LEVEL-TRAC & STEAM-TRAC

HRSG Drums, Boilers, Heaters, De-Aerators, Condensers Level Gage and Level Switch Direct and Indirect Per PG60.1
WATER LEVEL MEASUREMENT
THE PRINCIPLES UNDERLYING THE PRODUCT

Reliable detection of condensate levels within boiler drums is one of the most critical measurements required in a steam generation plant. Low condensate levels can damage boiler tubes while high condensate levels can damage steam turbines. These are catastrophic events that result in significant maintenance costs, but are fully preventable with the right safeguards.

Fortunately, steam and condensate have distinct electrical properties. Condensate is far more conductive (and less resistive) than steam. Boilers produce a wide range of condensate conductivities within their drum and piping systems. These simple properties can be leveraged to provide accurate, reliable measurement of condensate levels through two different approaches: conductivity and resistivity. Questtec offers both in our indirect gages.

CONDUCTIVITY

The conductivity approach utilizes a series of switches to determine the drum’s condensate level. A control unit houses detection modules that deliver a low voltage signal to probe tips in a water column. When a probe tip is submerged in condensate, its circuit is completed and two sets of DPDT “Form C” Dry contacts change state. By reading the probes switches and noting their locations, the condensate level is apparent.

The Level-Trac LT-100 Series is based on this principle and supports any number of horizontally or vertically mounted probes. The standard control units come in 50 kΩ sensitivity, and are also available in 25 or 75 kΩ. The 11 pin module plug in design is easily replaceable in the field by hand. An optional remote indicator may be mounted up to 500 ft away in a Fiberglass Reinforced Polycarbonate Nema-4X enclosure or control panel mount.

RESISTIVITY

The resistivity approach is a more technically nuanced approach that measures electrical resistance to determine condensate levels. Resistivity between condensate and steam is measured in a calibrated cell of the water column. The cell dimensions create a calibrated resistance typically greater than or equal to 0.1 MΩ when condensate is absent. When condensate is present, the resistance in the cell drops below 0.1 MΩ. A resistivity circuit is arranged to sense whether the probe resistance is less than or greater than the 0.1 MΩ mark within a series of cells to determine how many contain condensate. The condensate level in the drum becomes apparent in a manner similar to the conductivity system. The detection level is independent of water purity and boiler operating conditions.

The Level-Trac LT-210, 220, and 310 Series Electronics are based on this principles. As there is a continual live signal on every channel, this system offers engineered redundancy with fault tolerant fail safe operation. A push-to-test button completely tests the electronics integrity and system’s operation, a feature that aids in troubleshooting. Questtec can fulfill your level measurement needs on the principle of conductivity or resistivity.
All normally operating steam turbines carry the inherent risk of water ingress. Small amounts of condensate can enter from any connection to the turbine, sometimes arising rapidly from the condensation of steam. This almost always results in catastrophic damage to the turbine, even in low pressure situations. Human operators are rarely able to recognize and prevent these problems as quickly as they occur. Therefore, automatic turbine water induction prevention (TWIP) systems must be used to safeguard turbines from this danger. They save significant costs through quick detection and prevention of water ingress into the steam turbine.

THE QUESTTEC SOLUTION

Questtec offers a range of products to safeguard your system with TWIP. Safe plant operation begins with a 12 Probe Level-Trac LT-220 system installed on the boiler drum with high alarms and high trips set and continues with the LT-310 on Heater Drains, Superheat and Reheat Main Drains, and on Drip Pots downstream of Attemperators. This will monitor all potential areas for turbine water induction and automatically detect it. Our products fulfill ASME recommendations for safe steam turbine operation made in the TDP-1-2006 Standard.

The LT-310 Series' works on the same principles as the high integrity LT- 210 Series Resistivity and is selected where 1–6 probe channels are required. A single probe can be utilized to provide a control signal or several can be paired and validated against each other where greater reliability is demanded. It offers a sensitivity that is reliably able to detect condensate down to 0.5 mS/cm2 instantly.

The circuits are in a continual state of test, with any faults reported through relay contacts and a visual indicator mounted on the front panel. The system can be set up such that no failed individual probe or component can cause a false signal, thereby always maintaining the critical functionality of the probes.

STANDARD FEATURES

Questtec includes a number of standard features in all TWIP products to ensure easy operation and maintenance. Standard features include: Alarms & Validated Tripping Relays, Normally Energized or Deenergized Relays, Time Delays, Sensitivities Settings, LED flash. All are easily set with solder pads in the field or by Questtec before delivery. Products also include an electronics integrity test button that tests the entire system’s operation.

