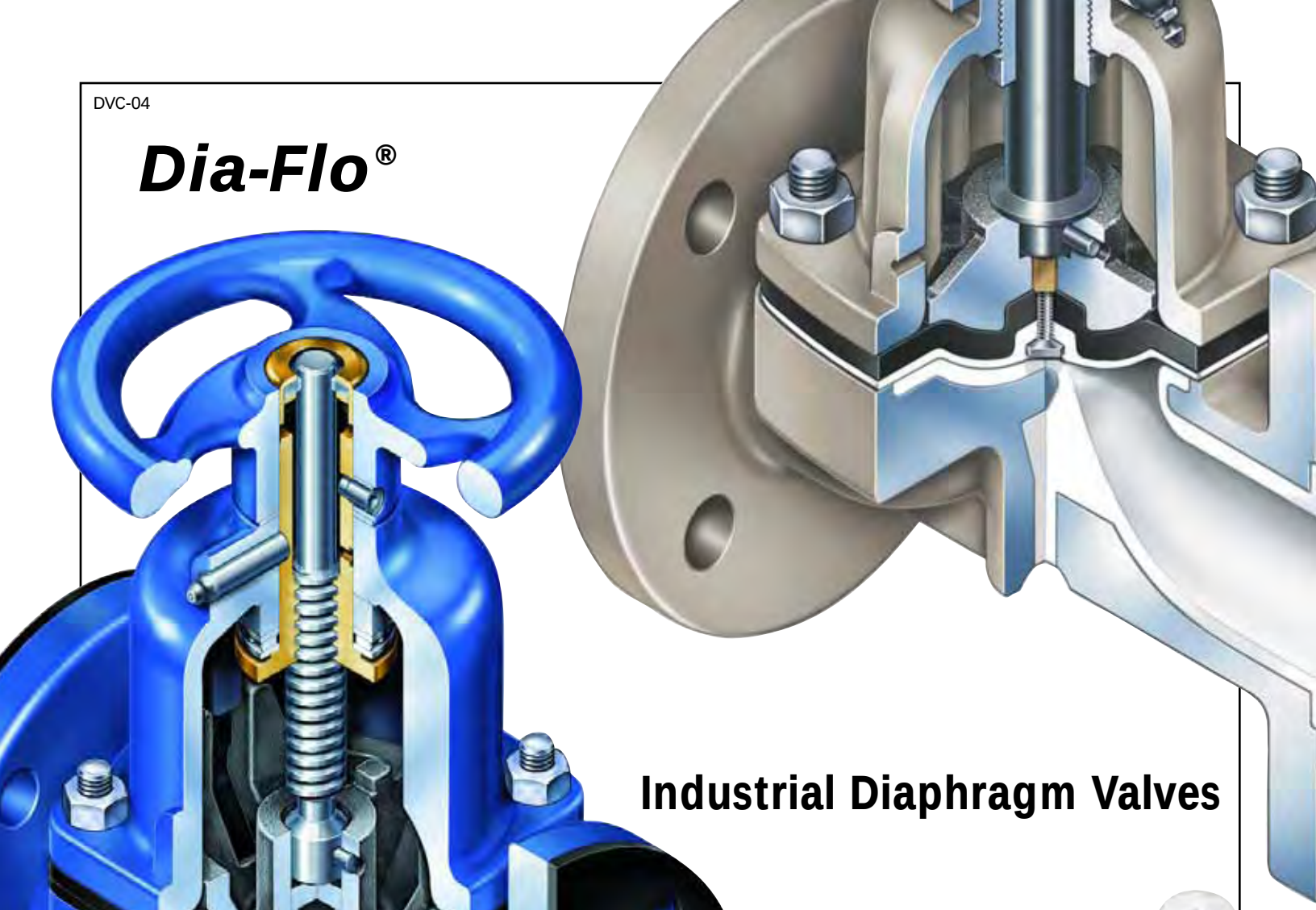
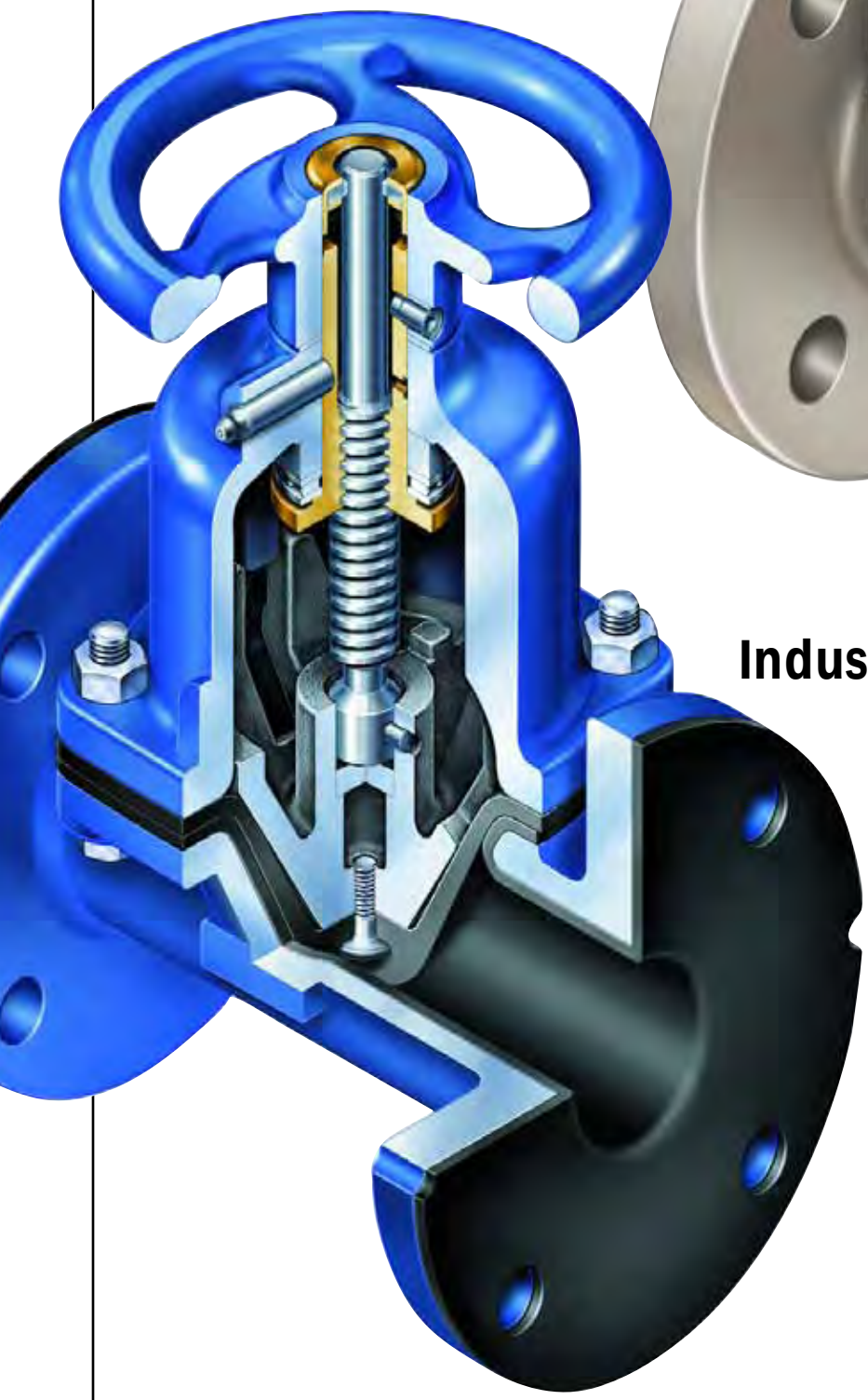
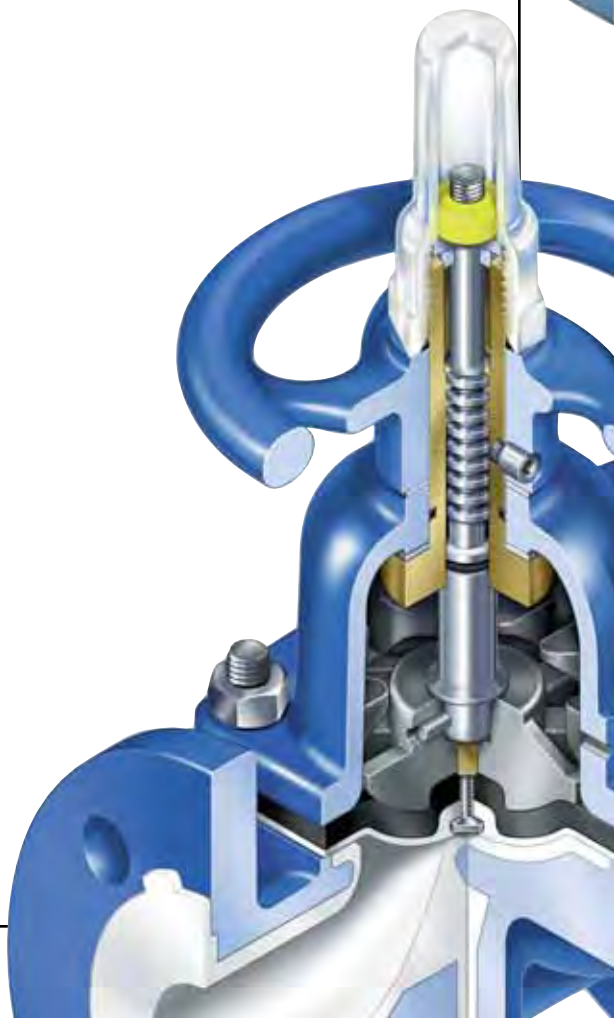
DVC-04

Dia-Flo®



Industrial Diaphragm Valves





ITT Industries

Engineered for life

DIA-FLO® DIAPHRAGM VALVES

Chemical: Dia-Flo Diaphragm Valves, available in a wide variety of metals, solid plastics, plastic, rubber and glass linings, are well suited to the handling of multiple chemical applications. Sulfuric acid, hydrochloric acid, hydrofluoric acid, and sodium hydroxide are typical applications handled by Dia-Flo Diaphragm Valves. The broad selection of body materials and diaphragms typically provides a chemically compatible and economical solution for almost any process system not exceeding 200 psi (13.8 bar) or 350ºF (177ºC)[1]. Available in weir and straightway designs, both manual or automated, the Dia-Flo Diaphragm Valve is capable of handling clear fluids as well as slurries.

Water Treatment: Dia-Flo Diaphragm Valves, due to their versatility in body and diaphragm materials, provide an economical solution for demineralizers, deionizers, reverse osmosis systems and filtration systems. The typical valves utilized in these systems are Dia-Flo Weir Diaphragm Valves with PP (Polypropylene) or Tefzel® ETFE lining, Teflon® PTFE or EPDM diaphragms with either manually operated or Dia-Flo pneumatically operated actuators. Typical accessories include limit switches, adjustable opening stops and handwheel opening devices.

Power: Dia-Flo Diaphragm Valves are used extensively in demineralizer systems, FGD (flue gas desulfurization) systems, chemical systems and radioactive waste handling systems. The typical valve selected by OEMs and end users for demineralizers are Dia-Flo Weir Diaphragm Valves with PP or Tefzel® ETFE lining, Teflon® PTFE or EPDM diaphragms with Dia-Flo pneumatic actuators and required accessories. FGD systems commonly utilize Dia-Flo Straightway Valves with rubber linings to handle abrasive and corrosive process media. The nuclear industry utilizes the Dia-Flo Diaphragm Valve manufactured in accordance with nuclear standards. ITT Engineered Valves Group maintains an "N" stamp.

Pulp & Paper: One of the largest industry users of chemicals, pulp and paper plants frequently utilize Dia-Flo Diaphragm Valves in water treatment, chemical, bleaching and coating processes. The Dia-Flo Straightway Valve is utilized for slurry services, such as titanium dioxide and lime mud. The Dia-Flo Weir Valve is utilized in clear fluid services typical of the water treatment, chemical handling and coating processes.

Mining:

Dia-Flo Diaphragm Valves, both weir and straightway, are installed in various process lines within gold, copper, zinc and phosphate mines. Common applications include chemical feed, process feed, metal refinery, and filter press lines. The Dia-Flo Straightway Diaphragm Valve, due to the unobstructed flow path and minimal cavities, is well suited for handling abrasive and corrosive slurry applications in line sizes 1/2" to 12". The chemical feed and process feed areas typically utilize clearer fluids and utilize the Dia-Flo Weir Diaphragm Valve.

Pharmaceutical and Bioprocessing:

Due to the streamlined flow path and minimal cavities, Pure-Flo® hygienic diaphragm valves minimize contamination and micro-organism growth in high purity water systems. Available in 316L stainless steel forged and cast bodies with either quick disconnect or buttweld end connections, the Pure-Flo diaphragm valve and Pure-Flo fabrications are designed to minimize contact surfaces, hold-up volume and space envelope. All contact materials are FDA compliant. Dia-Flo Weir Diaphragm Valves are commonly utilized on the chemical side of pharmaceutical manufacturing. Similar to the Pure-Flo hygienic diaphragm valve, Dia-Flo Diaphragm Valves are available in FDA compliant body and diaphragm materials. FDA compliant plastic linings, solid plastic and 316 stainless steel body materials are available.

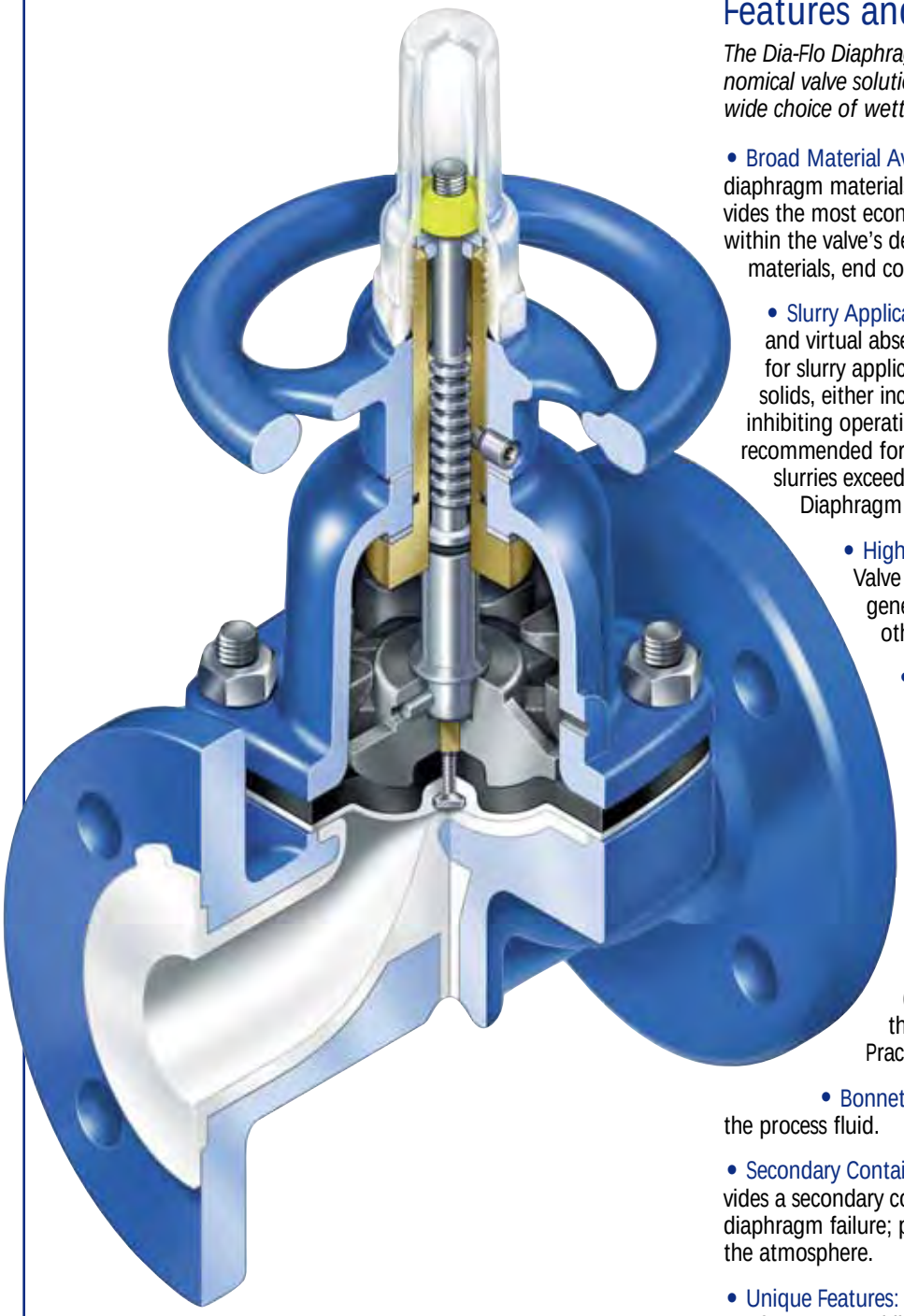
Electronics:

The stringent cleanliness requirements of the high purity water and high purity chemical systems in the semiconductor industry may be met with the Dia-Flo solid plastic weir diaphragm valve. Available in four solid plastic materials, including unpigmented grade 6000HD PVDF, the Dia-Flo Diaphragm Valve with a two-piece Teflon® PTFE diaphragm minimizes particle generation and entrapment.

