

*Quest-Tec Solutions*  
*The New Standard of Level*

Level Gage and Level Switch  
**HRSG Drums, Boilers, Heaters,  
De-Aerators, Condensers**

Direct and Indirect Per PG60.1

**LEVEL-TRAC & STEAM-TRAC**  
**STEAM/CONDENSATE LEVEL**  
**SYSTEMS**

# Turbine Water Induction Prevention

Direct and Indirect Per PG60.1

## Overview

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 Quest-Tec Solution

Quest-Tec 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 the ASME's recommendations

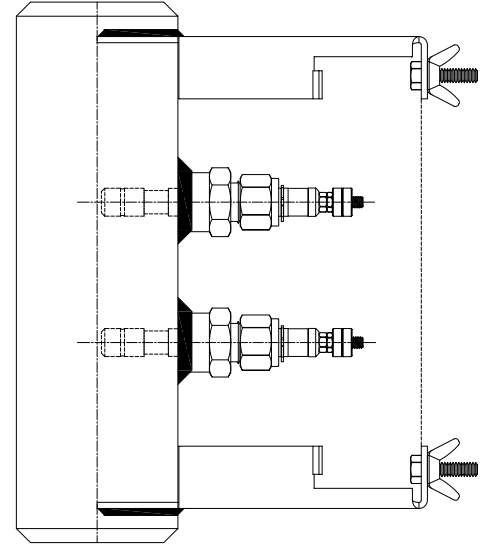
for safe steam turbine operation made in the TDP-1-2006 Standard.

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  $0.5 \text{ mS/cm}^2$  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

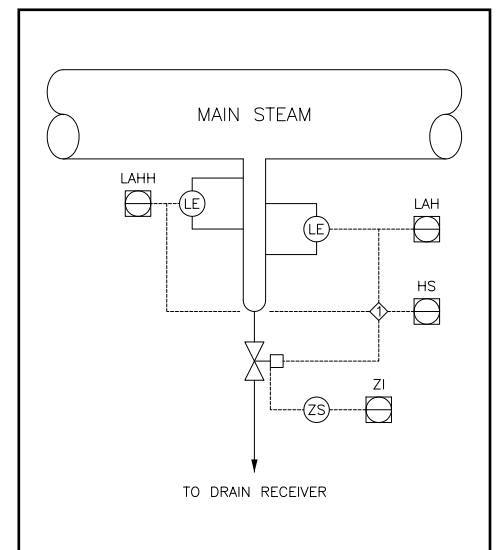
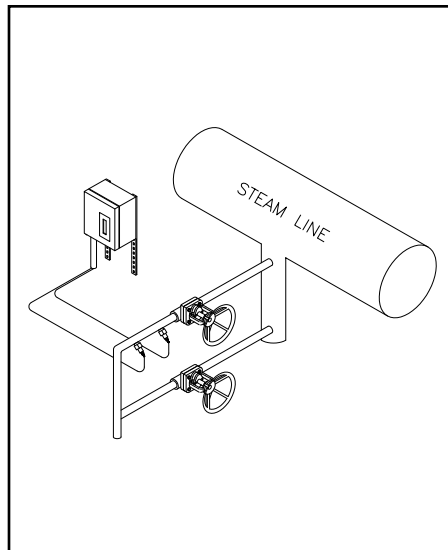
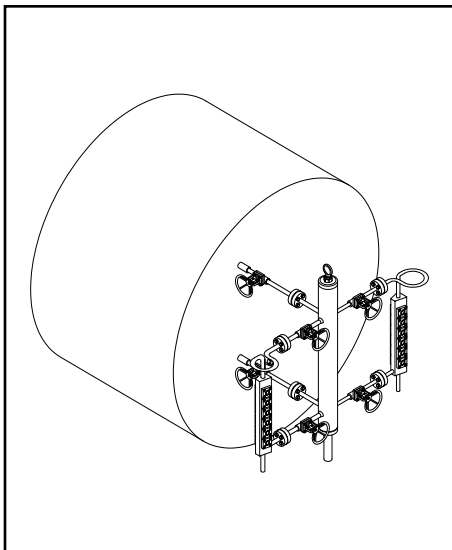
Quest-Tec includes a number of standard features in all TWIP products to ensure easy operation and maintenance. Standard features include: Alarms & Validated Tripping Relays, Normally Energized or De-energized Relays, Time Delays, Sensitivities Settings, LED flash. All are easily set with solder pads



in the field or by Quest-Tec 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 Quest-tec's high quality equipment to provide TWIP so you can operate your steam turbines safely and efficiently.