TWIP applications are standard in many respects, but engineered pressure parts are typically custom built to customer specifications to minimize installation costs. Trust Questtec’s high quality equipment to provide TWIP so you can operate your steam turbines safely and efficiently.
The Questtec Steam-Trac product line fully complies with the ASME Section I requirement for Direct Reading Gage Glass. Steam-Trac products are designed specifically for the rigorous service condition of steam generation, and consistently yield lower maintenance cost than competitive products.

**350 PSI**

**ST-350**
- Chamber: A-696 GR.C, Carbon Steel
- Gasket: Grafoil® GHR
- Glass: Tempered Borosilicate
- Cover: Forged Carbon Steel
- U-Bolts: A193-B7 Nickel Plated
- Nuts: A194-2H Nickel Plated
- Spring Washers: 17-7 PH SST Nickel Plated

**SLI-A SEE-LEVEL ILLUMINATOR FOR STEAM SERVICE**
- Lighting: Amber LED’s angled at 45° for easy viewing of meniscus
- Power Supply: 115/230 VAC @ 50/60 Hz
- Power Consumption: <150 mA @ 115 VAC
- Supply Connection: 3/4 NPT
- Ambient Temp: -40°F [-40°C] to 150°F [65°C]
- LED Estimated Life: 100,000 hours
- Certification: UL1203, UL913, CSA22.2, CL I, DIV 1, Groups B, C, & D, NEMA 4X & 8
- Savings: One Power Supply will illuminate four sections

**STBI-3000A BI-COLOR ILLUMINATOR**
- Power Supply: 84-264 VAC
- Power Consumption: 0.24 Amps per 5 Ports
- Power Supply Enclosure: NEMA 4X, Anodized Aluminum
- Lighting: Long Life, Low Current, High Intensity LED Lamps
- Material: Anodized Aluminum
- Connection Type: Quick Connect Latches for Ease of Assembly

**SPARE PARTS**

Kits including gasket, cushions, glass, & shields for reflex and transparent style gages are available for repair of Questtec or OEM direct reading gages.

**3000 PSI**

**STB-3000**
- Chamber: 304 SS Single-piece Extruded
- Gasket: Spiral Wound Grafoil
- Shield: Ruby HQ Mica
- Glass: Tempered Aluminosilicate
- Cover: Carbon Steel
- Bolts: A193-B7 Nickel Plated
- Bi-color Illuminator Required

Gaskets, cushions, glass & shields for reflex and transparent style gages

Glass, Gaskets, Cushions, & Mica Shields for STB-3000 Bi-Color Ported Gage
Questtec Solutions steam valves are designed specifically for use with water level gages in steam/water service. The angled flow path compactly facilitates installation of the level gage, bringing the assembly connection point to the side. Each model is designed to prevent steam galling and maximize packing life to extend the longevity of the valve.

**VALVES**

**450 PSI**

**SV-450**
- Offset Pattern
- Grafoil Packing for Temperatures to 700°F
- Screwed Bonnet
- Removable Seat
- Eccentric Union Tank Connector
- Optional Back-seating Stem

**ST-450 with Illuminator and Equalizer Tube**

**1100 PSI**

**SV-1100**
- Offset Pattern
- Outside Screw & Yoke (OS&Y) Design
- Non-Union Solid Shank Tank Connector
- Bolted Bonnet
- Grafoil Packing for Temperatures to 700°F
- Non-rotating Back-seating Stem

**ST-350 with Magne-Trac Magnetic level Gage**

**316 SS STB-3000**
- Stainless Steel Construction for Offshore or Corrosive Environments
- Center Tie-Tube to Meet Any Visible Range

**GAGE OPTIONS**
- Isolation or Drain Valves per customer requirements
- Gasketed Union Gage Connection to allow rotation of viewing angle
- Stainless Steel Construction for Offshore or Corrosive Environments
- Center Tie-Tube to Meet Any Visible Range

**COLUMN OPTIONS**
- Isolation or Drain Valves per customer requirements
- Pre-wired, Integral Mounted Junction Box
- Alternate Materials Available for Corrosive Environments and Extreme Temperatures

**READY TO SPEC?**
The following is an overview of Questtec Solution’s standard steam products. For more in depth information, contact your Questtec Sales Representative. You can also contact Questtec directly by phone at 866-240-9906, by email at sales@qtslevel.com, or online at www.qtslevel.com.
INDIRECT GAGES

Questtec Solutions Level-Trac products are designed exclusively to sense water in steam generation process. Level-Trac systems include remote water level indicators per ASME Section I and turbine water induction protection.