1 These pressure/temperature limitations are not permissible at the same time. Consult the Dia-Flo Technical Manual for individual P/T limitations.

Table of Contents

DIA-FLO® WEIR DIAPHRAGM VALVES



Features and Benefits

The Dia-Flo Diaphragm Valve is typically one of the most economical valve solutions in chemical applications due to the wide choice of wetted materials.

• Broad Material Availability: Given the various body and diaphragm materials, the Dia-Flo Diaphragm Valve often provides the most economical solution for your process system, within the valve's design parameters. See page 15 for specific materials, end connections, and sizes.

• Slurry Applications: Due to the streamlined flow path and virtual absence of cavities, the diaphragm valve is ideal for slurry applications. Cavities within valves tend to entrap solids, either increasing the valve's operational torque or inhibiting operation. The Dia-Flo Weir Diaphragm Valve is recommended for slurries containing 15% or less solids. For slurries exceeding 15% solids, the Dia-Flo Straightway Diaphragm Valve is recommended.

• High Purity Applications: The Dia-Flo Diaphragm Valve is the proven selection to minimize particle generation and product entrapment inherent to other valve types.

• Corrosive Applications: A broad selection of plastic linings and PTFE diaphragms, coupled with our corrosion resistant coatings, provide an excellent barrier to chemical attack and corrosion. In addition to our standard blue primer coating, PVDF and white epoxy coatings are available.

• Bubble Tight Shut-off: Dia-Flo Weir Diaphragm Valves provide bubble tight shut-off from 0.1 micron to 200 psi line in accordance with MSS SP-88 (Manufacturers Standardization Society of the Valves and Fittings Industry, Inc. Standard Practice– Diaphragm Valves).

• Bonnet Isolation: Working parts are isolated from the process fluid.

• Secondary Containment: The optional sealed bonnet provides a secondary containment boundary in the case of diaphragm failure; preventing the process media from entering the atmosphere.

• Unique Features: Unique features which optimize the valve per-formance and life, varying by valve size are: adjustable travel stop, protective stem cap, o-ring sealed stem, bronze bushing, Line-Lok® for plastic lined valves, yellow position indicator, molded closed diaphragms, and PVDF corrosion resistant coating.

• Vacuum Applications: The diaphragm valve is capable of bubble-tight shut-off down to 0.1 micron. Elastomer or Teflon® PTFE diaphragms may be used. The in-leakage rate is less than 1 x 10^{-6} cc-atm/sec for elastomer diaphragms and can be less upon request.

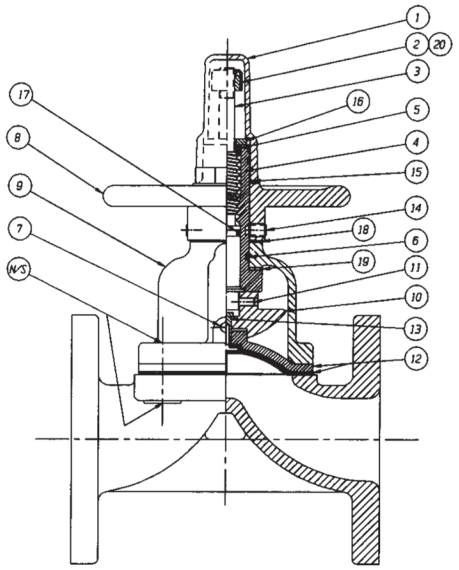
Common Applications

- Acids
- Caustics
- High purity chemicals
- Agricultural chemicals
- Demineralizer systems
- Plastics manufacturing
- Flue Gas Desulfurization (FGD)
  – Mist eliminator
  – Recycled water
- Rubber manufacturing
- Chlorine manufacturing

Materials

PARTS			
Item	**Description**	**Material**	**Quantity**
1	Protective Cap	Acrylic or Polysulfone*	1
2	Adjustable Travel Stop	Steel, Stainless Steel*	1
3	Stem	Steel, Stainless Steel*	1
4	Bushing	Bronze, Stainless Steel*	1
5	Seal, Wiper	Polyolefin Foam, FKM*	1
6	O-Ring**	Buna N, EPDM*, FKM*	1
7	V-Notch Vent Plug	Stainless Steel	AR
8	Handwheel	Cast Iron or PAS, Stainless Steel*, Bronze*, PP†	1
9	Bonnet	Cast Iron, Ductile Iron*, PAS†, PP†, Stainless Steel*, Bronze*	1
10	Compressor	Cast Iron or Zinc, Bronze*, PVDF Coated Cast Iron*	1
11	Spirol Pin	Stainless Steel	1
12	Diaphragm**	Elastomer, PTFE	1
13	Tube Nut	Brass, Stainless Steel*	AR
14	Set Screw	Stainless Steel	SD
15	O-Ring**	Buna N, EPDM*, FKM*	1
16	Thrust Washer	Steel, Stainless Steel*	1
17	O-Ring**	Buna N, EPDM*, FKM*	1
18	Washer, Shim	Polyethylene	AR
19	Bearing, Thrust	Carbon Steel	1
20	Cap, Indicating	Vinyl	1
N/S	Bolting & Nuts	Steel, Stainless Steel*	SD

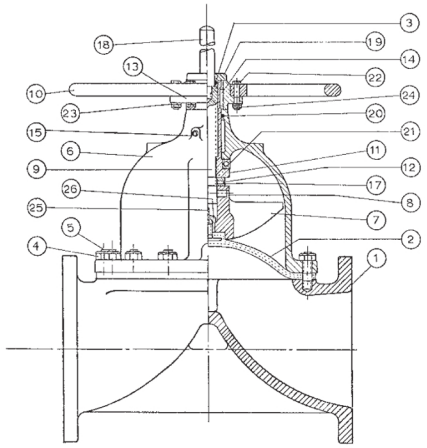
*Optional materials. †Solid plastic body only. AR—As required SD—Size dependent **Recommended spare parts.



903 Bonnet
1/2" through 4" standard
Consult factory for 6"

PARTS			
Item	**Description**	**Material**	**Quantity**
1	Body Flange	Various	1
2	Diaphragm**	Elastomer, PTFE	1
3	O-Ring**	Buna N	1
4	Nuts	Steel	14
5	Studs	Steel	14
6	Bonnet	Cast Iron	1
7	Compressor	Cast Iron	1
8	Pin	Stainless Steel	1
9	Spindle	Steel	1
10	Handwheel	Cast Iron	1
11	Bushing	Brass	1
12	Screw, set	Steel	1
13	Hub, Handwheel	Cast Iron	1
14	Key, Handwheel	Steel	1
15	Fitting Lube	Steel	1
17	Collar, Stop	Steel	1
18	Spindle, Extension, Ind.	Stainless Steel	1
19	Nut, Bushing	Brass	1
20	O-Ring**†	Elastomer	1
21	Bearing, Ball Thrust	Steel	1
22	Bolt	Steel	6
23	Lockwasher	Steel	6
24	Nut	Steel	6
25	Key, Tube Nut	Brass	1
26	Nut, Tube	Brass	1

**Recommended spare parts. †For sealed bonnet only.



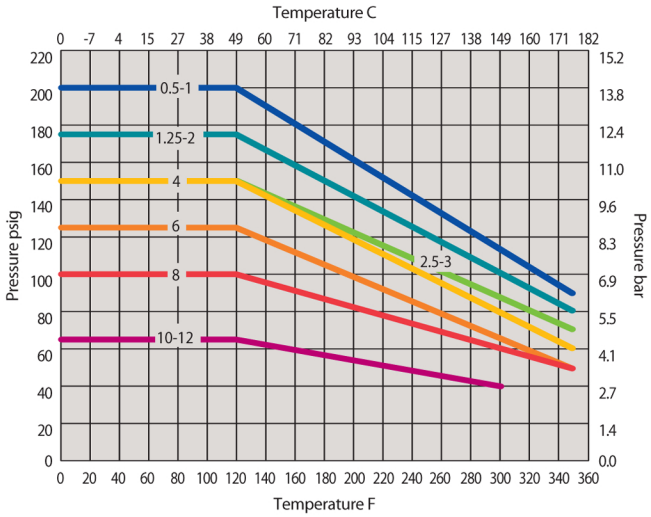
902 Bonnet
6" through 12" standard

Cv Values

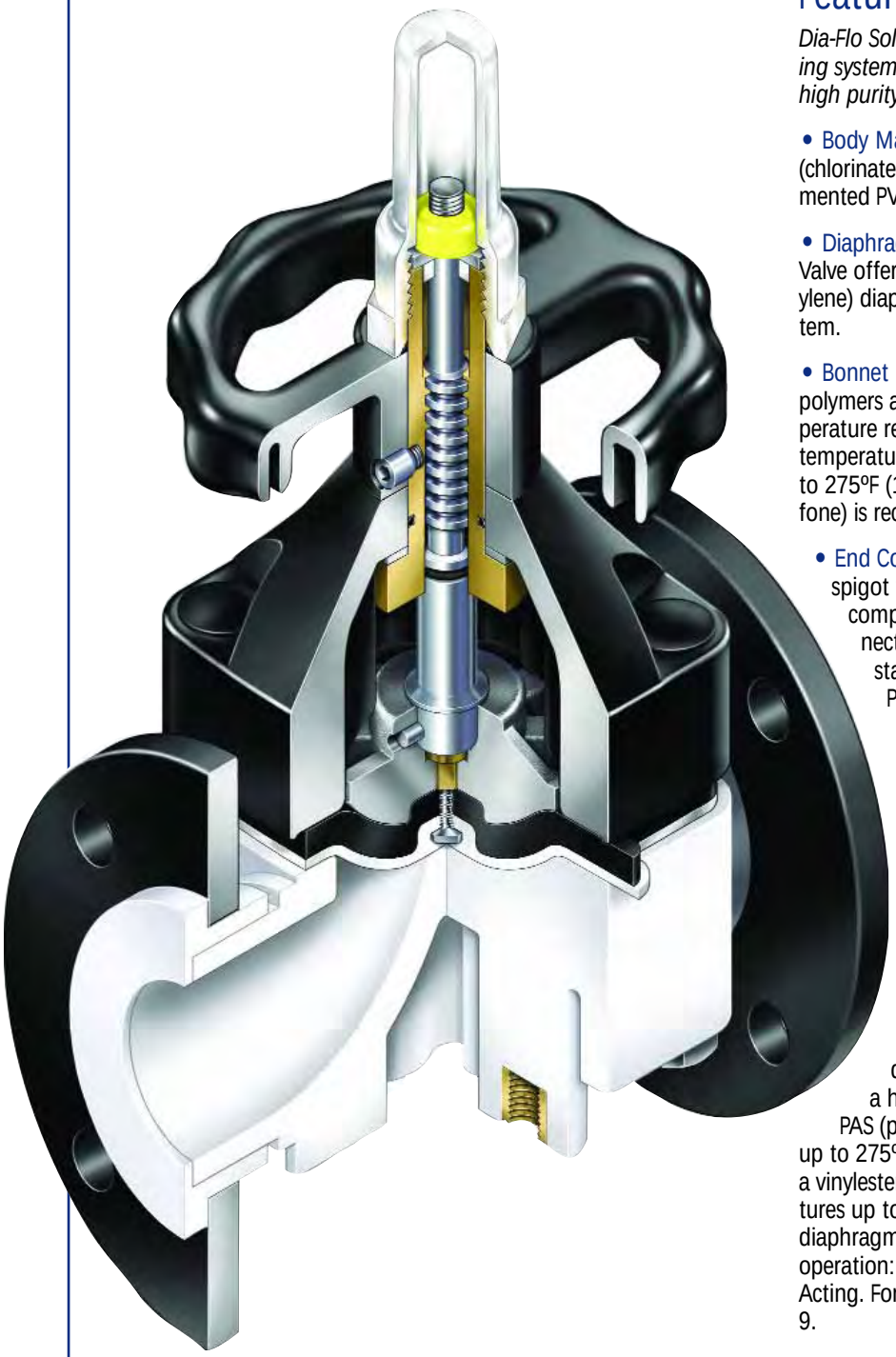
WEIR VALVE Cv RATINGS (100% OPEN)													
Item	**½**	**¾**	**1**	**1¼**	**1½**	**2**	**2½**	**3**	**4**	**6**	**8**	**10**	**12**
Flanged Unlined	5.5	22	22	56	56	70	160	190	310	600	1200	1800	2550
Flanged Plastic Lined	—	10	10	38	38	67	100	175	285	690	1070	—	—
Flanged PFA Lined	—	—	12	—	34	61	—	150	365	738	—	—	—
Flanged Hard Rubber Lined	4.0	10	10	31	31	55	115	160	260	625	1150	1750	2350
Flanged Soft Rubber Lined	2.0	7.0	7.0	25	25	50	110	155	250	515	1150	1750	2350
Flanged Glass Lined	5.5	22	22	53	53	78	180	250	420	850	1700	—	—
Screwed End	4.4	10	19	48	48	70	95	172	—	—	—	—	—
Butt Weld	3.5	7.5	18.6	—	48	70	95	180	400	600*	1200*	—	—

*Data is based on estimates.

PT Curve



DIA-FLO® SOLID PLASTIC DIAPHRAGM VALVES



Features and Benefits

Dia-Flo Solid Plastic Diaphragm Valves, ideal for solid plastic piping systems in sizes 1/2" - 4", are process proven in chemical and high purity applications.

