



ITT

Pure-Flo®

# Topworks

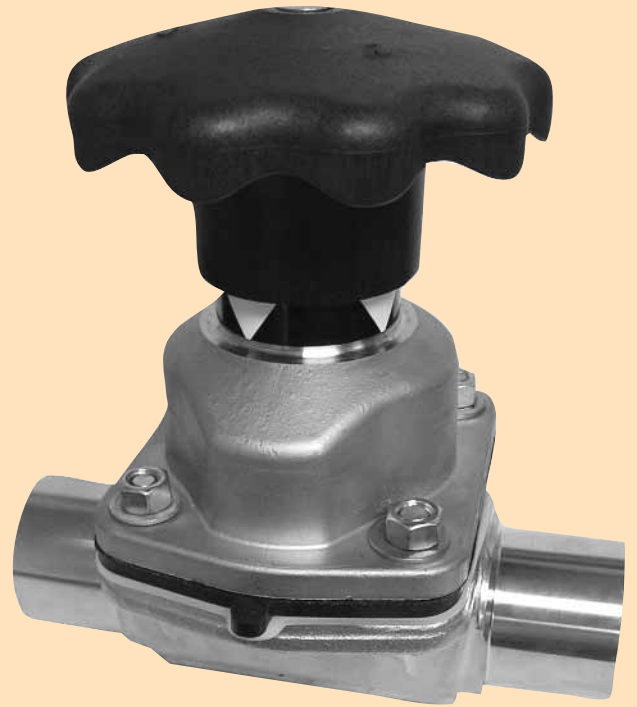


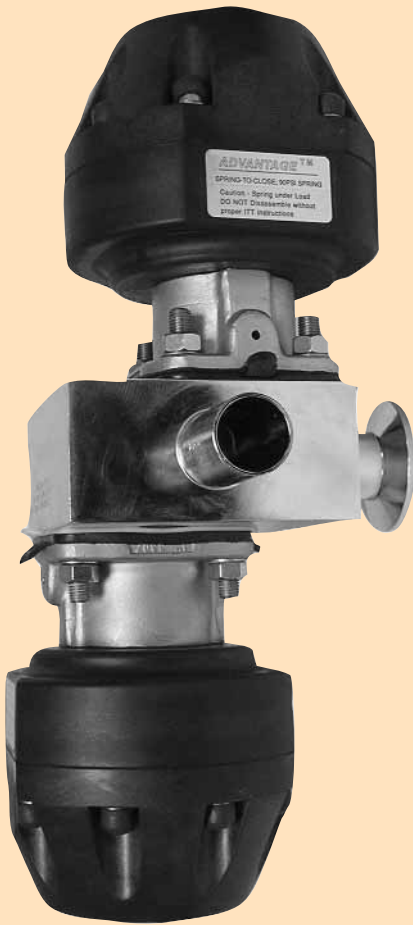
*Engineered for life*

[www.ittpureflo.com](http://www.ittpureflo.com)

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## Introduction

Available in a wide variety of manual and pneumatic styles to suit most any requirement, the Pure-Flo® actuator product line is designed and constructed to meet the most stringent applications within the Pharmaceutical and Bioprocessing industries.

All styles are constructed of FDA compliant materials and feature:

- Compact space saving designs
- Toughness
- Durability
- Reliability
- Resistance to most wash downs
- Ease of maintenance

# 963 PAS Manual Bonnet

Capable of withstanding typical washdown media, the 963 bonnet is a fully featured, compact, lightweight, yet rugged design. The 963 is packed with features that fulfill the most demanding requirements of today's critical bioprocessing systems.

**Type:** 963 & 963S

**Size Range:** ½"-4" (DN15-DN100)

## Service Pressure/Temperature:

Max Service Pressure:

150 psig (10.34 bar)

Max Service Temperature:

300° F (149° C)

## External Temperature

### Limitations:

300°F (149°C) for models 963-S2-M2-M17

S2 = Viton seal

M2 = Sanitary internals

M17 = PPS cap

175°F (79°C) for models 963

## Bonnet & Handwheel Material:

Glass reinforced polyarylsulfane (PAS)  
FDA compliant to 21CFR 177.1660

## Corrosion Resistance:

Resists alcohol, chloride and most caustic washdowns.

For specific chemical resistance, consult factory.

## Standard Features:

- Rising stem
- Adjustable travel stop
- Protective cap
- Brass stem bushing
- Visual position indicator
- Permanent lubrication
- "O" Ring seals
- Bronze compressor
- Enclosed fasteners ½"-3" (DN15-DN80)
- Hygienic internals: ½" - 2"



Adjustable Travel Stop  
prolongs diaphragm life

Brass Bushing acts as a  
lubricant and facilitates  
stem operation

Molded in Fingers

Top Entry In-Line  
Maintenance

Floating Tube  
Nut Design  
prevents stud  
pull out and  
point loading  
at diaphragm  
center

PTFE and Elastomer  
Diaphragms available

Protective Cap seals the  
internals from atmospheric  
conditions.