1000 PSI

LT-500
Chamber: SA-105 Extruded
Probe Mounting: Horizontal
Probe Type: Type 800
Probe Gasket: Spiral Wound

TYPE 800
Probe Rating: 1000 PSI WSP; 550°F
Threaded Column Connection High Quality Spiral Wound Gasket
TFE Insulator

2000 PSI

LT-501
Chamber: SA-105 Extruded
Probe Mounting: Horizontal
Probe Type: 810
Probe Gasket: Spiral Wound

PROBE 810
Probe Rating: 2000 PSI WSP; 1100°F
Threaded Column Connection
Helium Leak Tested
High Quality Spiral Wound Gasket
Zirconium Insulator
Ceramic to Metal Vacuum Brazing

3000 PSI

LT-502
Chamber: SA-106C Schedule 160
Probe Mounting: Horizontal
Probe Type: 820
Probe Seal: Ferrule Seat

PROBE 820
Probe Rating: 4350 PSI WSP; 1040°F
Single Hex Nut Closure
Helium Leak Tested
Metal-to-metal Ferrule Seat
Zirconium/Aluminosilicate Insulator
Ceramic to Metal Vacuum Brazing

4350 PSI

LT-502 PLUS+
Chamber: SA-106C Schedule XXS
Probe Mounting: Horizontal
Probe Type: 820
Probe Seal: Ferrule Seat

1000 – 2000 PSI

LT-40 / LT-41
Point Level Switch
Installation Within Any Vertical Pipe Run Top/Bottom End Connections
3/4" or 1", F.NPT or SW
Chamber: A-106C Carbon Steel
No. of Probes: 1-2
Rating: 1,000 PSI [LT-40] 2,000 PSI [LT-41]
(Recommended Control Unit: LT-310)

OEM ENHANCED PERFORMANCE KITS
Level-Trac probe replacement kits offer a better value as compared to original equipment manufacturers. Enhanced Performance kits are available for manufacturers such as: Clark Reliance Yarway/Fossil Diamond Power Hydrastep

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### ELECTRONIC CONTROL UNITS

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<tr>
<th>Model</th>
<th>Probe Channels</th>
<th>Relays</th>
<th>Power Supply</th>
<th>Enclosure</th>
<th>Features</th>
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</thead>
<tbody>
<tr>
<td>LT-100</td>
<td>1 - 12</td>
<td>All Channels</td>
<td>Single 120 240 VAC</td>
<td>NEMA 4X Fiberglass Reinforced Polyester</td>
<td>Plug-In Detection Modules</td>
</tr>
<tr>
<td>LT-210</td>
<td>1 - 12</td>
<td>2 Alarms, 2 Validated Trips, 1 Fault, 8A DPDT</td>
<td>Single 100-240 VAC</td>
<td>NEMA 4X Fiberglass Reinforced Polyester</td>
<td>Sequence Fault Detection Door mounted LED indicator</td>
</tr>
<tr>
<td>LT-220</td>
<td>1 - 14</td>
<td>2 Alarms, 2 Validated Trips, 1 Fault 8A DPDT</td>
<td>Dual 100-240 VAC</td>
<td>NEMA 4X Fiberglass Reinforced Polyester</td>
<td>Sequence Fault Detection Door mounted LED indicator</td>
</tr>
<tr>
<td>LT-310</td>
<td>1 - 6</td>
<td>Alarm/Trip Relays used individually or in validation, 6 8A DPDT</td>
<td>Dual 100-240 VAC</td>
<td>NEMA 4X Fiberglass Reinforced Polyester</td>
<td>Door mounted LED indicator Solid State Circuitry</td>
</tr>
</tbody>
</table>

### REMOTE INDICATORS
Each of these electronic units are available with remote indicators. These remote indicators come with individual channel wiring and the LT-210 and LT-220 models have an option for serial transmission.

### HIGH TEMPERATURE CABLING
Our cable is designed specifically for use with Level-Trac Remote Level Indicator Systems for connection of the probe column to the control unit. The probe side will be terminated with high temperature, nickel plated steel, un-insulated ring terminals for connection to the probes and common lug.
SYSTEM SUMMARY

PROBE COLUMN

CONTROL UNIT

REMOTE LEVEL INDICATOR

- Local indication at the boiler drum
- Remote indication for the control room
- (4) Relays for the switch points L/LL/H/HH
- 4-20mA Output

• 115 VAC POWER SUPPLY
• REMOTE INDICATOR 1
• REMOTE INDICATOR 2
• 4 - 20 MA OUTPUT
• 4 INDEPENDENT RELAYS

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