- Body Materials: Available in PVC (polyvinyl chloride), CPVC (chlorinated polyvinyl chloride), PP (polypropylene) and unpigmented PVDF (polyvinylidiene fluoride).

- Diaphragm Materials: Identical to the Dia-Flo Weir Diaphragm Valve offering, elastomeric and PTFE (polymerized tetrafluoroethylene) diaphragms are available to suit almost any process system.

- Bonnet Materials: Two bonnets molded from glass reinforced polymers are available to provide the most economical and temperature resistant solution. PP is the economical solution for line temperatures up to 200ºF (93ºC). For higher line temperatures up to 275ºF (135ºC), the thermoplastic material, PAS (polyarylsulfone) is recommended.

- End Connections: Available in flanged, threaded, socket and spigot weld end connections. Flanged end connections are compliant with ANSI 150# dimensions. Threaded end connections are compliant with NPT (National Pipe Thread) standards. Socket weld end connections are schedule 80. PVC and CPVC spigot weld end connections are schedule 80. PP and PVDF spigot weld end connections meet DIN SDR 11 dimensions.

- Increased Flange Strength: PP and PVDF bodies feature PVDF-coated steel flanges for increased mechanical strength and sealing properties. This is especially advantageous in fiberglass-reinforced plastic piping systems and thermocycling services.

- Actuation: The solid plastic Advantage® Actuator and standard Dia-Flo actuator are both available with the solid plastic diaphragm valve. The Advantage Actuator provides a lightweight, compact, durable solution. The 1/2" - 2" actuator is molded from a high-strength, glass-reinforced thermoplastic polymer, PAS (polyarylsulfone) capable of maximum line temperatures up to 275ºF (135ºC). In sizes 3" - 4", the actuator is molded from a vinylester thermoset plastic capable of maximum line temperatures up to 275ºF (135ºC). Pneumatically operated and diaphragm driven, the actuators are available in three modes of operation: Failed Closed (Reverse), Fail Open (Direct) and Double Acting. For details on the Dia-Flo Actuator, refer to pages 8 and 9.

- Actuator Accessories: Adjustable travel stops, adjustable opening stops, manual overrides, limit switches and positioners are available to meet your process needs. Limit switches, both mechanical and proximity, are available in designs compliant with NEMA (4, 4X, 7, 9) and NEC (Class I, Division 1 and 2). For control applications, the Advantage Actuator with Moore Products positioner is available in sizes 3/4" through 4".

- Size: The Dia-Flo Solid Plastic Diaphragm Valve is available in sizes 1/2"- 4". See page 15 for specific material, end connection and size availability.

Common Applications

- High purity water systems
- High purity chemical systems
- General chemicals
  - Hydrochloric acid
  - Sulfuric acid

Materials

PARTS			
Item	**Description**	**Material**	**Quantity**
1	Bonnet	Polypropylene	1
2	Handwheel	Polypropylene	1
3	Cap	Acrylic, Clear	1
4	Spindle	Carbon Steel	1
5	Bushing	Brass	1
6	Compressor	Zinc	1
7	Diaphragm*	As Specified	1
8	Bearing, Thrust	Carbon Steel	1
9	Washer, Shim	Polyethylene	AR
10	Seal, Wiper	Polyolefin Foam	1
11	Pin, Spirol	Stainless Steel	1
12	Scr., Set Hex Sdc.	Stainless Steel	SD
13	Scr., Hex Hd. Cap	Stainless Steel	SD
14	Washer, Plain	Stainless Steel	SD
15	Washer	Stainless Steel	1
16	Adjustable Travel Stop	Stainless Steel	1
17	Nut, Hex	Stainless Steel	SD
18	Cap	Silicone	SD
19	O-Ring*, (Spindle)	Buna N	1
20	O-Ring*, (Cap)	Buna N	1
21	O-Ring*, (Bushing)	Buna N	1
22	Body	PP, PVDF, CPVC, & PVC	1

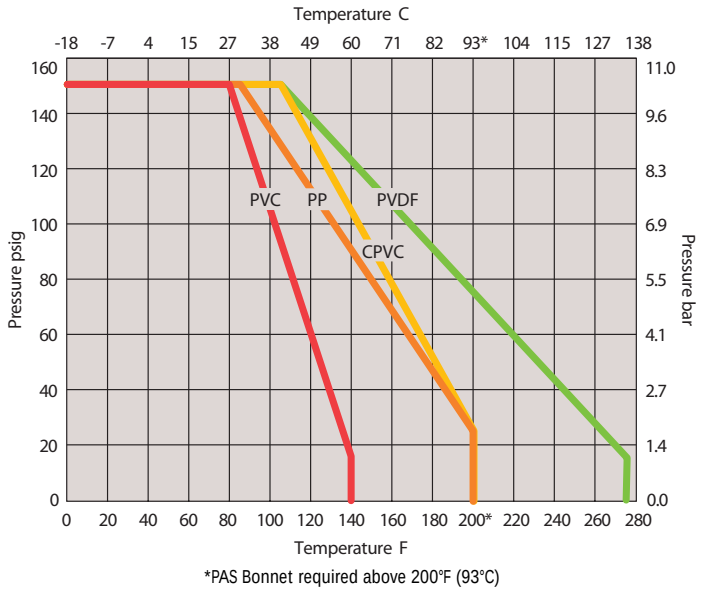
*Recommended spare parts. SD—Size Dependent

BODY MATERIAL SPECIFICATIONS				
Specification	**PVC**	**CPVC**	**PP**	**PVDF**
ASTM	D1784	D1784	D4101	D3222
Grade	12454A	23547B	Homopolymer	Homopolymer
FDA CFR Title 21	—	—	177.1520	177.2510

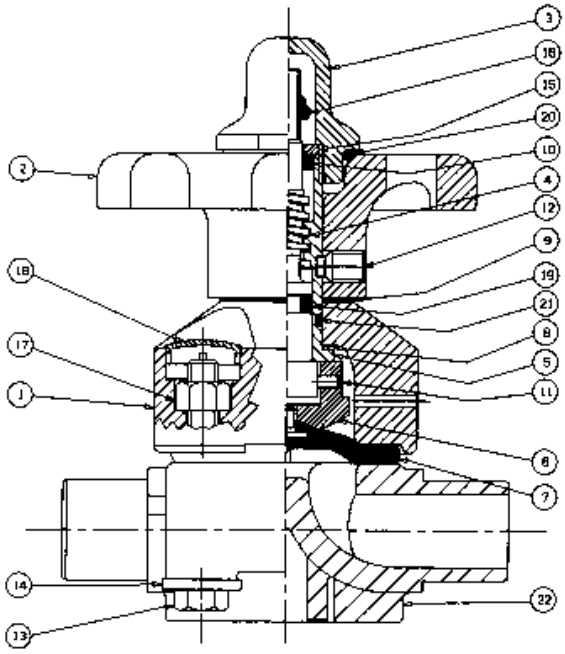
Cv Values

SOLID PLASTIC VALVE Cv RATINGS								
% Open	**½**	**¾**	**1**	**1¼**	**1½**	**2**	**3**	**4**
100	3.60	8.70	15.80	28.40	31.50	65.50	125	185

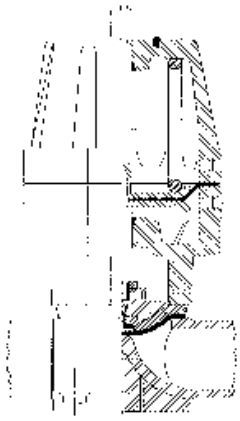
PT Curve



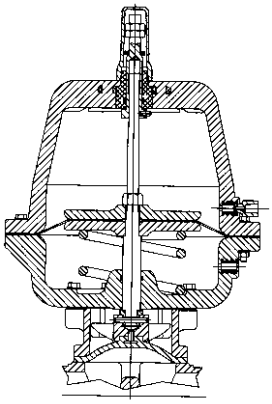
*PAS Bonnet required above 200°F (93°C)



1/2" through 4"

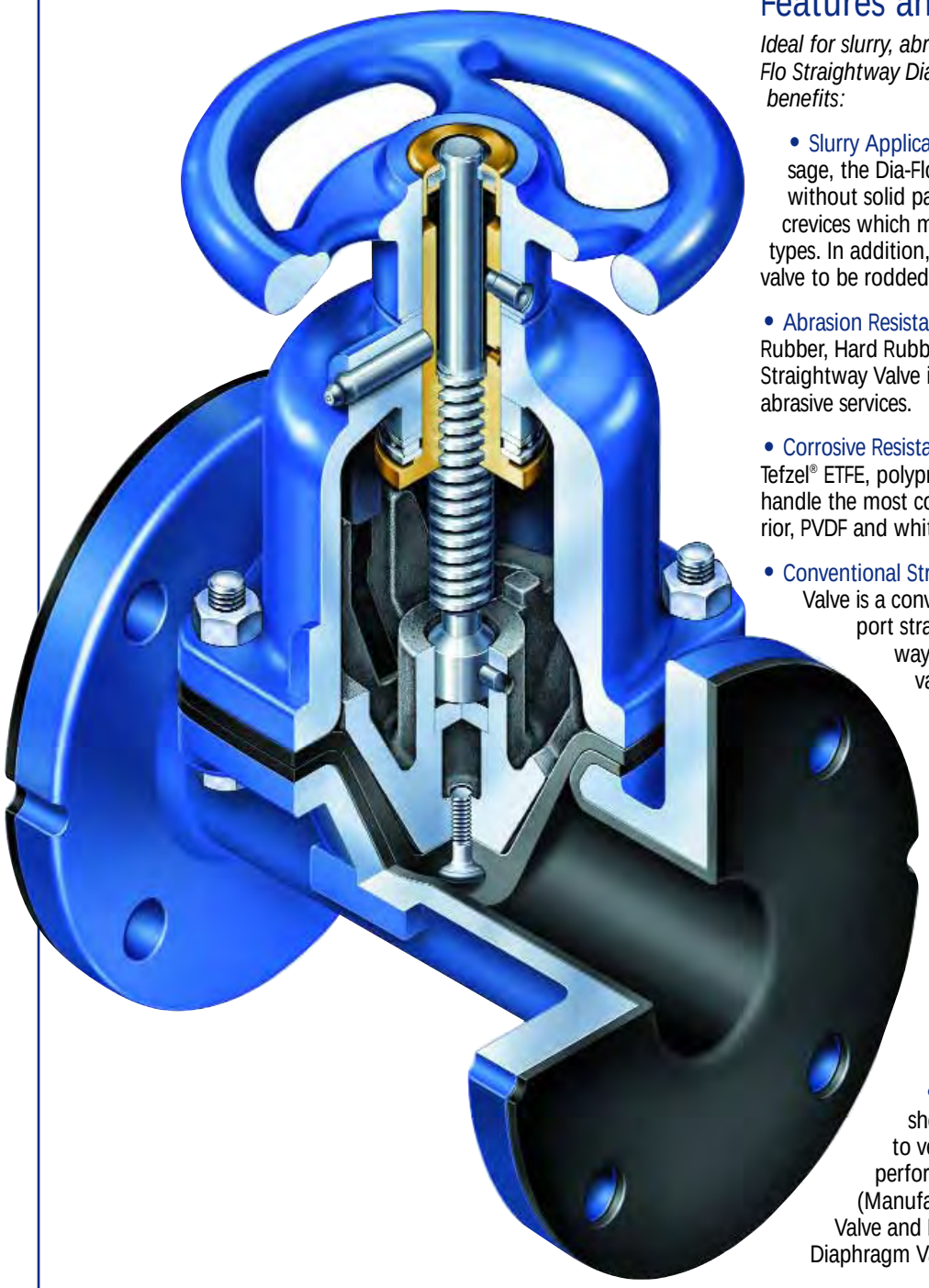


Advantage Actuator 1/2" through 2"
(Fail Closed Shown)



Advantage Actuator 3" and 4"
(Fail Open Shown)

DIA-FLO® STRAIGHTWAY DIAPHRAGM 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 fluid passage, 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 five rubber linings: Soft Rubber, Hard Rubber, Neoprene®, Hypalon® and Butyl, the Straightway Valve is well suited to handling corrosive and abrasive services.

- Corrosive Resistant: In addition to the rubber linings, Tefzel® ETFE, polypropylene, and glass 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.

- Bonnet Isolation: Similar to the weir valve, the working parts of the bonnet are completely isolated from the process media. Thus, in slurry or corrosive applications, the media can not adversely affect the operation of the valve internals, by either clogging or corroding them.

- Bubble-Tight Shut-Off: 100% seat and shell testing is performed on every assembly to verify bubble-tight shut-off. Testing is performed in accordance with MSS SP-88 (Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., Standard Practice - Diaphragm Valves).

- Valve Options: Adjustable travel stop, sealed bonnet, alternate materials, alternate coatings and chainwheel operated are options that can be specified with a manual valve. For valve automation refer to pages 8 and 9.

- Sizes: Rubber-lined bodies are available in sizes 1"–12". Metal flanged end bodies are available in 1/2"–12". Plastic and glass lined bodies are available in 1"–8". Screwed metal bodies are available in 1/2"–2". Refer to page 18 for material details.

Common Applications

- Titanium dioxide (TiO_2)
- Flue Gas Desulfurization (FGD)
- Fly ash
- Limestone slurry
- Fertilizers: phosphate, anhydrous ammonia
- Slurry services
- Abrasive services

Cv Values

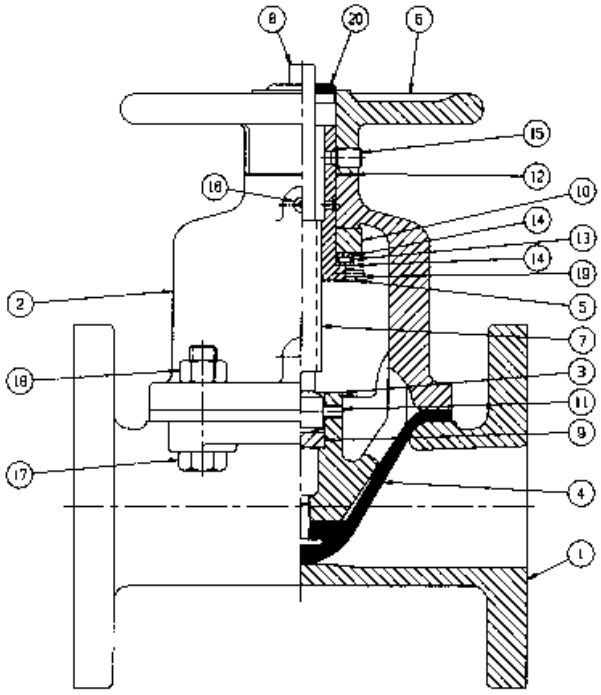
STRAIGHTWAY VALVE Cv RATINGS (100% OPEN)											
Item	½	1	1½	2	2½	3	4	6	8	10	12
Flanged Unlined	11	60	115	275	450	525	700	2250	4250	5000	5000
Flanged Plastic Lined	—	24	80	209	—	370	569	1400	2644**	—	—
Flanged Hard* Rubber Lined	—	55	130	260	365	460	700	1800	3500	4850	4850
Flanged Soft* Rubber Lined	—	42	79	220	365	460	700	1800	3500	4850	4850
Flanged Glass Lined	—	48	100	270	425	475	700	1950	4400	—	—
Screwed End	15	39	120	265	—	—	—	—	—	—	—

*Note: Flanged Soft Rubber = soft natural rubber, Neoprene®, Hypalon® and Butyl linings.
Flanged Hard Rubber = hard natural rubber lining.
**Note: Data is based on estimates.