# Water Level Measurement

## The Principles Underlying the Product

### Overview

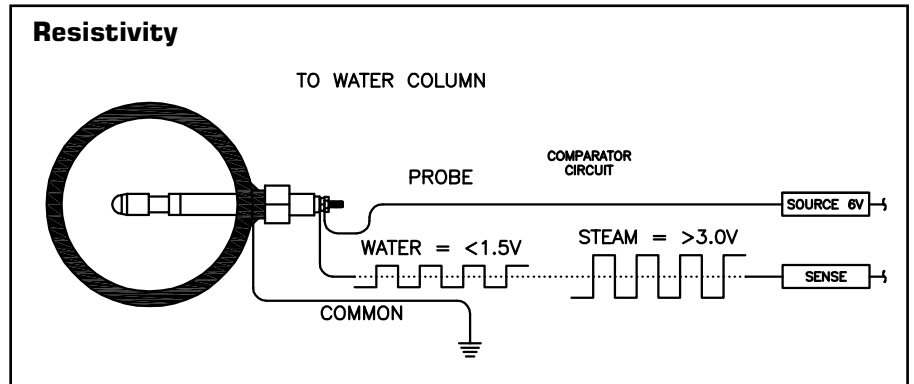
Reliable detection of condensate levels within boiler drums is one of the most critical measurements required in a steam generation plant. Low condensate levels can damage boiler tubes while high condensate levels can damage steam turbines. These are catastrophic events that result in significant maintenance 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 therefore 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. Quest-Tec 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

### Resistivity



"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 k $\Omega$  sensitivity, but are also available in 25 or 75 k $\Omega$ . 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

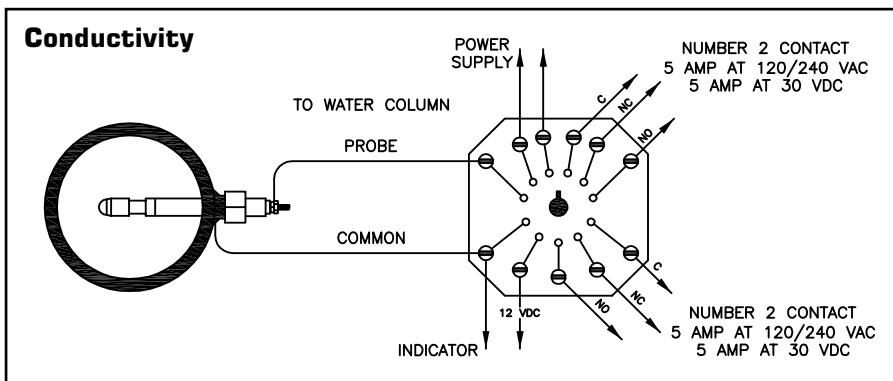
The resistivity approach is a more technically nuanced approach that measures electrical resistance to determine condensate levels.

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 M $\Omega$  when condensate is absent. When condensate is present, the resistance in the cell drops below 0.1 M $\Omega$ . A resistivity circuit is arranged to sense whether the probe resistance is less than or greater than the 0.1 M $\Omega$  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.

Whether you prefer the operating principles of conductivity or resistivity, Quest-Tec Solutions can fulfill your water level measurement needs with quality products and service.

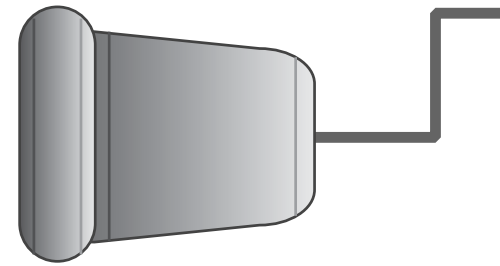
### Conductivity





The following is an overview of Quest Tec Solution's standard steam products. For more in depth information, contact your Quest-Tec Sales Representative. You can also contact Quest-Tec directly by phone at 866-240-9906, by email at sales@qtslevel.com, or online at www.qtslevel.com.

Turbine



# Direct Reading Gages

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

The Quest-Tec 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 than competitive products.

