OPW®

Engineered Systems

PART OF OPW FLUID TRANSFER GROUP

A DOVER™ COMPANY

SAFER. CLEANER. FASTER.

PROCESS PRODUCTS & ACCESSORIES

- PRESSURE SENSING EQUIPMENT
- SIGHT FLOW PRODUCTS • VALVES

OPW Engineered Systems, part of the OPW Fluid Transfer Group, provides expert solutions for the safe handling, transfer, monitoring, measuring and protection of hazardous bulk products worldwide.

ES-PPA-03/13 • 1.5M

OPW Engineered Systems
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A DOVER COMPANY

OPW Engineered Systems specializes in the engineering, designing and manufacturing of systems for the safe and efficient loading and unloading of critical hazardous materials: loading systems, swivel joints, process control equipment, quick and dry disconnect systems and safety breakaways.

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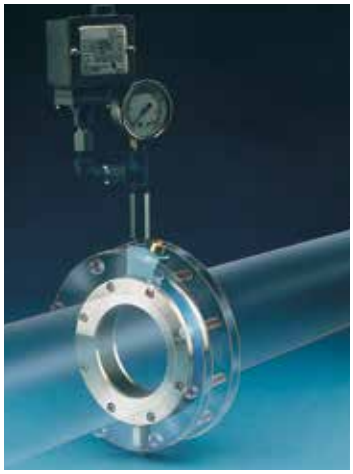
Visi-Flo® Sight Flow Indicators



Iso-Ring® Non-Plugging Pressure Isolation Rings

Overview

OPW Engineered Systems offers products that monitor, sense and reveal the fluids in your operation. Whether you're monitoring petroleum products, liquefied gases, solvents, or hazardous, corrosive chemicals, OPW instrumentation and accessories help you keep fluids under control. We can work with you to develop the right equipment for your application.

Proven Experience in Transfer Applications

Keeping your operation running smoothly means having dependable equipment and systems to handle your fluid requirements. You can't afford downtime for repairs and maintenance that cost you lost hours and money. For more than 60 years, OPW Engineered Systems has provided innovative solutions for some of the most challenging liquid handling applications, including, for example, the following industries:

- **Chemicals**
- **Petroleum**
- **Petrochemicals**
- **Asphalt**
- **Solvents**
- **Food**
- **Agriculture**
- **Metalworking**
- **Steel**
- **Ethanol**
- **Biofuels**

Full Line of Standard and Custom Systems

Customization is a hallmark of our comprehensive product offerings. Our product designs meet the modest demands of simple applications as well as the critical needs of major chemical and petroleum facilities throughout the world.

Quality Control for Dependable Operation

Our manufacturing and testing procedures meet or exceed industry standards. All products are rigorously tested to ensure high quality. CNC equipment is used to machine all critical dimensions within precise tolerances to ensure that each product meets our rigid engineering specifications.

Additional testing, including radiography as well as material certifications, can be provided to meet your specific requirements.

Innovative Products Designed for Safety

Our design efforts are supported by a state-of-the-art CAD system for faster, more accurate responses to your technical requests. We specialize in designing products that safely handle fluids, and, at the same time, solve problems.

Rely on OPW Service and Support

We provide in-depth technical assistance and work with you in designing and selecting the best product for your application. Our knowledgeable sales representatives are skilled in coordinating the steps involved in solving your fluid handling problems. This personalized professional service ensures your satisfaction. Support personnel are also available to assist you in determining which product design is best suited for your application. On-site evaluation and instrumentation recommendations are available upon request.

OPW continually strives to maintain its leadership position in the industry by responding to your needs and supplying the high-quality, dependable systems you require to ensure uptime, productivity and profitability.

Sight Flow Indicators

Seeing is Believing

OPW Engineered Systems offers a complete line of sight flow indicators, including the popular VISI-FLO® series.

OPW's sight flow indicators provide a quick, reliable and inexpensive way to verify flow rate and direction, and monitor color and clarity in fluid lines.

Available in a variety of sizes, styles and materials for a wide range of industrial applications, all OPW sight flow indicators are tested to 1-1/2 times rated pressure to ensure maximum reliability in harsh operating conditions.

SIGHT FLOW INDICATORS

AN INSIGHTFUL VIEW INTO HOW THESE COST-EFFICIENT VISUAL MONITORS CAN HELP CONTROL INDUSTRIAL FLUID PROCESSES

Dollar for dollar, sight flow indicators are the most cost efficient and effective way to visually monitor the flow of fluids and to determine where, if any, problems exist at certain points along the industrial process line.

These inexpensive, relatively simple devices – installed directly in the process line – allow operators to qualitatively observe flow rate, direction, color and clarity.

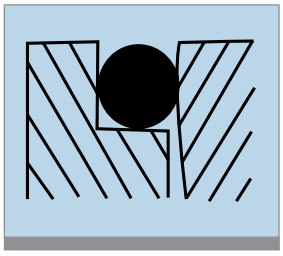
The various readings are visible through a glass viewing lens.

Sight flow indicators can be deployed in one of two ways: (1) either individually at critical points along fluid lines where changes, interruptions or contamination of fluids are likely to occur; or (2) together in banks where the simultaneous monitoring of multiple fluid lines is necessary.

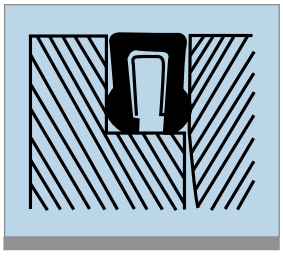
No-Leak Guarantee

Due principally to the failure of conventional flat seals, the complaint most often registered against sight flow indicators is that they leak.

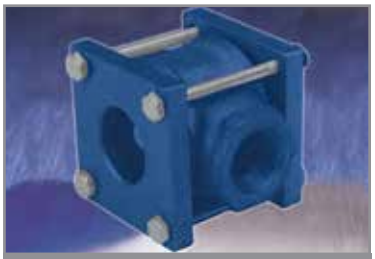
VISI-FLO® is guaranteed not to leak for three full years under normal use. The key design attributes that enable OPW's innovative radial sealing design is so good, it's guaranteed not to leak!



- Elastomer radial seal with memory retention for shape creates steady sealing force between the outside diameter of the lens and the sight flow indicator body.



- PTFE lip/spring seal with constant spring expansion force maintains sealing by holding the edges of the PTFE lip seal against the outside diameter of the glass and the sight flow indicator body.

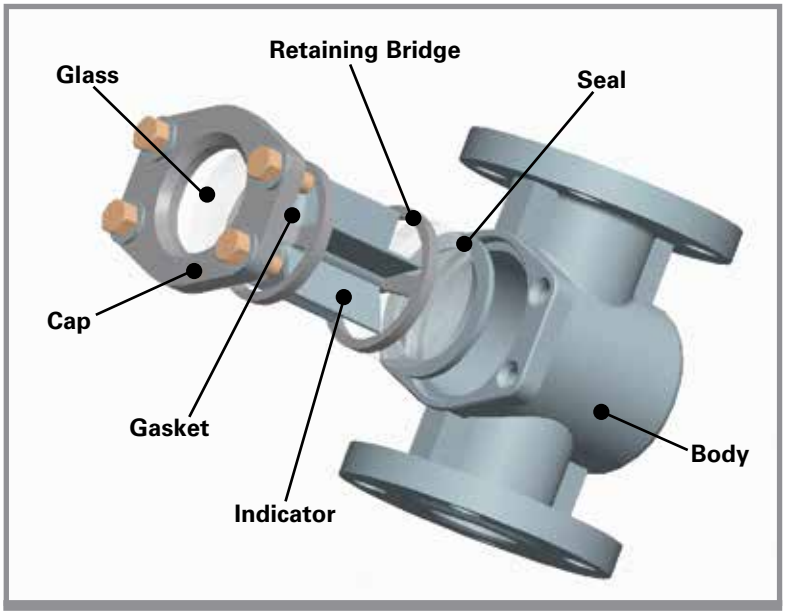


Tie Rod Design

VISI-FLO® Bolt-On Design

Easy Access Bolt-On Design

VISI-FLO's® unique bolt-on design fastens the face plate assembly directly to the body with no special torquing sequence. This provides quick, complete access to the unit from the front side, which gives companies the flexibility to install VISI-FLO® in locations where other sight flow indicators cannot be installed due to clearance problems. Tie rod design sight flow indicators present challenges when fastening the lens and seal to the body.



