Section 2

Diaphragm Valve Products

Contained in this section:

Weir Valves

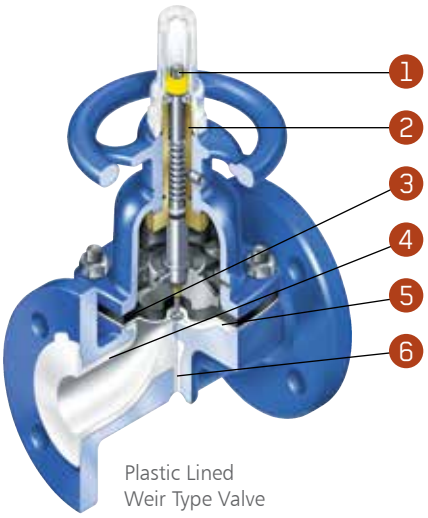
- Features and Benefits
- Body Selections
- Diaphragm Selections
- Bonnet Assembly Select

Straightway Valves

- Features and Benefits
- Body Selections
- Diaphragm Selections
- Bonnet Assembly Selections

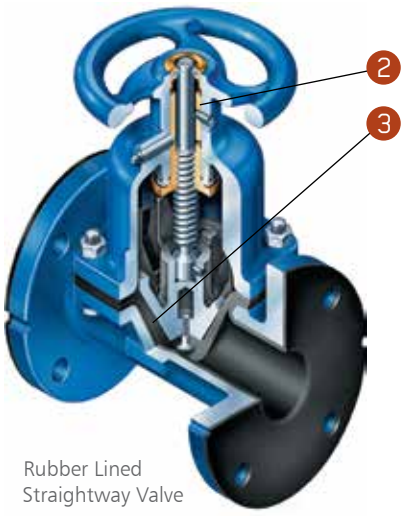
Features and Benefits

Weir Type Valve



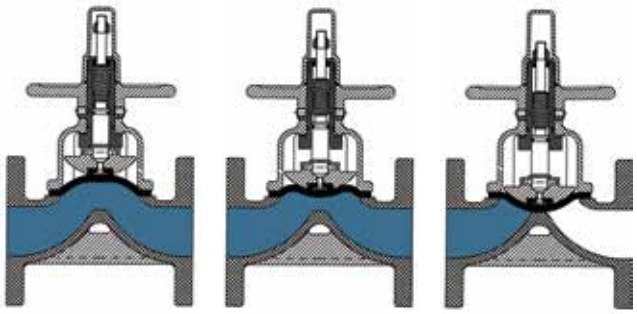
Plastic Lined
Weir Type Valve

Straightway Valve



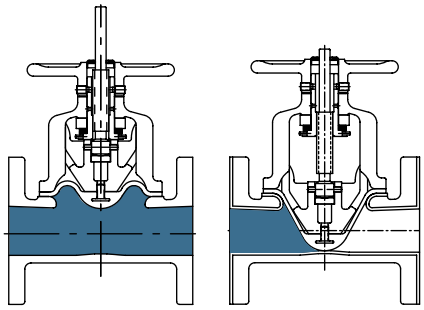
Rubber Lined
Straightway Valve

Modes of Operation



Open Throttling Closed

Modes of Operation



Open Closed

Versatile and Economical

Broad range of body materials and diaphragm materials.

- Metals
- Plastic Linings
- Rubber Linings
- Glass Linings
- Solid Plastic
- Choose from 12 grades of Elastomers or PTFE Diaphragms

Features and Benefits

1 Adjustable Travel Stop

- Prevents overclosure of the valve and prolongs diaphragm life. The adjustability feature assures that leak-tight shutoff can be maintained throughout the valve's life.

2 Bronze Bushing

- Reduces turning torque and enhances cycle life in "dirty" atmospheres.

Sealed Bonnet

- Offers secondary process containment to control fugitive emissions.
- Supplied with leak detection port as standard.

Floating Tube Nut*

- Prevents point loading of the stud on PTFE diaphragms, which enhances diaphragm life, particularly in high temperature and high cycle applications.
- 100% Seat & Shell Testing
- All valves are pressure tested bubble tight prior to shipment. No visible leakage is allowed.
- Extensive selection of body and diaphragm materials and actuation packages.
- Allows optimum selection of materials for service conditions, often without expensive upgrades.

3 Bonnet Isolation

- The diaphragm isolates the working parts of the valve from process fluids.

4 Streamlined Fluid Passage

- The smooth contoured body has minimal pockets, cavities or dead spaces, which prevent accumulation or stagnation of process fluids or contaminants.

No Packing Gland or Packing

- No more packing gland adjustment required or stem packing leakage problems for improved control of fugitive emissions.

Positive Leak Tight Closure

- Bubble tight closure is provided in accordance with MSS SP–88.

In-Line Maintenance

- Easily maintained when required for reduced downtime and lower cost of ownership.

5 Molded Closed 2-Piece PTFE Diaphragm*

- Diaphragms are molded to the exact contour of the weir for superior shutoff capabilities.
- 2-piece configuration eliminates delamination of PTFE which is common to 1-piece configurations.
- Superior flex life
- Reduced permeation
- Excellent chemical resistance

6 Line-Lok*

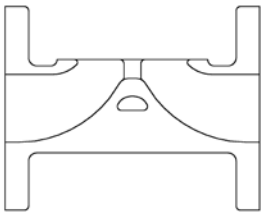
- Unique feature in all plastic lined weir valves that prevents liner flexing over the weir, which reduces the potential for liner cracking.