Materials

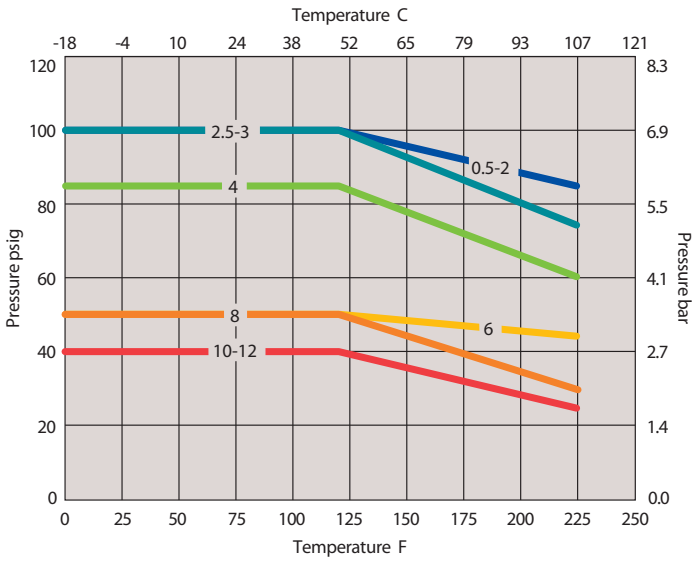
PARTS			
Item	Description	Material	Quantity
1	Body Flanged	Cast Iron	1
2	Bonnet	Cast Iron	1
3	Compressor	Cast iron	1
4	Diaphragm	Elastomer	1
5	Bushing	Brass	1
6	Handwheel	Cast Iron	1
7	Spindle	Steel	1
8	Spindle, Extension (indicating)	Stainless Steel	1
9	Insert	Steel	1
10	Spacer	Steel	1
11	Pin, Spirol	Stainless Steel	1
12	Washer, Shim	Polyethylene	AR
13	Bearing, Thrust Needle	Steel	1
14	Bearing, Thrust Race	Steel	2
15	Screw, Set Hex. Soc.	Steel	2
16	Fitting, Lube	Steel	1
17	Screw, Hex, Ho, Cp	Steel	SD
18	Nut, Hex.	Steel	SD
19	Pin, Spirol	Stainless Steel	1
20	Capseal	Brass	1

AR—As Required SD—Size Dependent

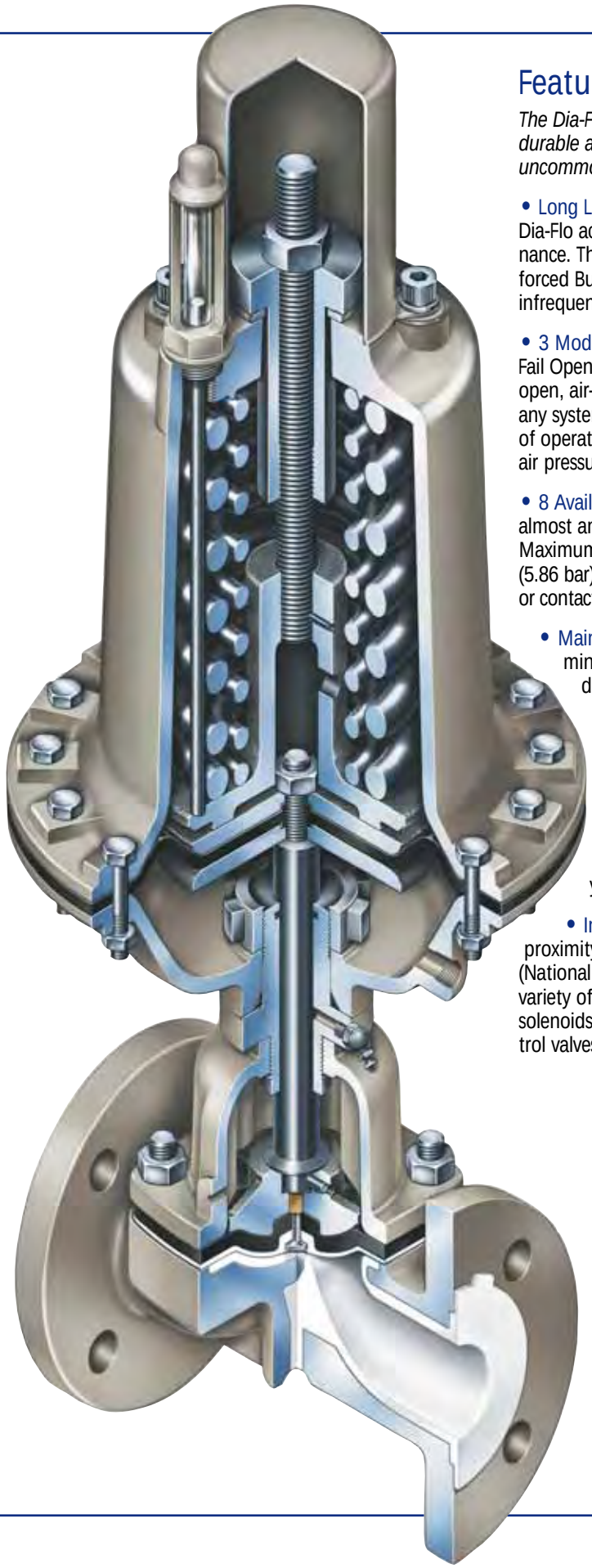


Standard 902 bonnet is shown.
903 bonnet features an extended stem and travel stop.

PT Curve



DIA-FLO® ACTUATED DIAPHRAGM VALVES



Features and Benefits

The Dia-Flo Actuator has been field tested and proven to be durable and long lasting. More than 20 years of service is not uncommon.

• Long Lasting: Pneumatically operated and diaphragm driven, the Dia-Flo actuator provides long service life with minimal maintenance. The actuator wear parts are limited to only the nylon-reinforced Buna N® diaphragm and Buna N® o-rings which require infrequent replacement.

• 3 Modes of Operation: Fail Closed (spring-to-close, air-to-open), Fail Open (spring-to-open, air-to-close) and Double Acting (air-to-open, air-to-close) models are available to accommodate almost any system design. Fail Closed, the most frequently ordered mode of operation, assures a bubble-tight shut-off in the case of supply air pressure loss.

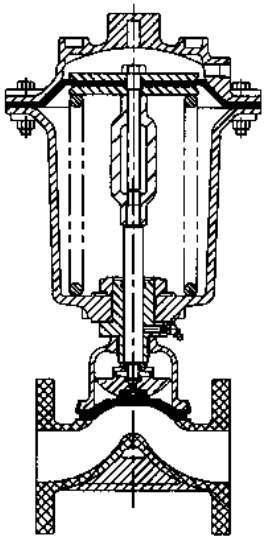
• 8 Available Sizes: The wide selection of sizes accommodates almost any combination of line pressure and supply pressure. Maximum supply pressure, either pneumatic or hydraulic is 85 psig (5.86 bar). For actuator sizing, refer to our Dia-Flo Technical Manual or contact your local distributor or Technical Sales Representative.

• Maintenance: Maintenance of the Dia-Flo actuator is typically minimal, requiring only periodic lubrication and occasional diaphragm and o-ring replacement.

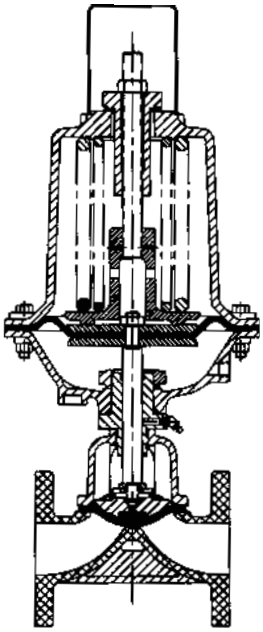
• Corrosion Resistance: PVDF and white epoxy coatings are available to protect the actuator and valve assembly from hazardous environments.

• Mechanical Accessories: Adjustable opening stops, adjustable travel stops, manual overrides, position indicators and yoke mountings are available to meet your processing requirements.

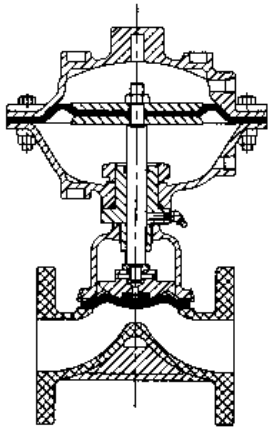
• Instrumentation: Limit switches, both mechanical and proximity, capable of meeting Nema 4, 4X, 7, 9, 13 and NEC (National Electrical Code) Class I, Division 1 and 2 are available in a variety of choices to meet your system requirements. In addition, solenoids, air filter regulators, transducers, positioners, speed control valves and snap-acting relays may also be factory mounted.



Direct Acting 3100 Series
Fail Open



Reverse Acting 3200 Series
Fail Closed

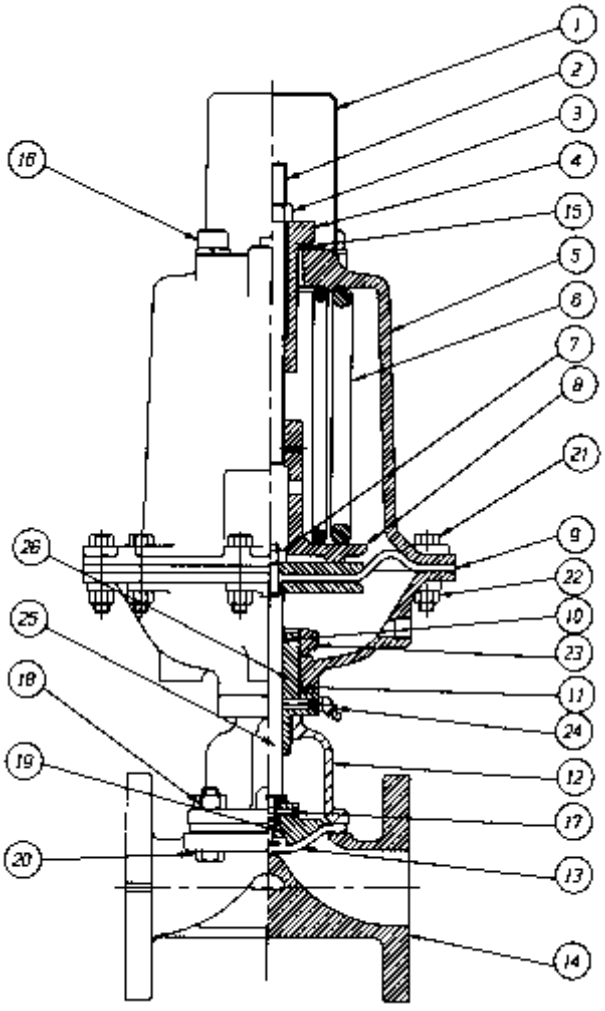


Double Acting 3300 Series

Materials

PARTS			
Item	**Description**	**Material**	**Quantity**
1	Safety Cap	Steel	1
2	Spring Rod	Steel	1
3	Jam Nut	Steel	1
4	Travel Stop	Steel	1
5	Top Cover	Aluminum, Ductile Iron*	1
6	Springs	Steel	AR
7	Spindle Nut	Steel	1
8	Spring Seat	Cast Iron	1
9	Actuator Diaphragm	Buna N	1
10	O-Ring	Buna N, EPDM*, FKM*	1
11	O-Ring	Buna N	1
12	Bonnet Assembly	—	1
13	Diaphragm	Elastomer, FKM*, PTFE*	1
14	Body	Cast Iron, Ductile Iron, Stainless Steel, Steel	1
15	Thrust Washer	Steel	1
16	Cap Screw	Steel	2
17	Spirol Pin	Stainless Steel	1
18	Nut	Steel, Stainless Steel*	SD
19	Compressor	Zinc, Cast Iron, Bronze*	1
20	Bolt	Steel, Stainless Steel*	SD
21	Bolt	Steel, Stainless Steel*	SD
22	Nut	Steel, Stainless Steel*	SD
23	Nut	Steel	1
24	Lube Fitting	Steel	1
25	Spindle	Steel, Stainless Steel*	1
26	Bushing	Steel, Stainless Steel*	1

* Optional material AR—As Required SD—Size Dependent



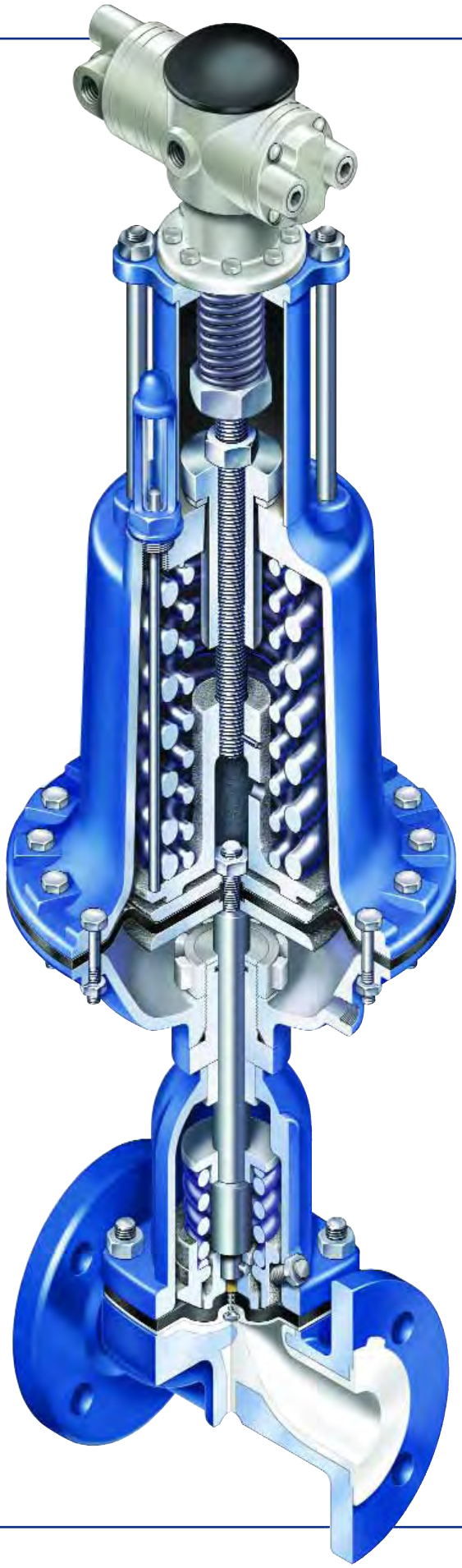
Cv Values & PT Curve

For Cv Values and P/T limitations, please refer to body types:

— Weir Diaphragm Valve pages 2-3
— Solid Plastic Diaphragm Valve pages 4-5
— Straightway Diaphragm Valve pages 6-7

Maximum housing pressure is 85 psig

DIA-FLO® DUALRANGE® CONTROL VALVE



Features and Benefits

The Dualrange Control Valve combines the standard features of the weir diaphragm valve with increased rangeability. Utilizing a unique two-piece compressor design, the Dualrange Control Valve has greater rangeability and controllability than typical diaphragm valves. Notable applications and benefits are as follows:

- Control: The unique bonnet design encompasses two nested compressors as opposed to one utilized in conventional diaphragm valves. The individual movement of each compressor allows an increase in rangeability over conventional diaphragm valves. When an increase in flow is desired, the inner compressor moves completely upward, followed by the outer compressor. This dual movement allows greater variance in the flow path cross-sectional area, which directly corresponds to greater variances in flow. Hence increased controllability is achieved.