Visual Position Indicator

"O" Ring sealing  
standard

Fasteners  
enclosed  
in bonnet  
housing

Weep Hole allows for leak  
detection (available with  
"V" notch vent plug)

# 963 PAS Manual Bonnet

## Optional Features:

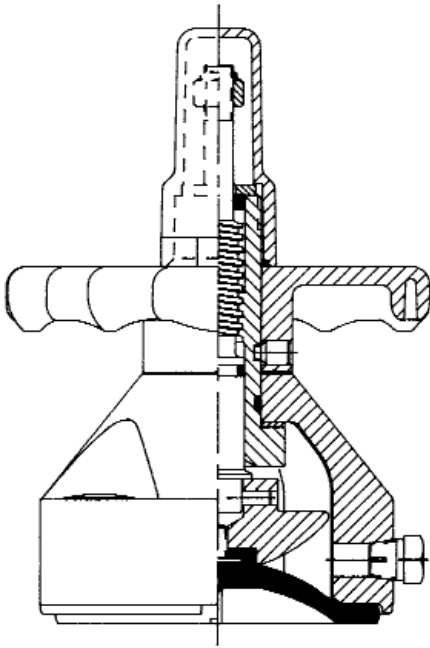
- Sealed bonnets: 963S
- Hygienic internals (M2): 3-4"
- Lockable: .5, .75, 1"

## Autoclavable Option:

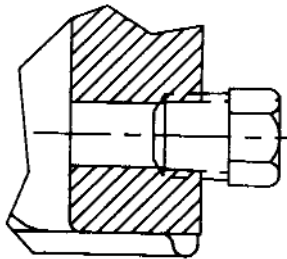
- 963S-S2-M2-M17
- S2 = Viton seal  
M2 = Sanitary internals  
M17 = PPS cap

A sealed bonnet provides a secondary containment area for process fluids if the diaphragm should ever fail. A "V" notch vent plug is provided to serve as a leak detector and prevents the release of process fluids into the atmosphere. Sealed bonnets are an available option on 963 manual bonnets.

Note: See page 23 and 27 for Dimensions and Bill of Materials



Sealed Bonnet - Vnotch Vent Plug



V-Notch Vent Plug Detail

# 970 Stainless Steel Manual Bonnet

Resistant to standard washdown protocols, the 970 stainless steel bonnet is the compact, autoclavable solution for Pharmaceutical/Bioprocessing applications.

**Type:** 970

**Size Range:** ½"-2" (DN15-DN50)

**Max Service Pressure:**

½ – 1": 200 psig (13.8 bar)

1½ – 2": 175 psig (12.1 bar)

**Max Service Temperature:**

See Page 27

**Bonnet Material:**

316 Stainless Steel

**Handwheel Material:**

Glass reinforced polyarylsulfane (PAS)  
FDA compliant to 21CFR 177.1660

**Corrosion Resistance:**

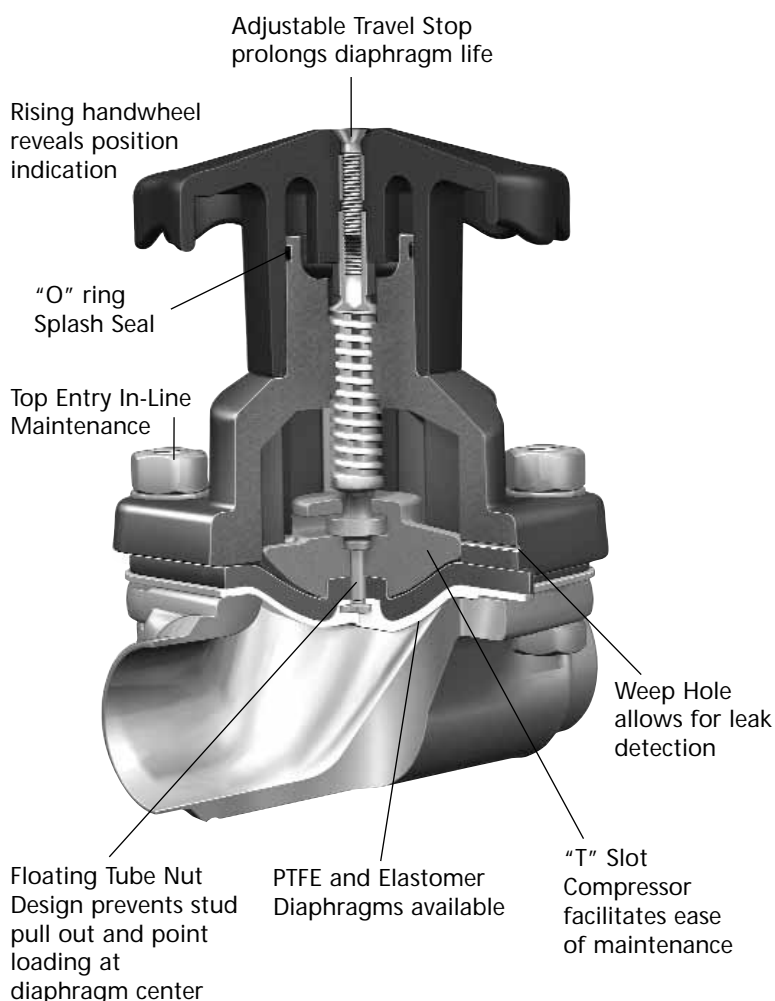
Resists alcohol, chloride and most caustic washdowns. For specific chemical resistance, consult factory.

