MAGNE-TRAC™
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MAGNE-TRAC™

A LEADER IN
LIQUID LEVEL MEASUREMENT
**Questtec Solutions** has a long history of quality, experience, and care in the development and engineering of the liquid level gage and valve product lines.

Over the past fifty years, under the direction of Daniel Measurement and Control, Questtec Solutions' products have been consistently refined to remain one of the industry leaders in liquid level measurement. Today, Questtec Solutions carries on this legacy with renewed dedication in order to bring you real solutions.

Questtec Solutions employs over 125 years of collective experience with all aspects of the liquid level gage and valve product lines. With a new state-of-the-art manufacturing facility, and custom weld shop fabrication services, Questtec Solutions is able to provide flexibility to tailor to its customer's specific needs.
When choosing your liquid level measurement solutions provider, why not choose the best? The symmetry of a field-tested, reputable product, coupled with the energy of new management, has positioned Questtec Solutions to be best suited to assist you in solving your liquid level measurement challenges.

**Questtec Solutions** delivers engineered solutions to meet the most complex level bridle requirements.

In addition to the existing Daniel Liquid Level Gage and Valve line, this new facility, allows **Questtec Solutions** to offer new products, which include:

- TRANSMITTERS & SWITCHES
- MAGNETIC GAGES
- BRIDLE SOLUTIONS
- LEVEL-TRAC STEAM & WATER INDIATORS & ALARMS
- STEAM-TRAC STEAM & WATER GAGES
- GLASS-TRAC LIQUID LEVEL GAGES & VALVES, LEGACY DANIEL LEVEL GAGES & VALVES
- LEVEL-TRAC STEAM & WATER INDIATORS & ALARMS
- STEAM-TRAC STEAM & WATER GAGES

At Questtec Solutions, we strive to exceed our customer’s expectations by using a hands-on approach.

For every project, we take our customers through a step-by-step process to identify both cost efficient options, as well as, effective solutions for even the most challenging applications. Our approach, high quality products, and experienced team members are testimony to customer confidence in **Questtec Solutions** as a leader in the liquid level instrumentation industry.

- ENGINEERED SOLUTIONS
- FULL-RANGE CAPABILITIES
- WORLD CLASS MANUFACTURING FACILITY
- TOP NOTCH WELDING FACILITY

**WHY CHOOSE US**

**READY TO SPEC? TURN TO “07: SPECIFICATION MODEL GUIDE”**
**ENGINEERED SOLUTIONS**
With collaborative efforts of our dynamic outside sales team and network of domestic and international product representatives, we provide quick insight and responsiveness that customers warrant. In addition, our knowledgeable inside sales team will work alongside production staff to deliver flexible lead times, a variety of options for customized bids, and explore all possible solutions for each individual project.

**FULL-RANGE CAPABILITIES**
Engineering operations are an essential aspect of developing, adapting, and refining any product line. We offer complete engineering services to all of our customers. From the early development stages of projects, our accomplished engineers will review applications to find efficient solutions. Our approval drawings provide real options for customers’ application in regards to applicable code and standards. We recognize that focusing on the engineering of each unit benefits in the assimilation of our products for seamless operations.

**WORLD CLASS MANUFACTURING FACILITY**
Our manufacturing is split into three distinct skill centers: machining, fabrication, and assembly. All shop work is carefully documented and inspected throughout the manufacturing process. Our production planners follow assigned orders, and communicate job specific requirements to the shop floor. We maintain focus on quality, speed, exceeding customer expectations.

CNC machining and laser engraving capabilities

**TOP NOTCH WELDING FACILITY**

<table>
<thead>
<tr>
<th>QUALIFICATIONS</th>
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<tr>
<td>Section IX Weld Procedures [WPS]</td>
<td>Procedure Qualifications [PQR]</td>
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<tr>
<td>Welder Certification [Level II Weld Inspector on Staff]</td>
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<tr>
<td>Standard Welds GTAW</td>
<td>MTR [Material Test Reports]</td>
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<td>PMI [Positive Material Identification]</td>
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</tr>
<tr>
<td>NB-415 Accreditation of R Repair Organizations [R Stamp]</td>
<td>CNC Precision Manufacturing</td>
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<tr>
<td>ASME &quot;S&quot; &amp; &quot;R&quot; Stamp and ANSI / ASME B 31.1, B31.3</td>
<td>Over 35 Weld Procedures for numerous material grades</td>
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<tr>
<th>TESTING PROCEDURES</th>
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<td>PWHT [Post Weld Heat Treat]</td>
<td>Dye-Penetration [performed in-house]</td>
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<td>Radiography</td>
<td>Ultrasonic</td>
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<tr>
<td>Magnetic Particle Testing</td>
<td>Destructive Testing</td>
</tr>
</tbody>
</table>

**APPROVALS**

- ATEX
- FM
- CSA
- NACE
- CRN
- IEC
- ISO 9001:2008 REGISTERED
- ASME SEC. I DIV 1 BPVC CERTIFIED

**APPLICATION OPPORTUNITIES**
YOUR SOLUTION FOR LIQUID LEVEL MEASUREMENT

- CHEMICAL & PETROCHEMICAL
- METALS & MINERALS
- REFINING
- OIL & GAS
- POWER GENERATION
- AEROSPACE
- FOOD PROCESSING
- PULP & PAPER

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02
MAGNETIC LEVEL INDICATOR COMPONENTS
What is a Magnetic Level Indicator, or MLI?

At Questtec Solutions, we have built our business on a readiness to adapt to specific customer requirements in terms of customer materials, fabrication, and delivery requirements. Our standard configuration is by no means the limits to our capacity of supply.

A Magnetic Level Indicator (MLI) consists of 5 major components

constructed of non-magnetic materials including standard 316 SST. Exotic materials such as Alloy 20 & Hastelloy C are available. Traditional inlet & outlet mounted design displaying liquid level to match the vessel level. Complete with flange end closure for accessibility to the float. Magne-Trac chambers are available to ASME 31.1 and 31.3.

FEATURES

- Innovative Flag Design Maximizes Magnetic Field
- Wide Flags for Enhanced Indicator View
- Impact Resistant Polycarbonate Indicator Window
- Corrosion Resistant Moving Parts
- Wide Variety of Materials
- Available to ASME 31.1 / 31.3 Standards

INDICATOR

Indicators provide a high-contrast visual representation of the liquid level.

LEARN MORE, PAGE 9

CHAMBER

A chamber is custom-engineered and constructed per the highest manufacturing standards. A wide range of non-magnetic materials such as stainless steel, exotic alloys, and hard plastics are available for construction.

LEARN MORE, PAGE 12
3. **SWITCH**
Externally mounted magnetic level switches expand control capabilities of MLIs. These can be used as latching level alarms or level controls by sensing the position of the float in the chamber.

4. **FLOAT**
Engineered and designed to solve each level application, the float is the science behind accurate magnetic level measurement. Size, volume, weight, buoyant force, and construction technique are variables carefully considered before each float is manufactured. Smooth Autogenous welds on all floats producing an ultra-smooth weld, without bead which could interfere with the float’s motion.

5. **TRANSmitter**
Loop-powered level transmitters expand the functionality of a magnetic level indicator by providing process data back to the control room. [Magnetostrictive or Guided Wave Radar, as shown.]