*Bridge Design not used in 3" and 4" sizes

Note: VISI-FLO's® unparalleled modular design allows maintenance personnel to interchange or replace internal assemblies without taking the indicator out of the line. This optimizes uptime and saves on replacement and reordering costs.

Selecting The Right Sight Flow Indicator

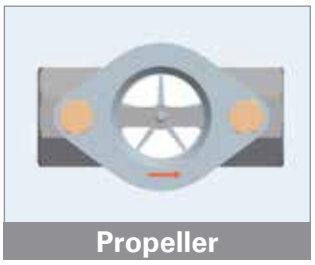
Placing the right sight flow indicators in the right places is not only a proven way to save considerable time and money, but also a sure-fire formula for identifying and repairing process-line problem areas reliably and efficiently.

For example:

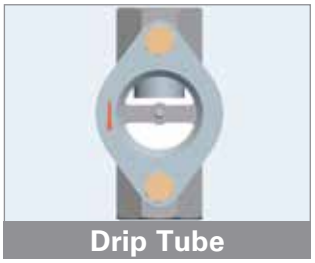
- A plain bi-directional sight flow indicator without a flapper is best in instances where observing color and clarity is more important than verifying flow.
- Opaque liquids are best shown by a propeller indicator.
- A bi-directional flapper is the indicator of choice to indicate flow and flow direction.
- Drip tube, used in vertical lines, is ideal for gravity flow as well as for extremely low or intermittent flow.

Installation options include threaded, flanged, and socket or butt weld ends.


Bi-Directional Plain


Propeller


Bi-Directional Flapper


Drip Tube

Material Selection Chart:

(shows factors that determine the selection of materials)

Influencing Factors	Components				
	Body Metal	Seals	Glass Lens	Indicator Material	Indicator Type
Fluid Compatibility	■	■	■	■	■
Fluid Color				■	■
Temperature	■	■	■	■	
Pressure	■		■		
Flow Rate					■
Pressure Drop					■
Environment	■	■	■		

While selecting the right type of indicator is relatively easy, the more difficult task is determining which materials are most appropriate and cost-effective for the job. Variables to be considered include:

Body Material

- Bronze, ductile iron, carbon steel and stainless steel are standard.
- Special materials, such as Monel® and Hastelloy®, are also available.

Seal Material

- Buna-N, Fluorocarbon, copolymers of ethylene and propylene, neoprene and PTFE are commonly used for specific chemical applications.
- Choice of seal material usually dictates temperature limitation.

Glass Type

- Soda-lime and borosilicate, available in annealed or tempered, are the two most common types.
- Mica shields (or similar protection) for the glass are effective when steam is present in the process line.
- Optional shields for installation above the glass are recommended.

APPLICATIONS

One of the key strengths of sight flow indicators is their remarkable versatility. For example, they can be used:

- In a variety of industries.
- To monitor and verify fluid flow through filter, cooling, intake/outlet pumping lines, as well as numerous other industrial processes.
- For troubleshooting or as backups for meters, switches, process indicators and other control devices.

Following are two examples where a line problem required the versatility of a VISI-FLO® Sight Flow Indicator solution:

Preventing Coolant Tank Overflow

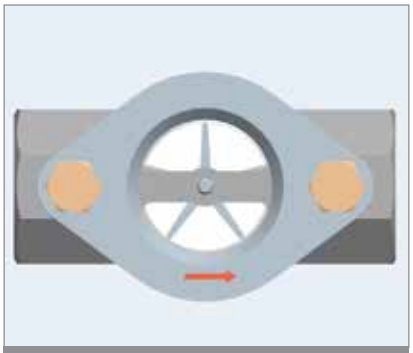
Problem: Coolant mixture for machine tools periodically overflows, creating spills on the floor of a major pump manufacturing plant. Coolant mixture contained in holding tank enters through open feed line. Electric float switches in coolant tanks close solenoid valve automatically to prevent flow when high level sensor in holding tank is activated. Float switches turn off filling indicator light to alert operator. When overflow occurs, filling indicator light turns off properly; however, solder or other foreign material obstructs solenoid valve, keeping it from closing fully. Tank continues to receive coolant, which causes overflow.

Solution: Install VISI-FIO® next to solenoid valve. By observing propeller indicator, operator is able to determine when valve is open or closed. When tank filling light shuts off, operator checks indicator to verify flow has stopped.

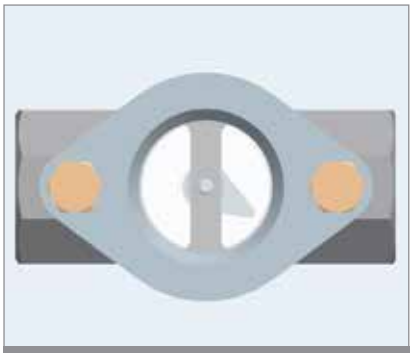
Monitoring Process and Purge

Problem: Several different chemicals use a common line in different stages of the operation at a large chemical plant. After use of each chemical, reverse flush is employed to purge line. Sight flow indication needed to monitor back flush process and be compatible with different chemicals.

Solution: Operators must be able to see flow direction and easily monitor the process and purge cycles. VISI-FIO® indicators featuring bi-directional flapper are specified.



Primary direction indicates process flow



Opposite direction indicates reverse flush

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Applications

Power Plants

New Power Plants: Sight flow indicators monitor the flow of critical fluids, such as lubricants pumped to turbines in hydro-electric generators and water in cooling lines.

Older Power Plants: New, more reliable sight flow indicators replace aging models (and additional indicators are also deployed) during upgrades.

Wastewater Treatment

VISI-FLO® sight flow indicators visually monitor the filtering process.

The most common point of installation: second stage aeration tank pumping lines.

The purpose: verify sludge removal to ensure efficient aeration.

Petroleum Industry

Sight flow indicators visually monitor drilling pump operations. In the photo below, VISI-FLO® is used to show dirty fluids being pumped from a down-hole hydraulic cleaning process. Should the indicator stop, this is a signal to the operator that the system is not cleaning properly and needs corrective action.

Chemical Industry

Paint and Varnish Processing Plants: VISI-FLO® sight flow indicators are used to notify operators when filters become clogged. Any drops in flow rate or discoloration of blended resins that pass through the press are indications that new filters are needed.

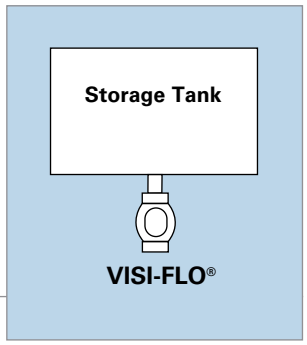
Distilling Operations: Sight flow indicators are used to gauge color and clarity of fluids. An amber fluid color indicates proper distillation; a brown-to-black color signals the process has been disrupted and requires corrective action.

Refineries: Sight flow indicators are used to monitor the draining of water from the bottom of storage tanks. The visual presence of oil in the indicator is a signal that the water is completely drained.

Manufacturing

VISI-FLO® sight flow indicators are used in a variety of manufacturing applications, including, for example, to monitor:

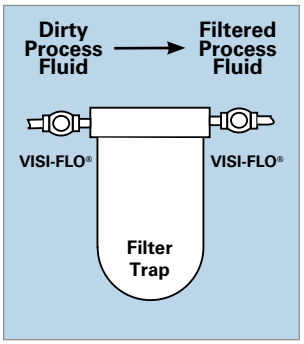
- The draining of hydraulic oil from nitrogen charged accumulators in die casting machine manufacturing facilities.
- Proper coolant flow, which is so vital to the operation of welding machines.
- Efficient filtration of process fluids.