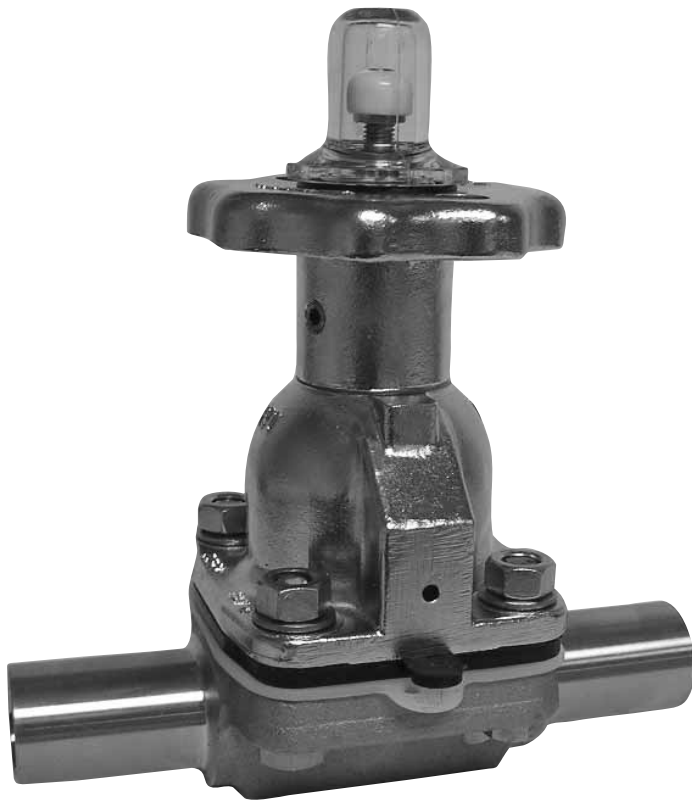
**Standard Features:**

- Easy assembly and disassembly
- Rising handwheel
- Adjustable travel stop\*
- Visual position indicator
- "O" ring splash seal
- Stainless steel stem
- Bronze compressor

Note: See page 23 and 26 for Dimensions and Bill of Materials

\* Patent # 6,241,213





## 913 Stainless Steel Manual Bonnet

Satisfying the most stringent bio-pharm processing requirements, the 913 is available with many standard and optional features. Stainless steel construction and the availability of a sealed option make the 913 bonnet an excellent choice for critical applications requiring reliability, corrosion resistance and secondary product containment.

**Type:** 913 & 913S

**Size Range:** ½"-4" (DN15-DN100)

**Max Service Pressure:**

½ – 1": 200 psig (13.8 bar)

1½ – 2": 175 psig (12.1 bar)

3 – 4": 150 psig (10.3 bar)

**Max Service Temperature:**

See Page 27

**Bonnet & Handwheel Material:**

300 Series Stainless Steel

**Corrosion Resistance:**

Resists alcohol and most caustic washdowns.

For specific chemical resistance, consult factory.

**Standard Features:**

- Adjustable travel stop
- Protective cap
- Brass stem bushing
- Visual position indicator
- Permanent lubrication
- "O" Ring seals
- Bronze compressor
- Hygienic internals: ½"- 4"

**Optional Features:**

- Sealed bonnets: 913S
- Adjustable opening stop
- 3A Bonnet internals
- Lockable
- Extended handwheel

**Autoclavable Options:**

- 913-S2-M2-M17 (Unsealed)
- 913S-S2-M2-M17 (Sealed)



## 903 Cast Iron Bonnet

The 903 is an economical option for applications that do not require auto-clavability. A selection of coatings makes the 903 suitable for a range of sanitary service including USDA 3A requirements.

**Type:** 903 & 903S

**Size Range:** ½"-4" (DN15-DN100)

**Max Service Pressure:**

½ – 1": 200 psig (13.8 bar)

1½ – 2": 175 psig (12.1 bar)

3 – 4": 150 psig (10.3 bar)

**Max Service Temperature:**

See Page 27

**Bonnet Material:**

Cast iron with coating

Coatings available: Atmospheric white epoxy and PVDF

**Handwheel Material:**

Glass reinforced polyarylsulfane (PAS) coated to match bonnet

½" – 1" (DN15-DN25)

Cast iron with coating from 1½" - 4" (DN40-DN100)

**Corrosion Resistance:**

Resists alcohol and most semi-caustic washdowns.

For specific chemical resistance, consult factory.

**Standard Features:**

- Adjustable travel stop
- Protective cap
- Brass stem bushing
- Visual position indicator
- Permanent lubrication
- "O" Ring seals
- Cast iron or zinc compressor

**Optional Features:**

- Sealed bonnets: 903S
- Hygienic internals: ½" - 4"
- Adjustable opening stop
- Bronze compressor
- Extended handwheel
- Lockable







## Bio-Tek® Manual Bonnet

The Bio-Tek® is a compact, light-weight solution ideal for Bioprocessing applications and utilized frequently as a sample or drain port in Pharmaceutical process systems and Pure-Flo fabrications.

**Type:** 18 & 18S

**Size Range:** ¼", ⅜", ½"  
(DN6-DN15)

**Service Pressure/Temperature:**  
150 psi at 220°F (10.34 bar, 104°C)  
Maximum external temperature:  
300°F (149°C)

### Bonnet Materials:

Model 18

- Bonnet: 316 Stainless Steel
- Spindle: Stainless Steel
- Compressor: Stainless Steel

Model 18S

- Bonnet: 316 Stainless Steel
- Spindle: Stainless Steel
- Compressor: Stainless Steel
- "O" Rings: Fluoropolymer, FDA compliant

### Standard Features:

- Adjustable travel stop
- Autoclavable

Note: This bonnet is available for Bio-Tek type bodies only.

# Advantage Piston Actuator - APA®

The APA was designed to provide a smaller dimensional envelope than the Advantage Actuator product line while satisfying the basic needs of the Bioprocessing and Pharmaceutical industries.