* Weir type valve only

Weir Valve Selections

Unlined Metal

- Excellent Cvs
- Complete Selection of End Connections
- ASTM Materials Include:
  - Cast Iron ASTM A-126 Class B
  - Ductile Iron ASTM A-395 Grade 60-40-18
  - Cast Steel ASTM A-216 Grade WCB
  - 316 Stainless Steel ASTM A-351 Grade CF8M
  - 316L Stalinless Steel ASTM A-351 Grade CF3M
  - Bronze ASTM B62 Alloy 836
  - Alloy 20 ASTM A-351 Grade CN7M
  - Hastelloy C ASTM A-494 Grade CW-6M
  - Monel ASTM A-494 Grade M-35-1
  - And More



SCREWED METAL[2]

½"–3"	Cast Iron	2401
½"–3"	Bronze	2402
½"–2"	Stainless Steel (316)	2403
½"–2"	Cast Steel	2405
½"–2"	CN7M	2407
½"–2"	Monel	2408
½"–2""	Hastelloy	2410
1"–3"	Ductile Iron	2412

FLAT-FACED FLANGED METAL[1,2]

½"–12"	Cast Iron	2431
½"–6"	Bronze	2432
½"–12"	Ductile Iron	2441

RAISED FACE FLANGED METAL[1,2]

½"–8"	Stainless Steel	2433R
½"–8"	Cast Steel	2435R
½"–8"	CN7M	2437R
½"–8"	Monel	2438R
½"–8"	Hastelloy	2440R

SOCKET WELD METAL[2]

½"–3"	Stainless Steel (316L)	2470
½"–3"	Cast Steel	2472
½"–3"	CN7M	2474

SOCKET (SOLDER)

1/2"-2"	Bronze	2456

BUTTWELD METAL[2]

½"–8"	Stainless Steel (316L)	
	Schedule 5	2464
	Schedule 10	2465
	Schedule 40	2466

Maximum temperature for all of the above configurations is 350° F (177° C).

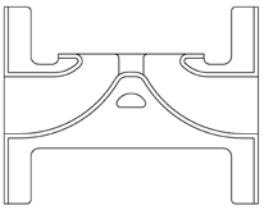
Notes:

1. ¾" flanged valve is supplied with 1" bonnet and diaphragm.
2. 1¼" valves are supplied with 1½" bonnet and diaphragm.
3. Temperature may decrease dependent upon media, pressure and valve size.

Weir Valve Selections

Rubber Lined Bodies

- 1/8" Minimum Lining Thickness Ductile Iron or Cast Iron
- Available Full Flat Faced Flange Lining
- Ductile Iron or Cast Iron Available



Broad Choice of Lining Materials

Neoprene
A synthetic base elastomer with some physical properties similar to natural rubber. Superior to natural rubber in resistance to heat, ozone, sunlight and oil. Typical applications include phosphoric acids; magnesium oxide and sodium hydroxide. Maximum temperature 200° F (93° C)[3]

Soft Rubber
Good resistance to most inorganic chemicals with the exception of strong oxidizing agents. Exhibits outstanding abrasion resistance. Typical applications include gypsum, flyash, titanium dioxide slurries and sewage. Maximum temperature 180° F (82° C)[3]

Hard Rubber
Better chemical and heat resistance than softrubber. Wide application in organic and inorganic ac ids and chlorine gas. Typical applications include potable water; oxidizing agents; plating solutions; salts; sludge and ferric chloride. Maximum temperature 200° F (93° C)[3]

Chlorobutyl
Good heat resistance. Unaffected by cold weather or rapid temperature changes. Typical applications include hydrofluoric acid, various zinc solutions and fertilizer solutions.Maximum temperature 200° F (93° C)[3]

FLANGED RUBBER LINED[1,2]

CAST IRON

½"–12"	Neoprene	#7	2501
½"–12"	Soft Rubber	#5	2516
½"–12"	Hard Rubber	#10	2521
½"–12"	Chlorobutyl	#16	2522

DUCTILE IRON

½"–8"	Neoprene	#7	2550
½"–8"	Soft Rubber	#5	2551
½"–8"	Hard Rubber	#10	2552

CAST STEEL

½"–8"	Neoprene	#7	2561
½"–8"	Hard Rubber	#10	2563

Notes:

1. ¾" flanged valve is supplied with 1" bonnet and diaphragm.
2. 1¼" valves are supplied with 1½" bonnet and diaphragm.
3. Temperature may decrease dependent upon media, pressure and valve size.

Weir Valve Selections

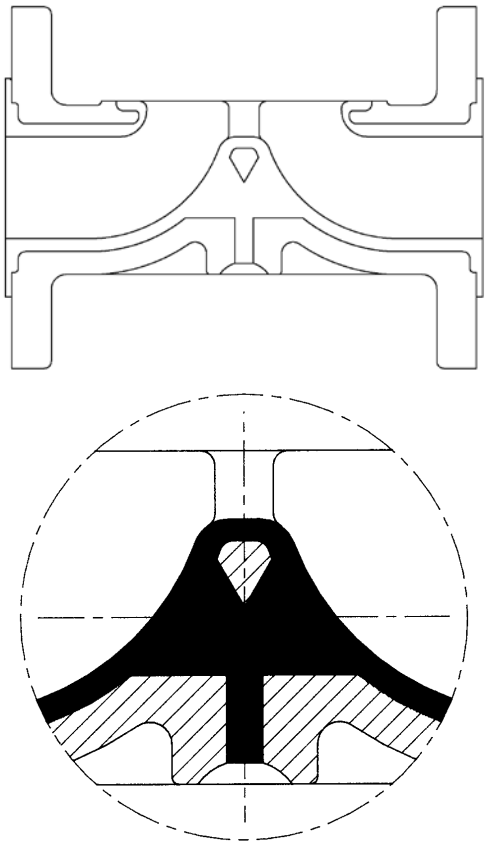
Plastic Lined

- 3/16" Minimum Lining Thickness*
- Superior Flow Capabilities
- Line-Lok feature
- Wide Selection of Lining Materials

*Lining thickness of PFA is .14" minimum.