LEARN MORE:
- **Page 19** for more on switches.
- **Page 17 & 18** for transmitters.
- **Page 8** for floats.
Precision Manufactured Float: The magnetic float is the most crucial component within Questtec Solutions’ magnetic level indicators. Constantly pushing the limits of design structure, buoyancy, density, weight and pressure Questec stays on the cutting edge of innovation. Our engineers aim to provide customers with the most effective solutions no matter how difficult the applications or extreme the environments. Questec boast solutions for a variety of unique high pressure/high temperature, flashing, interface and corrosive processes.

**THE HEART OF THE QUESTTEC FLOAT TECHNOLOGY**

The float’s 360º magnet assembly produces a strong and consistent flux array allowing visual indication through chambers as thick as schedule 80.

| STIFFENING RINGS; 2. MAGNET; 3. FLOAT BODY |

**CAPABILITIES**

| Process pressures up to 4,500+ psig (310 bar)¹ |
| Process temperatures up to 1,000°F (538°C)¹ |
| Total level specific gravities as low as 0.33¹ |
| Interface float designs available for liquid specific gravity differentials as little as 0.1 |
| Adequate buoyancy to operate effectively and freely in many viscous liquids, including crude oil |

¹maximum capabilities can vary depending on combination of pressure, temperature, and media specific gravity
Standard indicators consist of anodized aluminum housing; black & yellow rotating flags; and a clear UV scratch resistant polycarbonate window.

Each flag is 1.4” wide to heighten overall viewing capabilities from up to 200ft. The non-corrosive flag materials also eliminate problems with deterioration often encountered with market standard aluminum flag/stainless steel pins. Magne-Trac™ indicators are constructed with a UV scratch resistant polycarbonate window as standard, eliminating the fragility often encountered with glass while still forming a high integrity fit. The tightly sealed housing contains a single column wide flag assembly all aligned within an extruded aluminum case.

**SCALE OPTIONS**

In addition to the standard stainless steel scale (graduated in feet and inches), other custom scale options are available:
- Inches only
- Offset zero [plus & minus scale divisions]
- Negative/Positive [boiler service]
- Percent [0 to 100]
- Metric [mm/cm]
- Volumetric [gallons, liters]
- Decimal feet [0.1ft or 0.01ft divisions]

Given the characteristics of every vessel are different, drawings or strapping tables must be supplied.
SAFE & ECONOMICAL MEASUREMENT WITH MAGNE-TRAC PRODUCTS
The Questtec Magne-Trac Engineered to your Specifications!

In applications for extreme pressure, temperature, vibration, and highly corrosive or hazardous material, the Magne-Trac gauge will perform where others fail. Features include lower installation costs, easy to read liquid level indication, and low maintenance. The Magne-Trac gauge is constructed of non-magnetic materials including standard 316 SST. Exotic materials such as Alloy 20 & Hastelloy C are also available. Traditional inlet & outlet-mounted design display liquid level to match the vessel level. Comes complete with flange end closure for accessibility to float. Magne-Trac chambers are available to ASME 31.1 and 31.3.

**SPECIFICATIONS**

- **Measuring Range**
  - Standard single section: 12 to 216in
  - Multi section (custom): >216in

- **Temperature Range**
  - -320ºF to 800ºF

- **Pressure Range**
  - Full Vacuum to 4500 PSIG

- **Minimum Specific Gravity**
  - As low as 0.33

*Consult factory for additional limits/options

**MATERIALS OF CONSTRUCTION**

<table>
<thead>
<tr>
<th>Chamber Materials</th>
<th>Standard Alloys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>304/304L</td>
</tr>
<tr>
<td></td>
<td>316/316L</td>
</tr>
<tr>
<td></td>
<td>Other 300 series stainless</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plastics/ Composites</th>
<th>CPVC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PVDF (KYNAR)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exotic Alloys</th>
<th>Titanium, Hastelloy-C276, Alloy20</th>
</tr>
</thead>
</table>

**Chamber Diameters**

- 2" Sch 40 [Std]
- 2 ½" Sch 40 or 80
- 3" Sch 40

*Selected as appropriate

**Oversized Chamber (Flashing, Boiling & Dirty Service)**

- 3" Sch 40 with smaller OD floats

**PROCESS CONNECTIONS**

<table>
<thead>
<tr>
<th>Pressure Class Ratings</th>
<th>ANSI 150#; 300#; 600#; 900#; 1500#; 2500#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Connection</td>
<td>1/2&quot; to 10+ DN20 to DN150</td>
</tr>
<tr>
<td>Process Connection Types</td>
<td>MNPT, FNPT, Weldolet*, Sockolet®, Sockweld Flange, Weldneck Flange, Lap Joint Flange; RTJ Flanged, Plain Pipe Stub</td>
</tr>
</tbody>
</table>

**FEATURES**

- Innovative Flag Design Maximizes Magnetic Field
  - Wide Flags for Enhanced Indicator View

- Low Specific Gravities
  - Corrosion Resistant Moving Parts

- Wide Variety of Materials
  - High Pressure Applications

Available to ASME B31.1/31.3 Standards

**VISUAL INDICATION**

- **Indicator Flags**
  - 1.4" Wide Flag Assembly in Yellow/Black
  - [Additional Colors Available on Request]

- **Indicator Housing**
  - Anodized Aluminum
  - Stainless Steel casing available upon request

- **Scale Options**
  - Ft/Inches [Std.], Metric, Percentage, Volume, etc.
  - Custom Scales Available

**FLOAT SPECIFICATIONS**

- **Float Materials**
  - 316/316L, Titanium, Hastelloy-C276, Alloy 20, CPVC, PVDF (KYNAR)

- **Specific Gravity Range**
  - As low as 0.33

- **Pressure**
  - Up to 4500 PSIG @ 100ºF

- **High Temp Magnets**
  - Up to 1000ºF
  - *Selected by Questtec application

**TEMPERATURE OPTIONS**

- **High**
  - Insulation Blankets, Electric or Steam Tracing
  - High Temperature Indicators, etc.

- **Low**
  - Insulation Blankets, Cryogenic Insulation with Non-Frost Extensions, etc.

**LEVEL TRANSMITTER & DISCRETE ALARM OPTIONS**

- **Transmitter Options**
  - MTLT-5000 Magnetostrictive Guided Wave Radar [Use Page 22 for GWR Options]

- **Switch Options**
  - MTLS-1A; MTLS-5A; MTL5-10A; MTL5-PNEU
The Questtec Magne-Trac Plus combines the rugged versatility of the Magne-Trac with the flexibility, accuracy and reliability of a Guided Wave Radar Transmitter inserted into a Bridle-Trac Bypass Chamber.

The two independent level measurement technologies provide true redundancy with minimum vessel penetration, and maximum ease of installation with virtually maintenance-free operation. Although either instrument may be connected to the vessel, Questtec recommends that the bridle function as the primary chamber. By using the magnetic gage as the secondary chamber, the customer will have the option to rotate the indicator up to 180 degrees easily in the field. The two chambers may be welded or flanged together; Questtec recommends installing valves in between the magnetic gage and bridle chamber so one may be isolated if necessary.

Change in the process tank level corresponds to change in the Magne-Trac Plus chamber. The float within the chamber actuates flags for visual indication. The instrument mounted within the second chamber also reacts according to the level change.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Measuring Range</th>
<th>Standard single section 12 to 216in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi section [custom] &gt;216in</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-320°F to 800°F</td>
</tr>
<tr>
<td>Pressure Range</td>
<td>Full Vacuum to 4500 PSI</td>
</tr>
<tr>
<td>Minimum Specific Gravity</td>
<td>As low as 0.33</td>
</tr>
<tr>
<td>Unique Dual Chamber Design</td>
<td>True Independent Level Measurement Devices.</td>
</tr>
</tbody>
</table>

*Consult factory for additional limits/options

The Questtec Bridle-Trac is an idea means of utilizing the power of many technologies without mounting directly into process vessel.