OEM Markets

VISI-FLO® sight flow indicators are used in an array of OEM applications, including, for example:

- Compressor manufacturers install them on their products so end users can monitor the flow of water to compressor heads while in operation.
- Degreasing and defluxing equipment manufacturers use them to monitor recirculating solvent in cleaning operations and, thus, determine efficiency of the distillation/recovery process.
- Evaporators and filtration system manufacturers use them to monitor color and clarity of fluids in outlet lines and to confirm proper intake of fluids on inlet lines.



1400 & 1500 SERIES (FLANGED)

OPW Engineered Systems has been manufacturing Sight Flow Indicators for over 60 years. Our experience has led to many innovations in design and manufacturing, making VISI-FLO® the most thoroughly engineered Sight Flow Indicator on the market. VISI-FLOs are available in two series: the Standard 1400 Series, and the 1500 High-Pressure High-Temperature Series.

Standard Features

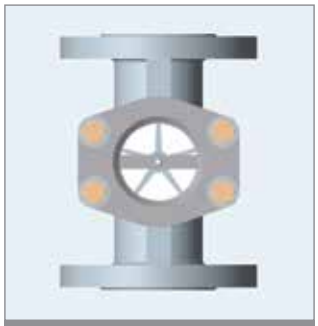
- **Exclusive *3-Year "No-Leak" Guarantee* -** VISI-FLO's innovative radial seal creates a constant and uninterrupted sealing force between the body and outside diameter of the glass lens. This sealing method provides a longer lasting and better seal than conventional flat seals.
- **Maintenance-Free Design -** VISI-FLO's unique, bolt-on-body design requires no special maintenance or torquing sequence to prevent leaks. This results in a safer, more reliable sight flow indicator than those units using tie rods to fasten lens and seal to body.
- **Dimensionally Interchangeable -** "FJP" Flanged VISI-FLOs feature end-to-end dimensions that match Jacoby-Tarbox and Penberthy and other manufacturers' units. "FJP" units are available in 3/4", 2", 3", and 4".
- **Shipment Within 48 Hours on Most Items**
- **Rated for Full Vacuum Service**
- **Four Indicator Styles**

  a. **Propeller** - The best way to show flow of opaque liquids. Ideal for observation at a distance. Flow from right to left is standard. Specify if left to right flow is needed. Not recommended for flow rates above 100 GPM.

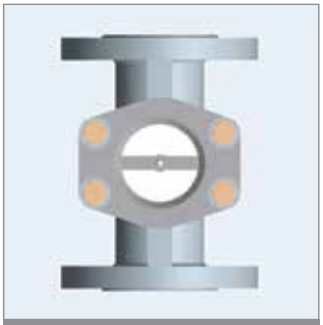
  b. **Bi-Directional Flapper** - This indicator points in either direction to show you at a glance which way the liquid is flowing.

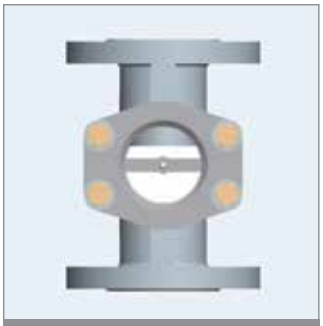
  c. **Bi-Directional Plain** - When the color and clarity of your liquid are of prime importance.

  d. **Drip Tube** - Ideal for gravity, extremely low or intermittent flow. Keeps product from dripping on the glass. Assures constant see-through for vertical lines.


a. Propeller


b. Bi-Directional Flapper


c. Bi-Directional Plain


d. Drip Tube

Maximum Pressure/Temperature Ratings for Visi-Flo® Sight Flow Indicators

Series	End Connection	Maximum ASME Pressure	Maximum Temperature
1400	Flanged 6" to 12"*	150 psig @ 150° F	150° F @ 150 psig
	Flanged ¼" to 4"*	200 psig @ 150° F	225° F @ 135 psig
1500	Flanged	275 psig @ 100° F	350° F @ 205 psig

** With standard seals. Temperatures up to 500° F possible with High Temp PTFE Seals.*

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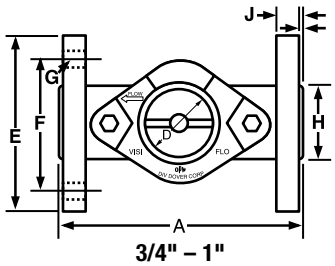
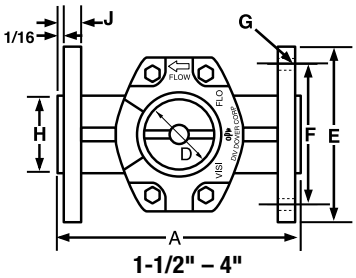
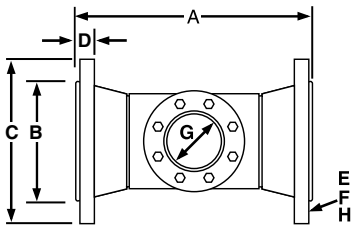


3/4" – 1"



1-1/2" – 4"



6" – 12"

Dimensions for Flanged VISI-FLO®

	3/4"		1"		1-1/2"		2"		3"		4"		6"		8"		10"		12"	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
A Overall Length	4 5/8	117	5	127	6 1/2	165	7	178	8	203	9	229	14 1/4	362	16 1/8	410	16 1/8	410	17 1/8	435
"FJP" Overall Length	4 5/8	117	N/A		*		7 7/8		9 3/8		11		*		*		*		*	
D Diameter of Sight Opening	1 1/2	38	1 1/2	38	2	51	2	51	3	76	3	76	4	102	4	102	4	102	4	102
E Flange Dia.	3 7/8	98	4 1/4	108	5	127	6	152	7 1/2	191	9	229	11	279	13 1/2	343	16	406	19	483
F Bolt Circle Dia.	2 3/4	70	3 1/8	79	3 7/8	98	4 3/4	121	6	152	7 1/2	191	9 1/2	241	11 3/4	298	14 1/4	362	17	432
G (#Bolt Holes) Size	(4) 5/8	(4) 16	(4) 5/8	(4) 16	(4) 5/8	(4) 16	(4) 3/4	(4) 19	(4) 3/4	(4) 19	(8) 3/4	(8) 19	(8) 3/4	(8) 19	(8) 3/4	(8) 19	(12) 7/8	(12) 22	(12) 7/8	(12) 22
H Dia. of Raised Face	1 11/16	43	2	51	2 7/8	73	3 5/8	92	5	127	6 3/16	157	8 1/2	216	10 5/8	270	12 3/4	324	15	381
J Thickness of Flange	1/2	13	15/32	12	19/32	15	11/16	17	13/16	21	1	25	1	25	1 1/8	29	1 3/16	30	1 1/4	32
Total Weight (lbs.)	5.2		5.4		11.1		15		29.3		35		85		125		165		250	

**Dimensionally interchangeable with standard flanged VISI-FLO®*

Pressure/Temperature Ratings

1400 Series Flanged VISI-FLO® (Standard Pressure/Temperature)

Temperature		psig (Barg)		
(˚F)	(˚C)	Steel	316 SST	Ductile Iron
-20 to 150	-29 to 65	200 (13.8)	200 (13.8)	200 (13.8)
200	93	165 (11.4)	165 (11.4)	165 (11.4)
225	105	150 (10.3)	150 (10.3)	150 (10.3)
250	121	135 (9.3)	135 (9.3)	135 (9.3)
With Optional Seals				
300	149	100 (6.9)	100 (6.9)	100 (6.9)
350	177	70 (4.8)	70 (4.8)	70 (4.8)
400	204	35 (2.4)	35 (2.4)	35 (2.4)