**Type:** Advantage Piston Actuator (APA)

**Size Range:** ½"-2" (DN 8-DN50)

**Mode of Operation:**

Reverse acting (fail closed) pneumatic piston actuator.

**Max Service Pressure:**

150 psig (10.34 bar)

**Max Service Temperature:**

292°F (145°C)

**Bonnet Material:**

316 Stainless Steel

**Cylinder/Cover Material:**

Polybutylene terephthalate (PBT)  
FDA compliant to 21CFR 177.1660

**Corrosion Resistance:**

Resists alcohol, chloride and most caustic washdowns. For specific chemical resistance, consult factory.

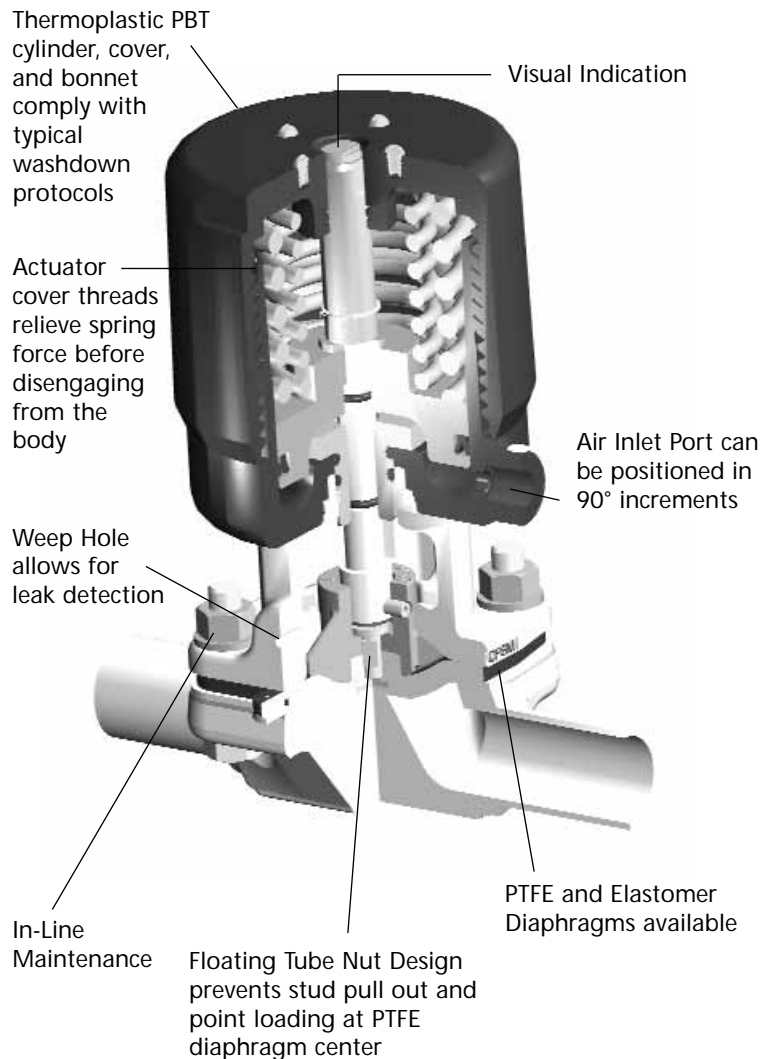
**Standard Features:**

- Visual position indicator
- Permanent lubrication
- "O" Ring seals
- Switch mounting bolt pattern

**Optional Features:**

- Adjustable opening stop
- Hygienic internals
- Switch packages

Note: See page 22 and 24 for Dimensions and Bill of Materials. See page 16 for Actuator sizing.





Stainless Steel Bonnet (31)

## Advantage<sup>®</sup> Actuator

The Advantage<sup>®</sup> is a diaphragm driven, compact, lightweight actuator designed to meet the stringent space constraints of the Bioprocessing and Pharmaceutical Industries. The unit is designed as an on/off pneumatic actuator available with three modes of closure.

**Type:** Advantage<sup>®</sup>

**Size Range:** ¼"-2" (DN6-DN50)

**Operating Modes:**

Fail Closed, Fail Open, Double Acting

**Service Pressure/Temperature:**

Max Service Pressure:

150 psig (10.34 bar)

Max Service Temperature:

300°F (149°C)

External Temperature Limitations:

300°F (149°C)

**Bonnet Material** (Bonnet Code 36):

Glass reinforced polyarylsulfone (PAS)

FDA Compliant to 21CFR 177.1660

**Corrosion Resistance:**

Resists alcohol, chloride and most caustic washdowns.

For specific chemical resistance, consult factory.

**Standard Features:**

- Visual position indicator
- "O" Ring seals
- Hygienic internals
- Autoclavable ¼-2"
- Switch mounting bolt pattern

**Optional Features:**

- Adjustable opening stop
- Stainless steel bonnet (Bonnet Code 31)
- Adjustable travel stop

Note: See page 20 and 25 for Dimensions and Bill of Materials. See pages 17-19 for Actuator sizing.

# Series 33 and 47 Advantage<sup>®</sup> Actuator

The 33 & 47 Advantage Actuators extend the size range of the Advantage Actuator product line to 3" and 4" valves.