The Questtec Bridle-Trac external chamber is a self-contained cage designed for use with our top mounting level transmitters or switches. Quality construction and a wide selection of configurations make this cage an ideal means of utilizing the power of our many technologies without mounting directly into the process vessel. The chamber is suitable for use with Guided Wave Radar, RF Capacitance Transmitters, Electronic point sensors and top mounted displacer switches. In addition, mount Level Gages and Valves to your Instrument Bridle for ease of maintenance.

**SPECIFICATIONS**

Sealed or flanged-top chamber options

2" and 4" nominal chamber diameters to accommodate all sensing elements, Schedule 40 pipe as a minimum

Carbon steel or 316 stainless steel materials of construction

Rugged Questtec commercial construction available as well as ASME B31.3, ASME B31.1, NACE or combined NACE and ASME B31.3 construction options

Rated for pressures up to 5000 psi (345 bar)

For applications to 842°F (450°C)

Lengths for measuring ranges to twenty feet (6.1 m)

Broad selection of process connections sizes and types

Head flange bolting included with flange-top models

Suitable for use with RF capacitance transmitters, all electronic point sensors and top mounted displacer switches

Optimal design for use with Guided Wave Radar transmitter:

- Smallest possible chamber diameters
- Pressure rating to match High Temperature, High Pressure [HTHP] and High Pressure [HP] probes
- Temperature rating to match HTHP probe
- Space above and below measuring range to accommodate measurement transition zones
Economical & Simple: In applications that are low-pressure and operating near or at ambient pressure, an Eco-Trac is an great alternative.

The Eco-Trac is a strong featured, reliable, cost-effective package. Field adjustable visual indicator to convenient viewing with a shatter resistant viewing window; the Eco-Trac precision-engineered to ensure long service life.

**FEATURES**
- High Quality 1.4” Wide Flag
- 150# Flange Pressure Class
- Switches and Transmitters available for expanded functionality.
- Float Accessible via Chamber Plug

**TECHNICAL**

<table>
<thead>
<tr>
<th>Materials</th>
<th>316 SST &amp; 304 SST</th>
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<tbody>
<tr>
<td>Pipe Diameter</td>
<td>2” Sch. 40</td>
</tr>
<tr>
<td>Minimum Specific Gravity</td>
<td>0.65 SG</td>
</tr>
<tr>
<td>Maximum Indication Length [C-C]</td>
<td>72”</td>
</tr>
<tr>
<td>Pressure Rating</td>
<td>Full Vacuum to 285 psig</td>
</tr>
<tr>
<td>Temperature Rating</td>
<td>-40°F to 450°F [-40º to 232ºC]</td>
</tr>
<tr>
<td>Indicator Type</td>
<td>Flag Indicator</td>
</tr>
</tbody>
</table>

*Carbon Steel / Stainless Steel Combos available upon request. Please contact sales for details.

**APPLICATIONS**

<table>
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<tr>
<th>Oil Water Separators</th>
<th>Hot Wells</th>
<th>Surge Tanks</th>
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</thead>
<tbody>
<tr>
<td>Stage Tanks</td>
<td>Day Tanks</td>
<td>and many others</td>
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</tbody>
</table>

**ACCESSORIES:**

**TRANSMITTERS & SWITCHES**

<table>
<thead>
<tr>
<th>Product</th>
<th>Amp</th>
<th>Description</th>
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<tbody>
<tr>
<td>MTLS-1A</td>
<td>1</td>
<td>Guided Wave Radar</td>
</tr>
<tr>
<td>MTLS-5A</td>
<td>5</td>
<td>MTLS-10A</td>
</tr>
<tr>
<td>MTLS-10A</td>
<td>10</td>
<td>MTLT-5000</td>
</tr>
<tr>
<td>MTLT-5000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QUESTTEC SOLUTIONS | PAGE 13
OPTIONAL EQUIPMENT
These items are listed on the Specification Guide for items to add to our MLI.

**HIGH-TEMPERATURE INSULATION**

Questtec Solutions specializes in custom fiberglass insulation blankets for MLIs of all shapes and sizes. They are constructed with high-quality materials capable of constant contact with temperatures up to 1,000° F [538° C]. This insulation is available as personal protection or with heat tracing options for freeze protection or process temperature maintenance.

**OVERSIZED CHAMBERS**

(BOILING FLUIDS, FLASHING VAPORS & DIRTY SERVICE)

Used to uniformly heat or cool process fluid. Over sized chamber allows vapors to pass floats when a fluid is close to vapor pressure and can be used in fluids with small suspended particles. Also, used in conjunction with Teflon S coating for non-stick. (Boiling Liquids, Flashing Vapors and Dirty Service)

**Applications:**
- Light Hydrocarbons
- Liquid Nitrogen
- Propane
- Anhydrous Ammonia
- Methane (or any pressure-liquified gas)
- Carbon Dioxide

**HEAT TRACING:**

(ELECTRIC & STEAM)

For applications where process freeze protection or temperature maintenance is required, heat tracing will allow the MLI to operate uninterrupted throughout harsh, cold conditions.

Electric Heat Tracing is available in self-regulating, constant wattage, and mineral insulated varieties. Contact the factory for more information.

**HERMETICALLY-SEALED FLAG INDICATOR**

No gaskets: can't leak or fog

Designed to meet needs of chemical wash down, severe environments and offshore industry. Flag indicators are purged with inert gas and permanently sealed in:

- Glass tubing with 100% fused glass end seals to 550° F [287° C] process temperatures

**CRYOGENIC INSULATING & FROST EXTENSION**

To facilitate operation where the product is kept cold via chillers, refrigerants, and condensers, cryogenic insulation is provided. By insulating the MLI with a specialized cryogenic jacket, process temperatures can be maintained in the liquid state down to -320° F [-195° C].

A frost extension option is available to prevent ice from collecting on the visual indicator, thereby decreasing the visibility. The extension is constructed of durable acrylic plastic and is provided standard with all cryogenic insulation.

**MAGNETIC PARTICLE TRAP**

Magnetic Particle Traps provide protection for MLIs. The particles are composed mostly of ferrite, often from carbon steel piping. The trap keeps magnetic particles out of float chamber. The Trap fits in line with the process connection. The trap collects the particles which can be cleaned periodically to ensure continued operation of the magnetic level indicator.
**PRINCIPLES OF OPERATION**

The MTL5000-Magnetostrictive M or L Series is based upon the magnetostrictive principle. The sensing tube contains a wire which is pulsed at fixed time intervals. The interaction of the current pulse with the magnetic field created by the magnetic float causes a torsion stress wave to be induced in the wire. This torsion propagates along the wire at a known velocity from the position of the magnetic float and toward both ends of the wire. The microprocessor-based electronics measure the elapsed time between the start and return pulses and convert it into a 4-20 mA DC output which is proportional to the level being measured.