Line-Lok is a unique feature of Dia-Flo® diaphragm valves. The weir area is locked firmly to the body eliminating flexing of lining during valve cycling, which can lead to premature liner failure.

Dia-Flo® weir diaphragm valve with Advantage Actuator and SP2.0 switch pack.



Weir Valve Selections

Plastic Lined

PFA

Excellent chemical resistance to all common solvents, superior high purity resistance, excellent temperature resistance. Maximum temperature 350° F (177° C)[3]

ETFE

Suitable for strong acids and solvents. Compatible with a very broad range of chemicals under a wide range of conditions. Maximum temperature 300° F (149° C)[3]

Polypropylene

Especially suitable for organic solvents degreasing agents, excellent resistance to alkalines. Economically priced, poor resistance to chlorinated solvents. Maximum temperature 200°F (93° C)[3]

PVDF

Very good corrosion and chemical resistance, performs well in many applications at elevated temperatures. Maximum temperature 285° F (140° C)[3]

PVC

Very good corrosion and weather resistance. Note that temperatures may be restricted. Maximum temperature 140° F (60° C)[3]

FLANGED PLASTIC LINED[1,2]

CAST IRON

¾"–8"	ETFE	2529
¾"–8"	PVC	2536
¾"–8"	Polypropylene	2538
¾"–8"	Polypropylene (unpigmented)	2539
¾"–8"	PVDF	2575

DUCTILE IRON

¾"–8"	PVDF	2555
¾"–8"	Polypropylene	2558
¾"–8"	ETFE	2559
1"–6"	PFA	2556

CAST STEEL

¾"–8"	ETFE	2545
¾"–8"	Polypropylene	2546
¾"–8"	PVDF	2548

STAINLESS STEEL

¾"–8"	ETFE	2549

Notes:

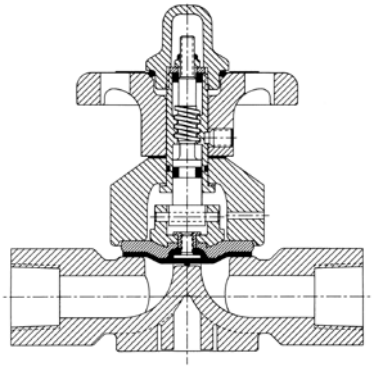
1. ¾" flanged valve is supplied with 1" bonnet and diaphragm.
2. 1¼" valves are supplied with 1½" bonnet and diaphragm.
3. Temperature may decrease dependent upon media, pressure and valve size.

Weir Valve Selections

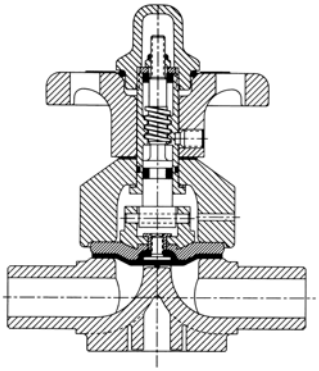
Solid Plastic

- Lightweight and economical
- Excellent interior / exterior corrosion resistance
- Body materials include:
  - PVC (Polyvinyl chloride)
  - CPVC (Chlorinated polyvinyl chloride)
  - PVDF (Polyvinylidene fluoride)
  - Polypropylene
- End Connections include:

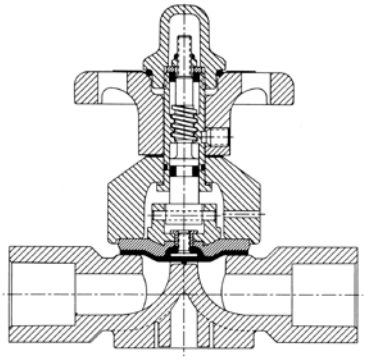
Solid plastic PVDF body with ring flanges and PAS plastic manual bonnet.