1500 Series Flanged VISI-FLO®

Temperature		psig (Barg)		
(˚F)	(˚C)	Steel	316 SST	Ductile Iron
-20 to -100	-29 to -38	285 (19.7)	275 (19.0)	245 (16.8)
150	65	270 (18.6)	255 (17.6)	225 (15.5)
200	93	260 (17.2)	240 (16.6)	200 (13.8)
225	105	250 (16.8)	230 (15.9)	195 (13.4)
300	149	230 (15.9)	215 (14.8)	180 (12.4)
350	177	215 (14.8)	205 (14.4)	165 (11.4)
With Optional Seals				
400	204	200 (13.8)	195 (13.4)	150 (10.3)
450	232	185 (12.8)	180 (12.4)	135 (9.3)
500	260	170 (11.7)	170 (11.7)	120 (8.3)

Seal & Indicator Operating Temperatures

Material	Degrees F	Degrees C
Seals		
Neoprene (1400 series standard)	-20 to 250	-29 to 121
Fluorocarbon (1500 series standard)	0 to 350	-17 to 177
Buna-N	-30 to 250	-29 to 121
EPDM	-20 to 250	-29 to 121
PTFE	-40 to 450	-40 to 232
Indicators		
Delrin®	-40 to 250	-40 to 121
Ryton®	-40 to 450	-40 to 232
PTFE	-40 to 450	-40 to 232

Construction and Material

Body:	Steel	ASTM A216 WCB
	316 Stainless Steel	ASTM A351 CF8M
	Ductile Iron	ASTM A536 65-45-12
	Optional Materials	Hastelloy®, Alloy® 20, Monel®, Others upon request
Windows:	1400 Series	Tempered Soda Lime*
	1500 Series	Tempered Borosilicate
	*Annealed Borosilicate used on sizes 3" and above.	
Indicators:	1400 Series	Delrin®
	1500 Series	Ryton®
	Optional Materials	PTFE
Seals:	1400 Series	Neoprene (Std.)
	1500 Series	Fluorocarbon (Std.)
Connections:	Steel	ASME B16.5 150 lb.RF Flange
	316 Stainless Steel	ASME B16.5 150 lb.RF Flange
	Ductile Iron	ASME B16.1 125 lb.RF Flange
	Options	ASME B16.5 300 lb.RF Flange
Options:	Protective Shield (1400SK)	Polycarbonate lens cover
	Pressure/Temperature Probe	Consult Factory

Ordering Chart: See page 13.

1400 & 1500 SERIES (THREADED)

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- **Shipment Within 48 Hours on Most Items**
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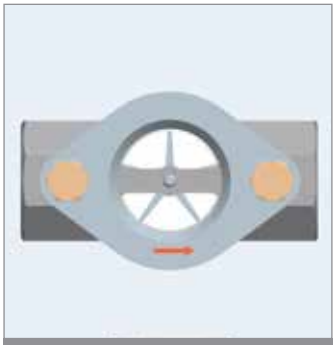
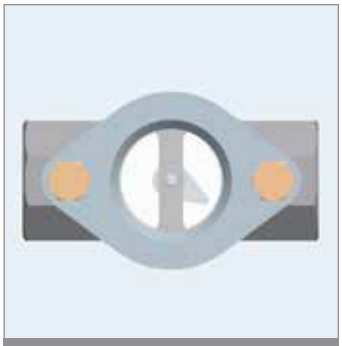
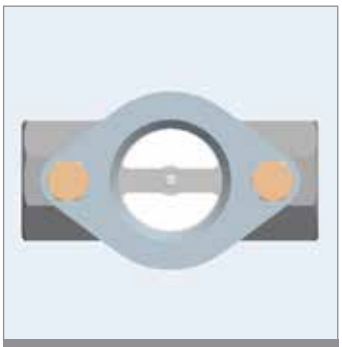
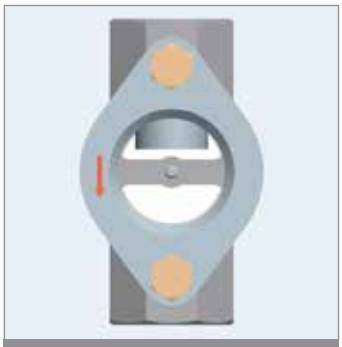
- **Four Indicator Styles**
  - a. **Propeller -** The best way to show flow of opaque liquids. Ideal for observation at a distance. Flow from right to left is standard. Specify if left to right flow is needed. Not recommended for flow rates above 100 GPM.
  - b. **Bi-Directional Flapper -** This indicator points in either direction to show you at a glance which way the liquid is flowing.
  - c. **Bi-Directional Plain -** When the color and clarity of your liquid are of prime importance.
  - d. **Drip Tube -** Ideal for gravity, extremely low or intermittent flow. Keeps product from dripping on the glass. Assures constant see-through for vertical lines.
- **On 2" and Smaller Units -** bottom PTFE spacer eliminates seal deformation due to pressure cycling.


a. Propeller


b. Bi-Directional Flapper


c. Bi-Directional Plain


d. Drip Tube

Maximum Pressure/Temperature Ratings for Visi-Flo® Sight Flow Indicators

Series	End Connection	Maximum ASME Pressure	Maximum Temperature
1400	Threaded ¼" to 4"*	200 psig @ 150° F	225° F @ 150 psig
1500	Threaded **	400 psig @ 150° F	350° F @ 200 psig

** With standard seals. Temperatures up to 450° F possible with High Temp PTFE Seals.*

*** With standard seals. Temperatures up to 500° F possible with High Temp PTFE Seals.*

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	1/4"		3/8"		1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
A Overall Length	3 ¼*	83	3 ¼*	83	3 ¼*	83	4 ¼**	108	4 ¼**	108	5 ¼***	133	5 ¼***	133	5 ½***	140
B Overall Width	2	51	2	51	2	51	2 5/16	65	2 5/16	65	3 5/16	84	3 5/16	84	3 5/16	84
C Overall Height (1400 series)	2 3/8	60	2 3/8	60	2 3/8	60	3 ¼	83	3 ¼	83	4 5/16	110	4 5/16	110	4 5/16	110
Overall Height (1500 series)	2 5/16	65	2 5/16	65	2 5/16	65	3 7/16	87	3 7/16	87	4 ½	114	4 ½	114	4 ½	114
D Diameter of Sight Opening	1 ⅛	29	1 ⅛	29	1 ⅛	29	1 ½	38	1 ½	38	2	51	2	51	2	51
K Added Height Due to Shield	7/16	11	7/16	11	7/16	11	½	13	½	13	1½	13	½	13	½	13
Total Weight (lbs.)	1.6		1.6		1.4		3.0		2.7		8.4		7.9		6.6	

*Stainless steel units are 3 5/8" **Bronze units are 4 1/8" ***Stainless Steel units are 5 5/8"

Pressure/Temperature Ratings

1400 Series Threaded VISI-FLO® (Standard Pressure/Temperature)

Temperature		psig (Barg)			
(˚F)	(˚C)	Steel	316 SST	Bronze	Ductile Iron
-20 to 150	-29 to 65	200 (13.8)	200 (13.8)	200 (13.8)	200 (13.8)
200	93	165 (11.4)	165 (11.4)	165 (11.4)	165 (11.4)
225	105	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)
250	121	135 (9.3)	135 (9.3)	135 (9.3)	135 (9.3)
With Optional Seals (see below)					
300	149	100 (6.9)	100 (6.9)	100 (6.9)	100 (6.9)
350	177	70 (4.8)	70 (4.8)	70 (4.8)	70 (4.8)
400	204	35 (2.4)	35 (2.4)	35 (2.4)	35 (2.4)

