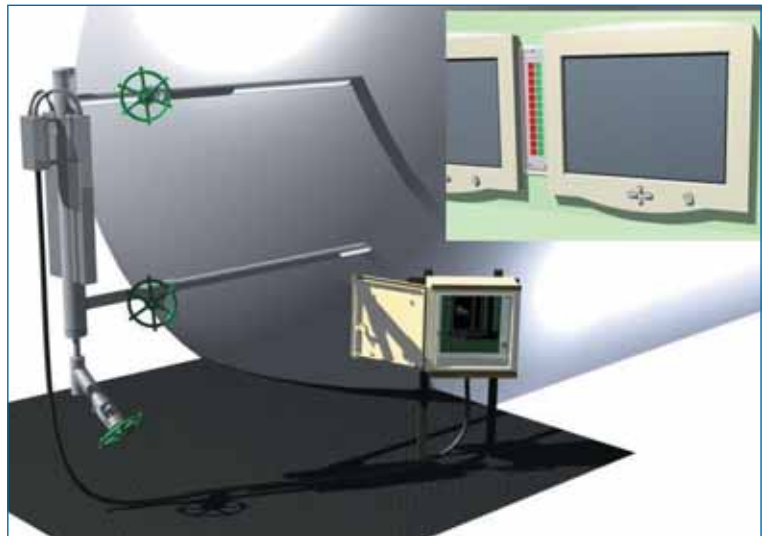


# Power Boiler Steam Drum Electronic Level Gauge

It is critically important that proper steam drum water level be maintained at all times. If the water level is too low, boiler tubes may be damaged. If the water level is too high, damage to the steam separator or steam turbine from water carry over can occur. The diagram below shows a typical high pressure electronic level gauge installation.

The American Society of Mechanical Engineers (ASME) along with various insurance agencies have recognised and addressed this important steam plant parameter. The ASME Boiler and Pressure Vessel Code require at least one visual level gauge for every fired steam drum. The visual level gauge is the only product considered to give “Direct” indication of steam drum water level. However, the boiler code allows for “Indirect” indication to supplement and replace some of the “Direct” visual gauges. Section PG-60 of the ASME B and PV Code addresses these water level indicator requirements. From the 2001 code, some of the requirements within these paragraphs include the following:



¶¶ **PG-60.1.1** *Boilers having a maximum allowable working pressure exceeding 400 psi shall have two gage glasses. Instead of one of the two required gage glasses, two independent remote water level indicators (two discrete systems that continuously measure, transmit, and display water level) may be provided.*

**PG-60.1.1.1** *When the water level in at least one gage glass is not readily visible to the operator in the area where control actions are initiated, either a fiber optic cable (with no electrical modification of the optical signal) or mirrors shall be provided to transfer the optical image of the water level to the control area. Alternatively, any combination of two of the following shall be provided: (a) an independent remote water level indicator; (b) an independent continuous transmission and display of an image of the water level in a gage glass.*

**PG-60.1.1.2** *When two independent remote water level indicators are in reliable operation (continuously indicating water level), the one required gage glass may be shut off, but shall be maintained in the serviceable condition. ¶¶*

Additional requirements for low level alarms and trips are defined by insurance companies such as Factory Mutual (FM) Global in their instruction #6-12.

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## MAJOR COMPONENTS

(Note: Always refer to the latest ASME boiler code to confirm requirements)

### 1. Connecting piping.

Minimum connecting piping size is 1". It is important that the steam pipe slope down from the drum to the Probe Column. The slope is necessary to ensure that condensate formed in this piping flows into and heats the probe column. The steam pipe (upper pipe) should not be insulated. The water pipe (lower pipe) should be insulated and be horizontal or sloped down to the drum.

### 2. Drum Isolation Valves.

"Through Flow" valves to prevent stoppage by deposits of sediment, and with an indication of the open or closed position. Often, double block valves are required.

### 3. Probe column.

Holds the probes at fixed levels, junction box, and probe covers. The column is normally welded directly to the drum connecting piping, but connections can also be flanged. Probes are typically located at the critical drum level alarm and trip points, and then spaced evenly over the remainder of the required indicating range. Probe column length is dictated by the total span of level visibility required. The probe position in the column is "Density Corrected" to indicate true drum level. This correction is required because the probe column is at a lower temperature than the steam drum.

### 4. Junction Box.

Provides terminal point for the wiring from the probes to the electronics control unit.

### 5. Probe column drain.

Minimum 3/4" drain size.

### 6. Electronics Control Unit

Normally located within 100 feet of the probe column. This component discriminates the probe level, and provides local and remote display and relay output for alarm/trip functions.

### 7. Remote Display.

Installed in the control room panel to provide continuous indication of drum level.

## BOILER LEVEL MEASUREMENT OPTIONS

Power plants typically used a combination of equipment that together provides the best cost, plant safety, low maintenance, drum level control, redundancy and optimum reliability. As discussed earlier, at least one visual gauge is required for the steam drum. However, other instruments must be selected. The drum level dp transmitter is ideal for level control because it provides a continuous control signal and true drum level can be calculated for a variety of operating pressures. The electronic level gauge provides point level display that is a totally independent confirmation of the dp level transmitter. In addition, it provides fixed alarm and trip drum level points that can not be changed or that must rely on a programming algorithm.

## INSTALLATION OPTIONS

Typical options with these systems include additional level displays. These can be local (mounted on the enclosure door) or remote (feedwater station, blowdown station).

The equipment can provide a 4-20 mA output proportional to the indicated level. This signal should not be used for level control, but is suitable for level indication or trend recording.

## REFERENCES

1. ASME Boiler and Pressure Vessel Code, 2001
2. Aquarian AQ3000M Electronic Gauge Brochure, PN 9340-1103
3. Density Error and its Correction in Boiler Drum Level Indication, 1995 ISA Convention, David Kalix
4. Factory Mutual (FM) Global Property Loss Prevention Data Sheets #6-12, Jan. 2003
5. ASME CSD-1-2004 Controls and Safety Devices for Automatically Fired Boilers



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