**FEATURES**

- High Accuracy
- 4/20mA Analog with HART
- AMS Aware
- Two Channel Output
- Explosion Proof and/or Intrinsically Safe
- No scheduled Maintenance or Recalibration (due to non-contact design of sensing element)
- Designed and Tested with Questtec Magne-Trac Series

**SPECIFICATIONS**

**LEVEL OUTPUT**

- **Full Range**: .5 ft. to 25 ft.
- **Non-Linearity**: .035% of Full Scale
- **Repeatability**: .01% of Full Scale or 0.015in (0.381)*
- **Operating Temperature**
  - Electronics: -40°F [-40°C] to 160°F (71°C)
  - Sensing Element: -40°F [-40°C] to 257°F (125°C)
  - Chambered Temperature: -40°F -9-40°F to 400°F (204°C)
- **Output: Signal/Protocol**: Standard 4-20mA DC, 2 Wire HART
- **Inherent Accuracy**: +/- 0.039in (1mm)
  - 20” [508mm] to 300” (7620mm)

**TRANSMITTER LOOP**

- **Input Voltage**: 10.5-28 VDC
- **Fail Safe**: High (>21.4mA), or Low (<3.8mA)

**CALIBRATION**

- **Zero Adjust Range**: Anywhere within active length
- **Span Adjust Range**: FS > 6” from zero

**FIELD INSTALLATION**

- **Mounting**: Z Brackets to Mag-Gage
- **Wiring**: 2-wire twisted shielded cable 3/4” FNPT Conduit Opening

**ENVIRONMENTAL**

- **Housing Type**: NEMA Type 4X Epoxy Coated Cast Aluminum, 316L Stainless Steel
- **Humidity**: 0 to 100% humidity, non-condensing

**HOUSING OPTIONS/ DIMENSIONS**

- **Single and Dual Cavity**: ¾” FNPT Conduit M20 for ATEX/IECEX Version
- **Safety Approval**: FM/CSA: Explosion-Proof Class I, Groups B, C, D Class II, Groups E, F, G Division I, NEMA 4X

The E&H Guided Wave Radar works with high-frequency radar pulses which are guided along a probe.

These top mounted, direct insertion radars measure interface and direct level of liquids and solids, both of high and low pressures and temperatures. GWR technology provides dependable level indication through pulsating high-frequency, microwave energy down the probe within a bypass chamber. A GWR will read the true level of the process, even in the density diverges over time.

**PRINCIPLES OF OPERATION**
Levelflex works with high-frequency radar pulses which are guided along a probe. As the pulse impacts the medium surface, the characteristic impedance changes and part of the emitted pulse is reflected. The time between pulse launching and receiving is measured and analyzed by the instrument and constitutes a direct measure for the distance between the process connection and the product surface.

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>FMP51</th>
<th>FMP54</th>
<th>FMP55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process connections</td>
<td>Thread or flange</td>
<td>Thread or flange</td>
<td>Thread or flange</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40 to +200°C [-40 to +392°F]</td>
<td>-196 to +450°C [-320 to +842°F]</td>
<td>-50 to +200°C [-58 to +392°F]</td>
</tr>
<tr>
<td>Pressure</td>
<td>-1 to +40bar [-14.5 to +580psi]</td>
<td>Vacuum -1 to +400bar [Vacuum -14.5 to +5,800psi]</td>
<td>-1 to +40bar [-14.5 to +580psi]</td>
</tr>
<tr>
<td>Maximum measuring range</td>
<td>Rod 10m (33ft), rope 45m (148ft), coax 6m (20ft)</td>
<td>Rod 10m (33ft), Rope 45m (148ft), coax 6m (20ft)</td>
<td>Rod 4m (13t), rope 10m (33ft), coax 6m (20ft)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2mm [0.08&quot;]</td>
<td>±2mm [0.08&quot;]</td>
<td>Rod ±2mm [0.08&quot;]</td>
</tr>
<tr>
<td>Dielectric Constant</td>
<td>1.6 (Rod probe, Rope probe), 1.4 (Coax probe)</td>
<td>1.6 (Rod probe, Rope probe), 1.4 (Coax probe)</td>
<td>1.6 [Rod probe, Rope probe], 1.4 [Coax probe]</td>
</tr>
</tbody>
</table>

International explosion protection certificates, overfill prevention WHG SIL, marine approval, 5-point linearity protocol

---

**GUIDED WAVE RADAR FOR REDUNDANT LEVEL TECHNOLOGY**

**FMP51**
Continuous level measurement of liquids, pastes and slurries but also for interface measurement. The measurement is not affected by changing media, temperature changes, gas blankets or vapors.

**FEATURING**
- Process connections: Thread or flange
- Temperature: -40 to +200°C [-40 to +392°F]
- Pressure: -1 to +40bar [-14.5 to +580psi]
- Maximum measuring range: Rod 10m (33ft), rope 45m (148ft), coax 6m (20ft)
- Accuracy: ±2mm [0.08"]
- Dielectric Constant: 1.6 (Rod probe, Rope probe), 1.4 (Coax probe)

International explosion protection certificates, overfill prevention WHG SIL, marine approval, 5-point linearity protocol

**FMP54**
Continuous measurement in liquids under extreme conditions. Excellent for steam boilers, toxic media using gas tight feed-through guarantee. Reliable results in case of gas and steam phases. Reliable in moving surface, foam and changing medias.

**FEATURING**
- Process connections: Thread or flange
- Temperature: -196 to +450°C [-320 to +842°F]
- Pressure: Vacuum -1 to +400bar [Vacuum -14.5 to +5,800psi]
- Maximum measuring range: Rod 10m (33ft), Rope 45m (148ft), coax 6m (20ft)
- Accuracy: ±2mm [0.08"]
- Dielectric Constant: 1.6 (Rod probe, Rope probe), 1.4 (Coax probe)

International explosion protection certificates, overfill prevention WHG, SIL, marine approval, steam boiler approval, 5-point linearity protocol

**FMP55**
Combination of capacitance and guided wave radar measuring principle in one device. The instrument guarantees safe measured value acquisition even in emulsion layers and issues level and interface layer signals simultaneously.

**FEATURING**
- Process connections: Thread or flange
- Temperature: -50 to +200°C [-58 to +392°F]
- Pressure: -1 to +40bar [-14.5 to +580psi]
- Maximum measuring range: Rod 4m (13t), rope 10m (33ft), coax 6m (20ft)
- Accuracy: Rod ±2mm [0.08"]
- Dielectric Constant: 1.6 [Rod probe, Rope probe], 1.4 [Coax probe]

International explosion protection certificates, overfill prevention WHG, SIL, marine approval, steam boiler approval, 5-point linearity protocol
Questtec level switches are hermetically sealed, non-mercury, bi-stable latching switches, which are designed for use with Magne-Trac level gages.

**LEVEL SWITCHES**

The bias magnet design latches the switch maintaining the contact after the level continues to rise or fall. The switch will change state when the float magnet passes by. The switches are fully adjustable and non-invasive. Level switches are mounted to the Magne-Trac chamber with all 316 Stainless Steel worm gear pipe clamps. Switch points can be changed easily at any time without any interruption to the visual indication or process.

Standard Enclosure is Cast Aluminum Junction box. Optional, Stainless Steel Junction box. Enclosure Rating is FM/CSA. Level Switches are C Clamp mounted on MLI (standard), clamp mounted on MLI with insulation pad and or attached to a switch mount rod.