**Type:** Advantage<sup>®</sup> 33 & 47

**Size Range:** 3"-4" (DN80-DN100)

**Operating Modes:**

Fail Closed\*, Fail Open, Double Acting

**Max Service**

**Pressure/Temperature:**

150 psig (10.34 bar)  
300°F (149°C)

**External Temperature**

**Limitations:**

150°F (66°C)

**Actuator Cover Material:**

Vinyl-Ester thermoset (FDA compliant)

**Bonnet Material:**

Nylon coated ductile iron

**Corrosion Resistance:**

Resists alcohol, chloride and most caustic washdowns. For specific chemical resistance, consult factory.

**Standard Features:**

- Visual position indicator
- "O" Ring seals
- Adjustable Travel Stop (47 series only)
- Switch mounting bolt pattern

**Optional Features:**

- Hygienic internals

\*Springs self-contained (Fail closed only)

Note: See page 21 and 22 for Dimensions and Bill of Materials. See pgs 17-19 for Actuator sizing.



Series 47

Similar to the smaller valve sized Advantage Actuators, the 3"-4" series 47 (DN80-DN100) actuator is also diaphragm driven, "O" ring furnished and available in three modes of operation. The actuator design features the same dimensional envelope regardless of operation mode.



Series 33

The 3"-4" Pure-Flo 33 series Advantage Actuators have been introduced to further reduce the dimensional envelope and weight for installations in the Pharmaceutical/Bioprocessing industries. The 33 series 4" Spring to Close actuator is 25% smaller in diameter, has 22% reduction in height and offers a 32% reduction in weight than a comparable 4" 47 series actuator.



## Dia-Flo® Actuator

The Dia-Flo actuator, diaphragm driven and pneumatically operated, is a process proven actuator suitable for both the Pure-Flo and Dia-Flo product lines. The Dia-Flo actuator is recommended as an alternative to the Advantage Actuator for applications in which the line pressure or available plant air pressure is not within the advantage actuator parameters.

**Type:** Dia-Flo

**Size Range:**

The Dia-Flo actuator is available in seven interchangeable sizes and can be readily mounted to any size valve with the proper size bonnet. See Dia-Flo catalog DV-01 for actuator sizing

