



## WATER LEVEL MEASUREMENT

WATER LEVEL MEASUREMENT AND INDICATION FOR THE STEAM POWER INDUSTRY

# Aquarian 1000Plus

The Aquarian 1000Plus represents the standard in electronic level detection. Based on the widely accepted conductivity probe technology, it was specifically designed to meet industry's growing needs and demand for a reliable, cost effective and versatile means of sensing water levels in a variety of applications.

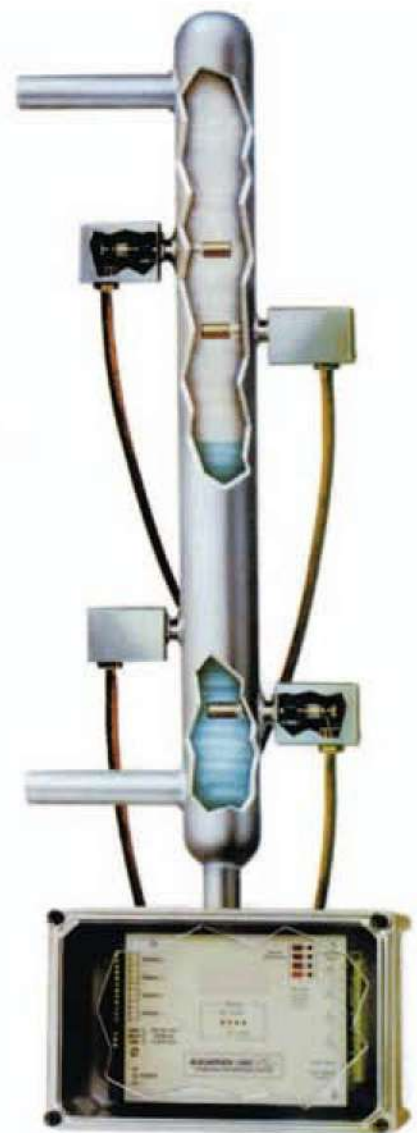
Equipped with one to four probes which can be mounted directly to pressure vessels or factory mounted in a column, the Aquarian 1000Plus measures the difference in resistance between high purity water and steam. The insulated probe and the pressure vessel, in which it is mounted, form a resistivity cell. Coupled with a reference resistor, the cell forms a resistor divider network. By passing a square wave dc voltage through the network, and processing the resulting signal, a distinction between steam and water is made, even in water conductivities as low as 0.5 micromho.

To provide maximum system reliability and diagnostics, redundant power supplies were incorporated to maintain system operation while alarming operators of system service requirements.

In addition to level indication, the Aquarian 1000Plus provides relays for each probe, enabling it to serve as a system trip, alarm or on-off control device. The system is completely field configurable to provide maximum versatility.

## FEATURES AND BENEFITS

- Passive non-moving sensors - no moving parts to fail
- Up to 4 independent electrode channels
- 120/240 VAC operation
- Redundant power supplies
- Probe wiring continuity monitor
- Level Fault Monitor
- 4 level relay outputs - 10 amp rated
- Local fault indication on: Power supply failure, Probe wire/connector failure, Level indication failure, Clock (timing circuit) failure
- Field configurable to handle any service requirement
- System and level fault relays
- Economical alternative to float level switches