### SWITCH WIRING

**MTLS-1A & 5A**

- **Common**
- **NC**
- **NO**

Green = Common
Red = NC
Blue = NO

Red [NC] = Closed when float below switch
Blue [NO] = Closed when float above switch

A switch mount rod is an available alternative method for mounting the MTLS to an MLI when insulation is present. The rod assembly, which is welded to the MLI chamber, allows the switch to slide along the full length. When the desired position is selected, simply tighten it in place. Consult Factory.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Max Volts</th>
<th>Max Current</th>
<th>Max Power</th>
<th>Dead Band</th>
<th>Max Temp</th>
<th>Min Temp</th>
<th>Contacts</th>
<th>Enclosure Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLS-1A</td>
<td>120 VAC/150 VDC</td>
<td>1.0 AMPS</td>
<td>25W</td>
<td>0.50 Inch</td>
<td>302°F [150°C]</td>
<td>-40°F [-40°C]</td>
<td>SPDT</td>
<td>Class 1 Div 1 Groups B, C, D</td>
</tr>
<tr>
<td>MTLS-5A</td>
<td>125/250 VAC</td>
<td>.5 AMPS</td>
<td>1200W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTLS-10A</td>
<td>0.5 amp @ 110VDC 250VAC</td>
<td>10.1 AMPS</td>
<td>2500W</td>
<td>0.50 inch</td>
<td>248°F [120°C]</td>
<td>-40°F [-40°C]</td>
<td>2 SPDT</td>
<td>Class 1 &amp; 2 Div 1 &amp; 2 Groups B, C, D</td>
</tr>
<tr>
<td>MTLS-PNEU</td>
<td>Consult Factory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Adjusting Screws**

- Hold adjusting screws stationary and loosen locknuts 1 turn.
- Turn each screw clockwise to increase sensitivity. Turn each screw no more than 0.50 Inch (–40ºF) 2 SPDT
- Turn each screw no more than 0.50 Inch (–40ºC) –40ºF
- Turn each screw no more than 0.50 Inch (120ºC)
- Turn each screw no more than 0.50 Inch (50ºC)
- Turn each screw no more than 0.50 Inch
- Turn each screw no more than 0.50 Inch

**Mounting**

- The switch is to be placed over the MLI indicator to the chamber over top of the worm drive clamp.
- The two (supplied) worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point. Wrap the two supplied MLI indicator to the chamber over top of the worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point.
- Wrap the two supplied MLI indicator to the chamber over top of the worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point. Wrap the two supplied MLI indicator to the chamber over top of the worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point.
- Wrap the two supplied MLI indicator to the chamber over top of the worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point.
- Wrap the two supplied MLI indicator to the chamber over top of the worm-drive clamps over the tabs of the enclosure hub below the MTLS-10A switch-point.

**Installation & Operation**

- Connect conduit to the enclosure hub end(s). Install mounting the MTLS to an MLI when insulation is present. The couple/switch non-sealed, non-mercury, bi-stable latching switch continues to rise or fall.
- When the desired position is selected, simply tighten it in place. Consult Factory.
The Mavrick In-Tank liquid level transmitter satisfies the demand for an accurate and robust liquid-level sensor with unsurpassed flexibility to meet most process application conditions.

The Mavrick transmitter provides 3-in-1 measurement using one process opening for product level, interface level, and temperature measurements. Once the transmitter is installed and calibrated there is no requirement for scheduled maintenance or recalibration. **Set it and forget it!**

### FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-in-1 Measurement</td>
<td>Product, Interface, Temperature</td>
</tr>
<tr>
<td>No Scheduled Maintenance or Recalibration</td>
<td></td>
</tr>
<tr>
<td>Inherent Accuracy</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Integral Display</td>
<td></td>
</tr>
<tr>
<td>Intrinsically Safe &amp; Hazardous Area Certified</td>
<td>API Temperature Corrected Volumes</td>
</tr>
</tbody>
</table>

### APPLICATIONS

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Control</td>
<td>Bulk Storage, Custody Transfer</td>
</tr>
</tbody>
</table>

### LEVEL OUTPUT

<table>
<thead>
<tr>
<th>Measured Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product level</td>
<td>Interface level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output signal /Protocol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus RTU, DDA, Analog [4-20 mA], HART*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible hose: 1575 mm [62 in.] to 22000 mm [866 in.] Δ§</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inherent Accuracy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>±1 mm [0.039 in.]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repeatability</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001% F.S. or 0.381 mm [0.015 in.] *</td>
<td>[any direction]</td>
</tr>
</tbody>
</table>

### TEMPERATURE OUTPUT

<table>
<thead>
<tr>
<th>Measured Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average and multi-point temperatures [Modbus, DDA]</td>
<td></td>
</tr>
<tr>
<td>Single point temperature [Analog, HART*]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Accuracy [Modbus, DDA]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.2 °C [0.4 °F] range -40 °C [-40 °F] to -20 °C [-4 °F], ±0.1 °C [0.2 °F] range -20 °C [-4 °F] to 70 °C [158 °F], ±0.15 °C [0.3 °F] range 70 °C [158 °F] to 100 °C [212 °F], ±0.5 °C [0.9 °F] range 100 °C [212 °F] to 105 °C [221 °F]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Accuracy [Analog, HART*]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.28 °C [0.5 °F] range -40 °C [-40 °F] to 105 °C [221 °F]</td>
<td></td>
</tr>
</tbody>
</table>

### ELECTRONICS

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.5 to 28 Vdc</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fail Safe</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High, Full scale [Modbus, DDA] Low, 3.5 mA default or High, 22.8 mA [Analog, HART*]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rev. Polarity Protection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series diode</td>
<td></td>
</tr>
</tbody>
</table>

### MOUNTING

<table>
<thead>
<tr>
<th>Flexible Hose</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in. Adjustable MNPT or BSPP fitting, Flange mount</td>
<td></td>
</tr>
</tbody>
</table>

### WIRING

<table>
<thead>
<tr>
<th>Connections</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-wire shielded cable or twisted pair, Daniel Woodhead 6-pin male connector, 4570 mm [180 in.] Integral cable with pigtail</td>
<td></td>
</tr>
</tbody>
</table>

### ELECTRICAL CONNECTIONS

<table>
<thead>
<tr>
<th>Single &amp; Dual Cavity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ in. FNPT conduit opening, M20 for ATEX/IECEX version</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEMA Type 4X</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ in. FNPT conduit opening Low, 3.5 mA default or High, 22.8 mA [Analog, HART*]</td>
<td></td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL

<table>
<thead>
<tr>
<th>Enclosure Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA Type 4X, IP65</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Humidity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 100% relative humidity, non-condensing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Temperatures</th>
<th>Description</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Vessel Pressure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible hose: 260 psi [18 bar]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted parts: 316L stainless steel † Non-wetted parts: 316L stainless steel, Epoxy coated aluminum</td>
<td></td>
</tr>
</tbody>
</table>

### DISPLAY

<table>
<thead>
<tr>
<th>Measured Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product level, interface level and temperature</td>
<td></td>
</tr>
</tbody>
</table>
In addition to Magnetic Gage manufacturing, Questtec manufacturers custom instrument bridles in several configurations, utilizing various technologies, including guided wave radar, buoyancy-based devices, process gages, boiler gage systems, differential pressure and other equipment needing to be attached to the bridle.
TYPICAL TANK CONFIGURATIONS

QUESTTEC SOLUTIONS

STYLE A

STYLE B

STYLE C

STYLE D

STYLE H

INTERFACE
**MAGNE-TRAC™**

**MODEL NUMBER**

The Questec Solutions Magne-Trac utilizes a non-magnetic pipe chamber mounted directly to a vessel. The process connections from the chamber to the vessel act as an inlet and outlet that allow the liquid level in the pipe chamber to match the level in the process vessel. Inside the chamber, a custom designed float rises and falls with the level of the liquid in the chamber. A 360º magnet array within the float projects a magnetic field through the pipe chamber to an externally mounted indicator to provide a visual read out of the liquid level within the vessel.