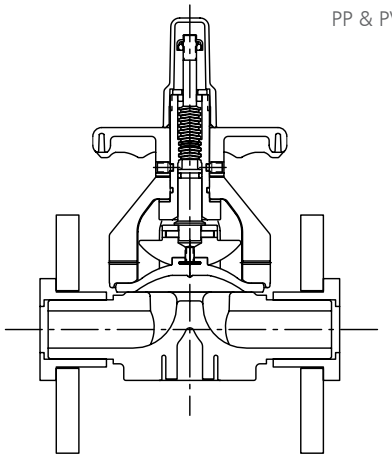
NPT THREADED



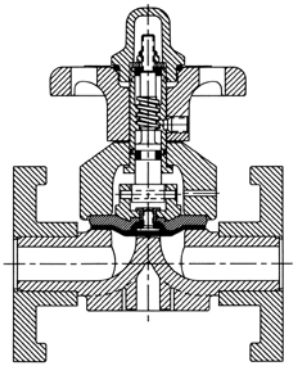
SPIGOT WELD
PVC & CPVC: IPS SCH 80
PP & PVDF: DIN 11



SOCKET WELD
PVC & CPVC: SCH. 80
PP & PVDF: SCH. 80



FLANGED*
PP & PVDF: RING FLANGE



FLANGED*
PVC & CPVC: FIXED FLANGES

Weir Valve Selections

Solid Plastic

The body of the Dia-Flo plastic diaphragm valve is available in a variety of high-performance engineered polymers including polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), and natural polyvinylldene fluoride (PVDF). The bonnet is manufactured from glass-reinforced polymer, PAS (polyarylsulfone). An optional PAS pneumatic actuator is also available.

SCREWED PLASTIC[4]

½"–2"	PVC	2406
½"–2"	CPVC	2416
½"–2"	PVDF[2,3]	2417

SOCKET WELD PLASTIC[4]

½"–2"	PVDF[2,3]	2427
½"–2"	PVC	2451
½"–2"	CPVC	2463

FLANGED PLASTIC[2,4]

½"–4"	PVC	2436
½"–2"	CPVC	2442
½"–4"	PVDF[3]	2447

SPIGOT WELD PLASTIC[4]

IPS-SPIGOT

½"–2"	CVPC	2443
½"–4"	PVC	2486

DLN-SPIGOT[4]

½"–4"	PVDF[3]	2487

*150# ANSI Dimensions

Glass Lined

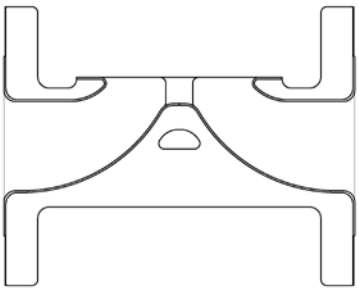
- Excellent lining for contaminant-free or corrosion-resistant applications
- Available in cast or ductile iron
- 100% spark testing before and after assembly assures the highest lining integrity

Flanged Glass LIned[1, 4]

Cast Iron
½"–8" Glass 2511

Ductile Iron
½"–10" Glass 2544

Maximum temperature for glass lined valves is 350° F[5] (177° C).



Notes:

1. ¾" flanged valve is supplied with 1" bonnet and diaphragm
2. Not available in 1¼" size
3. Unpigmented
4. 1¼" valves are supplied with 1½" bonnet and diaphragm
5. Temperature may decrease dependent upon media, pressure and valve size

Weir Valve Selections

The diaphragm material and design are integral to the successful performance of the diaphragm valve.

10 weir elastomer diaphragms and 2 weir PTFE diaphragms are available to handle a multitude of process fluids and parameters.

Elastomer Diaphragms[1]

Grade	Material (FDA Compliant)	Size	Temperature[2,3]	Typical Services
Grade B	Black Butyl (FDA Compliant)	½"–12"	-20 to 250° F (-29 to 121° C)	Chemicals, gases, stronger acids
Grade W1	White Butyl (FDA Compliant)	½"–6"	0 to 225° F (-18 to 107° C)	Foods, beverages, pharmaceuticals
Grade E1	EPDM (FDA Compliant)	½"–8"	-30 to 300° F (-34 to 149°C)	Beverages, pharmaceuticals
Grade M	EPDM	½"–12"	-30 to 300° F (-34 to 149°C)	Chemicals, acids, hi-temp, abrasives
Grade S	Natural Rubber	½"–8"	-30 to 180° F (-34 to 82°C)	Water, abrasives
Grade T	Neoprene®	½"–12"	-20 to 200° F (-29 to 93°C)	Weak chemicals, air, oil resistant
Grade DP	Buna N® NBR (FDA Compliant) Direct Loaded Valve only	½"–3"	10 to 180°F (-12 to 82°C)	For direct load valve only
Grade P	Buna N® NBR (FDA Compliant)	½"–12"	+10 to 180° F (-12 to 82° C)	Foods, oils
Grade V	Viton® FKM[4]	½"–6"	-20 to 325° F (-29 to 163° C)	Specific solvents & chemicals, oils

[1] To be used as general guide; for complete service guide see section 5 of this binder.
[2] Diaphragms at maximum temperature cannot be used satisfactorily at maximum pressures. Pressure/temperature charts are provided in section 5 of this binder.
[3] Cast Iron, Ductile iron & Carbon Steel should not be used below -20 degrees F (-29 C).
[4] Viton is a registered trademark of DuPont de Nemours and Co. Inc.

Our elastomer diaphragms are available in a variety of materials to address various process characteristics. Some elastomer diaphragms are softer and better suited to abrasive and slurry applications. Others are harder, providing greater chemical resistivity and higher temperature limitations. All elastomer diaphragms in sizes 1"–8" are molded in the closed position to provide the most effective seal. Each diaphragm contains markings identifying the size, material, mold date and diaphragm supplier.