Controlling  
the **power**  
of **steam**

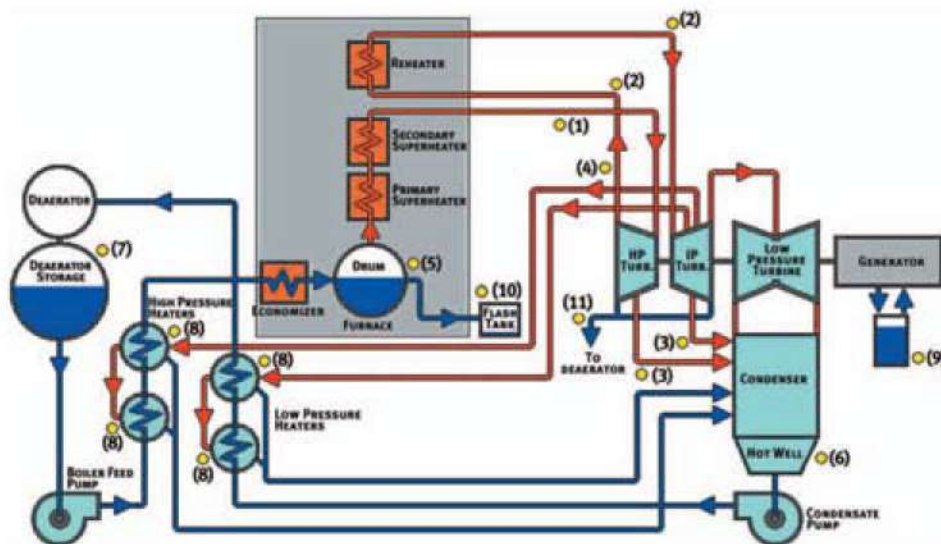
# Aquarian 1000Plus

## SPECIFICATIONS

- Supply Voltage: 120 or 240 VAC
- Supply Frequency: 50-60 Hz
- Supply Current: 1/4" & 1/8" A
- Relay Contact Ratings:
  - 10A @ 120 VAC
  - 10A @ 24 VDC Resistive
  - 1/3 hp @ 120 VAC
- Enclosure: NEMA 4X
- Enclosure Dimensions: 11-3/4" x 7-3/8" x 6-3/4"
- Weight: 13 lbs. (6 kg)
- Ambient Temperature: 32°F to 140°F (0° to 60°C)
- Conductivity Capability: 0.5 micromho and up
- Electronic Unit to Column Distance:
  - 500 ft. (150m) @ >25 micro mho
  - 165 ft. (50m) @ 4 to 25 micro mho
  - 65 ft. (20m) @ 0.5 micro mho
- Probe Connectors:
  - Type A - 1/2" male Socket Weld
  - 1-1/2" male Socket Weld

## COLUMNS OPTIONS

- Completely hydro tested assemblies with 1 to 4 probe locations with 1" Socket Weld drum connections.
- Column mounted pre-wired junction box
- Column ratings:
  - up to 3000psi maximum
  - 1200°F maximum
- Column materials:
  - carbon steel
  - stainless steel
  - chrome moly



## APPLICATIONS(BELOW)

1. Mainstream header drain
2. Hot and cold reheat drains
3. Turbine extraction drain
4. Turbine water induction prevention (TWIP)
5. Main boiler high/low alarms and trips
6. Hot well alarms
7. Deaerator storage level alarms
8. HP and LP Feedwater heater- column level alarms and trips
9. Generator coolant liquid level
10. Blow-down flash tank alarm
11. Turbine casing drains

*The manufacturer reserves the right to change the designs and materials of its products without notice.*

## ORDERING

Each Aquarian 1000Plus system Includes: one detection/verification unit, a maximum of four conductivity probes each with one of the following:

- 1/2" Type A male Socket Weld probe connector.
- 1-1/2" male Socket Weld probe connector for welding in 1-1/2" ANSI Class 3000# SW Tee.
- 1 to 4 port water column
- Request Form # 9340-1201

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## WATER LEVEL MEASUREMENT

WATER LEVEL MEASUREMENT AND INDICATION FOR THE STEAM POWER INDUSTRY

# Aquarian 3000Mini

The Aquarian 3000Mini was developed to satisfy basic level indication needs utilizing vacuum brazed probes for boiler drum, feedwater heaters and other liquid level applications. The Aquarian system consists of three major components: the column with probes, the detection and verification unit (D&V) and the remote display.

The Fossil conductivity probe with vacuum brazed insulators, has been used and proven reliable for many years of service. The Swagelok metal to metal seal of the Aquarian probe insures leak proof installation in the Aquarian column.