---

**MT ORIENTATION**

(ONLY 1 ACCESSORY ALLOWED PER POSITION)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>AT TRANSMITTER</th>
<th>SWITCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>90º</td>
<td>270º</td>
<td>180º</td>
</tr>
<tr>
<td>180º</td>
<td>90º</td>
<td>270º</td>
</tr>
<tr>
<td>270º</td>
<td>180º</td>
<td>90º</td>
</tr>
</tbody>
</table>

Note: Overall length will always be greater than measuring length (ML). Please specify if a max overall length is required.

---

**MLI MATERIAL**

| 4S = 304 SS     |
| 4C = 304 SS/CS  |
| 6S = 316 SS     |
| 6C = 316 SS/CS  |
| MN = Monel      |
| Ti = Titanium   |
| HC = Hastelloy C|
| CP = CPVC       |
| CS = Customer Spec |

**VEssel CONNECTION**

| 04 = 1/2"     |
| 06 = 3/4"     |
| 08 = 1" (STD.)|
| 10 = 1½"     |
| 12 = 2"       |
| 16 = 2½"      |
| 20 = 3"       |
| 24 = 3½"      |
| 28 = 4"       |

**FLANGE CLASS**

| 01 = 150#     |
| 03 = 300#     |
| 04 = 400#     |
| 06 = 550#     |
| 09 = 900#     |
| 15 = 1500#    |
| 25 = 2500#    |
| CS = Customer Spec |

**SCALE/INDICATOR**

| MS = Metric Scale |
| PS = Percentage Scale |
| NS = Negative Scale |
| SH = SS Indicator Housing |
| SS = Custom Scale [Specify] |
| FE = Non Frost Extension |
| DI = Dual Indication |
| IF = Interface Indication |
| AR = Arrow Points |

**TEMP CONTROL**

| CI = Cryogenic Insulation w/ Frost Extension |
| HB = High Temp Insulation Blanket |
| EH = Electrical Heat Tracing |
| FP = Freeze Protection (Electrical) |
| ST = Steam Tracing |
| VO = Vent & Drain Valves [Specify Type] |
| IS = Isolation Valves [Specify Type] |

**TRANSMITTER/ SWITCHING OPTIONS**

| MT = Magnetostrictive Transmitter |
| RX = Reed Switches [Specify Amperage] |

---

**INDICATOR STYLE**

| WF = Wide Flag |
| ST = FOLLOWER |
| HF = High Temp Flag |
| XX = None |

**VENT/DRAIN**

| XX = None |
| XA = 1/4” Vent or Drain |
| XB = 1/4” Vent or Drain |
| XC = 1” Vent or Drain |
| AA = 1½” Top Vent & 1½” Drain (NPT) |
| BB = 1½” Top Vent & 1½” Drain (NPT) |
| CC = 1” Top Vent & 1” Drain (NPT) |
| AB = 1½” Top Vent & 1½” Drain (NPT) |
| AC = 1½” Top Vent & 1” Drain (NPT) |
| BC = 1½” Top Vent & 1½” Drain (NPT) |
| CB = 1” Top Vent & 1½” Drain (NPT) |
| CS = Customer Spec |

**SPEcification SHEET**

These parameters must be based on Maximum Operating Conditions and are the basis for Float construction.
The Questtec Solutions Magne-Trac Plus combines the Magne-Trac magnetic level gage with the Bridle-Trac bypass chamber. It may be used with our VAR Partner E+H GWR and customer specified radar for redundant level measurement. See page 4 for listing of our partners GWR models. The Magne-Trac Plus is recommended in applications that require both visual and electronic level viewing.

**MTP ORIENTATION**
(ONLY ONE ACCESSORY ALLOWED PER POSITION)
- Indicator at Transmitter
- Switches
- 90º
- 180º
- 270º

Note: Overall length will always be greater than measuring length (ML). Please specify if a max overall length is required.

**VESEL CONNECTION**
- 04 = 1/2"
- 06 = 3/4"
- 08 = 1"
- 10 = 1 1/16"
- 12 = 1 1/8"
- 16 = 2" [Std]
- 20 = 2 1/4"
- 24 = 3"
- CS = Customer Specified

**TOP BRIDLE CONNECTION**
- 06 = 3/4"
- 08 = 1"
- 10 = 1 1/4"
- 12 = 1 1/16"
- 16 = 2" [Std]
- 20 = 2 1/4"
- 24 = 3"
- CS = Customer Specified

**FLANGE CLASS**
- 01 = 150#
- 03 = 300#
- 04 = 400#
- 06 = 600#
- 09 = 900#
- 15 = 1500#
- 25 = 2500#
- CS = Customer Specified

**SPECIFIC GRAVITY**

**MAXIMUM PRESSURE**

**MAXIMUM TEMPERATURE**

**C-C** DIMENSION

**BRIDLE MATERIAL**
- 3C = Alloys CS
- 4S = 304 SS
- 6S = 316 SS
- MN = Monel
- Ti = Titanium
- HC = Hastelloy C
- CP = CPVC
- CS = Custom Specified

**INDICATOR STYLE**
- WP = Wide Flag
- ST = Stacker
- HW = High Temp Flag
- XX = None

**VENT/DRAIN**
- XX = None
- XA = 1/2" Vent or Drain
- XB = 3/4" Vent or Drain
- XC = 1" Vent or Drain
- AA = 1/2" Top Vent & 1/4" Drain (NPT)
- BB = 3/4" Top Vent & 1/4" Drain (NPT)
- CC = 1" Top Vent & 1 1/4" Drain (NPT)
- AB = 1/2" Top Vent & 1 1/4" Drain (NPT)
- AC = 3/4" Top Vent & 1 1/4" Drain (NPT)
- BA = 1 1/2" Top Vent & 1/4" Drain (NPT)
- BC = 1 1/2" Top Vent & 1 1/4" Drain (NPT)
- CA = 1" Top Vent & 1/4" Drain [NPT]
- CB = 1" Top Vent & 1 1/4" Drain [NPT]
- CS = Customer Specified

**TESTING/MATERIAL**
- CI = Cryogenic Insulation w/ Frost Extension
- HB = High Temp Insulation Blanket
- EH = Electrical Heat Tracing
- FP = Freeze Protection [Electrical]
- ST = Steam Tracing
- ND = Vent & Drain Valves (Specify Type)
- IS = Isolation Valves (Specify Type)

**TEMPERATURE**
- HB = High Temp Material
- CS = Custom Specified

**SCALE/INDICATOR**
- MS = Metric Scale
- PS = Percentage Scale
- NS = Negative Scale
- SH = SS Indicator Housing
- SS = Custom Scale [Specify]

**EXPANSION LOOP**
- FE = Non Frost
- DI = Dual Indication
- IF = Interface Indication
- AR = Arrow Pointers

**SWITCHING**
- MT = Magnetostriuctive Transmitter
- RX = Reed Switches [Specify Ampereage]
- LG = Level Gage
The Questtec Solutions Bridle-Trac utilizes a pipe chamber mounted directly to a vessel with two or more process connections. These connections act as an inlet and outlet that allow the liquid level in the pipe chamber to match the level in the process vessel. A Bridle-Trac may be referred to in the industry as a bridle chamber, a stilling well, a bypass chamber, a cage or a standpipe. It may be used with a customer specified radar for level measurement. All standard chambers are manufactured to Questtec’s Heavy Duty Design. Requirements to ASMEB31.1, 31.3 and NACE Design is available upon request.
LEVELFLEX FMP51
MODEL NUMBER

Levelflex FMP51 for level measurement even under extreme process conditions like high temperature and high pressure in the process industry. FMP51 offers maximum reliability even in case of moved surface and foam or when numerous tank baffles interfere with the measurement. Levelflex FMP51 is used for continuous level measurement of liquids, pastes and slurries but also for interface measurement. The measurement is not affected by changing media, temperature changes, gas blankets or vapors.