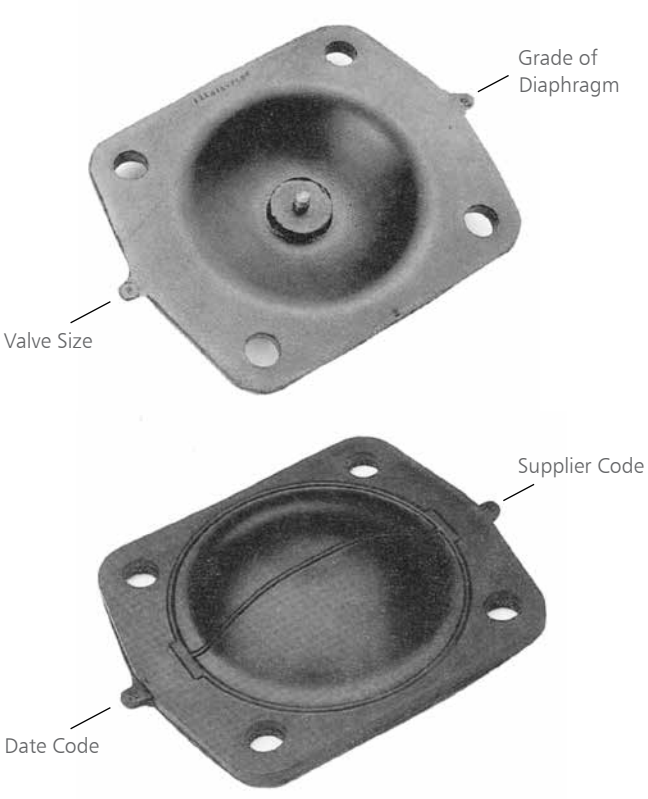
The molded closed design increases the sealing properties of the diaphragm. The relaxed position of the diaphragm is contoured to the same shape as the weir which increases the ability of the diaphragm to provide a bubble-tight shut-off.

Due to diaphragm area limitations, sizes smaller than 1" are molded open.

Diaphragm Traceability

All diaphragm materials and physical properties are batch traceable via permanent codes molded into the diaphragm tabs. The molding date, material type, and diaphragm size provide traceability to original batch records.

Diaphragm Identification



See chart above for Diaphragm Grades.

Weir Valve Selections

PTFE Diaphragms

Grade	Material (FDA Compliant)	Size	Temperature[2, 3]
Grade TM	Modified PTFE (FDA Compliant)	½"–6"	-30 to 350° F (-34–177° C)
Grade R2	PTFE (FDA Compliant)	8"–10"	-30 to 350° F (-34–177° C)

The two-piece PTFE (Polytetrafluoroethylene) diaphragm assembly utilized in the Dia-Flo® diaphragm valve has proven through years of outstanding service to be the best design available. The two-piece construction, consisting of PTFE diaphragm and ethylene propylene elastomer backing cushion, fully eliminates the problem of delamination permeational cracking common to competitive "PTFE-faced" designs.

To ensure the best possible diaphragm, ITT maintains a continuing development program to utilize new materials and improve existing compounds. The result of this effort is the recent introduction of the PTFE-grade TM diaphragm (½"–6").

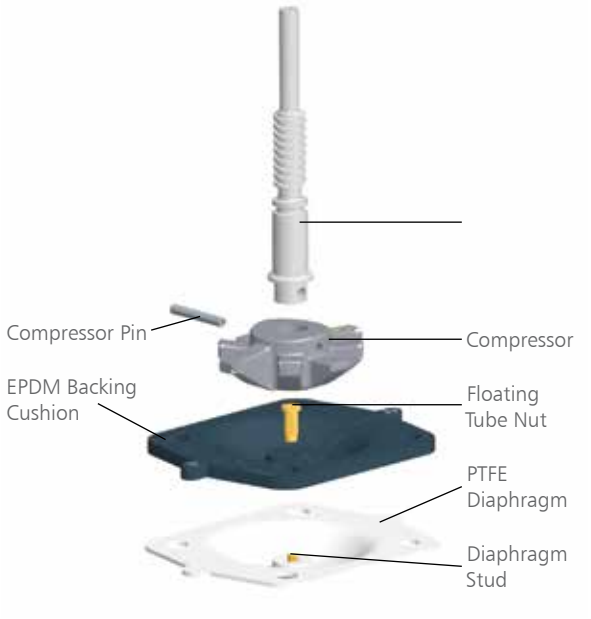
Proven benefits of the PTFE grade TM diaphragm versus conventional PTFE diaphragms are:

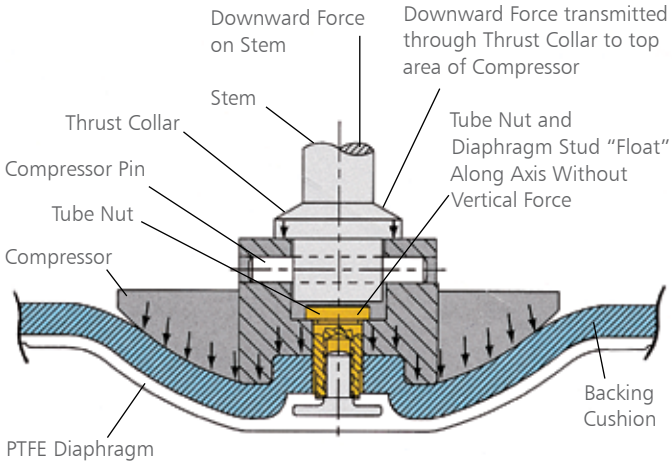
- Reduced permeation due to a more homogeneous microstructure with minimal voids
- Reduced cold flow similar to 25% carbon reinforced PTFE
- Increased cycle life due to a more amorphous compound

PTFE Diaphragm Assembly

Floating Tube Nut

The floating tube nut feature contributes largely to the successful operation of plastic diaphragms in Dia-Flo® diaphragm valves. The downward force of the stem is transferred to the compressor, bypassing the tube nut. The result is that forces are evenly distributed over the seating area of the diaphragm, thus reducing cold flow and stud pull out concerns. This design is also used on 6" and larger elastomer diaphragms.