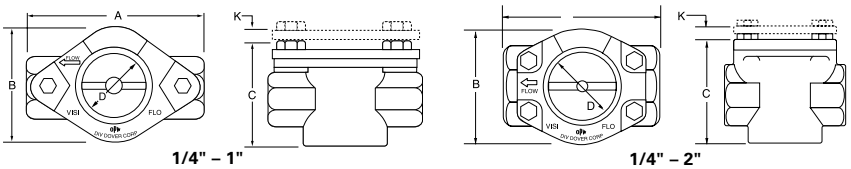
1500 Series Flanged VISI-FLO®

Temperature		psig (Barg)			
(˚F)	(˚C)	Steel	316 SST	Bronze	Ductile Iron
-20 to -150	-29 to 65	400 (27.6)	400 (27.6)	400 (27.6)	400 (27.6)
200	93	350 (24.1)	350 (24.1)	350 (24.1)	350 (24.1)
250	121	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)
300	149	240 (16.6)	240 (16.6)	240 (16.6)	240 (16.6)
350	177	200 (13.8)	200 (13.8)	200 (13.8)	200 (13.8)
With Optional Seals (see below)					
400	204	160 (11.0)	160 (11.0)	160 (11.0)	160 (11.0)
450	232	120 (8.3)	120 (8.3)	120 (8.3)	120 (8.3)
500	260	80 (5.5)	80 (5.5)	80 (5.5)	80 (5.5)

Seal and Indicator Operating Temperatures

Material	Degrees F	Degrees C
Neoprene (1400 series standard)	-20 to 250	-29 to 121
Fluorocarbon (1500 series standard)	0 to 350	-17 to 177
Buna-N	-30 to 250	-34 to 121
EPDM	-20 to 250	-29 to 121
PTFE	-40 to 450	-40 to 232
Indicators		
Delrin®	-40 to 250	-40 to 125
Ryton®	-40 to 450	-40 to 232
PTFE	-40 to 450	-40 to 232

General Dimensions for Threaded VISI-FLO®



Construction and Material

Body:	Steel	ASTM A216 WCB
	316 Stainless Steel	ASTM A351 CF8M*
	*6" and larger ASTM A351 CF3M (316L)	
	Ductile Iron	ASTM A536 65-45-12
	Bronze	ASTM B62 83600
	Optional Materials	Hastelloy®, Alloy® 20, Monel®, Others upon request
Windows:	1400 Series	Tempered Soda Lime
	1500 Series	Tempered Borosilicate
Indicators:	1400 Series	Delrin®
	1500 Series	Ryton®
	Optional Materials	PTFE
Seals:	1400 Series	Neoprene (Std.)
	1500 Series	Fluorocarbon (Std.)
Connections:	1400 Series	ASME B1.20 FNPT
	1500 Series	ASME B1.20 FNPT
	Options	
	Socket Weld	ASME B16.11
	BSP	ASME BS21
Options:	Protective Shield (1400SK)	Polycarbonate lens cover
	Pressure/Temperature Probe	Consult Factory

1600 SERIES

OPW 1600 Series Sight Flow Indicators are manufactured of quality materials and safety tested to assure long, dependable service at economical prices. Good for monitoring critical fluid flow, lubricant, coolant lines and sprinkler systems.

Benefits

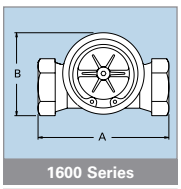
- Economical prices
- Allows you to quickly verify flow, and monitor color and clarity in fluid lines
- 48-hour delivery available to help minimize down time

Standard Features

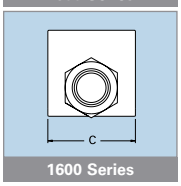
- Brass construction
- Single and double window designs
- Sizes from 1/8"- 2"
- 125 psig pressure rating
- Available with or without rotor
- FNPT or BSPT connections

General Dimensions for 1600 Series

Size	1/8"– 3/8"	1/2"– 3/4"	1"– 1 1/4"	1 1/2" – 2"
A Overall Length	3 3/16"	3 13/16"	4 3/8"	4 5/8"
B Overall Height	2 1/8"	2 7/16"	3 1/8"	4"
C Overall Width	2 7/32"	2 7/16"	3"	3 13/16"



1600 Series



1600 Series

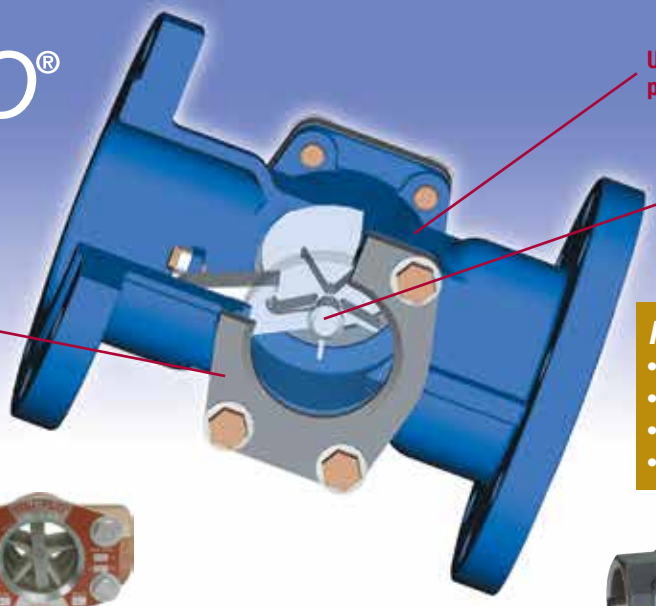
Physical Data

Maximum Pressure:	125 psig
Maximum Temp.:	200° F (93° C)
Seals:	Buna-N standard on all 1600 Series. Alternative seals available on request.
Glass Type:	Tempered Soda lime
Threads:	NPT or BSPT
Indicator:	Delrin®
Body:	Bronze

Ordering Chart: See page 13.

VISI-FLO®

Sight Flow Indicators



Unique radial seal prevents leakage

Four indicator choices cover every application

Bolted glass retainers eliminate routine maintenance

Flow monitoring made easy
- Quick, reliable flow verification
- Easy monitoring of fluid color and clarity
- Economical, maintenance-free design
- 3-year warranty, guaranteed not to leak

1400 Series
Standard pressure/temperature units in flanged and threaded styles

1500 Series
High pressure/temperature units in flanged and threaded styles

Your guide to the industry's most complete line of sight flow indicators

Indicator Styles

Plain - When fluid color/clarity is of prime importance (bi-directional)

Propeller - Ideal for opaque fluids and observation from a distance (right to left flow std., specify other)

Flapper - Points in either direction to show fluid flow (bi-directional)

Drip Tube - Ideal for gravity, intermittent or extremely low flow; prevents fluid from dripping on glass (vertical lines only)

Ordering Chart Call OPW Customer Service at 800-547-9393 for complete ordering information

Construction
- **2** - Carbon Steel
- **3** - Bronze
- **7** - 316 Stainless Steel
- **8** - Ductile Iron
- **9** - Alloy 20

Other construction materials available

Indicator Material
- **D** - Delrin® (Std. 1400 Series, white)
- **R** - Ryton® (Std. 1500 Series, brown)
- **T** - PTFE (Std. 6" - 12", white)
- **C** - Carbon Steel (Drip Tubes only)
- **S** - Stainless Steel (Drip Tubes only)

End Connections
- ***Blank*** - FNPT
- **F** - ASME 150 Lb. Flange
- **B** - British Threaded
- **FJP** - Flanged Replacement
- **FT** - ASME 300 Lb. Flange
- **SW** - Socket Weld

1 5 2 0 R F [ ] - 0 2 0 1

Seal Materials
- **1** - Buna-N
- **2** - Fluorocarbon (Std. 1500 Series)
- **3** - PTFE
- **4** - EPDM
- **5** - Neoprene (Std. 1400 Series)
- **6** - Kalrez®
- **7** - PTFE - High Temperature
- **X** - Customer Specified

Series
- **14** - 1400 Series
- **15** - 1500 Series

See charts below for temperature and pressure ratings.