SECTION 1: APPROVAL:
AA = Non-hazardous area
CA = CSA C/US General Purpose
C2 = CSA C/US IS Cl.II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d
C3 = CSA C/US XP Cl.II,III Div.1 Gr.A-G, NI Cl.1 Div.2
FB FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2
FD FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2
8A FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G

DISPLAY, OPERATION
A = Without, via communication
C = SD02 4-line, push buttons + data backup function
E = *SD03 4-line, illum., touch control + data backup function

ELECTRICAL CONNECTION
A = Gland M20, IP66/68 NEMA4X/6P
B = Thread M20, IP66/68 NEMA4X/6P
C = Thread G1/2, IP66/68 NEMA4X/6P
D = Thread NPT1/2, IP66/68 NEMA4X/6P
I = Plug M12, IP66/68 NEMA4X/6P

SEAL
A4 = Viton, -30...150ºC/-22...302ºF
B3 = EPDM, -40...120ºC/-40...248ºF
C3 = Kalrez, -20...200ºC/-4...392ºF, saturated steam max 150ºC/302ºF
E1 = *FVMQ, -40...150ºC/-40...302ºF

CALIBRATION
F4 = 5-point linearity protocol
F3 = *3-point linearity protocol

MARKING
Z1 = stainless steel tag

PROCESS CONNECTION
AEj = 1-½” 150lbs RF, 316/316L flange ANSI B16.5
AQj = 1-½” 300lbs RF, 316/316L flange ANSI B16.5
ADM = 1-½” 300lbs, AlloyC316/316L flange ANSI B16.5
AF = 2” 150lbs RF, 316/316L flange ANSI B16.5
AFM = 2” 150lbs, AlloyC316/316L flange ANSI B16.5
AR = 2” 300lbs RF, 316/316L flange ANSI B16.5
ARM = 2” 300lbs, AlloyC316/316L flange ANSI B16.5
AG = 3” 150lbs RF, 316/316L flange ANSI B16.5
AGM = 3” 300lbs, AlloyC316/316L flange ANSI B16.5
ASj = 3” 300lbs RF, 316/316L flange ANSI B16.5
ASM = 3” 300lbs, AlloyC316/316L flange ANSI B16.5
AHJ = 4” 150lbs RF, 316/316L flange ANSI B16.5
ATj = 4” 300lbs RF, 316/316L flange ANSI B16.5
AJ = 6” 150lbs RF, 316/316L flange ANSI B16.5
AJK = 8” 150lbs RF, 316/316L flange ANSI B16.5

PROBE DESIGN
AA = 300 mm, rod 8mm 316L
AB = 12 inch, rod ⅜” 316L
AC = 300 mm, rod 12mm 316L
AD = 12 inch, rod ½” 316L
AL = 300 mm, rod 12mm AlloyC
AM = 12 inch, rod ⅜” AlloyC
BA = 591 mm, rod 16mm 316L, 500mm divisible
BB = 23 inch, rod 0.63in 316L, 20inch divisible
BC = 1091 mm, rod 16mm 316L, 1000mm divisible
BD = 43 inch, rod 0.63in 316L, 40inch divisible
LA = 1000 mm, rope 4mm, 316, max 150mm nozzle height, center rod
MB = 1000 mm, rope 4mm 316, max 300mm nozzle height, center rod
LB = 40 inch, rope ¼” 316, max 6in nozzle height, center rod
MD = 40 inch, rope ¼” 316, max 12in nozzle height, center rod
UA = 300 mm, coax 316L
UB = 12 inch, coax 316L
UC = 300 mm, coax AlloyC
UD = 12 inch, coax AlloyC

POWER SUPPLY, OUTPUT
A = 2-wire; 4-20mA HART
C = 2-wire; 4-20mA HART
E = 2-wire; FOUNDATION Fieldbus, switch output
G = 2-wire; PROFIBUS PA, switch output
K = 4-wire 90-253VAC, 4-20mA HART
L = 4-wire 10-48VDC, 4-20mA HART

HOUSING
C = GT20 dual compartment, Alu coated
B = GT18 dual compartment, 316L
A = GT19 dual compartment, Plastics PBT

ACCESSORY
MOUNTED
NC = Gas-tight feed through
NA = Overvoltage protection
OA = Rod center washer d=75mm/2.95”, 316L pipe diameter DN80/3” + DN100/4”
OB = Rod center washer d=45mm/1.77”, 316L pipe diameter DN50/2” + DN65/2-1/2”
OC = Rope center washer d=75mm/2.95”, 316L pipe diameter DN80/3” + DN100/4”
OD = Rod center washer d=48-95mm/1.88-3.74”, PEEK, interface measurement, pipe diameter DN50/2” + DN100/4”
Levelflex FMP54 for continuous level measurement in liquids under extreme conditions. The process connection with its ceramic-graphite seal safeguards high temperature and high pressure applications as they occur in steam boilers and toxic media like ammonia. The gas tight feed through guarantees additional safety. Only the gas phase compensation of the FMP54 gives reliable results in case of gas and steam phases. Reliable measurement in case of moving surface and foam or in changing medias.

### Approval
AA = Non-hazardous area  
CA = CSA C/US General Purpose  
C2 = CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, Ni Cl.I Div.2, Ex ia  
C3 = CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, Ni Cl.I Div.2, Ex ia  
CD CSA C/US DIP Cl.I,II,III Div.1 Gr.E-G  
FB = FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2  
FD = FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2  
8A = FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G

### Display, Operation
A = Without, via communication  
C = SD02 4-line, push buttons + data backup function  
E = SD03 4-line, illum., touch control + data backup function  
L = Prepared for display FHX50 + M12 connection  
M = Prepared for display FHX50 + custom connection

### Electrical Connection
A = Gland M20, IP66/68 NEMA4X/6P  
B = Thread M20, IP66/68 NEMA4X/6P  
D = Thread NPT1/2, IP66/68 NEMA4X/6P  
I = Plug M12, IP66/68 NEMA4X/6P

### Seal
D1 = Graphite, -196...280°C/321...536°F (XT), saturated steam max 200°C/392°F  
D2 = Graphite, -196...450°C/321...842°F (HT)

### Application Package
EB = Interface measurement  
EF = Gas Phase Compensation, L ref=500mm/1lin see additional spec.  
EG = Gas Phase Compensation, L ref=500mm/2lin see additional spec.