Weir Valve Selections

Manual Bonnet Assemblies

Dia-Flo® diaphragm valve bonnet assemblies are equipped as standard with:

- Bronze Stem Bushing
- Molded-In Fingers*
- Grease Fitting** (6"–12")
- Thrust Bearing Visual Position Indication
- Adjustable Travel Stop (½"–4")
- Permanently Sealed Lubrication (½"–4")
- Clear Stem Cover (½"–4")

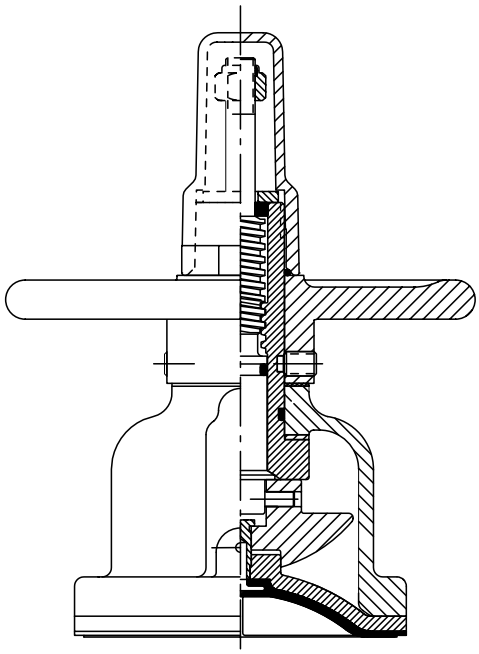
*In conjunction with the compressor, the fingers positively support the diaphragm from the closed to open position. The diaphragm is lifted high when the valve is opened and is pressed tightly against the weir when the valve is closed. It is supported in all positions by alternate fingers of the compressor and bonnet. Fingerplates in place of molded in fingers are utilized in 3" through 6" stainless steel bonnet assemblies.

For specific 902 and 903 bonnet parts call-out refer to the technical section of this binder.

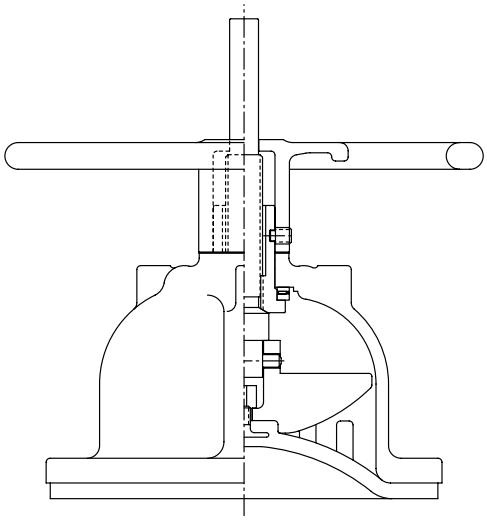
Refer to Bonnet Assembly Options pages for other bonnet variations.

PVDF corrosion resistant coated bonnet shows the molded-in fingers utilized to support the diaphragm in the open position.

*** Not used with sealed bonnet*



903 BONNET ASSEMBLY
Standard on valves 1/2"–4"



902 BONNET ASSEMBLY
Standard on valves 6"–12".
See technical section for parts call-outs and materials for 902 and 903 assemblies.

Straightway Valves

Features and Benefits

Ideal for slurry, abrasive and corrosive applications, the Dia-Flo® Straightway Diaphragm Valve provides the following benefits:

Slurry Applications

Due to the streamlined fluidpassage, the Dia-Flo® Straightway Valve can handle slurries, without solid particles becoming entrapped in cavities or crevices which may obstruct the operation of other valve types. In addition, the unobstructed flow path allows the valve to be rodded through.

Abrasion Resistant

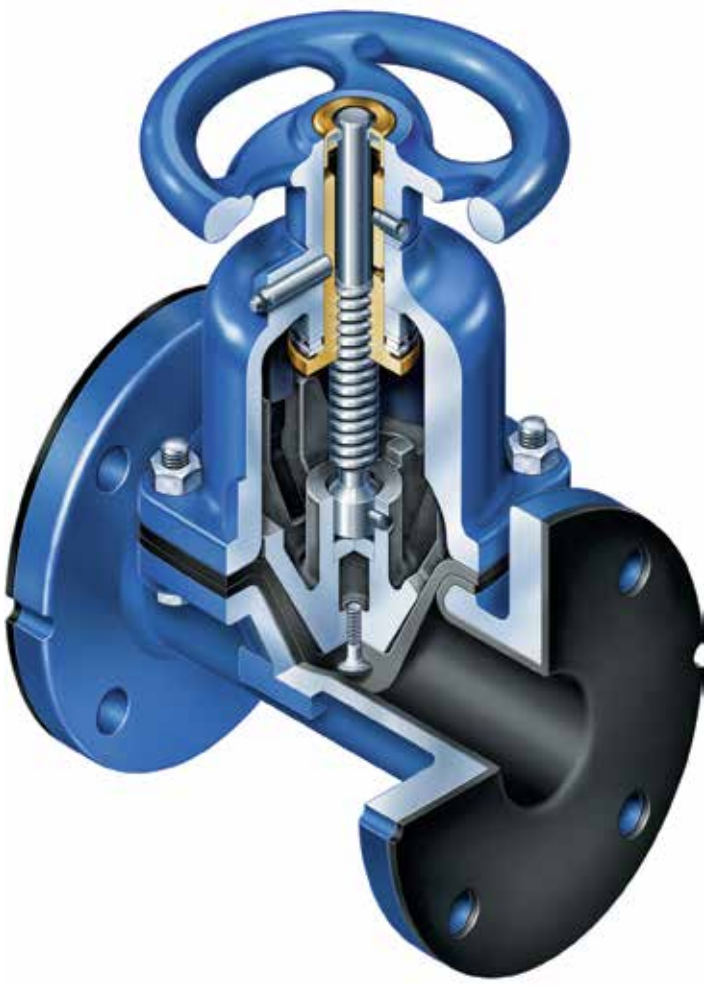
Available in four rubber linings: Soft Rubber, Hard Rubber, Neoprene®, and Butyl the Straightway Valve is well suited to handling corrosive and abrasive services.

