

Sight Flow Indicators and Their Applications in Process Systems

The ability to see what is happening inside a pipe can be invaluable to process operators. Despite technological advances, no sensor can equal the human eye which has more than 94 million photo receptors.

Process observation equipment falls into two major categories: sight glasses, also called sight glass windows, which are used on process vessels, and sight flow indicators, which are used in process pipelines. This white paper covers the latter. (For information on sight glass windows, see our *Chemical and Pharmaceutical Sight Glass Application Handbook*.)

A sight flow indicator is a device installed in a pipe to provide a visual means of verifying liquid flow for direction and approximate rate. Simple and low-cost, it also allows operators to observe the color and clarity of process fluids through a window.

Unlike sight glass windows that don't have indicating mechanisms, sight flow indicators may have passive components that are set in motion by the flow in order to indicate flow direction or intensity. If the flow indicator has indication components, a certain level of flow is required to set them in motion. Flow indicators without indication components are used where observing the characteristics of a process fluid is more important than verifying flow. Because indication components complicate cleaning in hygienic systems, they are rarely used in sanitary applications.

In addition, some flow indicators, called "flow meters," have a calibrated scale that provides a rough measurement of flow to an observing operator.

Flow indicators can be custom made for large diameter pipes. A cost-saving alternative is to install a standard diameter flow indicator on a smaller pipe running in parallel.

360° View Flow Indicator

Also called full view, cylindrical- or tube-style flow indicator, this type of flow indicator passes fluid through a glass cylinder that is visible from all angles. This allows ample ambient light to illuminate the flow. It is ideal for observation of process fluid for clarity, color, foam, and other conditions, and for the presence of moisture. Often designs feature impact-deterrent shields or sheaths made of plastic. This style of flow indicator suited for lower-pressure systems with moderate flow rates. These indicators must be installed on pipes where there is minimal mechanical strain.



An alternative design has a metal shield or sheath with windows. This adds strength to the indicator and protects it from moderate mechanical strain.

360° view flow indicators may be fitted with glass marked with a calibrated scale and used for level indication.

View-Through Flow Indicator

This type of flow indicator has two opposing windows so that an operator can see the intervening flow of fluid lighted from behind, either by ambient light or with an attached luminaire. Unlike 360-degree full-view flow

indicators, this design is suited for ANSI pressure classes, high temperature, and harsh fluid applications. This type may be ordered with Teflon® lining of the metal body for corrosive service.

Mount types include flange, threaded, butt-weld, socket-weld and clamp. Sizes depend on the manufacturer but generally range from ¼ inch diameters to 16 inch diameters, with larger units available as special order. Stock models are available in pressure ratings ranging from 150 to 3000 psi.

This style covers the widest range of applications and may be fitted with indication devices such as flappers, drip tubes, balls, and rotors.

Flapper Flow Indicator

Flow indicators may be fitted with a hinged flapper or flag visible through the sight glass. The flapper is deflected toward the flow direction. Because the position of the flapper changes in relationship to the force of flow, it provides operators with an approximate gauge of flow. This style is best applied on horizontal pipelines, but it may also be employed in vertical pipelines with upward flow. It is ideal for use with transparent solutions and gases which cannot be observed directly, and for dark, nearly opaque fluids in which flow is difficult to observe.

Visual Flow Meters

Flapper-style sight flow indicators are available in which the flapper has a reset spring. The force of the spring is overcome by the relative flow of the process fluid. A graduated scale is marked on the glass so that the flow volume is indicated. In simple applications this may be used as an alternative to an expensive flow meter.

Some sight flow indicators use a weighted flapper or flag that indicates the volume of flow by its position on a calibrated scale marked on the sight glass. These flow meters are factory-set for a specific flow of water at 20°C for a given diameter of pipe. Therefore they are not useful for non-water applications.

Visual flow meters work with flow going in one direction only.

Rotary Flow Indicator

Flow indicators may be fitted with rotors or impellers that are turned by the flow of liquid or gas. The rotors are mounted in the window view so operators can observe the direction and approximate speed of flow. This is particularly useful for clear gases and fluids, but the rotor is visible with dark fluids as well. This indicator operates in any position and with any direction of flow. Rotor-style flow indicators should not be used if the flow rate is very low, because the rotating device or propeller may not turn.



Drip Indicator

Drip indicators may be models designed for drip observation or conventional flow indicators installed with a drip tube. Drips and low-volume intermittent flows may be observed in applications such as distillation. Because gravity is utilized, drip indicators are normally applied in vertical pipes with a downward flow. Nevertheless there are some applications where horizontal installation is possible.

Ball Flow Indicator

Flow moves a ball from the bottom of the indicator housing to a position at the top of the sight window. The ball is visible through the window so that flow may be observed easily at a glance. The suspension of the ball by the fluid indicates the presence of flow. Because gravity returns the ball to its rest position, this style of indicator must be applied in vertical pipes with upward flow. Generally this is used with slow moving fluids or gases, and not with high-rate or turbulent flows.

There is another style of ball flow indicator in which the flow of process fluid or gas causes a ball to oscillate in a glass dome. When the flow stops, the ball drops out of sight. This style must be installed in a horizontal position. It is especially useful for fast moving fluids and gases.

Plastic ball flow indicators are also available, some with calibrated scale markings that indicate relative flow, but plastic indicators are not recommended for use in process applications.

Accessories

Steam Jackets

Steam heated jackets are available to cover view-through flow indicators. Only the sight glass window is not covered. The jackets prevent cool spots in a process and increase the viscosity of fluids.

Cameras

Sight ports may be fitted with video cameras that allow remote monitoring as well as recording. For hazardous environments, explosion-proof versions are available.

Luminaires

Lights, also called luminaires, may be added to view-through and full-view style sight flow indicators. Generally these lights mount externally using a bracket, or the luminaire fits directly into a sanitary fitting for one-piece mounting right onto the ferrule or cover flange. For hazardous environments, explosion-proof versions are available. Illumination is provided by a halogen bulb or LEDs. In addition, fiber optic cable may be used to transmit light from the light source to the sight glass. More information about applying lighting to sight glass applications is provided in the L.J. Star Sight Glass Lighting Handbook.

Thermocouple Wells

Thermocouple wells may be added to standard flow indicators.

Washers

Material such as foam, solids, and condensation may stick to the inside of a sight glass and obscure the view. For these applications, spray washers that clean the inner surface of the glass are available.

About L.J. Star

L.J. Star Incorporated provides an extensive line of process observation equipment — sightglasses, lights, sanitary fittings, and level gage instrumentation. Product lines include Metaglas® Safety Sight Windows, Lumiglas® Explosion Proof Lights and Cameras, Visual Flow Indicators, Sight Ports, Sanitary Clamps, Magnetic Level Gages and Gage Glass. Metaglas is the #1 selling fused sightglass, proven in thousands of installations around the world. Unlike some other sightglasses, it meets stringent DIN 7079 and DIN 7080 quality standards, and it is approved for USP Type I use. For additional information, or to request third-party documentation of standards compliance and product performance claims, contact L.J. Star Incorporated, P.O. Box 1116, Twinsburg, OH 44087. Phone: (330) 405-3040. Fax: (330) 405-3070. Email: view@ljstar.com. Website: www.ljstar.com.