- Cleanability: The streamlined flow path allows the control of high purity services while still maintaining stringent cleanliness requirements.

- Slurries and Abrasives: Given the relative absence of cavities and crevices, the Dualrange Control Valve is ideal for controlling slurries up to 15% in solid concentration.

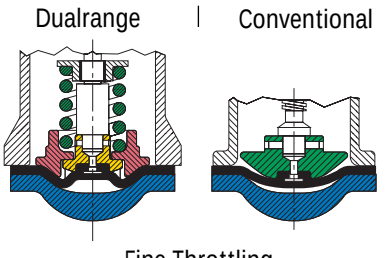
- Positioners: The ITT Conoflow and Moore Products positioners are available as standard with the Dualrange Control Valve. Other positioners are available upon request.

- Maintenance: The Dualrange utilizes standard Dia-Flo actuators and weir diaphragms. Therefore, part interchangability and maintenance are standardized. Typically, only periodic lubrication and diaphragm and o-ring replacement are required.

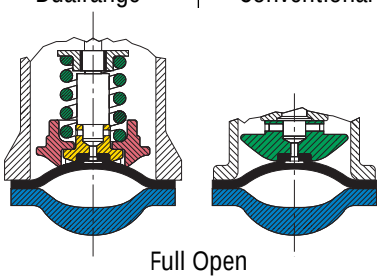
- Control Valve Sizing: To optimize the desired control within your system parameters, please contact us to perform sizing calculations and offer valve recommendations.

- Sizes: The Dualrange is available with all weir style bodies and diaphragms in sizes 1" - 6".

Dualrange® vs Conventional Weir Valve



Fine Throttling



Full Open

Cv Values

FLANGED UNLINED							
% open	¾–1	1½	2	2½	3	4	6
10	1.0	2.0	4.0	8.0	14	24	65
20	3.2	8.0	9.0	18	27	47	125
30	5.2	14	14	28	42	70	255
40	7.4	21	19	52	68	130	365
50	9.4	33	33	78	97	185	445
60	13	43	50	105	120	245	515
70	18	50	62	130	145	275	550
80	21	52	69	150	160	295	570
90	22	54	70	160	175	305	590
100	22	56	70	160	190	310	600

FLANGED SOFT RUBBER LINED							
% open	¾–1	1½	2	2½	3	4	6
10	0.5	3.0	3.5	6.0	12	22	65
20	1.6	8.0	10	15	26	41	125
30	3.2	14	17	25	39	60	250
40	5.5	20	23	47	55	105	350
50	6.2	29	33	76	77	155	405
60	6.9	28	47	95	99	195	450
70	7.1	26	54	105	120	220	485
80	7.2	26	54	110	135	240	505
90	7.1	25	52	110	145	245	510
100	7.0	25	50	110	155	250	515

FLANGED PLASTIC LINED							
% open	¾–1	1½	2	2½	3	4	6
10	1.0	3.0	4.5	7.0	16	20	70
20	2.8	8.0	11	17	34	55	145
30	4.7	13	16	28	52	80	280
40	6.6	21	27	50	84	125	430
50	8.2	32	43	75	125	190	540
60	9.5	37	60	88	150	240	610
70	10	38	68	97	160	270	655
80	11	39	69	100	170	285	680
90	10	38	69	100	175	290	690
100	10	38	67	100	175	285	690

FLANGED GLASS LINED							
% open	¾–1	1½	2	2½	3	4	6
10	1.4	3.0	3.0	8.0	12	24	98
20	3.8	9.0	9.0	18	32	50	190
30	6.2	16	17	28	48	77	370
40	8.6	26	25	56	84	145	520
50	12	40	40	85	135	210	640
60	18	51	62	115	185	270	750
70	22	54	75	140	220	335	805
80	22	55	82	155	240	395	835
90	22	54	82	180	245	415	845
100	22	53	78	180	250	420	850

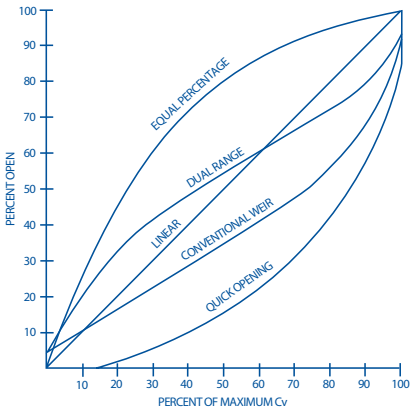
FLANGED HARD RUBBER LINED							
% open	¾–1	1½	2	2½	3	4	6
10	0.5	3.5	6.0	10	12	25	65
20	3.0	10	12	20	26	50	130
30	5.9	16	17	30	40	71	275
40	8.3	26	22	49	57	130	430
50	10	29	37	65	84	190	530
60	11	29	51	84	110	230	570
70	11	30	60	96	125	245	590
80	11	30	60	105	145	250	620
90	10	31	59	110	155	260	625
100	10	31	55	115	160	260	625

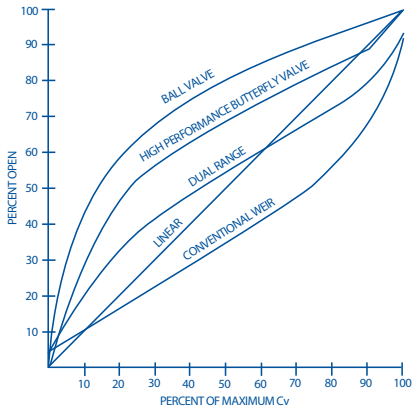
FLANGED END - PFA LINED - DUALRANGE						
% open	1	1½	2	3	4	6
10	0.3	2	4	8	11	45
20	1.0	6	12	26	32	106
30	1.8	10	20	47	59	215
40	3.9	19	25	88	107	407
50	6.6	24	34	101	181	525
60	9.5	28	49	124	262	625
70	10	29	59	134	302	670
80	11	31	60	141	330	698
90	11	32	60	147	356	728
100	12	34	61	150	365	738

SOLID PLASTIC*						
% open	1	1¼	1½	2	3	4
10	0.26	0.40	0.60	2.00	7.90	11.10
20	1.19	1.40	3.22	4.27	17.00	21.90
30	2.17	3.43	5.60	8.60	29.00	36.90
40	3.12	6.08	8.28	14.63	44.50	57.50
50	6.09	12.12	15.78	28.71	75.00	94.30
60	10.24	20.24	25.20	45.60	102.00	117.00
70	13.44	24.82	29.61	56.40	117.00	135.00
80	15.20	27.10	31.50	62.60	125.00	150.50
90	15.80	27.70	31.50	64.00	126.00	161.00
100	15.80	28.40	31.50	65.50	126.00	170.00

Cv values are expressed in gpm per 1 psi pressure drop.
*These values, with the exception of the 3" and 4" columns, are based on engineering estimates and not actual test data.

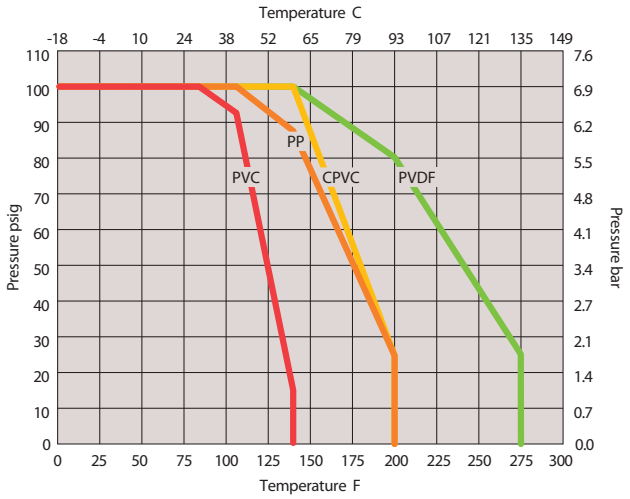
Valve Flow Characteristics



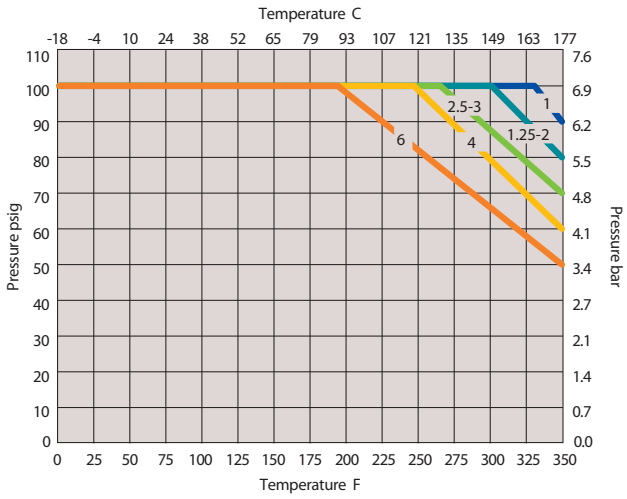


PT Curves

Solid Plastic Body with Dualrange Actuator



Weir Body with Dualrange Actuator



DIA-FLO® DIAPHRAGMS

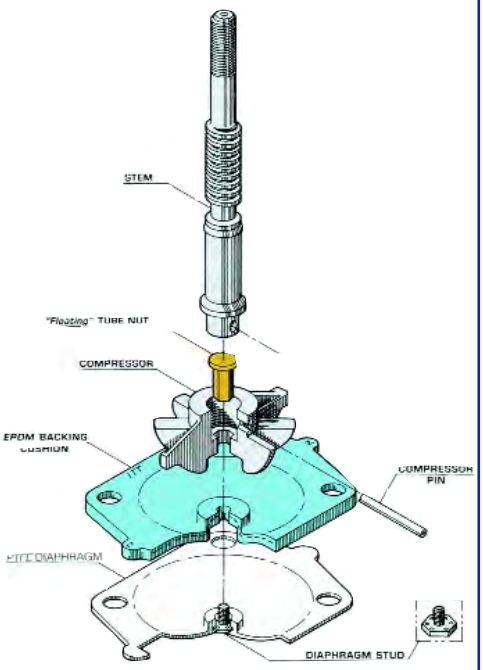
WEIR DIAPHRAGMS

Grade	Material (FDA Compliant)	Size	Temperature	Durometer
Grade B	Black Butyl (FDA Compliant)	1/2-12"	-20 to 250°F (-29 to 121°C)	A 65-75
Grade W1	White Butyl (FDA Compliant)	1/2-6"	0 to 225°F (-18 to 107°C)	A 65-75
Grade 17	EPDM (FDA Compliant)	1/2-4"	-30 to 300°F (-34 to 149°C)	A 65-75
Grade M	EPDM	1/2-12"	-30 to 300°F (-34 to 149°C)	A 60-70
Grade A	Soft Natural Rubber (FDA Compliant)	1/2-4"	-20 to 160°F (-29 to 71°C)	Faceside A 45-55 Backside A 60-70
Grade C	Hypalon® CSM	1/2-12"	0 to 225°F (-18 to 107°C)	A 65-75
Grade S	Natural Rubber	1/2-10"	-30 to 180°F (-34 to 82°C)	A 65-75
Grade T	Neoprene®	1/2-12"	-20 to 200°F (-29 to 93°C)	A 65-75
Grade DP	Buna N® NBR (FDA Compliant) Direct Loaded Valve only	1/2-3"	10 to 180°F (-12 to 82°C)	A 67-77
Grade P	Buna N® NBR (FDA Compliant)	1/2-12"	-10 to 180°F (-12 to 82°C)	A 67-77
Grade R2	PTFE (FDA Compliant)	1/2-10"	-30 to 350°F (-34 to 177°C)	N/A
Grade TM	Modified PTFE (FDA Compliant)	1/2-6"	-30 to 350°F (-34 to 177°C)	N/A
Grade V	Viton® FKM	1/2-6"	-20 to 325°F (-29 to 163°C)	A 70-80

STRAIGHTWAY DIAPHRAGMS

Grade SB	Black Butyl (FDA Compliant)	1/2-4"	0 to 200°F (-18 to 93°C)	A65-75
Grade SC	Hypalon® CSM	1/2-4"	0 to 180°F (-18 to 82°C)	A65-75
Grade SE	EPDM (FDA Compliant)	1/2-12"	-20 to 225°F (-29 to 107°C)	A64-72
Grade SP*	Buna N® NBR (FDA Compliant)	1/2-6"	10 to 180°F (-12 to 82°C)	A67-77
Grade SS	Natural Rubber	1/2-12"	-20 to 180°F (-29 to 82°C)	A65-75
Grade ST	Neoprene®	1/2-12"	-10 to 180°F (-23 to 82°C)	A65-75

*2.5" not available



PTFE Diaphragm Compressor Assembly showing Floating Tube Nut Design

The diaphragm material and design are integral to the successful performance of the diaphragm valve. For that reason, 12 weir elastomer diaphragms, two weir PTFE diaphragms and six elastomer straightway diaphragms are available to handle a multitude of process fluids and parameters.

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 valve supplier.

To ensure the best possible diaphragm, ITT Engineered Valves 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.

- 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
- 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.
- The 2-piece design includes an EPDM elastomer backing cushion and a PTFE diaphragm. This design eliminates the common problems inherent to laminated PTFE diaphragms, such as delamination, permeation, and cracking.
- The floating tube nut design shown on this page prevents point loading of the PTFE diaphragms which can cause downstream leakage and premature diaphragm failure. The downward force of the stem is transferred to the compressor bypassing the tube nut. Thus, the forces are evenly distributed over the seating area of the PTFE diaphragm reducing cold flow and stud pull out problems. This same design is used on elastomer diaphragms 6" and larger.

** 1/2" and 3/4" elastomer are molded open.*

Seat & Shell Test Criteria as stated in MSS SP-88†

Test Durations and Test Pressures Based on Diaphragm Maximum Service Pressure Ratings					
Nominal Valve Size	Maximum Pressure Rating psi (bar)	Shell Test Pressure psi (bar)	Minimum Duration of Shell Test Minutes(1)	Seat Test Pressure psi (bar)	Minimum Duration of Seal Test Minutes(1)
1/2 – 1	200 (13.8)	240 (16.5)	1/4	200 (13.8)	1/4
1-1/4 – 1-1/2 – 2	175 (12.1)	210 (14.5)	1/4	175 (12.1)	1/4
2-1/2 – 4	150 (10.3)	180 (12.4)	1	150 (10.3)	1/2
6	125 (8.6)	150 (10.3)	1	125 (8.6)	1/2
8	100 (6.9)	120 (8.3)	1	100 (6.9)	1/2
10 – 12	65 (4.5)	80 (5.5)	3	65 (4.5)	1/2

(1)The minimum duration is the period of inspection after the valve is fully prepared and under full test pressure.

† Valves with solid plastic bodies, plastic bonnets and/or plastic actuators are limited to 150 psi (10.3 bar) maximum.