Corrosion Resistant

In addition to the rubber linings, ETFE and polypropylene linings are available to handle the most corrosive services. To protect the valve exterior, PVDF and white epoxy coatings are available.

Conventional Straightway Design

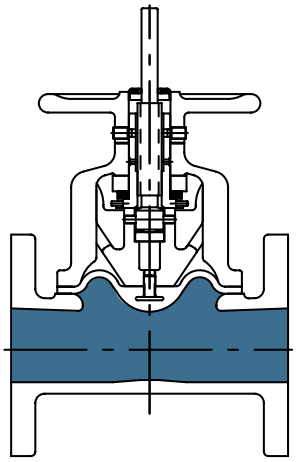
The Dia-Flo® Straightway Valve is a conventional design as opposed to a reduced port straightway design. A reduced port straightway design is similar to a pre-pinched pinch valve, in that the flow path cross-sectional area is generally reduced. The reduction in area results in reduced flow capacity (Cv), increased velocity, increased pressure drop and accelerated wear through the valve.



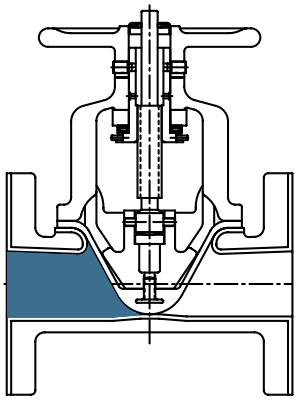
Straightway Valves

Additional Features

- Can be rodded out in either direction
- Unimpeded Flow
- Negligible pressure drop
- Self-draining when piping is pitched



Valve Open



Valve Closed

Valve Open

Straightway Rubber Lined Valves in Phosphoric Acid Service

Straightway Valves

Unlined Metal

- Excellent CVs
- Flanged or raised face flanges
- ASTM materials include:
  - Cast Iron ASTM A-126 Class B
  - Ductile Iron ASTM A-395 Grade 60-40-18
  - Stainless Steel ASTM A-351 Grade CF8M
  - Cast Steel ASTM A-216 Grade WCB

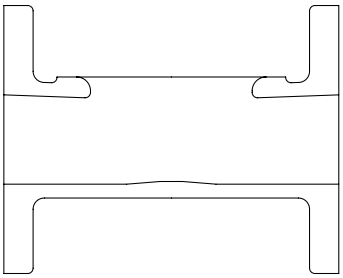
FLANGED METAL

1"–12"	Cast Iron	2811
1"–12"	Ductile Iron	2812

RAISED FACE FLANGED METAL

1"–8"	Stainless Steel	2813R
1"–8"	Cast Steel	2815R

Maximum temperature for all of the above configurations is 225° F (107° C).



Plastic Lined

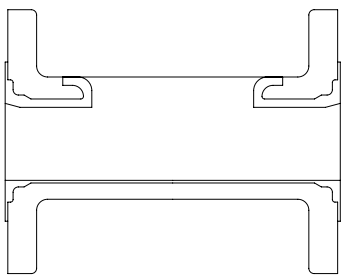
- Superior Flow Characteristics
- $^{3}/_{16}$" Minimum Lining Thickness
- Excellent Corrosion Resistance

ETFE
Suitable for strong acids and solvents. Compatible with a very broad range of chemicals under a wide range of conditions. Maximum temperature 225° F (107° C)[1]

Polypropylene
Especially suitable for organic solvents degreasing agents, excellent resistance to alkalines. Economically priced, poor resistance to Chlorinated solvents. Maximum temperature 200° F (93° C)[1]

FLANGED PLASTIC LINED

1"–8"	Tefzel® (Cl)	2829
1"–8"	Polypropylene (Cl)	2838
1"–8"	Tefzel® (Dl)	2859



[1]*Temperature may decrease dependent upon media, pressure and valve size.*

Straightway Valves

Rubber Lined

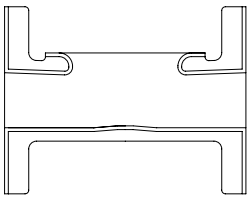
- 1/8" Minimum Lining Thickness
- Cast Iron or Ductile Iron available
- Excellent for slurries and abrasive applications