**Actuator Materials:**

Aluminum  
Ductile iron - optional

**Corrosion Resistant Coatings:**

White epoxy  
PVDF  
Nylon

**Bonnet Materials:**

Ductile iron  
Stainless steel – optional

**Actuator Air Pressure:**

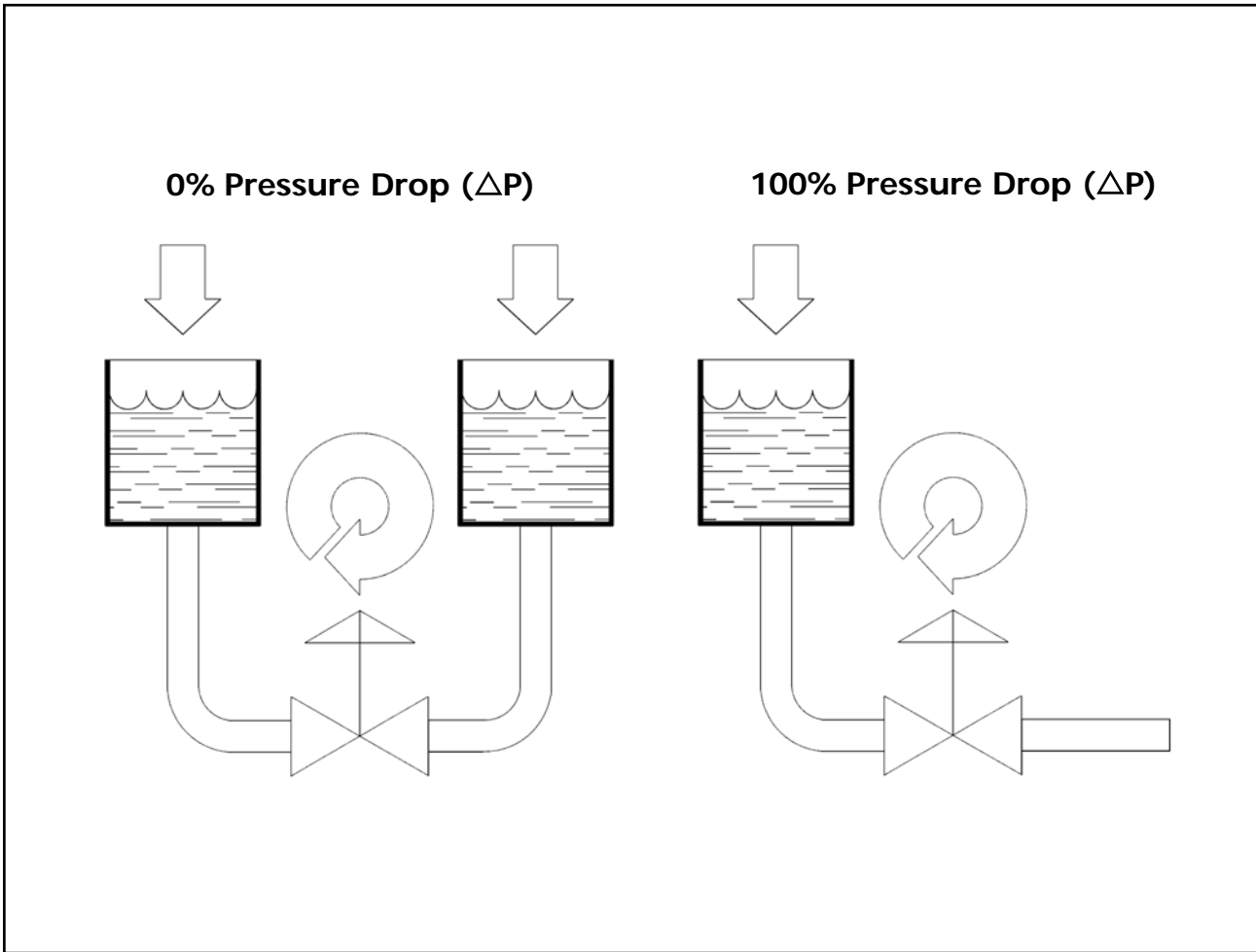
85 psi (5.9 bar) max

**Options:**

- Adjustable opening stop
- Adjustable travel stop\*
- Hygienic internals
- Visual position indicator
- Wrench or handwheel operated
- Manual overrides

\*Adjustable Travel Stop standard on all Fail Closed actuators (except 3212)

# Pressure Drop Definition



## Approximate Maximum Chamber Volume

Valve Size		Advantage Actuator				APA	
		Upper Chamber		Lower Chamber		Lower Chamber	
Inch	DN	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>
.25, .375, .50*	6, 10, 15*	2.62	43	2.26	37		
0.50	15	5.49	90	4.27	70	3.22	52.8
0.75	20	12.51	205	7.63	125	3.72	61.0
1.00	25	12.08	198	9.15	150	4.06	66.5
1.50	40	71.00	1163	34.78	570	14.6	239
2.00	50	71.00	1163	38.75	635	18.3	300
3.00 (47)	80	463.80	7600	250.20	4100	NA	NA
4.00 (47)	100	463.80	7600	250.20	4100	NA	NA

\*Blo-Tek sizes

# Advantage Piston Actuator (APA) Sizing

Reverse Action Actuators - Air-To-Open, Spring-To-Close (APA only)														
DIAPHRAGM	Actuator Model	Maximum Line Pressure											Air Pressure required to open, for full stroke at 0 psi line pressure	
		Valve Size												
		100% ΔP					0% ΔP							
		Bio-Tek**	0.50	0.75	1.00	1.50	2.00	Bio-Tek**	0.50	0.75	1.00	1.50		2.00
Bio-Tek**	15	20	25	40	50	Bio-Tek**	15	20	25	40	50			
ELASTOMER	AP0506		80						60					60
			5.52						4.14					4.14
	AP0509		150						100					85
			10.34						6.89					5.86
	AP0756			100						50				60
				6.89						3.45				4.14
	AP0759			150						100				85
				10.34						6.89				5.86
	AP1006				130						70			60
					8.96						4.83			4.14
	AP1009				150						110			88
					10.34						7.58			6.07
	AP1506					100						50		54
						6.89						3.45		3.72
AP1509					150						120		82	
					10.34						8.27		5.65	
AP2006						70						30	58	
						4.83						2.07	4.00	
AP2009						140						75	90	
						9.65						5.17	6.21	
PTFE	AP0506		50						30				60	
			3.45						2.07				4.14	
	AP0509		150						70				85	
			10.34						4.83				5.86	
	AP0756			60						60			60	
				4.14						4.14			4.14	
	AP0759			105						80			85	
				7.24						5.52			5.86	
	AP1006				40						35		60	
					2.76						2.41		4.14	
	AP1009				110						75		88	
					7.58						5.17		6.07	
	AP1506					40						40	54	
						2.76						2.76	3.72	
AP1509					150						90	82		
					10.34						6.21	5.65		
AP2006						40						20	58	
						2.76						1.38	4.00	
AP2009						90						35	90	
						6.21						2.41	6.21	

Legend 

psig
bar

Note: See page 14 for ΔP Pressure Drop definition.

\* The exposure of the diaphragm to steam may increase the air requirements to close by as much as 30%.

\*\* Bio-Tek includes size 0.25" (DN8), 0.38" (DN10), and 0.50" (DN15).