450

PSI



## ST-450

Chamber: A-696 Grade C Carbon Steel  
Gasket: Grafoil® GHR  
Shield: HQ Mica  
Glass: Tempered Borosilicate  
Cover: Forged Carbon Steel  
Studs: 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 Consumptions: <150 mA @ 115 VAC  
Supply Connection: 3/4 NPT  
Ambient Temperature: -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

1000

PSI



## ST-1000

Chamber: A-105 Carbon Steel  
Gasket: Grafoil® GHR  
Shield: HQ Mica  
Glass: Tempered Borosilicate  
Cover: Forged Carbon Steel  
Studs: A193-B7 Nickel Plated  
Nuts: A194-2H Nickel Plated  
Spring Washers: 17-7 PH SST Nickel Plated

## STBI-3000 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: 304 Stainless Steel  
Connection Type: Quick Connect Latches for Ease of Assembly

1600

PSI

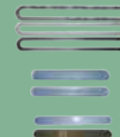


## ST-1600

Chamber: A516 Grade 70 Carbon Steel  
Gasket: Grafoil® GHR  
Shield: HQ Mica  
Glass: Tempered Borosilicate  
Cover: A516 Carbon Steel  
Studs: A193-B7 Nickel Plated  
Nuts: A194-2H Nickel Plated  
Spring Washers: 17-7 PH SST Nickel Plated

## Spare Parts

Kits including glass, gaskets, cushions and shields are available for repair of Quest-tec or OEM direct reading gages.