Neoprene
A synthetic base elastomer with some physical properties similar to natural rubber. Superior to natural rubber in resistance to heat, ozone, sunlight and oil. Typical applications include phosphoric acids; magnesium oxide and sodium hydroxide. Maximum temperature 200° F (93° C)[1]

Soft Rubber
Good resistance to most inorganic chemicals with the exception of strong oxidizing agents. Exhibits outstanding abrasion resistance. Typical applications include gypsum, flyash, titanium dioxide slurries and sewage. Maximum temperature 180° F (82° C)[1]

Hard Rubber
Better chemical and heat resistance than softrubber. Wide application in organic and inorganic ac ids and chlorine gas. Typical applications include potable water; oxidizing agents; plating solutions; salts; sludge and ferric chloride. Maximum temperature 200° F (93° C)[1]

Chlorobutyl
Good heat resistance. Unaffected by cold weather or rapid temperature changes. Typical applications include hydrofluoric acid, various zinc solutions and fertilizer solutions.Maximum temperature 200° F (93° C)[1]



FLANGED RUBBER LINED

CAST IRON

1"–12"	Neoprene #7	2831
1"–12"	Soft Rubber #5	2833
1"–12"	Hard Rubber #10	2834
1"–12"	Chlorobutyl #16	2836

DUCTILE IRON

1"–12"	Neoprene #7	2840
1"–12"	Soft Rubber #5	2841
1"–12"	Hard Rubber #10	2842

[1]Temperature may decrease dependent upon media, pressure and valve size.

Straightway Valves

Straightway Diaphragms

Grade	Material	Size	Temperature[1]	Typical Services
Grade SB	Black Butyl (FDA Compliant)	1–4"	0 to 200° F (-18 to 93° C)	Chemicals, stronger acids
Grade SE	EPDM (FDA Compliant)	1–12"	-20 to 225° F (-29 to 107° C)	Chemicals, acids, hi-temp, abrasives
Grade SP*	Buna N® NBR (FDA Compliant)	1–6"	10 to 180° F (-12 to 82° C)	Foods, oils
Grade SS	Natural Rubber	1–12"	-20 to 180° F (-29 to 82°C)	Water, abrasives
Grade ST	Neoprene®	1–12"	-10 to 180° F (-23 to 82° C)	Weak chemicals, air, oil

*2.5" not available

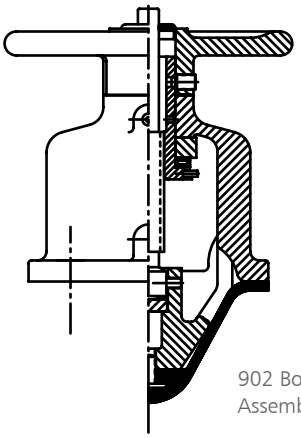
[1] Diaphragms at maximum temperature cannot be used satisfactorily at maximum pressures.

[2] Cast Iron, Ductile iron & Carbon Steel should not be used below -20 degrees F (-29 C)

Bonnet Assemblies for Straightway Manual Valves

Straightway bonnet assemblies include:

- Indicating Stem
- Bronze Bushing
- Lubrication Fitting
- Cast Iron Bonnet Shell Handwheel



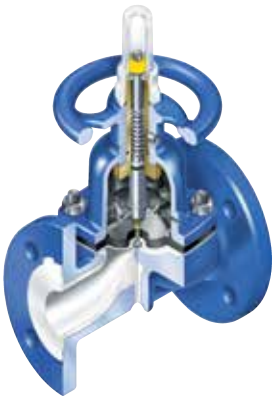
902 Bonnet Assembly

Manual Valve Bonnet Assembly Selections

O-Ring Sealed Bonnet
Provides a secondary seal which retains fluids or gases within the valve bonnet in the event of diaphragm failure. A standard sealed bonnet is recommended for hazardous materials which will not damage bonnet shell, bushing or spindle (stem). On corrosive fluids or gases, either non-sealed bonnets or in cases where the fluids or gases must be contained, more corrosion-resistant materials should be utilized. All sealed bonnets are provided with v-notch vent plugs to provide a safe and easy method of checking diaphragm integrity.

If a sealed bonnet is used and the bonnet assembly cannot handle the line media for a prolonged period of time, contact ITT for recommendations.

Handwheel Locking Device



Secures valve in position so that it may not be operated unless unlocked and disengaged.

Chain Wheel Operated
Uses standard sprocket rim, guide and chain. Available ½"–12", weir or straightway.

Extended Stem
Available in all sizes. Not available with solid plastic bodies.

Direct Loaded Bonnet
An economical approach to automatic on-off operation. Ideal for multi-valve panel operation of batching systems, water and waste treatment systems. Furnished with or without pilot solenoid utilizing pneumatic or hydraulic operation. Available in sizes ½"–3" for pressures up to 100 psi. Suitable for all standard weir body materials. See Actuator section for details.

Other Available Options
Bonnet Assemblies of:

- Stainless Steel
- Ductile Iron
- Bronze
- PAS (Polyarylsulfone) Plastic

Gear Boxes
Especially suitable for large size valves with high line pressures this accessory reduces the amount of force required to manually operate the valve.

Vacuum Preparation
Dia-Flo® diaphragm valves are capable of bubble-tight shut-off down to 0.1 micron. Elastomer or PTFE diaphragms may be used. The standard weir valve design with elastomer diaphragm is capable of in-leakage of less than 1×10^{-6} atmcc/sec, and on special order it can be furnished with a substantially lower in-leak rate.