Body Materials Available

Weir Bodies					
Body Type	Material	Identification*	Durometer/ FDA Compliant	Maximum Temperature**	
				°F	°C
Metal	Iron	CI or GXXX		350	177
	Ductile Iron	DI or DXXX		350	177
	Carbon Steel	WCB or LCB		350	177
	Bronze	B61 or B62		350	177
	Stainless Steel 316	CF8M	FDA	350	177
	CN7M	CN7M		350	177
	Monel	M35		350	177
	Hastelloy	CWXM		350	177
Plastic Lined	PP	Blue	FDA	200	93
	PVC	Grey		140	60
	Kynar® PVDF	White with tab	FDA	285	140
	Tefzel® ETFE	White		300	149
	PFA	Translucent	FDA	350	177
Rubber Lined	Soft Natural	#5	A 55-60	180	82
	Neoprene®	#7	A 60-65	200	93
	Hypalon® CSM	#9	A 60-65	200	93
	Hard Natural	#10	D 40-70	200	93
	Graphite Loaded Natural	#12	D 72-78	200	93
	Butyl	#16	A 60-65	200	93
Glass Lined	Borosilicate Glass	Blue Glass	FDA	350	177

Straightway Bodies					
Body Type	Material	Identification*	Durometer/ FDA Compliant	Maximum Temperature**	
				°F	°C
Metal	Iron	CI or GXXX		225	107
	Carbon Steel	WCB		225	107
	Stainless Steel 316	CF8M	FDA	225	107
Plastic Lined	PP	Blue	FDA	200	93
	Tefzel® ETFE	White		225	107
Rubber Lined	Soft Natural	#5	A 55-60	180	82
	Neoprene®	#7	A 60-65	200	93
	Hypalon® CSM	#9	A 60-65	200	93
	Hard Natural	#10	D 40-70	200	93
	Butyl	#16	A 60-65	200	93
Glass Lined	Borosilicate Glass	Blue glass	FDA	225	107

*X designates a numerical value
**Temperature may decrease dependent on media, pressure and valve size.

Recommended Guidelines

Weir Valves
Maximum Velocity ≤ 25 fps for media with no suspended solids
Maximum Velocity ≤ 10 fps for media with 1-15% solids
Maximum Valve $\triangle P \leq 25\% P_{inlet}$ for throttling
Maximum Solids ≤15%

These guidelines are recommended to optimize performance and may vary dependent on exact media and conditions. The intent is to help prevent cavitation, choke flow and premature lining and diaphragm wear.

Straightway Valves
Maximum Velocity ≤ 25 fps for media with no suspended solids
Maximum Velocity ≤ 15 fps for media 1-15% solids
Maximum Velocity ≤ 10 fps for media with solids > 15%
Maximum Solids ≤ 50%

These guidelines are recommended to optimize performance and may vary dependent on exact media and conditions. The intent is to help prevent cavitation, choke flow and premature lining and diaphragm wear.

DIA-FLO® ORDERING INFORMATION

Fax to: Customer Service, ITT Engineered Valves Group **Fax:** 717-509-2336

From: _____ Date: _____

Company: _____ Page: _____ of _____

Phone: _____ P.O.#: _____

Weir Diaphragm Valve

FEATURES (BLOCK)	CODE
SIZE (A)	
BODY (B)	
DIAPHRAGM (D)	
BONNET (E)	
BONNET SEAL MATERIAL (F)	
OPTIONAL BONNET INTERNALS (H)	
OPTIONAL BOLTING (G)	
YOKE (K)	
LOCKING DEVICE (L)	
EXTENDED STEM (M)	
CHAIN (CH)	
OPTIONAL COATINGS (N)	
ADAPTED FOR BUT LESS ITT AIRMOTOR (P2)	
NON ITT ACTUATION (R)	
ACTUATOR (S)	
AIR MOTOR (P)	
OPTIONAL AIRMOTOR COVERS (P1)	
ADVANTAGE ACTUATOR (Q)	
POSITION INDICATOR (T)	
MECHANICAL ACCESSORIES FOR ACTUATORS (V)	
ACT. HARDWARE OPTIONS (U)	
SOLENOID VALVE (W)	
SOLENOID VOLTAGE (X)	
ADAPTED FOR BUT LESS SWITCHES (Y3)	
LIMIT SWITCHES (Y)	
OPTIONAL LIMIT SWITCH POSITION (Y1)	
LIMIT SWITCHES, YOKE MOUNTED (Y2)	
ADV. SWITCH PACK SP-2 (Z)	
ADV. SWITCH PACK SP-2.5 (Z5)	
ADV. SWITCH PACK SP-3 (Z3)	
POSITIONER (AA)	
SIGNAL RANGE (AB)	
FILTER REGULATOR (AC)	
TRANSDUCER (AD)	
SPEED CONTROL (AE)	
JUNCTION BOX (AF)	
SPECIAL END PREPARATION (BB)	
DRAINS PORTS (C)	
CUSTOMER HOLD POINTS (CHP)	
SPECIAL QUALITY DOCUMENTATION (SQD)	
SPECIAL SERVICE/PREPARATION (SPSERV)	

Straightway Diaphragm Valve

FEATURES (BLOCK)	CODE
SIZE (A)	
BODY (B)	
SPECIAL END PREPARATION (BB)	
DIAPHRAGM (D)	
BONNET (E)	
OPTIONAL BONNET SEALS (F)	
CHAIN (CH)	
OPTIONAL BONNET INTERNALS (H)	
OPTIONAL BOLTING (G)	
YOKE (K)	
LOCKING DEVICE (L)	
EXTENDED STEM (M)	
OPTIONAL COATINGS (N)	
ADAPTED FOR BUT LESS ITT AIRMOTOR (P2)	
NON ITT ACTUATION (R)	
ACTUATOR (S)	
AIR MOTOR (P)	
OPTIONAL AIRMOTOR COVERS (P1)	
POSITION INDICATOR (T)	
MECHANICAL ACCESSORIES FOR ACTUATORS (V)	
ACT. HARDWARE OPTIONS (U)	
SOLENOID VALVE (W)	
SOLENOID VOLTAGE (X)	
ADAPTED FOR BUT LESS SWITCHES (Y3)	
LIMIT SWITCHES (Y)	
OPTIONAL LIMIT SWITCH POSITION (Y1)	
LIMIT SWITCHES, YOKE MOUNTED (Y2)	
POSITIONER (AA)	
SIGNAL RANGE (AB)	
FILTER REGULATOR (AC)	
TRANSDUCER (AD)	
SPEED CONTROL (AE)	
JUNCTION BOX (AF)	
CUSTOMER HOLD POINTS (CHP)	
SPECIAL QUALITY DOCUMENTATION (SQD)	
SPECIAL SERVICE/PREPARATION (SPSERV)	

For features not detailed on the following pages, contact the ITT Engineered Valves Group Customer Service Department at 800-366-1111 or (717) 291-1901.

Weir Diaphragm Valves

Weir Bodies, Unlined (Block B)

Code	Body Material	Size
NO BODY SUPPLIED		
2000	No Body	1/2-12"
SCREWED		
2401	Iron	1/2-3"
2402	Bronze	1/2-3"
2403	Stainless Steel (316L)	1/2-3"
2405	Steel (WCB)	1-3"
2406	PVC	1/2-3"
2407	CN7M	1/2-3"
2408	Monel	1/2-3"
2410	Hastelloy	1/2-3"
2412	Ductile iron	1-3"
2414	PP (FDA)	1/2-3"
2416	CPVC	1/2-2"
2417**	PVDF (FDA)	1/2-2"
FLANGED		
2431	Cast Iron	1/2-12"
2432	Bronze	1/2-6"
2433R	Stainless Steel (316)	1/2-8"
2435R	Cast Steel	1/2-8"
2436	Solid PVC	1/2-4"
2437R	CN7M	1/2-8"
2438R	Monel	1/2-8"
2440R	Hastelloy	1/2-8"
2441	Ductile Iron	1/2-8"
2442	Solid CPVC	1/2-2"
2444	Solid PP (FDA)	1/2-4"
2447**	Solid PVDF (FDA)	1/2-4"
SOCKET SOLDER		
2456	Bronze	1/2-2"
SOCKETWELD		
2424	Solid PP (FDA)	1/2-2"
2427**	Solid PVDF (FDA)	1/2-2"
2451	Solid PVC	1/2-2"
2463	Solid CPVC	1/2-2"
2470	Stainless Steel (316L)	1/2-3"
2472	Cast Steel	1/2-3"
2474	CN7M	1/2-3"
BUTTWELD (316L)		
2464	Stainless Steel Sch. 5	1/2-8"
2465	Stainless Steel Sch. 10	1/2-8"
2466	Stainless Steel Sch. 40	1/2-8"
SPIGOTWELD		
2443	CPVC (IPS)	1/2-2"
2484	Solid PP (FDA, DIN)	1/2-2"
2486	PVC (IPS)	1/2-2"
2487**	Solid PVDF (FDA, DIN)	1/2-2"

Weir Bodies, Lined (Block B)

Code	Lining Material	Size
FLANGED	CAST IRON	
2501	Neoprene No. 7	1/2-12"
2511	Glass Lined (FDA)	1/2-8"
2516	Soft Rubber No. 5	1/2-12"
2521	Hard Rubber No. 10	1/2-12"
2522	Butyl Lined No. 16	1/2-12"
2523	Hypalon Lined No. 9	1/2-12"
2536	PVC Lined	3/4-6"
2538	PP Lined (FDA)	3/4-8"
2539**	PP Lined (FDA)	3/4-8"
2529	Tefzel Lined	3/4-8"
2530	Hard Rubber No. 12	1/2-12"
2575**	PVDF Lined (FDA)	3/4-8"
FLANGED	DUCTILE IRON	
2544	Glass Lined (FDA)	1/2-8"
2550	Neoprene No. 7	1/2-8"
2551	Soft Rubber No. 5	1/2-8"
2552	Hard Rubber No. 10	1/2-8"
2555**	PVDF Lined (FDA)	3/4-8"
2556	PFA Lined (FDA)	1-6"
2558	PP Lined (FDA)	3/4-8"
2559	Tefzel Lined	3/4-8"
FLANGED	CAST STEEL	
2545	Tefzel Lined	3/4-8"
2546	PP Lined (FDA)	3/4-8"
2548	PVDF Lined (FDA)	3/4-8"
2563	Hard Rubber No. 10	1/2-8"
2564	Hard Rubber No. 12	1/2-8"

Angle Bodies, Unlined (Block B)

Code	Body Material	Size
FLANGED		
2611	Cast Iron	1/2-8"

Angle Bodies, Lined (Block B)

Code	Lining Material	Size
FLANGED		
2621	Neoprene No. 7	1/2-8"
2622	Glass Lined (FDA)	1/2-8"
2623	Soft Rubber No. 5	1/2-8"
2624	Hard Rubber No. 10	1/2-8"

Diaphragms (Block D)
WEIR TYPE

Code	Material	Size
A	Soft Natural Rubber (FDA)	1/2-4"
B	Black Butyl (FDA)	1/2-12"
C	Hypalon	1/2-12"
H	EPDM (FDA)	1/2-6"
17	EPDM (FDA)	1/2-4"
M	EPDM	1/2-12"
P	BUNA N (FDA)	1/2-12"
S	Natural Rubber	1/2-10"
T	Neoprene	1/2-12"
WB	White Butyl (FDA)	1/2-6"
DP	BUNA N	
	Direct Loaded (FDA)	1/2-3"
V	Viton	1/2-6"
R2	PTFE (FDA)	1/2-10"
TM	PTFE (FDA)	1/2-6"
EN	Elastomer	
	Not Supplied	1/2-12"
PN	PTFE	
	Not Supplied	1/2-10"

Bonnets, Handwheel (Block E)

Code	Bonnet Description
CAST IRON	
902	Indicating (6" - 12")
902S	Indicating - Sealed (6" - 12")
903	Indicating with Travel Stop (1/2" - 12")
903S	Indicating with Travel Stop - Sealed (1/2" - 12")
STAINLESS STEEL (316)	
912	Indicating (6" - 12")
912S	Indicating - Sealed (6" - 12")
913	Indicating with Travel Stop (1/2" - 12")
913S	Indicating with Travel Stop - Sealed (1/2" - 12")
POLYPROPYLENE (PP)	
923	Indicating with Travel Stop (1/2" - 4")
BRONZE	
933	Indicating with Travel Stop (1/2" - 4")
933S	Indicating with Travel Stop - Sealed (1/2" - 4")
DUCTILE IRON	
942	Indicating (6" - 8")
942S	Indicating - Sealed (6" - 8")
943	Indicating with Travel Stop (1/2" - 8)
943S	Indicating with Travel Stop - Sealed (1/2" - 8")
POLYARYLSULFONE (PAS)	
963	Indicating with Travel Stop (1/2" - 4")
963S	Indicating with Travel Stop - Sealed (1/2" - 4")

Bonnets, Chainwheel (Block E)

Code	Bonnet Description
CAST IRON	
905	Indicating with Travel Stop (1/2" - 12")
905S	Indicating with Travel Stop - Sealed (1/2" - 12")
STAINLESS STEEL (316)	
915	Indicating with Travel Stop (1/2" - 12")
915S	Indicating with Travel Stop - Sealed (1/2" - 12")
BRONZE	
935	Indicating with Travel Stop (1/2" - 4")
935S	Indicating with Travel Stop - Sealed (1/2" - 4")
DUCTILE IRON	
945	Indicating with Travel Stop (1/2" - 6")
945S	Indicating with Travel Stop - Sealed (1/2" - 6")

* R - Raised Face
** Unpigmented

Weir Diaphragm Valves

Actuated Bonnets (Block E)

Code	Bonnet Description
STAINLESS STEEL	
(Option for Dia-Flo® Actuator & Non-ITT Actuator)	
31	Actuated
31S	Actuated - Sealed
BRONZE	
(Option for Dia-Flo® Actuator & Non-ITT Actuator)	
33	Actuated
33S	Actuated - Sealed
DUCTILE IRON	
(Standard for Dia-Flo® Actuator, Non-ITT Actuator and 3" - 4" Advantage® Actuator)	
34	Actuated (1/2" - 10")
34S	Actuated - Sealed (1/2" - 10")
PLASTIC PAS	
(Standard for Advantage® Actuator)	
36	Actuated (1/2" - 2")
36S	Actuated - Sealed (1/2" - 2")
CAST IRON	
40	Direct Load (1/2" - 3")
DUALRANGE® CONTROL	
(Option for Dia-Flo® Actuator)	
84	Dualrange (1" - 6")
84S	Dualrange - Sealed (1" - 6")

Bonnet Seal Materials (Block F)

Code	Seal Material
S1	EPDM
S2	FKM

Optional Bonnet Internals (Block H)

Code	Description
M2	Sanitary Internal
M5	Stainless Steel Stem
M6	Cast Iron Compressor
M7	Bronze Compressor
M8	PVDF Coated Cast Iron Compressor
M9	Stainless Steel Bushing
M10	Stainless Steel Tube Nut
M11	316 Stainless Steel Stem
M14	Clear Cap (6" only)

Optional Bolting (Block G)

Code	Description
B1	Stainless Steel
B316	Stainless Steel (316)
BTFE	Xylan 1014 Coated B7
B72H	B7Bolt/2H Nut
B88	B8 Bolt/8 Nut
BA20	Alloy 20

Yoke (Block K)

Code	Description
Y	Yoke Supplied

Locking Device (Block L)

Code	Description
LD	Locking Device

Extended Stem (Block M)

Code	Description
EXTSTEM	Extended Stem*

Optional Coatings (Block N)