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

Glass, Gaskets, Cushions, & Mica Shields for STB-3000 Bi-Color Ported Gage

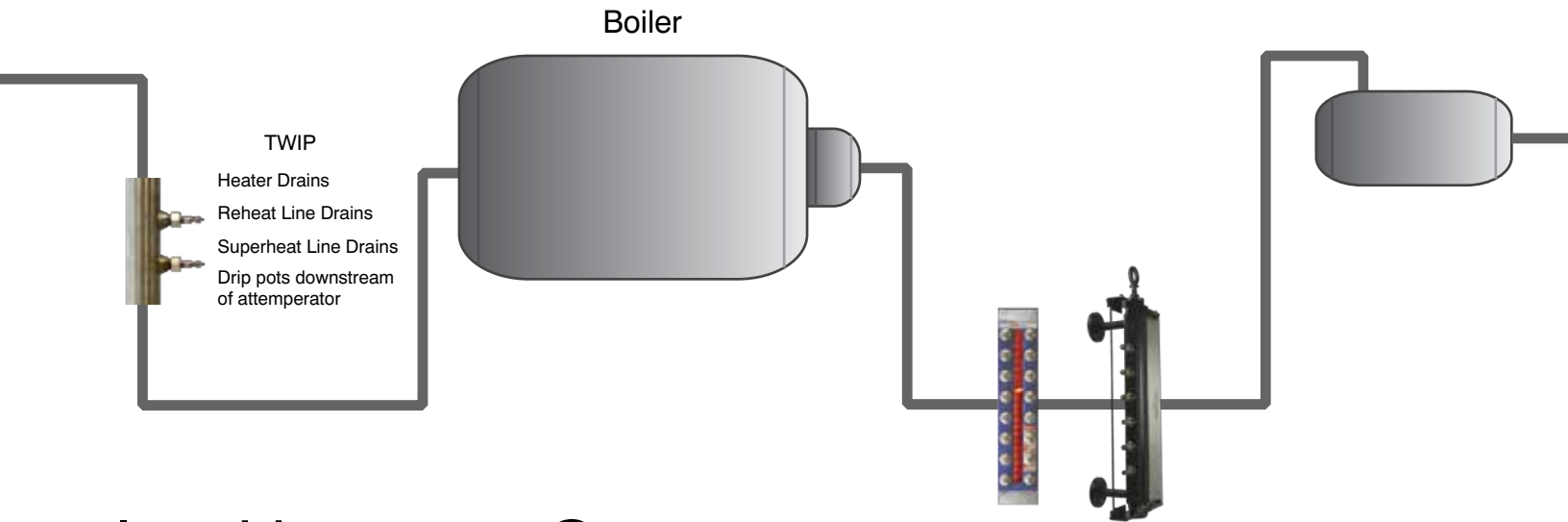
3000

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



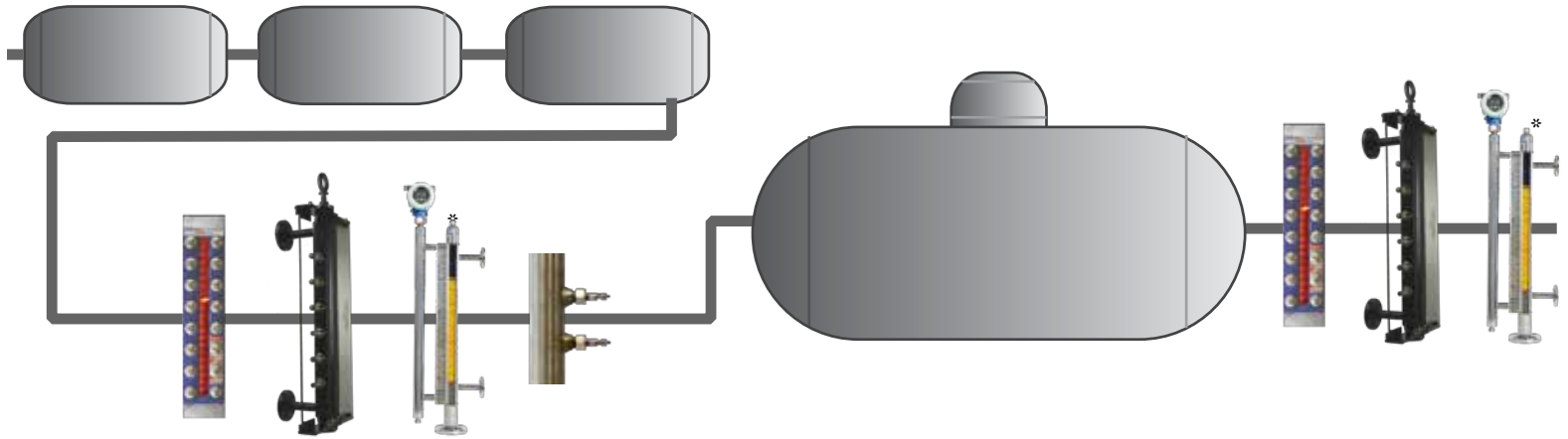
# Indirect Gages

Quest-Tec 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	<p><b>LT-500</b></p> <p>Chamber: A-105 Extruded            Probe Mounting: Horizontal            Probe Type: Type 800            Probe Gasket: Spiral Wound</p>	<p><b>Type 800</b></p> <p>Probe Rating: 1000 PSI WSP; 550 F            Threaded Column Connection            High Quality Spiral Wound Gasket            TFE Insulator            Ceramic to Metal Vacuum Brazing</p>
2000 PSI	<p><b>LT-501</b></p> <p>Chamber: A-105 Extruded            Probe Mounting: Horizontal            Probe Type: 801            Probe Gasket: Spiral Wound</p>	<p><b>Type 810</b></p> <p>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</p>
3000 PSI	<p><b>LT-502</b></p> <p>Chamber: A-106B Schedule 160            Probe Mounting: Horizontal            Probe Type: 802            Probe Seal: Ferrule Seat</p>	<p><b>Type 820</b></p> <p>Probe Rating: 3000 PSI WSP; 1100 F            Single Hex Nut Closure            Helium Leak Tested            Metal-to-metal Ferrule Seat            Zirconium/Aluminosilicate Insulator            Ceramic to Metal Vacuum Brazing</p>
1000 - 2000 PSI	<p><b>LT-40 / LT-41</b></p> <p>Point Level Switch            Installation Within Any Vertical Pipe Run            Top/Bottom End Connections            3/4" or 1", F.NPT or SW            Chamber: A-106B Carbon Steel            No. of Probes: 1-2            Rating: 1,000 PSI (LT-40)            Rating: 2,000 PSI (LT-41)            (Recommended Control Unit: LT-310)</p>	<p><b>OEM Probe Upgrade Kits</b></p> <p>Level-Trac probe upgrade kits offer a better value as compared to original equipment manufacturers. Probe upgrades are available for manufacturers such as:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             Clark Reliance            Yarway/Fossil         </div> <div style="text-align: center;">             Diamond Power            Hydrastep         </div> </div>

Heaters

Deaerator



# Electronic Control Units

## LT-100 Series



Probe Channels: 1 - 12  
 Relays: All Channels  
 Power Supply: Single 120-240 VAC  
 Enclosure: NEMA 4X Fiberglass Reinforced Polyester  
 Features: Plug-In Detection Modules



## LT-210



Probe Channels: 1 - 12  
 Relays: 2 Alarms, 2 Validated Trips, 1 Fault, 8A DPDT  
 Power Supply: Single 100-240 VAC  
 Output Power: 4-20mA, Remote Display  
 Enclosure: NEMA 4X Fiberglass Reinforced Polyester  
 Features: Sequence Fault Detection  
 Door mounted LED indicator



## LT-220



Probe Channels: 1 - 14  
 Relays: 2 Alarms, 2 Validated Trips, 1 Fault 8A DPDT  
 Power Supply: Dual 100-240 VAC  
 Output Power: 4-20mA, Remote Display  
 Enclosure: NEMA 4X Fiberglass Reinforced Polyester  
 Features: Sequence Fault Detection  
 Door mounted LED indicator