### Calibration
F4 = 5-point linearity protocol observe minimum probe length, see documentation ref=550mm >=1500mm), rod/Coax >=1250mm / L  
F3 = 3-point linearity protocol observe minimum probe length, rod/coax >=1000mm (Gas Phase Comp., L ref=300mm >=1250mm / L

### Power Supply, Output
A = 2-wire; 4-20mA HART  
B = 2-wire; 4-20mA HART, switch output  
C = 2-wire; 4-20mA HART + 4-20mA analog  
E = 2-wire; FOUNDATION Fieldbus, switch output  
G = 2-wire; PROFIBUS PA, switch output  
K = 4-wire 90-253VAC, 4-20mA HART  
L = 4-wire 10.4-48VDC, 4-20mA HART

### Housing
C = GT20 dual compartment, Alu, coated  
B = GT18 dual compartment, 316L  
A = GT19 dual compartment, plastic PBT

### Probe Design
MB = Sensor remote, 3m/9ft cable, detachable + mounting bracket  
MC = Sensor remote, 6m/18ft cable, detachable + mounting bracket  
MD = Sensor remote, 9m/30ft cable, detachable + mounting bracket

### Process Connection
AF = NPS 2" Cl.150 RF, 316/316L flange ASME B16.5  
AR = NPS 2" Cl.300 RF, 316/316L flange ASME B16.5  
AJ = NPS 2" Cl.600 RF, 316/316L flange ASME B16.5  
AG = NPS 3" Cl.150 RF, 316/316L flange ASME B16.5  
A9 = NPS 3" Cl.300 RF, 316/316L flange ASME B16.5  
A8 = NPS 3" Cl.600 RF, 316/316L flange ASME B16.5  
AT = NPS 4" Cl.150 RF, 316/316L flange ASME B16.5  
AH = NPS 4" Cl.300 RF, 316/316L flange ASME B16.5  
AJ = NPS 4" Cl.600 RF, 316/316L flange ASME B16.5  
AZ = NPS 4" Cl.900 RF, 316/316L flange ASME B16.5
Levelflex FMP55 guided radar with SensorFusion offers the worldwide first combination of the capacitance and guided radar measuring principle in one device. The instrument guarantees safe measured value acquisition even in emulsion layers and issues level and interface layer signals simultaneously. This makes the FMP55 Multiparameter the new standard in interface measurement especially in the oil & gas, chemical and petrochemical industry.

### APPROVAL

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>AA</td>
<td>Non-hazardous area</td>
</tr>
<tr>
<td>CA</td>
<td>CSA C/US General Purpose</td>
</tr>
<tr>
<td>C2</td>
<td>CSA C/US IS Cl.III Div.1 Gr. A-G, Ni Cl.I Div.2, Ex ia</td>
</tr>
<tr>
<td>C3</td>
<td>CSA C/US XP Cl.III Div.1 Gr. A-G, Ni Cl.I Div.2, Ex d</td>
</tr>
<tr>
<td>FB</td>
<td>FM IS Cl.II,III Div.1 Gr. A-G, AEX ia, Ni Cl.II Div.2</td>
</tr>
<tr>
<td>FD</td>
<td>FM XP Cl.II,III Div.1 Gr. A-G, AEX d, Ni Cl.II Div.2</td>
</tr>
<tr>
<td>GA</td>
<td>FM/CSA IS+XP Cl.II,III Div.1 Gr. A-G</td>
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### DISPLAY, OPERATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without, via communication</td>
</tr>
<tr>
<td>C</td>
<td>SD02 4-line, push buttons + data backup function</td>
</tr>
<tr>
<td>E</td>
<td>*SD03 4-line, illum., touch control + data backup function</td>
</tr>
<tr>
<td>L</td>
<td>Prepared for display FH X50 + M12 connection</td>
</tr>
<tr>
<td>M</td>
<td>Prepared for display FH X50 + custom connection</td>
</tr>
</tbody>
</table>

### POWER SUPPLY, OUTPUT

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2-wire; 4-20mA HART</td>
</tr>
<tr>
<td>C</td>
<td>2-wire; 4-20mA HART, 4-20mA</td>
</tr>
<tr>
<td>E</td>
<td>2-wire; FOUNDATION Fieldbus, switch output</td>
</tr>
<tr>
<td>G</td>
<td>2-wire, PROFIBUS PA, switch output</td>
</tr>
<tr>
<td>K</td>
<td>4-wire 90-23VAC, 4-20mA HART</td>
</tr>
<tr>
<td>L</td>
<td>4-wire 10.4-48VDC, 4-20mA HART</td>
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### ELECTRICAL CONNECTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Gland M20, IP66/68 NEMA44/6P</td>
</tr>
<tr>
<td>B</td>
<td>Thread M20, IP66/68 NEMA44/6P</td>
</tr>
<tr>
<td>C</td>
<td>Thread G1/2, IP66/68 NEMA44/6P</td>
</tr>
<tr>
<td>D</td>
<td>Thread NPT1/2, IP66/68 NEMA44/6P</td>
</tr>
<tr>
<td>E</td>
<td>Plug M12, IP66/68 NEMA44/6P</td>
</tr>
</tbody>
</table>

### HOUSING

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>500 mm, rod 16mm PFA&gt;316L</td>
</tr>
<tr>
<td>CB</td>
<td>19.5 inch, rod 0.63in PFA&gt;316L</td>
</tr>
<tr>
<td>NA</td>
<td>1000 mm, rope 4mm PFA&gt;316L</td>
</tr>
<tr>
<td>ND</td>
<td>40 inch, rope 1/6&quot; PFA&gt;316L</td>
</tr>
<tr>
<td>UA</td>
<td>500 mm, cox 316L</td>
</tr>
<tr>
<td>UB</td>
<td>19.5 inch, cox 316L</td>
</tr>
</tbody>
</table>

### PROCESS CONNECTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEK</td>
<td>1-1/2&quot; 150lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>AKJ</td>
<td>1-1/2&quot; 300lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>AFK</td>
<td>2&quot; 150lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>ARK</td>
<td>2&quot; 300lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>AGK</td>
<td>3&quot; 150lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>ASK</td>
<td>3&quot; 300lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>AUK</td>
<td>4&quot; 150lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>ATK</td>
<td>4&quot; 300lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
<tr>
<td>A4K</td>
<td>6&quot; 150lbs, PTFE&gt;316/316L flange ANSI B16.5</td>
</tr>
</tbody>
</table>
MTLT 5000
MODEL NUMBER

The MTLT-5000 is based upon the magnetostrictive principle. The sensing tube contains a wire which is pulsed at fixed time intervals. The interaction of the current pulse with the magnetic field created by the magnetic float causes a torsion stress wave to be induced in the wire. This torsion propagates along the wire at a known velocity, from the position of the magnetic float and toward both ends of the wire. A patented piezo-magnetic sensing element placed in the transmitter assembly converts the received mechanical torsion into an electrical return pulse. The microprocessor-based electronics measures the elapsed time between the start and return pulses and converts it into a 4-20 mA DC output which is proportional to the level being measured.
The Questtec Maverick In-Tank transmitter is configured with a flexible hose constructed of 316L stainless steel that can be ordered in lengths from 120 inches to 866 inches with a 4-20mA. Once installed and calibrated there is no requirement for scheduled maintenance or recalibration.

**FEATURES**

- No maintenance required
- Multidrop HART Communications
- FM Approved Explosion Proof/IS
- NEMA 4x/7 enclosures
- Modular design
- Adjustable output damping
- Up to .001" resolution
- 2-wire loop powered
- RFI/EMI protection
- Available up to 866 inches
- Process temperature range: -30 to 400°F
- Offers a 4/20 mA 2-wire loop powered circuit for continuous level measurement

**UNIT OF MEASURE**

- M = Metric: Millimeters
- U = US customary: Inches

**LENGTH (NO DECIMAL SPACES)**

- Rigid Pipe: 12 to 144 in (code as 01200 to 14400)
- Rigid Pipe: 305 to 3658 mm (code as 00305 to 03658)

*Order length is equal to center to center dimension*
**Questtec** is an International Company with Representatives based throughout the world. Our Partners can assist with Commissioning Start Up and Calibration, 24 Hour Service and Repair Support.

**866.240.9906**

**IMMEDIATE HELP VIA-REMOTE MAINTENANCE**

Using the remote maintenance service TeamViewer, the Questtec service technician can assist you immediately, check the instrument configuration and perform certain analysis.
40,000ft² climate controlled

Questtec Solutions Registration #0736

ASME “S” & “R”
Stamp Cert# 51,922

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400-04 10/18