# Advantage<sup>®</sup> Actuator Sizing

## Direct Acting Actuators - Air-To-Close, Spring-To-Open, Fail-Open

DIAPHRAGM	Air Pressure Required to Close (psig, bar)																				
	Valve Size	Bio-Tek**	0.50	0.75	1.00	1.50	2.00	3.00	4.00	3.00	4.00										
	Bio-Tek**	15	20	25	32-40	50	80	100	80	100											
Actuator Model	A103	A105	A108	A108	A116	A116	A133	A133	A147	A147											
Line Pressure	% ΔP																				
	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	
ELASTOMER	20	38	40	38	45	38	55	28	40	36	40	40	45	44	46	48	55	32	37	30	40
	1.38	2.62	2.76	2.62	3.10	2.62	3.79	1.93	2.76	2.48	2.76	2.76	3.10	3.03	3.17	3.31	3.79	2.21	2.55	2.07	2.76
	40	40	42	40	50	42	60	32	45	38	44	45	50	50	58	55	69	41	44	36	47
	2.76	2.76	2.90	2.21	3.45	2.70	4.14	2.21	3.10	2.62	3.03	3.10	3.45	3.45	4.00	3.79	4.76	2.83	3.03	2.48	3.24
	60	42	44	44	55	46	65	36	55	42	48	50	60	55	66	64	85	42	49	42	56
	4.14	2.90	3.03	3.03	3.79	3.17	4.48	2.48	3.79	2.90	3.31	3.45	4.14	3.79	4.55	4.41	5.86	2.90	3.38	2.90	3.86
	80	46	48	48	60	50	70	40	60	44	52	56	70	61	76	72	90	44	56	48	66
	5.52	3.17	3.31	3.31	4.14	3.45	4.83	2.76	4.14	3.03	3.59	3.86	4.83	4.21	5.24	4.97	6.21	3.03	3.86	3.31	4.55
	100	48	52	50	65	52	75	45	70	48	56	60	75	66	90	80	—	52	65	53	79
	6.90	3.31	3.59	3.45	4.48	3.59	5.17	3.10	4.83	3.31	3.86	4.14	5.17	4.55	6.21	5.52	—	3.59	4.48	3.65	5.45
	125	52	56	54	70	60	85	50	75	50	60	64	80	78	—	90	—	63	73	59	90
	8.62	3.59	3.86	3.72	4.83	4.14	5.86	3.45	5.17	3.45	4.13	4.41	5.52	5.38	—	6.21	—	4.34	5.03	4.07	6.21
	150	56	60	58	75	68	—	55	85	52	65	68	—	81	—	—	—	71	83	65	—
10.34	3.86	4.14	4.00	5.17	4.70	—	3.79	5.86	3.59	4.48	4.69	—	5.59	—	—	—	4.90	5.72	4.48	—	
PTFE*	20	42	50	46	66	55	55	50	55	45	52	48	50	64	60	78	80	36	53	46	48
	1.38	2.90	3.45	3.17	4.55	3.79	3.79	3.45	3.79	3.10	3.59	3.31	3.45	4.41	4.14	5.38	5.52	2.48	3.65	3.17	3.31
	40	44	52	50	68	58	60	55	60	50	56	50	60	68	78	84	90	44	60	52	66
	2.76	3.03	3.59	3.45	4.70	4.00	4.14	3.79	4.14	3.45	3.86	3.45	4.14	4.69	5.38	5.79	6.21	3.03	4.14	3.59	4.55
	60	48	56	52	72	60	65	60	65	55	60	56	70	74	88	90	—	51	75	56	74
	4.14	3.31	3.86	3.59	4.97	4.14	4.48	4.14	4.48	3.79	4.14	3.86	4.83	5.10	6.07	6.21	—	3.52	5.17	3.86	5.10
	80	52	60	56	76	65	70	65	70	60	64	64	80	78	—	—	—	55	85	62	81
	5.52	3.59	4.14	3.86	5.24	4.48	4.83	4.48	4.83	4.14	4.41	4.41	5.52	5.38	—	—	—	3.79	5.86	4.27	5.58
	100	54	65	60	82	68	75	70	80	64	68	70	90	84	—	—	—	57	—	70	90
	6.90	3.72	4.48	4.14	5.65	4.69	5.17	4.83	5.52	4.41	4.69	4.83	6.21	5.79	—	—	—	3.93	—	4.83	6.21
	125	58	70	64	86	74	80	75	—	68	72	76	—	90	—	—	—	59	—	79	—
	8.62	4.00	4.83	4.41	5.93	5.10	5.52	5.17	—	4.69	4.69	5.24	—	6.21	—	—	—	4.07	—	5.45	—
	150	62	75	68	—	80	85	80	—	72	76	82	—	—	—	—	—	63	—	83	—
10.34	4.27	5.17	4.70	—	5.52	5.86	5.52	—	4.96	5.24	5.65	—	—	—	—	—	4.34	—	5.72	—	

Legend

psig
bar

Note: See page 14 for ΔP Pressure Drop definition

\* The exposure of the diaphragm to steam may increase the air requirements to close by as much as 30%.

\*\* Bio-Tek includes size 0.25" (DN8), 0.38" (DN10), and 0.50" (DN15).

# Advantage® Actuator Sizing

## Reverse Action Actuators - Air-To-Open, Spring-To-Close, Fail-Close

DIAPHRAGM	Maximum Line Pressure																	Air Pressure Required to open, for full stroke at 0 PSI Line Pressure
	Valve Size																	
	100% ΔP								0% ΔP									
	Actuator Model	Bio-Tek**	0.50	0.75	1.00	1.50	2.00	3.00	4.00	Bio-Tek**	0.50	0.75	1.00	1.50	2.00	3.00	4.00	
	Bio-Tek**	15	20	25	32-40	50	80	100	Bio-Tek**	15	20	25	32-40	50	80	100		
ELASTOMER	A203	150 10.34							150 10.34								55 3.79	
	A204	150 10.34							150 10.34								75 5.17	
	A205		110 7.58							90 6.21							50 3.45	
	A206		150 10.34							150 10.34							90 6.21	
	A208			100 6.89							60 4.14						45 3.10	
	A208				150 10.34							80 5.52					60 4.14	
	A209			150 10.34	150 10.34							120 8.27	130 8.96				90 6.21	
	A216					100 6.89							65 4.48				50 3.45	
	A216						70 4.83							30 2.07			60 4.14	
	A217					150 10.34	150 10.34						130 8.96	75 5.17			90 6.21	
	A233						95 6.55	70 4.83								60 4.14	35 2.41	62 4.28
	A234						150 10.34	110 7.59								92 6.34	50 3.45	85 5.86
	A247						150 10.34									92 6.34		57 3.93
	A247							119 8.20									59 4.07	60 4.14
	A248						150 10.34									150 10.34		76 5.24
	A248							150 10.34									93 6.41	82 5.65
	PTFE*	A203	70 10.34							55 3.79								55 3.79
		A204	150 10.34							125 8.62								75 5.17
		A206		150 10.34							150 10.34							90 6.21
		A208		150 10.34	140 9.65						100 6.89	70 4.83						60 4.14
A208					100 6.89							35 2.41					70 4.83	
A209				150 10.34	150 10.34						80 5.52	80 5.52					90 6.21	
A216						125 8.62							70 4.83				50 3.45	
A216							60 4.14							45 3.10			60 4.14	
A217						150 10.34	150 10.34						125 8.82	70 4.83			90 6.21	
A233							50 3.45	30 2.07							20 1.38	15 1.03	62 4.28	
A234							105 7.24	60 4.14							45 3.10	30 2.07	85 5.86	
A247							133 9.17	70 4.83							68 4.69		61 4.21	
A247																41 2.83	62 4.27	
A248							150 10.34	126 8.69								114 7.86		82 5.65
A248																70 4.83	90 6.21	