The electronic system in the (D&V) unit is connected to 5, 8, 10, 12 or more probes on the water column. The number of probes can be selected and spaced to indicate liquid level through a desired operating range. The Aquarian column is custom manufactured to provide the most accurate indication for any application. An individual relay is provided for every probe level to provide versatility in selecting high/low or other system alarm and trip points.

A remote LED display panel, customized for the number of probes and their locations, is standard. A local display mounted on the D&V door is optional.

Operation of the system is based on measurement of the difference in resistance between water and steam, which is compared with a known reference resistor. The signal output to the probes is a symmetrical source wave  $\pm 5$  VDC current which precludes electroplating of the probe. The Aquarian 3000Mini measures the returning signal to indicate 'water' or 'steam'.

System diagnostics perform an ongoing wire continuity check (using optional two wires per probe) to ensure the integrity of the cable connecting the probes to the D&V. System fault indication is provided by a relay which monitors the internal power supply, clock and wire continuity. A second relay, for level fault, activates if water is detected above steam.

### FEATURES AND BENEFITS

- Solid state electronics and two color display
- Solid state output to drive up to three remote displays
- NEMA 4X (IP66) enclosed detection and verification unit
- 10 amp power relay contact output for each probe to control trips and alarm
- Three way adjustment for water conductivity
- Electronic self-monitoring and indication in the D&V unit; optional probe wire continuity monitor, power supply failure (redundant power supplies), clock (DC detection circuit) failure
- 10 amp power relay contact output for electronic faults
- 10 amp power relay contact output for level fault (water over steam)
- On board water detection indication in the D&V unit



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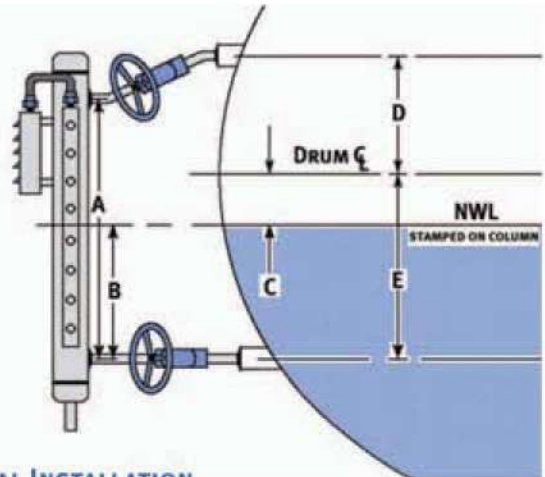
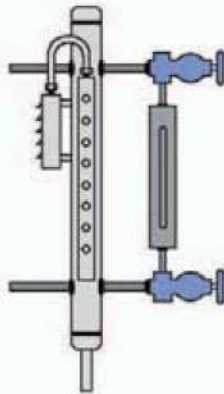
# Aquarian 3000Mini

## SPECIFICATIONS

- Power source: 120 or 240 VAC, single phase, 50-60 Hz, 1/2 - 1/4 A
- Relay contact ratings: 10A @ 120 VAC, 8 A @ 24 VDC, 1/3 HP @120 VAC.
- Column: Ratings - up to 3000psi and 1200°F maximum. Materials - Carbon Steel, Stainless Steel and Chrome Moly
- Enclosure: NEMA 4X (IP66)
- Minimum conductivity capability 0.5 micro mho
- Electronics to column distance:  
0.5 to 4 micro mho - 65 ft (20m)  
4 to 25 micro mho - 165ft (50m)  
Above 25 micro mho - 500ft 150m)

## OPTIONS

- To customize unit for individual applications:
  - Door mounted local display
  - Small Remote display (reduced size for desk mounting)
  - Dual power source
  - Adjustable trip/alarm time delay
  - In service test switch
  - Additional remote displays
  - Column mounted pre-wired junction box
  - Wire continuity fault detection
  - Zener barrier for intrinsically safe probe connections
  - 4-20mA analog output
  - 2000 psi and 3000 psi FM approved systems
  - 16, 20, 24 (and up) probe systems
  - Column ratings: up to 3000 psi maximum and 1200°F maximum
  - Column materials: carbon steel, stainless steel, chrome moly



TYPICAL INSTALLATION

## APPLICATIONS

For high and low pressure feedwater heater, and boiler drum level indication.