## LT-310



Probe Channels: 1 - 6  
 Relays: Alarm/Trip Relays used individually or in validation, 6 8A DPDT  
 Power Supply: Dual, 100-240 VAC  
 Output Power: Remote Display  
 Enclosure: NEMA 4X Fiberglass Reinforced Polyester  
 Features: Door mounted LED indicator Solid State Circuitry



## Remote Indicators



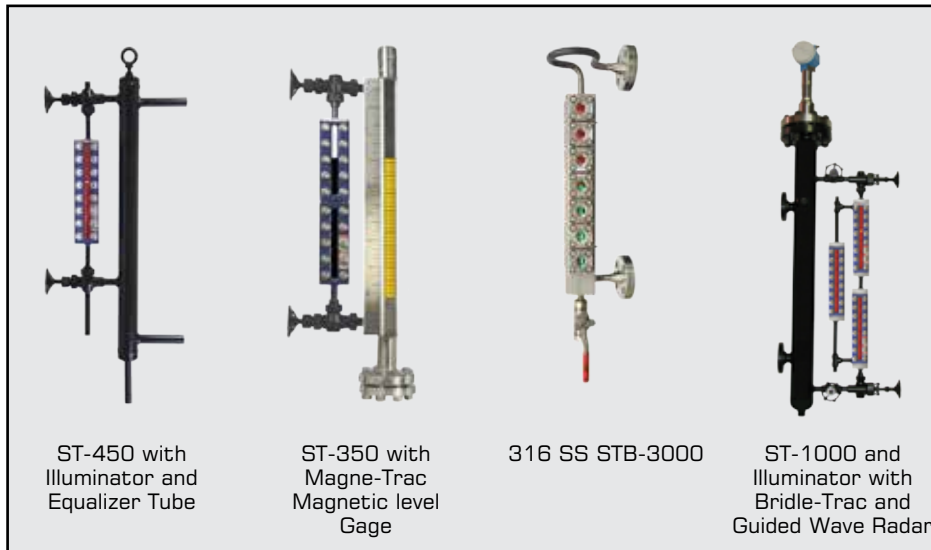
Each of these electronic units are available with remote indicators. These remote indicators come with individual channel wiring and the LT-210 and LT-220 models have an option for serial transmission.



## High Temperature Cabling

Our cable is designed specifically for use with Level-Trac Remote Level Indicator Systems for connection of the probe head 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.

# Custom Designed Level Measurement Products



ST-450 with Illuminator and Equalizer Tube

ST-350 with Magne-Trac Magnetic level Gage

316 SS STB-3000

ST-1000 and Illuminator with Bridle-Trac and Guided Wave Radar

## 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

Quest-Tec 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.

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

### Valve Options

Gasketed Union Gage Connection to allow rotation of viewing angle  
Quick-Closing Levers  
Chainwheel Operation  
Vertical Rising Ball Check

1600

PSI

### SV-1600



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

### 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

3000

PSI

### SV-3000



Outside screw & yoke design  
Back Seating Stem  
Graphite packing  
High performance packing system  
Integral Gland Wrench  
Clampseal Bonnet/Chamber

### Column Options

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

# QUEST-TEC SOLUTIONS

## Contact Quest-Tec

Phone:  
866-240-9906

Email:  
sales@qtslevel.com

Online:  
www.qtslevel.com



Quest-Tec Solutions is a company focused on quality, identifying and matching customer needs with comprehensive and current product designs and features. The development and engineering of the liquid level gage and valve product lines began more than fifty years ago with Daniel Measurement & Control. Since then, we have expanded our product offering to include a complete line of magnetic level gauges and indicators, steam level gages and indicators and remote boiler drum level instrumentation and valves. Whether direct or indirect gages are required, we are a full line supplier for all your level needs.

The senior management of Quest-Tec is well respected within the industry for their leadership throughout the company's rapid growth. During the first seven years of operation, QTS received Houston Business Journal's "Fast 100 Growing Companies" award for two consecutive years. That growth led to the establishment of Quest-Tec's current site in Houston, Texas. The six acre site includes a state of the art 45,000 square foot manufacturing facility utilizing CNC machinery to produce products efficiently with consistently high quality.

In 2011, Quest-Tec Solutions received ISO 9001:2008 certification from the ANSI-ASQ National Accreditation Board. We are also now proud to offer products in compliance with PED. These certifications are a testament to the same high quality standards from which our customers have always benefited. As a leader in liquid level measurement innovation, we will continue to offer the quality and performance our customers expect.

## Represented By:



Quest-tec Headquarters  
Houston, TX



CNC Machining of  
ST-1600 Cover