Indicator
- **0** - Plain
- **1** - Propeller (1/4" to 4" only)
- **2** - Flapper
- **3** - Drip Tube
- **4** - Low Flow (1/4", 3/8", 1/2" only)

Shielding
- ***Blank*** - Not Shielded
- **SK** - Shielded

Size

001 - 1/8"	**010** - 1"	**040** - 4"
002 - 1/4"	**012** - 1-1/4"	**060** - 6"
004 - 3/8"	**015** - 1-1/2"	**080** - 8"
005 - 1/2"	**020** - 2"	**100** - 10"
007 - 3/4"	**030** - 3"	**120** - 12"

Availability of styles, sizes and materials may vary depending upon Visi-Flo configuration. Consult OPW Customer Service regarding your exact requirements.

Maximum Pressure/Temperature Ratings

1400 Series

End Connection	Max. ASME Pressure	Max. Temperature*
Flanged (6" - 12")	150 PSIG at 150°F	150°F at 150 PSIG
Threaded/Flanged (1/4" - 4")	200 PSIG at 150°F	250°F at 135 PSIG

* With standard seals. Temperatures up to 500°F possible with High Temperature PTFE seals.

Maximum Pressure/Temperature Ratings

1500 Series

End Connection	Materials	Max. ASME Pressure	Max. Temperature*
Threaded	All	400 PSIG at 150°F	350°F at 200 PSIG
Flanged	All	275 PSIG at 100°F	350°F at 205 PSIG

* With standard seals. Temperatures up to 500°F possible with High Temperature PTFE seals.

Temperature Range for Seal Materials

Seal Material	Min.	Max.
Neoprene (Std. 1300/1400 Series)	–20°F	250°F
Fluorocarbon (Std.1500 Series)	0°F	350°F
Buna-N (Std. 1700 Series)	–30°F	250°F
EPDM	–20°F	250°F
PTFE	–40°F	450°F
PTFE - High Temperature	0°F	500°F
Kalrez®	0°F	500°F

OPW Engineered Systems
PART OF OPW FLUID TRANSFER GROUP
A DOVER COMPANY

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Unlike Diaphragm Seals, Non-Plugging Gauge Isolation Ring Assures Reliable Pressure Ratings

ISO-Ring®

The OPW Engineered Systems patented Gauge Isolation Ring, called ISO-Ring®, is designed to isolate gauges or pressure switches from solids in process flow and to ensure accurate pressure readings.

Clogging or fouling typically associated with diaphragm seals used in viscous fluid applications result in erroneous pressure readings. This is never a problem with the OPW ISO-Ring®.

ISO-Ring® utilizes a specially designed flush-mounted flexible inner cylinder, behind which is a clean, captive liquid. As process liquid flows through the pipe, it exerts pressure through the flexible cylinder to the captive liquid. Pressure is monitored by the gauge or the switch, which is completely isolated from the process flow.

The OPW Engineered Systems ISO-Ring is the same unit as the Ronningen-Petter unit. OPW Engineered Systems purchased the entire product line from them in 1996. Product specifications that currently read Ronningen-Petter ISO-Ring products should be changed to read OPW Engineered Systems products.

ISO-RING®

For years now, a common refrain has reverberated throughout the industrial world with an unmistakably clear message:

Out with the diaphragm seal. In with the OPW Engineered Systems' ISO-Ring®.

For the growing number of companies that have embraced and implemented this simple call-to-action, something powerfully refreshing and highly reassuring has happened as process liquid has flowed through their pipes:

Process flow is smooth and uninterrupted; pressure readings are consistently reliable and accurate.

Thanks to OPW Engineered Systems' advanced, patented Gauge Isolation Ring, gone are the days when solids from the process flow plug the pressure-sensing mechanism or clog the access port on the diaphragm seal.

Features & Benefits

- Gauge (or switch) is in contact only with captive liquid and never directly with the process liquid.
- Isolating the gauge (or switch) from solids in process flow results in accurate readings.
- Gauge (or switch) can be removed for calibration, repair, or replacement – without interrupting process flow.
- Unique flexible cylinder prevents plugging, which means pressure readings are reliable and accurate.
- Integral design eliminates accidental breakage.
- Adaptable to a variety of process conditions and applications.
- Will not clog (which is not true of diaphragm seals).

Ordering Information

RING OR SPOOL	BODY MATERIAL	END FLANGE MATERIAL	TYPE	FILL	Gauge	SIZE	CYLINDER MATERIALS
OR = ISO Ring® OS = ISO Spool® OB = Bolt-Thru ISO-Ring®	**CS = carb. stl.** SS = 316 SST	**1 = carb. stl.** 2 = 316 SST 3 = carb. stl. w/ PTFE envelope 4 = 316 SST PTFE envelope 5 = cpvc (flat faced flange) 6 = cpvc - ISO-Spool only (flat faced flange) 7 = other 8 = Fully Wetted PTFE (Bolt-Thru ISO-Ring) carb. stl. 9 = Fully Wetted PTFE (Bolt-Thru ISO-Ring) 316 SST	N = without IRD** **I = with IRD**** T = Threaded* F = Flngd/150 Lb.* G = Flngd/300 Lb.* *Spool Only ** IRD = Instrument Removal Device	00 = less fill** **11 = propylene glycol** 12 = distilled water 13 = mineral oil 14 = silicone oil 15 = vegetable oil 16 = glycerine 17 = fluorolube 18 = fluorosilicone 19 = other	00 = less gauge 01 = less gauge; 1/2" conn. 02 = 0-60 psi 03 = 0-100 psi **04 = 0-200 psi** 05 = 0-400 psi 06 = 0-600 psi 08 = customer supplied 09 = other	010 = 1" 015 = 1.5" **020 = 2"** 025 = 2.5" 030 = 3" 040 = 4" 050 = 5" 060 = 6" 080 = 8" 100 = 10" 120 = 12" 140 = 14" 160 = 16" 180 = 18" 200 = 20"	**1 = Buna-N** 2 = Fluorocarbon 3 = PTFE 4 = EPDM* 5 = silicone** 6 = white neoprene 7 = natural rubber 8 = other *Ring Only **Spool Only

Example: OR CS 1 I 11 04 - 020 1

OPW Engineered Systems
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ISO-Spool® For Small Diameter Piping

This patented product is designed to provide a large sensing area in smaller pipe diameters from 1" to 4". Offered in both NPT threaded and flanged models and available with flat or raised face.

Threaded ISO-Spool®

Flanged ISO-Spool®

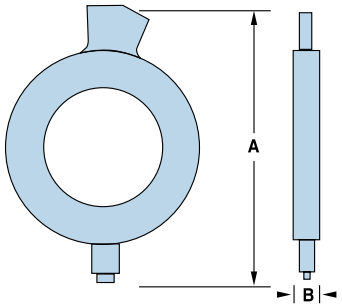
ISO-Rings®

Specifications

	ISO-Ring®	ISO-Spool®
Housing:	Carbon Steel	Carbon Steel
	316 Stainless Steel	
Assembly Flanges:	Carbon Steel	Carbon Steel
	316 Stainless Steel	316 Stainless Steel
	CPVC	CPVC
		PTFE enveloped
Inner Flexible Wall:	Buna-N	up to 225 ˚F (107 ˚C)
	PTFE	up to 350 ˚F (177 ˚C)
	Silicone[1]	up to 450 ˚F (232 ˚C)
	Fluorocarbon	up to 350 ˚F (177 ˚C)
	White Neoprene	up to 225 ˚F (107 ˚C)
	Natural Rubber	up to 225 ˚F (107 ˚C)
Captive Sensing Liquid:	50% Water/50% Prop. Glycol	-20 F to 200 ˚F (-29 ˚C to 93 ˚C)
	Silicone Oil (FDA Approved)	-20 F to 450 ˚F (-29 ˚C to 232 ˚C)
	Fluorosilicone	-20 F to 450 ˚F (-29 ˚C to 232˚ C)
	Mineral Oil	35 F to 225 ˚F (1.7 ˚C to 107 ˚C)
	Distilled Water	35 F to 200 ˚F (1.7 ˚C to 93.3 ˚C)