Code	Description
C1	PVDF Coated Topworks
C2	PVDF Coated Body
C3	PVDF Coated Body & Topworks
C4	White Epoxy Coated Topworks**
C5	White Epoxy Coated Body**
C6	White Epoxy Coated Body & Topworks**
C7	Nylon Coated Topworks
C14	White Epoxy Coated Topworks
C15	White Epoxy Coated Body
C16	White Epoxy Coated Body & Topworks

Adapted for but less ITT Actuation (Block P2)

Code	Description
Y	Adapted for but less ITT Actuator

Non ITT Actuation (Block R & S)

Code	Description
POF	Mounted Non-ITT Customer Supplied Actuator
POA	Adapted For But Less Customer Supplied Actuator
POM	Mounted Non-ITT Actuator Supplied by ITT

Dia-Flo® Actuators Fail Open (Block P) (Spring-to-Open - Air-to-Close)

Code	Actuator Size
3112	#12
3125	#25
3150	#50
31101	#101
31130	#130
31250	#250

Dia-Flo®Actuators Fail Closed (Block P) (Air-to-Open - Spring-to-Close)

Code	Spring Description
SIZE #12	
3213	88 Spring
3214	88 & 89 Springs
3215	88 & Raymond Springs
3216	89 Spring
SIZE #25	
3226	101 Spring
3227	101 & 102A Springs
3228	102A Spring
SIZE #50	
3251	101 Spring
3252	101 & 102A Springs
3253	97 Spring
3254	96 Spring
3255	96 & 97 Springs
3256	102A Spring
SIZE #75	
3274	96 Spring
3276	96 & 97 Springs
3277	97 & 98 Springs
3278	96 & 98 Springs
3279	96, 97 & 98 Springs
SIZE #101	
32102	96 Spring
32103	98 Spring
32104	96 & 97 Springs
32105	96 & 98 Springs
32106	97& 98 Springs
32107	96, 97, & 98 Springs
32108	130 Spring
32109	97 Spring
SIZE #130	
32131	97 Spring
32132	96 Spring
32133	98 Spring
32134	96 & 97 Springs
32135	96 & 98 Springs
32136	97 & 98 Springs
32137	96, 97, & 98 Springs
32138	130 Spring
SIZE #250	
32251	129 & 130 Springs
32252	129 Spring
32253	130 Spring

Dia-Flo® Actuators Double Acting (Block P) (Air-to-Open - Air-to-Close)

Code	Actuator Size
3312	#12
3325	#25
3350	#50
3375	#75
33101	#101
33130	#130
33250	#250

Optional Air Motor Covers (Block P1)

Code	Description
DICVR	Ductile Iron

Advantage® Actuators Fail Open (Block Q)

Code	Actuator Size	Valve Size
A105	# 5	1/2"
A108	# 8	3/4", 1"
A116	# 16	11/4", 11/2", 2"
A133	# 33	3", 4"
A147	# 47	3", 4"

* Specify valve centerline to top of handwheel distance

**FDA Compliant

Weir Diaphragm Valves

Advantage® Actuators Fail Closed (Block Q)

Code	Actuator Size/Spring	Valve Size
A205	# 5 with 60# Spring	1/2"
A206	# 5 with 90# Spring	1/2"
A208	# 8 with 60# Spring	3/4", 1"
A209	# 8 with 90# Spring	3/4", 1"
A216	# 16 with 60# Spring	1 1/4", 1 1/2", 2"
A217	# 16 with 90# Spring	1 1/4", 1 1/2", 2"
A233	# 33 with 60# Spring	3", 4"
A234	# 34 with 90# Spring	3", 4"
A247	# 47 with 60# Spring	3", 4"
A248	# 47 with 80# Spring	3", 4"

Advantage® Actuators Double Acting (Block Q)

Code	Actuator Size	Valve Size
A305	# 5	1/2"
A308	# 8	3/4", 1"
A316	# 16	1 1/4", 1 1/2", 2"
A333	# 33	3", 4"
A347	# 47	3", 4"

Dia-Flo® Actuator Accessories Position Indicator (Block T)

Code	Description
P1	Position Indicator

Mechanical Accessories (Block V)

Code	Description
See Cross Reference Table on page 20	

Actuator Hardware Options (Block U)

Code	Description
HW1	SS Airmotor Bolts
HW2	SS Accessory Brackets
HW3	SS Tubing and Fittings
HW4	Plastic Tubing / Brass Fittings
HW5	PVC Coated Tubing / Brass Fittings
HW6	PVC Coated Tubing / SS Fittings

Solenoid Valve (Block W)

Code	Description
SV1	Asco 8320G184, 3 Way
SV2	Asco EF8320G184, 3 Way
SV3	Asco 8345G1, 4 Way
SV4	Asco EF8345G1, 4 Way
SV7	Asco 8320G202, 3 Way
SV8	Asco EF8320G202, 3 Way
SV9	Asco EF8320G45, 3 way
SV10	Asco EF8320G174, 3-way
SV13	Asco 8320G174, 3-way
SV14	Burkert 6012 Series (Recommended for Advantage)
SV15	Burkert 6014 Series (Recommended for Advantage)

Solenoid Voltage (Block X)

Code	Description
V1	120V / 60HZ
V2	24VDC
V3	240V / 60HZ

Dia-Flo® Actuator Limit Switches (Block Y)

Code	Description
LS1	Micro BZE6 - 2RN
LS2	Micro BAF1 - 2RN
LS3	Micro DTE6 - 2RN
LS4	Micro DTF2 - 2RN
LS5	Micro EXQ
LS6	Micro EXDQ
LS7	Micro LSA1A
LS8	Westlock 3479 Model 3
LS9	GO 74-13528-A2
LS10	Namco EA700-80100
LS11	Westlock E3479 Model 3
LS12	Namco EA170-34100 / 35100
LS16	Westlock 9881
LS17	Westlock E9881

Optional Limit Switch Position (Block Y1)

Code	Desription
LSO	Limit Switch - Open Only
LSC	Limit Switch - Closed Only

Advantage® Actuator Switch Pack SP-2 (Block Z)

Code	Description	1/2" - 4"
SP2S	Silver Contacts	
SP2G	Gold Contacts	
SP2Z	2-Wire Proximity	
SP2N	NAMUR Proximity	
SP2P	3-Wire PNP Proximity	
SP2NP	3 Wire NPN Proximity	

Adv. Switch Pack SP-2.5 (Block Z5)

Code	Description	1/2" - 1"
SP5S	Silver Contacts	
SP5G	Gold Contacts	
SP5Z	2-Wire Proximity	
SP5N	NAMUR Proximity	
SP5P	3-Wire PNP Proximity	
SP5NP	3 Wire NPN Proximity	

Adv. Switch Pack SP-3 (Block Z3)

Code	Description	1/2" - 2"
SP3S48	Silver Contacts 48V	
SP3S110	Silver Contacts 110V	
SP3G48	Gold Contacts 30V	
SP3Z	2-Wire Proximity	
SP3N	NAMUR Proximity	
SP3P	3-Wire PNP Proximity	
SP3NP	3 Wire NPN Proximity	

Positioners (Block AA)

Code	Description	Size
PR1[1]	Conoflow Model 31	1 1/2" - 12"
PR2[2]	Conoflow Model 33	3/4" - 10"
PR3[1]	Moore 73 NI2F	1/2" - 6"
PR4[2]	Moore 73 NB	1/2" - 6"
PR5	Moore 73 NFR	1/2" - 6"
PR6[3]	Conoflow P50	1" - 10"
PR7[3]	Conoflow P51	1" - 10"
PR8[3]	Conoflow P52	1" - 10"

Only PR3-5 are available on the Advantage®.

Signal Ranges (Block AB)

Code	Description
SR1	3-15 PSI
SR2	6-30 PSI
SR3	3-9 PSI
SR4	9-15 PSI

Filter Regulators (Block AC)

Code	Description
FR1	Conoflow GFH60XTKEG3G
FR2	Fisher 67CFR-239

Transducer (Block AD)

Code	Description
TR1	Conoflow GT2108ED
TRWS	Watson Smith 53-4904-3XR

Speed Controllers (Block AE)

Code	Description
SC	Schrader 337-1001
SS	Whitey Needle Valve SS 1RMA

Drain Ports (Block C)

Code	Description Unlined Bodies Only
D1	1/4" NPT Drain Port
D2	Two 1/4" NPT Drain Ports
D3	3/8" NPT Drain Port
D4	Two 3/8" NPT Drain Ports

Special Service/Preparation (Block SPSERV)

Code	Desription
SPEC	Special Service per Cust. Spec.
VAC	Vacuum
OXY	Oxygen
TOB	Tobacco
WCL2	Wet Chlorine
SIFREE	Silicone-Free
B311	ASME B31.1
B1634	ANSI B16.34

1 Fail Open and Double Acting Actuators
2 Fail Closed Actuators
3 Requires yoke mounted actuator

Straightway Diaphragm Valves

Straightway Bodies, Unlined (Block B)

Code	Body Material	Size
NO BODY SUPPLIED		
2800	No body	1/2-12"
SCREWED		
2801	Iron	1/2-2"
2803	Stainless Steel (316)	1/2-2"
FLANGED *		
2811	Iron	1/2-12"
2813R	Stainless Steel (316)	1/2-8"
2815R	Cast Steel	1/2-8"

Straightway Bodies, Lined (Block B)

Code	Lining Material	Size
FLANGED	CAST IRON	
2829	Tefzel	1-8"
2831	Neoprene No.7	1-12"
2832	Glass	1-8"
2833	Soft Rubber No. 5	1-12"
2834	Hard Rubber No.10	1-12"
2835	Hypalon No. 9	1-12"
2836	Butyl No. 16	1-12"
2838	Polypropylene (FDA)	1-8"
FLANGED	CAST STEEL	
2863	Hard Rubber No. 10	1-6"
FLANGED	DUCTILE IRON	
2840	Neoprene No. 7	1-12"
2841	Soft Rubber No. 5	1-12"
2842	Hard Rubber No 10	1-12"
2859	Tefzel	1-8"

Diaphragms (Block D) Straightway Type

Code	Material	Size
SB	Black Butyl (FDA)	1/2-4"
SS	Natural Rubber	1/2-12"
ST	Neoprene	1/2-12"
SE	EPDM (FDA)	1/2-12"
SC	Hypalon	1/2-4"
SP*	BUNA - N (FDA)	1/2-6"
EN	Elastomer Not Supplied	1/2-12"

*2.5 not available.

Bonnets, Handwheel (Block E)

Code	Bonnet Description
CAST IRON	
902	Indicating
902S	Indicating - Sealed
903	Indicating with Travel Stop
903S	Indicating with Travel Stop - Sealed
DUCTILE IRON	
942	Indicating
942S	Indicating - Sealed
943	Indicating with Travel Stop
943S	Indicating with Travel Stop - Sealed

Bonnets, Chainwheel (Block E)

Code	Bonnet Description
CAST IRON	
905	Indicating with Travel Stop
905S	Indicating with Travel Stop - Sealed

Bonnets, Actuated (Block E)

Code	Bonnet Description
DUCTILE IRON	
34	Actuated
34S	Actuated - Sealed

Optional Bonnet Seal Material (Block F)

Code	Seal Material
S1	EPDM
S2	Viton

Optional Bonnet Internals (Block H)

Code	Description
M5	Stainless Steel Stem
M8	PVDF Coated Cast Iron Compressor
M9	Stainless Steel Bushing
M11	316 Stainless Steel Stem

Optional Bolting (Block G)

Code	Description
B1	Stainless Steel

Yoke (Block K)

Code	Description
Y	Yoke Supplied

Locking Device (Block L)

Code	Description
LD	Locking Device

Extended Stem (Block M)

Code	Description
EXTSTEM	Extended Stem

Optional Coatings (Block N)

Code	Description
C1	PVDF Coated Topworks
C2	PVDF Coated Body
C3	PVDF Coated Body & Topworks
C4	White Epoxy Coated Topworks**
C5	White Epoxy Coated Body**
C6	White Epoxy Coated Body & Topworks**
C14	White Epoxy Coated Topworks
C15	White Epoxy Coated Body
C16	White Epoxy Coated Body & Topworks

Adapted for but less ITT Actuation (Block P2)

Code	Description
Y	Adapted for but less ITT Actuator

Non ITT Actuation (Block R & S)

Code	Description
POF	Mounted Non-ITT Customer Supplied Actuator
POA	Adapted For But Less Customer Supplied Actuator
POM	Mounted Non-ITT Actuator Supplied by ITT

Dia-Flo® Actuators Fail Open (Block P) (Spring-to-Open - Air-to-Close)

Code	Actuator Size
3112	#12
3125	#25
3150	#50
31101	#101
31130	#130
31250	#250

* R - Raised Face
** FDA Compliant

Straightway Diaphragm Valves

Dia-Flo® Actuators Fail Closed (Block P) (Air-to-Open - Spring-to-Close)

Code	Spring Description
SIZE #25	
3226	101 Spring
3227	101 & 102A Springs
3228	102A Spring
SIZE #50	
3251	101 Spring
3252	101 & 102A Springs
3253	97 Spring
3254	96 Spring
3255	96 & 97 Springs
3256	102A Spring
SIZE #75	
3273	98 Spring
3274	96 Spring
3276	96 & 97 Springs
3277	97 & 98 Springs
3278	96 & 98 Springs
3279	96, 97 & 98 Springs
SIZE #101	
32102	96 Spring
32103	98 Spring
32104	96 & 97 Springs
32105	96 & 98 Springs
32106	97& 98 Springs
32107	96, 97, & 98 Springs
32108	130 Spring
32109	97 Spring
SIZE #130	
32131	97 Spring
32132	96 Spring
32133	98 Spring
32134	96 & 97 Springs
32135	96 & 98 Springs
32136	97 & 98 Springs
32137	96, 97, & 98 Springs
32138	130 Spring
SIZE #250	
32251	129 & 130 Springs
32252	129 Spring
32253	130 Spring

Dia-Flo® Actuators Double Acting (Block P) (Air-to-Open - Air-to-Close)

Code	Actuator Size
3312	#12
3325	#25
3350	#50
3375	#75
33101	#101
33130	#130
33250	#250

Optional Air Motor Covers (Block P1)

Code	Description
DICVR	Ductile Iron

Actuator Accessories Position Indicator (Block T)

Code	Description
P1	Position Indicator

Mechanical Accessories (Block V)

Code	Description
See Cross Reference Table on page 20	

Actuator Hardware Options (Block U)

Code	Description
HW1	SS Airmotor Bolts
HW2	SS Accessory Brackets
HW3	SS Tubing and Fittings
HW4	Plastic Tubing / Brass Fittings
HW5	PVC Coated Tubing / Brass Fittings
HW6	PVC Coated Tubing / SS Fittings

Solenoid Valve (Block W)

Code	Description
SV1	Asco 8320G184, 3 Way
SV2	Asco EF8320G184, 3 Way
SV3	Asco 8345G1, 4 Way
SV4	Asco EF8345G1, 4 Way

Solenoid Voltage (Block X)

Code	Description
V1	120V / 60HZ
V2	24VDC
V3	240V / 60HZ

Limit Switches (Block Y)

Code	Description
LS1	Micro BZE6 - 2RN
LS2	Micro BAF1 - 2RN
LS3	Micro DTE6 - 2RN
LS4	Micro DTF2 - 2RN
LS5	Micro EXQ
LS6	Micro EXDQ
LS7	Micro LSA1A
LS8	Westlock 3479 Model 3
LS9	GO 74-13528-A2
LS10	Namco EA700-80100
LS12	Namco EA170-34100 / 35100

Positioners (Block AA)

Code	Description
PR1[1]	Conoflow Model 31
PR2[2]	Conoflow Model 33
PR3[1]	Moore 73 N12F
PR4[2]	Moore 73 NB
PR5	Moore 73 NFR
PR6[3]	Conoflow P50
PR7[3]	Conoflow P51
PR8[3]	Conoflow P52

Signal Range (Block AB)

Code	Description
SR1	3-15 PSI
SR2	6-30 PSI
SR3	3-9 PSI
SR4	9-15 PSI

Filter Regulator (Block AC)

Code	Description
FR1	Conoflow GFH60XTKEG3G
FR2	Fisher 67CFR-239

Transducer (Block AD)

Code	Description
TR1	Conoflow GT2108ED
TRWS	Watson Smith 53-4904-3XR

Speed Control (Block AE)

Code	Description
SC	Schrader 337-1001

1 Fail Open and Double Acting Actuators
2 Fail Closed Actuators
3 Requires Yoke-Mounted Actuators

Cross Reference Chart - Bodies, Bonnets & Actuators

Only those figure numbers that have changed are listed below.