The 1998 ASME\* Boiler and Pressure Code (Section I, Para. PG-60) states: "Two independent remote level indicators may be provided instead of one of the two required gage glasses for boiler drum water level indication in the case of power boilers with all drum safety valves set at or above 400 psi. When both remote level indicators are in reliable operation, the remaining gage glass may be shut off, but shall be maintained in serviceable condition".

"When the direct reading of gage glass water level is not readily visible to the operator in the area where immediate control actions are initiated, two dependable indirect indications shall be provided, either by transmission of the gage glass image or by remote level indicators".

The Fossil Aquarian 3000Mini was designed to satisfy the described code requirement. An Aquarian installed as one of two remote indicators along with the required gauge is shown. A duplicate Aquarian can be used as the second remote indicator. The Aquarian column with probes provides remote indication and it also acts as a stabilizer for the gauge.

## ORDERING

Request Form # 9340-1203

Water column to be certified in accordance with ASME\* Section I.

\* American Society of Mechanical Engineers

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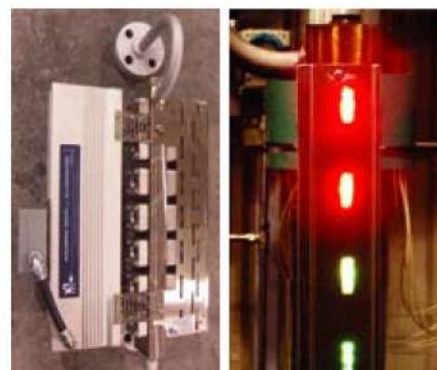
### Aquarian 3000 Visual Bi-Colour Gauge Illuminator Series 2 and Display

The Aquarian 3000 Visual is a high pressure ported water level gauge used to measure the water level in high-pressure boiler steam drums. The ASME Boiler and Pressure Vessel Code states that "ported gages or end-connected strip gages, shall be equipped to afford obvious visual discrimination between the appearance of water or vapor in the individual sections." The Solid State Bi-Colour Gauge Illuminator and Display attach to the 3000 psi ported gauge to produce a red or green image on the display. A red image indicates that steam is present and a green image indicates that water is present. The red/green image is produced by an array of solid-state light emitting diodes (LED's) and precision lenses that focus the image through the gauge body onto the display. The LED's replace the unfocused incandescent light bulb and colored glass that are currently used in conventional bi-colour illuminators.

The LED arrays and precision Plano-convex lens provide a bright, clear and unmistakable image in the presence of steam and water. The high intensity narrow beam LED's are mounted on an electronic printed circuit board with current limiting resistors. A precision 24VDC power supply provides the Illuminator with the exact current that is required for a constant clean image.

#### FEATURES

- All stainless steel and aluminum construction provides corrosion resistance and long service life
- LED's are immune to failure from vibration
- Extremely efficient; converts virtually all energy into light, reducing power consumption and costs. Only 0.5 watts per port
- Average LED life is 11 years, resulting in reduced maintenance and service costs
- Absence of fragile colored glass prevents unnecessary repairs
- Display and Illuminator can be installed on either side of the gauge to provide viewing flexibility
- Side vents for internal cooling
- Indoor or outdoor installations rated NEMA 4X
- Adjustable end plate for exact placement of viewing screen, providing an unmistakable image
- Easily removed for gauge port inspection or repair
- Illuminator and display are extremely light weight and compact
- Illuminator power supply can utilize voltage of either 120 or 240VAC
- 6 LED's per port produce extremely bright image, visible at more than 100 ft away
- Level Display enables operator to easily view image without standing at a precise spot