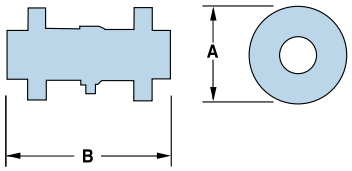
[1] ISO-Spool® only

Dimensions



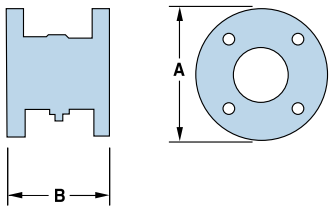
ISO-Ring®

Pipe Size	A		B		Approx. Shipping Wt.	
	in.	mm	in.	mm	lbs	kg
2"	6 15/16"	(176 mm)	2"	(51 mm)	3 lbs	(1.35 kg)
3"	8 3/16"	(208 mm)	2"	(51 mm)	6 lbs	(2.70 kg)
4"	9"	(229 mm)	1½"	(38 mm)	8 lbs	(3.6 kg)
5"	10¼"	(260 mm)	1½"	(38 mm)	10 lbs	(4.5 kg)
6"	11 3/16"	(284 mm)	1½"	(38 mm)	12 lbs	(5.4 kg)
8"	13⅜"	(340 mm)	1½"	(38 mm)	16 lbs	(7.3 kg)
10"	15 9/16"	(395 mm)	1½"	(38 mm)	20 lbs	(9.1 kg)
12"	17 9/16"	(446 mm)	1½"	(44 mm)	25 lbs	(11.4 kg)
14"	19 15/16"	(506 mm)	1½"	(44 mm)	50 lbs	(22.7 kg)
16"	21 15/16"	(557 mm)	2"	(51 mm)	60 lbs	(27.2 kg)
18"	24 3/16"	(614 mm)	2"	(51 mm)	70 lbs	(31.8 kg)
20"	26 1/16"	(662 mm)	2"	(51 mm)	80 lbs	(36.3 kg)



ISO-Spool® (threaded)

Pipe Size	A		B		Approx. Shipping Wt.	
	in.	mm	in.	mm	lbs	kg
1"	3 9/16"	(90 mm)	7⅝"	(194 mm)	10 lbs	(4.5 kg)
1½"	4⅜"	(111 mm)	7⅞"	(200 mm)	12 lbs	(5.4 kg)



ISO-Spool® (flanged)

Pipe Size	Class 150		Class 300		B		Class 150		Class 300	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1"	4¼"	(108 mm)	4⅞"	(124 mm)	5⅜ lbs	(136 mm)	8 lbs	(3.6 kg)	9 lbs	(4.1 kg)
1½"	5"	(127 mm)	6⅛"	(156 mm)	5⅜ lbs	(136 mm)	10 lbs	(4.5 kg)	12 lbs	(5.4 kg)
2"	6"	(152 mm)	–	–	5⅜ lbs	(136 mm)	15 lbs	(6.8 kg)	–	–
3"	7½"	(191 mm)	–	–	5⅜ lbs	(136 mm)	22 lbs	(10.0 kg)	–	–
4"	9"	(229 mm)	–	–	5⅜ lbs	(136 mm)	27 lbs	(12.2 kg)	–	–

ISO-RING® SETS STANDARD FOR RELIABLE PRESSURE RATINGS

The design and engineering excellence of ISO-Ring® is embodied within a unique 360-degree flexible cylinder, behind which is a clean, captive liquid.

Here's how it works and its significance:

As process liquid flows through the pipe, it exerts pressure. This pressure is transmitted through the ISO-Ring's unique flexible cylinder to the captive liquid. The pressure exerted by the captive liquid is monitored by the gauge's (or switch's) sensing mechanism, which is completely isolated from the flow. The gauge (or switch), thus, comes in contact only with captive liquid and never directly with the process flow.

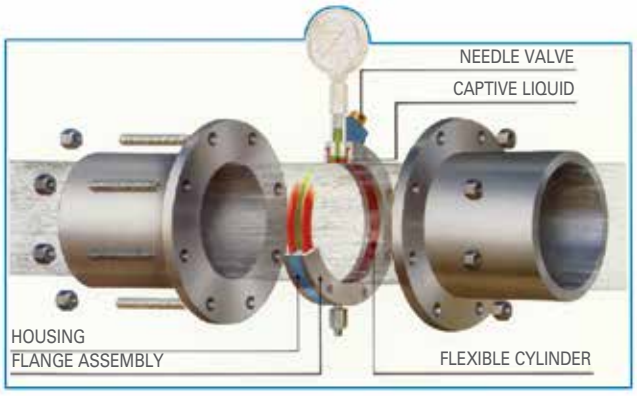
The result: the pressure-sensing mechanism never plugs.

ISO-Ring® has no access ports; consequently, there is nowhere for solids to collect and no openings that can plug. The inner flexible cylinder is the same diameter as the inner diameter of the piping, so it's continually cleaned by the flowing liquid.

The result: pressure readings are reliable and more accurate.

In addition, ISO-Ring® pressure readings represent the circumferential average of the pipe's internal pressure distribution (not just the pressure at a single point in the line, which is all you get with a diaphragm seal).

The result: pressure readings are more consistent.



ISO-RING® PERMITS GAUGE REMOVAL FOR CALIBRATION, WITHOUT INTERRUPTING PROCESS FLOW

A built-in needle valve is yet another unique feature of OPW Engineered Systems' ISO-Ring®.

Here's how it works and its significance:

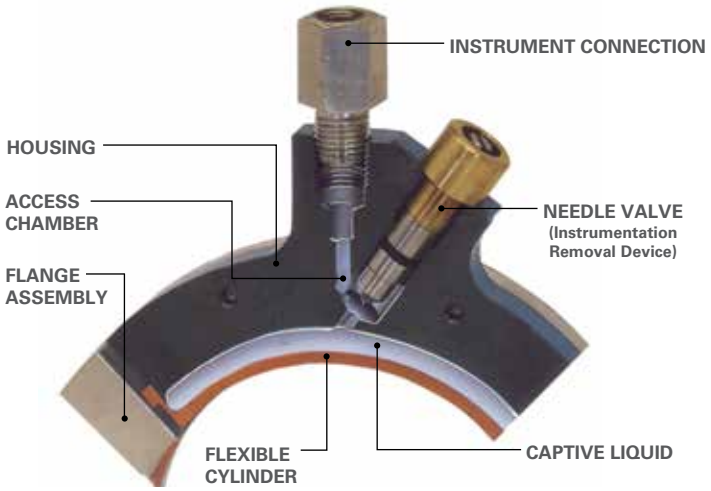
When the needle valve is open, pressure is transmitted into the access chamber by the captive liquid. It is then monitored by a gauge or switch.

When the valve is closed, it blocks entrance to the access chamber.

The result: users have the freedom and flexibility to remove the pressure instrument for calibration, repair or replacement – without shutting down the process flow. The system remains on stream and no captive liquid is lost.

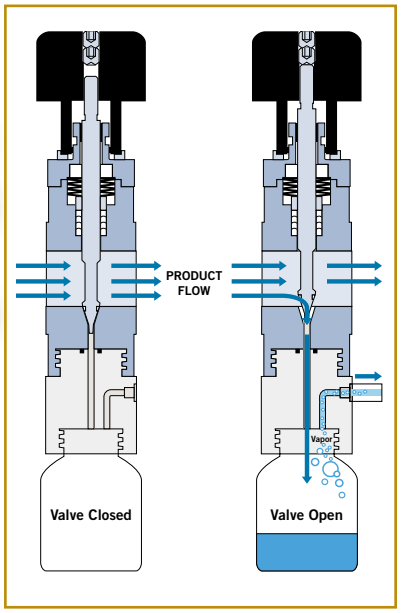
There are other important design advantages of ISO-Ring®, specifically:

- The needle valve is an integral part of the unit's housing, which means accidental breakage during transit, installation, or while in service, is virtually impossible.
- The needle valve, when adjusted to the "nearly closed" position, also acts as a snubber, which dampens pressure spikes that may occur, for example, from system upsets. This helps protect pressure instruments from damage.
- The ISO-Ring® is dramatically lighter in weight (vs. units from other manufacturers) and, therefore, substantially easier and more cost efficient to ship and install. The ISO-Ring® 8-inch unit, for example, weighs 16 pounds, whereas similar-sized units from other manufacturers weigh up to 58 pounds. As the unit size increases, so too does the comparative weight differential.
- The ISO-Ring® also is adaptable to a variety of process conditions and applications, including for the protection of delicate, expensive instrumentation (when used with a simple pressure gauge). Also available for piping diameters from 2" to 20". ISO-Ring® can be used at any pressure within the limitations of ASME Classes 150 and 300, and in most vacuum applications.



