the gage chamber. Be sure to examine the float for excessive wear and clean as required. If excessive wear or damage, reorder from Quest-Tec Solutions.
6. Clean the inside wall of the chamber with a "bottle brush" or similar scrubbing tool. Some processes may dictate the use of a suitable solvent for cleaning.
7. After cleaning the chamber, replace the float and drain flange. A new flange gasket should be installed. Use gaskets compatible with the process media if replaced.
8. Check the stainless steel pipe clamps to insure they are tight and adjust the scale channel. Correctly match the zero point to process connection elevations.
9. If necessary, use a permanent magnet to attract the yellow indicator until it is coupled to the float inside the chamber.

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Section 2.7.0. - Troubleshooting

2.7.1. INTRODUCTION

Quest-Tec Solutions magnetic level gages are simple to install and operate. The following troubleshooting tips may be of assistance during installation and startup. Complete reading of this is suggested.

2.7.2. FLOAT & INDICATOR DETACHMENT

1. If detachment is a frequent problem, it could be caused by several factors, most of them resulting from improper installation of the gage, particularly the float.
2. Check to ensure that the scale and channel assembly is fastened tight against the gage chamber so that magnetic coupling is maintained from top to bottom of the indicator.
3. Check to ensure the internal magnetic float within the chamber is right side up. If the float was installed inverted, the single yellow indicator will magnetically couple, but the actual process level will be higher than what the indicator records. All floats are clearly marked TOP. Floats designed for *inverted* gages will have a loop welded at the top of the float for installation and removal purposes.
4. If the float springs mounted in the top and bottom of the gage chamber have been removed, the float could rise past the top of the indicator and lose magnetic coupling with the indicator.
5. If the process connection dimension has been miscalculated and the gage length is too long, do not attempt installation because it will warp the chamber. A warped chamber will prohibit the float to move freely. This can cause float and indicator detachment.

2.7.3. DIFFERENTIAL LEVEL

This can occur during startup and is easily corrected. Under normal operating conditions, most floats are about 80% submerged in the process media. It is important to note that the position of the float in the fluid will vary with different process conditions. To attain a true level elevation, adjust the scale vertically to get an exact reading.

Magnetic Level Gages
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Section 2.7.0. - Troubleshooting (cont.)

2.7.4. DEFECTIVE INDICATOR

If the polycarbonate indicator cover is cracked or broken, a replacement cover can be shipped within 24 hours after receipt of order. One advantage of the magnetic level gage is the indicator assembly can be serviced without removing the gage chamber from service. To replace the indicator cover, remove the four screws from cover plate at the top and bottom of the indicator channel. There are two red gaskets beneath each cover that require removal. Remove the two red seal strips and slide the polycarbonate plate cover out of the channel. Clean any debris or fragments. Replace the cover with the new polycarbonate plate by sliding into the channel again. Replace each red side and top gaskets with the top and bottom covers. If the gage is in excess of 6 feet in length, it may be easier to remove the indicator from the channel.

Section 2.8.0. - Parts List

2.8.1. INTRODUCTION

When ordering spare parts for the Magne-Trac™ series magnetic level gage, the following information will be required.

1. Serial number of the gage or accessory item.
2. Description of parts to be ordered.
3. Model number of the parts to be ordered, if known.
4. Original purchase order, if known.

2.8.2. CHAMBER

1. Vent plug.
2. Float chamber
3. Chamber blind flange, spring, and gasket.
4. Drain plug.
5. Internal magnetic float.

2.8.3. INDICATOR & SCALE ASSEMBLY

1. Channel assembly
2. Anodized Alum. Indicator track with single tracker follower or wide flag indication
3. Stainless Steel Indicator track with single tracker follower or wide flag indication
4. Top and bottom seals
5. Calibration scale (total inches, feet & inches, centimeters)
6. Chamber clamps
7. Identification Tag.

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Section 2.9.0. - Warranty

2.9.1. INTRODUCTION

All Quest-Tec Solutions products are warranted against defects in material and workmanship for one year (365 days) from the date of shipment. Quest-Tec Solutions will repair or replace those products that fail to perform as specified with the following exceptions. This warranty does not apply to glass breakage or any other liability other than materials and workmanship.

2.9.2. CONDITIONS

1. Products repaired or modified by persons that are unauthorized by Quest-Tec Solutions, Inc.
2. Products subject to misuse, negligence or accidents
3. Products that are incorrectly installed or otherwise used in such a way not in accordance with the manufacturer's instructions.

2.9.3. PROVISIONS

This warranty is in lieu of any other warranty expressed or implied by any party other than Quest-Tec Solutions. Repairs and/or replacements shall be at the sole discretion of Quest-Tec Solutions based on the terms and conditions.

Magnetic Level Gages
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Section 2.10.0. - Terms and Condition of Sale

2.10.1. INTRODUCTION

All orders should be entered to the following address:

Quest-Tec Solutions
13960 S. Wayside Dr.
Houston, TX 77048
Phone: 281-240-0440
Fax: 281-240-2440

2.10.2. TERMS

The payment terms are **Net 30 days for** approved customers. Sales representatives may assume collection responsibility for new accounts at their discretion. Late charges will be added at the rate of 1.5% per month.

2.10.3. SHIPMENT

All shipments will be **EXW factory location, Houston, Texas**, via motor freight insured. Freight charges are normally prepaid and added to the invoice unless specified otherwise. Air freight is the total responsibility of the customer (shipped collect).

2.10.4. RESTOCKING

Every magnetic level gage is designed and manufactured to exact customer specifications. As a result, there will be **no restocking option** after fabrication or shipment.

2.10.5. CANCELLATION

Cancellation charges after order placement will be at the discretion of Quest-Tec Solutions, Inc. and dependent upon production phase of the product.