Bodies	
Old	New
4250	2464
4260	2465
4270	2466

Bonnets	
Old	New
2	902
3	903
4	905
6	932
7	933
9	912
10	913
25	942
26	943
30	POA
854	902 - C4
855	902S - C4
872	902S - C1
873	903S - C1
874	903S - C1
903	903
904	903S
907	933
910	913
913	913S
923	923
924	923S
926	943
927	943S
955	903 - C4
956	903S- C4

Bonnets (cont.)	
Old	New
963	963
964	963S
974	903S-C1

DIA-FLO Actuators	
Old (spring#)	New
3112	3112
3212 (88)	3213
3212 (88&89)	3214
3212 (88&Raymond)	3215
3212 (89)	3216
3312	3312
3125	3125
3225 (101)	3226
3225 (101&102A)	3227
3225 (102A)	3228
3325	3325
3150	3150
3250 (101)	3251
3250 (101&102A)	3252
3250 (97)	3253
3250 (96)	3254
3250 (96&97)	3255
3250 (102A)	3256
3350	3350
3175	3175
3275 (96)	3274
3275 (96&97)	3276
3275 (97&98)	3277
3275 (96&98)	3278
3275 (96, 97&98)	3279
3375	3375
31101	31101
32101 (96)	32102
32101 (98)	32103
32101 (96&97)	32104
32101 (96&98)	32105
32101 (97&98)	32106
32101 (96, 97&98)	32107
32101 (130)	32108
32101 (97)	32109
33101	33101
31130	31130
32130 (97)	32131
32130 (96)	32132
32130 (98)	32133
32130 (96&97)	32134
32130 (96&98)	32135
32130 (97&98)	32136
32130 (96, 97&98)	32137
32130 (130)	32138
33130	33130
31250	31250
32250 (129&130)	32251
32250 (129)	32252
32250 (130)	32253
33250	33250

Switches	
Old	New
R, S, T	LS1-LS10

Positioners		
Old		New
YC	Conoflow	PR1-PR2
YM	Moore	PR3-PR4

Cross Reference Table for Dia-Flo Actuator Accessories:

Description	Old Code	New Code Size #12 Actuators		New Code Size #25-250 Actuators	
		Fail Open & Double Acting 3100 & 3300	Fail Closed 3200	Fail Open & Double Acting 3100 & 3300	Fail Closed 3200
Position Indicator	Z	P1	P1	P1	P1
Adjustable Travel Stop	X	ATS	ATS	ATS	Standard
Adjustable Opening Stop	W	TOHC	TOWO	AO	AO
Adjustable Opening & Travel Stop	Q	TOHC	TOWO	TO	AO
Handwheel Closing Device	V	TOHC	Not Available	HWC	Not Available
Handwheel Opening Device	JH	Not Available	HWO	Not Available	HWO
Wrench Opening Device	JW	Not Availalble	WO	Not Available	WO
Adjustable Opening & Travel Stop + Handwheel Closing Device	Q + V	TOHC	Not Available	THC	Not Availalble
Adjustable Travel Stop + Handwheel Closing Device	X + V	TOHC	Not Available	THC	Not Available
Adjustable Opening Stop + Handwheel Closing Device	W + V	TOHC	Not Available	HWC	Not Available
Adjustable Opening Stop + Handwheel Opening Device	W + JH	Not Available	TOHO	Not Available	TOHO
Adjustable Opening Stop + Handwheel Opening Device	W + JW	Not Available	TOWO	Not Available	TOWO

CONDITIONS & TERMS OF SALE

of ITT Industrial & Biopharm Group (IBG)

WARRANTY - Company warrants title to the product(s) and, except as noted with respect to items not of Company's manufacturer, also warrants the product(s) on date of shipment to Purchaser, to be of the kind and quality described herein, and free of defects in workmanship and material. This warranty is expressly in lieu of all other warranties, including but not limited to implied warranties of merchantability and fitness, and constitutes the only warranty of the company with respect to the product(s).

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company of any item of product(s), Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof. Company shall remedy such nonconformance by, at Company's option, adjustment or repair or replacement of the item and any affected part of the product(s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Company hereunder. Company shall have the right of disposal of parts replaced by it. Purchaser agrees to notify Company, in writing, of any apparent defects in design, material or workmanship, prior to performing any corrective action back chargeable to the Company. Purchaser shall provide a detailed estimate of the material, labor costs associated with proposed remedy for expeditious review and approval by the Company.

Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factories or authorized service centers, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instructions or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representatives.
Any separately listed item of the product(s) which is not manufactured by the company is not warranted by the company and shall be covered only by the express warranty, if any, of the manufacturer thereof.

This states purchaser's exclusive remedy against company and its suppliers relating to the product(s), whether in contract or in tort or under any other legal theory, and whether arising out of warranties, representations, instructions, installations or defects from any cause. Company and its suppliers shall have no obligation as to any product which has been improperly stored or handled, or which has not been operated or maintained according to instructions in Company or supplier furnished manuals.

LIMITATION OF LIABILITY - Neither Company nor its suppliers shall be liable, whether in contract or in tort or under any other legal theory, for loss of use, revenue or profit, or for cost of capital or of substitute use or performance, or for incidental, indirect, or special or consequential damages, or for any other loss or cost of similar type, or for claims by Purchaser for damages of Purchaser's customers. Likewise, Company shall not, under any circumstances, be liable for the fault, negligence, or wrongful acts of Purchaser or Purchaser's employees, or Purchaser's other contractors or suppliers.

In no event shall company be liable in excess of the sales price of the part(s) or product found defective.

GENERAL - (a) Company will comply with all laws applicable to Company. Compliance with OSHA or similar federal, state or local laws during any operation or use of the product(s) is the sole responsibility of Purchaser. (b) The laws of the State of New York shall govern the validity, interpretation and enforcement of any contract of which these provisions are a part, without giving effect to any rules governing the conflict of laws. (c) This document and any other documents specifically referred to as being a part hereof, constitute the entire contract on the subject mater, and it shall not be modified except in writing signed by both parties, Unless otherwise specified, any reference to Purchaser's order is for identification only. Assignment may be made only with written consent of both parties.

ACCEPTANCE - The determination of compliance with performance guarantees will be based on results of factory tests under controlled conditions with calibrated instruments and tested per standards of the Hydraulic Institute, ISO standards, API standards, or other nationally recognized accreditation standards mutually acceptable to Company and Purchaser.

SHIPMENT - The term "shipment" means delivery to the initial carrier in accordance with the delivery terms of this order. Company may make partial shipments. Company shall select method of transportation and route, unless terms are f.o.b. point of shipment and Purchaser specifies the method and route and is to pay the freight costs in addition to the price, When terms are f.o.b. destination or freight allowed to destination, "destination" means common carrier delivery point (within the continental United States, excluding Alaska) nearest the destination. For movement outside the United States, company shall arrange for inland carriage to port of exit and shall cooperate with Purchaser's agents in making necessary arrangements for overseas carriage and preparing necessary documents.

SPECIAL SHIPPING DEVICES - On shipments to a destination in the continental United States or Canada, Company has the right to add to the invoice, as a separate item, the value of any special shipping device (barrel, reel, tarpaulin, cradle, crib and the like) used to contain or protect the product(s) invoiced, while in transit. Full credit will be given on the return to Company of the device in a reusable condition, f.o.b. destination, freight prepaid.

DELAYS - If Company suffers delay in performance due to any cause beyond its control, including but not limited to act of God, war, act or failure to act of government, act or omission of Purchaser, fire, flood, strike or labor troubles, sabotage, or delay in obtaining from others suitable services, materials, components, equipment or transportation, the time of performance shall be extended a period of time equal to the period of the delay and its consequences. Company will give to Purchaser notice in writing within a reasonable time after Company becomes aware of any such delay.

NONCANCELLATION - Purchaser may not cancel or terminate for convenience, or direct suspension of manufacture, except on mutually acceptable terms.

STORAGE - Any item of the product(s) on which manufacture or shipment is delayed by causes within Purchaser's control, or by causes which affect Purchaser's ability to receive the product(s), may be placed in storage by Company for Purchaser's account and risk.

TITLE AND INSURANCE - Title to the product(s) and risk of loss or damage shall pass to Purchaser at the f.o.b. point, except that a security interest in the product(s) and proceeds and any replacement shall remain in Company, regardless of mode of attachment to realty or other property, until the full price has been paid in cash. Purchaser agrees to do all acts necessary to perfect and maintain said security interest, and to protect Company's interest by adequately insuring the product(s) against loss or damage from any external cause with Company named as insured or co-insured.

INSPECTIONS / EXPEDITING - The Company wishes to clarify that it will have to restrict access to agreed upon reasonable times and only for the purpose of conducting those inspections agreed upon. We request 72 hours notice prior to each visit. We request notification prior to visits to our subcontractors and require that we accompany inspectors/expeditors on their visit(s).

TERMS OF PAYMENT - Unless otherwise stated all payments shall be Letter of Credit or Net Thirty (30) Days and in United States dollars, and a pro rata payment shall become due as each shipment is made. If shipment is delayed by Purchaser, date of readiness for shipment shall be deemed to be date of shipment for payment purposes. If at any time in Company's judgment Purchaser may be or may become unable or unwilling to meet the terms specified, Company may require satisfactory assurances or full or partial payment as a condition to commencing or continuing manufacture or making shipment; and may, if shipment has been made, recover the product(s) from the carrier, pending receipt of such assurances.

TAXES - Any applicable duties or sales, use, excise, value added or similar taxes will be added to the price and invoiced separately (unless acceptable exemption certificate is furnished).

PRODUCT RETURN - Products can be returned for credit only after receiving Company's authorization and shipping instructions. Consignor's name and address must be plainly written on the shipping tag.

PATENTS - Company shall pay costs and damages finally awarded in any suit against Purchaser or its vendees to the extent based upon a finding that the design or construction of the product(s) as furnished infringes a United States patent (except infringement occurring as a result of incorporating a design or modification at Purchaser's request) provided that Purchaser promptly notifies Company of any charge of such infringement, and Company is given the right at its expense to settle such charge and to defend or control the defense of any suit based upon such charge. This paragraph sets forth company's exclusive liability with respect to patents.

(Continued on back page)

CONDITIONS & TERMS OF SALE (CONT.)

of ITT Industrial & Biopharm Group (IBG)

BUYER DATA - Timely performance is contingent upon the Purchaser supplying to the Company, when needed, all required technical information, including drawing approval, and all required commercial documentation.

NUCLEAR - Purchaser represents and warrants that the product(s) covered by this contract shall not be used in or in connection with a nuclear facility or application.

PRICES - The prices stated herein will remain firm for the period up to the stated date of shipment providing the shipment is not delayed by the customer. If shipment is delayed by the customer beyond the shipment date quoted herein, the prices will be based on the prices in effect at time of shipment, including storage and material handling costs. In no event shall the adjusted price be less than the original order price, including change orders. Prices are F.O.B. Shipping Point, unless otherwise specified. When price includes transportation and other charges pertaining to the shipment of goods, any increase in transportation rates and other charges will be for the account of the purchaser. There will be an extra charge for any test other than that which may be normally run by the Company, or for any test performed to suit the convenience of the purchaser.

CONTROLLING PROVISIONS - These terms and conditions shall control with respect to any purchase order or sale of the Company's products. No waiver, alteration or modification of these terms and conditions whether on Purchaser's purchase order or otherwise shall be valid unless the waiver, alteration or modification is specifically accepted in writing and signed by an authorized representative the of Company.

EXPORT - If this transaction involves EXPORT, the following additional terms and conditions shall apply:

- Compliance is required for ALL applicable US export laws, and the export laws of the country from where the product is exported.
- PACKING - when packing is in IBG scope of supply, equipment will be packed, boxed or crated in accordance with the Company's standard commercial practice, for under deck export shipment, unless otherwise agreed.
- LETTER OF CREDIT - Unless otherwise specified in writing, payment shall be made by irrevocable letter of credit in form acceptable to Company, confirmed by a major USA bank, acceptable to the company and providing for payment in full in United States dollars against presentation of United States inland shipping documents and invoices, such letter of credit to be established prior to company's acceptance of the order. The letter of credit shall also provide that in the event Company is, for any reason beyond its control, prevented from making shipment from Company's factory or delivery at the port of embarkation, a certificate of manufacture of the whole or any part of the goods shall constitute delivery of such whole or any part of the goods and payment in full of any and all drafts drawn against the letter of credit for the goods so "delivered" shall be made upon presentation of such certificates of manufacture in lieu of United States inland shipping documents. In the event that Company is prevented by law, or otherwise, from making shipment from Company's factory or delivery at port of embarkation of the goods or any part thereof, on completion of manufacture, Company reserved the right to place the goods in storage for the Purchaser's account and risk. Any charges incurred in this connection will be for the account of the Purchaser at cost and will be payable upon demand. In regions where Letters of Credit are not available, surety bonds will be utilized in lieu of the bank guarantee.
- COMPANY AS AGENT - If Company makes or arranges for ocean shipment, Company shall act as agent for the Purchaser and reserves the right to procure full insurance coverage, including war risk insurance, at the expense of the Purchaser. All expenses incurred in this connection will be payable upon demand to the Company. If Company as agent applies for or secures manufacturing, financing, exporting or other licenses required by the United States Government, or any department thereof, Company shall make such applications or secure such licenses solely as gent for the purchaser, and assumes no responsibility therefore.

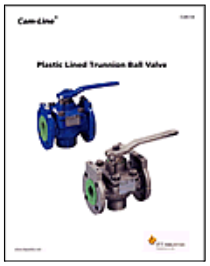
Engineered Valves Group

For additional information on the products below visit www.engvalves.com.

CAM-TITE®
Metal Ball Valves

RICHTER®
Lined Valves For Corrosive Applications

SKOTCH®
Burner Shut-Off Valves



CAM-LINE®
Lined Ball Valves

FABRI-VALVE®
Knife Gate and Special Fabricated Valves

Engineered Valves Group

For more information write to:
Engineered Valves Group
33 Centerville Road, P.O. Box 6164,
Lancaster, PA 17603-2064 USA
or call: (800) 366-1111
(717) 509-2200
Fax: (717) 509-2336
Website: www.engvalves.com
E-mail: engvalves.custserv@itt.com

8H.POD

ITT Industries