Sample Valves

Sure Seal's sampling system valves are safer, cleaner and greener. The SV/SB series inline sampling system valve is engineered to effectively collect a representative sample of a hazardous process material. All valves are available with several methods of operation: Knob Handles, Safety "Spring-to-Close" Handles and Fail-Closed Pneumatic Actuators.



Sure Seal BTSV Series Sample Valve System

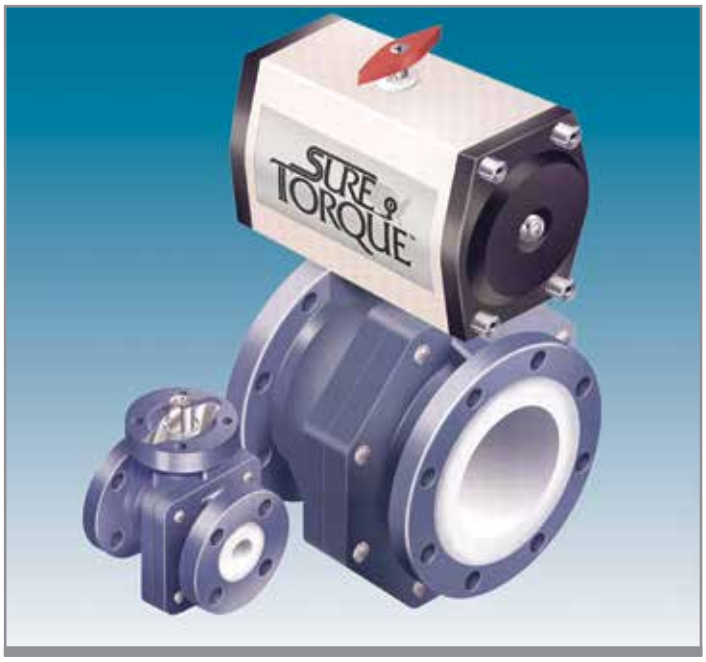
Specifically engineered for the environmentally safe collection of representative samples of lethal, toxic, and corrosive process media direct from: process piping.

Lined Valves

Sure Seal's LBV series lined ball valves are strictly produced under a company committed, statistical quality assurance process to assure defect-free products that are delivered to our customers on time. All valves are manufactured utilizing the latest computer aided production methods and molding technology, guaranteeing control of the manufacturing process and reduction of rework. Sure Seal, part of OPW Fluid Transfer Group, stands behind all of its industrial valve products.

Sure Seal LBF Series Lined Butterfly Valve

This fully-lined butterfly valve is designed specifically for controlling and isolating corrosive, high-purity and abrasive process media. Conforms to API 609, MSS SP-67, ISO 5752/20 (5752/25 for 14"), PED 97/23/EC, MSS-SP25, ASME B16.5 and ISO 5211 (Mounting Flanges), and PN10 requirements.



Sure Seal LBV Series 100 Lined Ball Valve, Full Port, Class 150

Specifically designed for direct actuator mounting on 1"-6" valves. Conforms to ASME B16.5, B16.10, B16.42, ISO 5211 and MSS-SP25.

BUTTERFLY "RESILIENT SEATED" VALVES

Sure Seal's Superior Encapsulated design results in total encapsulation of the seat and disc/stem, providing the ultimate in contamination-free service. In addition, every Sure Seal valve is tested to 110% of full pressure rating!

Sure Seal Series 899/892 Patented Butterfly Valves

Available in sizes 1"-24". Superior encapsulated design results in total encapsulation of the seat and disc/stem providing the ultimate in contamination free service.

Sure Seal Series 899/892 Investment Cast Stainless Patented Butterfly Valves

A superior sanitary valve for the chemical and food processing industry. Available in sizes 1"-12". Superior encapsulated design results in total encapsulation of the seat and disc/stem providing the ultimate in contamination-free service.

Sure Seal Series 500/522 Heavy Industrial/Utility Butterfly Valves

Designed for general industrial applications, this valve is the ultimate resilient seated butterfly valve for industry applications. Available in a wide variety of materials for many service applications.

HIGH PERFORMANCE VALVES

Sure Seal High Seal Series High-Performance Butterfly Valves

Bubble-tight bi-directional service. Sizes 2"– 60" for a wide range of severe process applications.

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CHEMICALS	• Chlorine • Acids & Bases • Amines • Anhydrous Ammonia • Propylene • Butadiene • Hazardous Liquids	• Bellow Sealed Valves • Sample Valves • Lined Ball Valves • Lined Butterfly Valves • Industrial Valves • ISO Rings • Sight Flow Indicators • Globe Valves • Swivels • Dry Disconnects • Quick Disconnects • Epsilon	• Loading Arms • Autoloks • Kamvaloks • Dryloks • Loading Manholes • Valves • Actuators • Swivels • Epsilon	**Cargo Tanks** • **Manholes** • **Vapor Vents** • **Electronics** • **Internal Valves** • **Sealed Parcel** • Epsilon	**Rail Tank Cars** • **Safety Valves** • Plug Valves • Ball Valves • Level Measurement • Autoloks • Kamvaloks • Dryloks • Rupture Disc Devices • Angle Valves • Epsilon	• Loading Arms • Autoloks • Kamvaloks • Dryloks • Valves • Actuators • Safety Breakaways • Swivels • Epsilon
DRY BULK	• Cement • Flour/Starch • Pharmaceuticals	• Industrial Valves • Sight Flow Indicators • Butterfly Valves • Swivels	• Loading Arms • Aerators • Hatch Covers • Swivels	**Cargo Tanks** • **Manholes** • Check Valves • Hopper Tees • Butterfly Valves • Aerators • Weld Rings	**Railcars** • **Manholes** • Hatches • Access Ports • Check Valves • Hopper Tees • Butterfly Valves • Aerators • Pressure Vacuum Valves	• Aerators • Butterfly Valves • Tank Hatches • Pressure Relief • Vacuum Relief • Temperature Monitoring
INDUSTRIAL/GENERAL	• Food Processing • Pharmaceuticals • Waste Water • High-Purity Liquids • Breweries • Pulp and Paper • Steel Processing	• Lined Ball Valves • Lined Butterfly Valves • Sample Systems • Sight Flow Indicators • ISO Rings • Dry Disconnects • Swivels • Quick Disconnects • High-Performance Butterfly Valves • Epsilon	• Loading Arms • Couplers • Rack Monitors • Swivels • Dry Disconnects • Quick Disconnects • Butterfly Valves • Epsilon	**Cargo Tanks** • **Manholes** • Vapor Vents • Electronics • Weld Rings • Hopper Tees • Pneumatic Controls • Sealed Parcel • Dry Disconnects • Epsilon	**Rail Tank Cars** • **Safety Valves** • Plug Valves • Ball Valves • Level Measurement • Autoloks • Kamvaloks • Dryloks • Rupture Disc Devices • Angle Valves • Epsilon	• Loading Arms • Couplers • Rack Monitors • Swivels • Dry Disconnects • Quick Disconnects • Butterfly Valves • Epsilon

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- **Waste Water Treatment**
- **Pharmaceutical**
- **Breweries**
- **High-Purity Liquids**
- **Ethanol Processing**
- **Biodiesel Processing**

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- **Dry Bulk Railcars**
- **Ethanol Rail Tank Cars**
- **Diesel**
- **Biodiesel**

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