

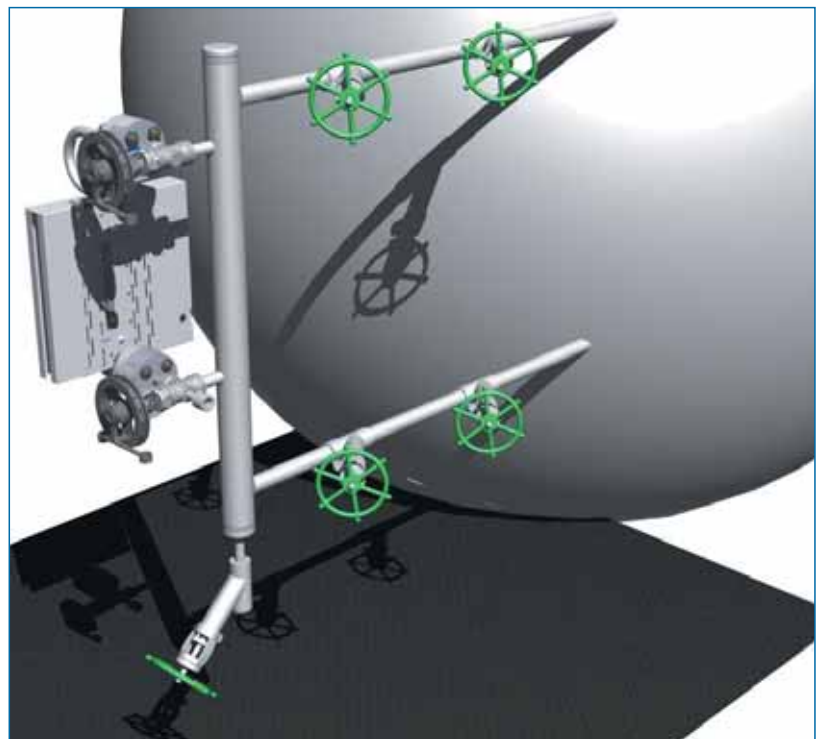
## Power Boiler Steam Drum Visual Level Gauge

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 visual gauge glass 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. 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** All boilers having a fixed water level (steam and water interface) shall have at least one gage glass (a transparent device that permits visual determination of the water level).

*Segmented gage glasses, such as ported or end-connected strip gages, shall be equipped to provide obvious visual discrimination between water and vapour in the individual sections.*



**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. 99

# Power Boiler Steam Drum Visual Level Gauge

## MAJOR COMPONENTS

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

- 1. Connecting piping.**  
Minimum connecting piping size is 1”.
- 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. Water column.**  
A water column minimizes the quantity of condensate flowing through the visual gauge. Excess condensate flow can cause unstable level indication and also obscure the visual level.
- 4. Water column drain.**  
Minimum 3/4” drain size.
- 5. Gauge isolation valves.**  
Often with chainwheel operators to isolate the gauge from a safe lower level in case of gauge failure.
- 6. Ported Bi-Colour Visual level gauge.**  
Best design to withstand high boiler operating pressures.
- 7. Bi-Colour Illuminator.**  
Required to differentiate water level. LED type focused design provides best visibility and low maintenance.
- 8. Illuminator Display.**  
Provides fixed view point for level image
- 9. Illuminator Power Supply.**  
Converts line voltage to the low voltage required for the Illuminator.

## INSTALLATION OPTIONS

As the Boiler Code states, the visual gauge provides the only direct indication of the drum level. Many plant operating designs require this image to be transmitted to the control room. This can be done in several ways:

- 1. Mirrors.**  
A series of gauge mounted or wall/floor mounted mirrors can be installed. Sometimes, sheet metal ducting is installed to insure that nothing can be placed to obstruct the image.
- 2. Fiber Optic Cable.**  
An individual fiber cable is installed on the display side of the gauge. The cable bundle is run to the control room, with a small panel mounted readout. Fiber optic cable is expensive and these systems tend to be difficult to adjust. The image quickly deteriorates due to the effect of heat and dust, or long cable lengths.
- 3. Closed Circuit Camera with TV.**  
These systems are low cost and provide for long cable distance. A colour camera and TV must be used to view Red/Green bi-colour gauges.

In case of catastrophic gauge glass failure, significant steam and water will be discharged from the drum, and could necessitate a boiler shut down. The ASME Code permits the installation of ball check valves constructed per appendix A-18. The “Gauge Ball Check Valve” limits the steam/water discharge in case of glass failure, and allows the gauge to be safely isolated and then repaired.

Below are a few equipment photographs.



## REFERENCES

1. ASME Boiler and Pressure Vessel Code, 2001
2. Aquarian 3000V Visual Level Gauge Brochure, PN 9340-1106
3. Aquarian 3000V Gauge Illuminator Brochure, PN 9340-1116
4. Aquarian 3000 Ball Check Valve Brochure, PN 9340-1120



Fossil Power Systems Inc.  
10 Mosher Drive Dartmouth, Nova Scotia  
B3B 1N5 Canada  
Phone: 1-902-468-4701  
Fax: 1-902-468-2323

Sales: [Aquarian@Fossil.ca](mailto:Aquarian@Fossil.ca)  
Technical: [Aqsupport@Fossil.ca](mailto:Aqsupport@Fossil.ca)  
[www.Fossil.ca](http://www.Fossil.ca)  
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