HALF FULL GAUGE, ILLUMINATOR AND DISPLAY ASSEMBLY

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# Aquarian 3000Visual Bi-Colour Gauge Illuminator and Display

## OPTIONS

- Display hood, for increased visibility of display in bright sunlight
- Mirror or closed circuit TV for remote viewing

## ORDERING

Use Fossil form 9340-1206 to list the particular equipment design specifications, configuration, and options



## STANDARD BI-COLOUR GAUGE ILLUMINATOR SYSTEM

A small power supply (120 or 240 VAC input) in a NEMA 4X enclosure is provided with each Illuminator

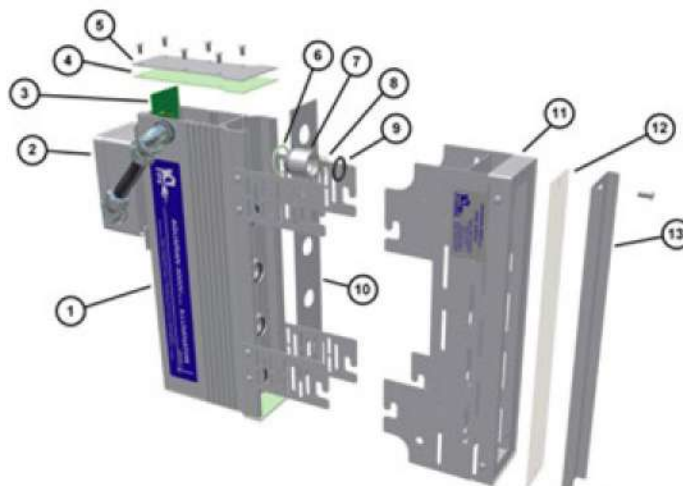
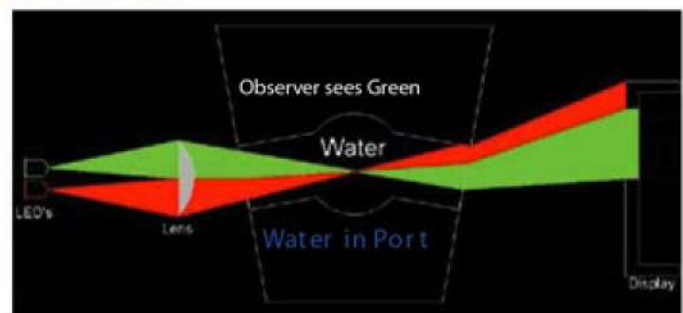
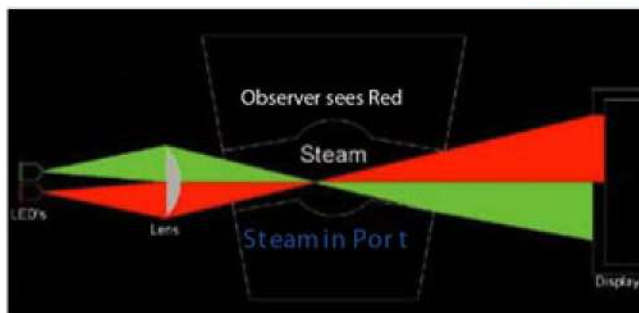
**U.S. Patent NO.'s: 6,938,477;**

**7,197,926; 7,213,457**

**Canada Patent No.: 2,465,601**

Europe, Japan and China Patent Pending

## BI-COLOUR GAUGE OPERATION



1	Illuminator Cabinet
2	Power Supply
3	LED PCB
4	Gasket
5	Cover
6	Lens Gasket
7	Lens Holder
8	Lens
9	O-ring
10	Heat Divider
11	Display Cabinet
12	Display Window
13	Adjustable End Plate

\* American Society of Mechanical Engineers

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