Legend 

psig
bar

Note: See page 14 for ΔP Pressure Drop definition

\* The exposure of the diaphragm to steam may derate the shut-off line pressure by as much as 30%.  
 \*\* Bio-Tek includes size 0.25" (DN8), 0.38" (DN10), and 0.50" (DN15).

# Advantage<sup>®</sup> Actuator Sizing

## Double Acting Actuators - Air-To-Close, Air-To-Open

		Air Pressure Required to Close (psig, bar)																				
		Bio-Tek**		0.50	0.75	1.00	1.50	2.00	3.00	4.00	3.00	4.00										
DIAPHRAGM	Valve Size	Bio-Tek**		15	20	25	32-40	50	80	100	80	100										
	Actuator Model	A303	A305	A308	A308	A316	A316	A333	A333	A347	A347											
Line Pressure		% ΔP																				
		100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0	
ELASTOMER	20	22	26	24	30	18	25	12	20	16	20	22	40	18	24	16	25	11	14	9	25	
	1.38	1.51	1.79	1.65	2.07	1.24	1.72	0.83	1.38	1.10	1.38	1.52	2.76	1.24	1.66	1.10	1.72	0.76	0.79	0.62	1.72	
	40	24	28	26	35	20	30	16	25	20	25	26	45	26	29	24	38	17	21	15	30	
	2.76	1.65	1.93	1.79	2.41	1.38	2.07	1.10	1.72	1.38	1.72	1.79	3.10	1.79	2.00	1.66	2.62	1.17	1.45	1.03	2.07	
	60	26	30	28	40	24	35	20	35	24	30	30	50	32	38	30	55	22	28	22	46	
	4.14	1.79	2.07	1.93	2.75	1.65	2.41	1.38	2.41	1.65	2.07	2.07	3.45	2.21	2.62	2.07	3.79	1.52	1.93	1.52	3.17	
	80	28	32	32	45	26	40	24	40	28	35	35	55	38	48	38	68	23	35	27	60	
	5.52	1.93	2.21	2.21	3.10	1.79	2.76	1.65	2.76	1.93	2.41	2.41	3.79	2.62	3.31	2.62	4.69	1.59	2.41	1.86	4.14	
	100	30	34	34	50	30	50	28	50	32	40	40	60	42	58	48	84	26	43	32	68	
	6.90	2.07	2.34	2.34	3.45	2.07	3.45	1.93	3.45	2.21	2.76	2.76	4.14	2.90	4.00	3.31	5.79	1.79	2.96	2.21	4.69	
	125	32	38	38	55	34	55	36	55	36	45	45	70	52	68	58	—	34	53	40	76	
	8.62	2.21	2.62	2.62	3.79	2.34	3.79	2.48	3.79	2.48	3.10	3.10	4.83	3.59	4.69	4.00	—	2.34	3.65	2.76	5.24	
	150	34	44	42	60	38	60	44	65	40	50	50	80	57	80	68	—	37	61	49	88	
	10.34	2.34	3.03	2.90	4.14	2.62	4.14	3.03	4.48	2.76	3.45	3.45	5.52	3.93	5.52	4.69	—	2.55	4.21	3.38	6.07	
PTFE*	20	34	36	34	36	28	30	25	35	25	34	35	40	38	38	42	44	19	33	31	37	
	1.38	2.34	2.48	2.34	2.48	1.93	2.07	1.72	2.41	1.72	2.34	2.41	2.76	2.62	2.62	2.90	3.03	1.31	2.28	2.14	2.55	
	40	36	40	36	40	34	35	35	40	30	38	40	50	41	49	50	60	21	40	35	53	
	2.76	2.48	2.76	2.48	2.76	2.34	2.41	2.41	2.76	2.07	2.62	2.76	3.45	2.83	3.38	3.45	4.14	1.45	2.76	2.41	3.66	
	60	40	44	40	46	38	40	45	50	35	42	50	60	47	58	56	74	29	46	44	59	
	4.14	2.76	3.03	2.76	3.17	2.62	2.76	3.10	3.45	2.41	2.90	3.45	4.14	3.24	4.00	3.86	5.10	2.00	3.17	3.03	4.07	
	80	42	46	42	50	40	45	50	55	40	46	55	70	53	67	65	90	32	51	49	65	
	5.52	2.90	3.17	2.90	3.45	2.76	3.10	3.45	3.79	2.76	3.17	3.79	4.83	3.66	4.62	4.48	6.21	2.21	3.52	3.38	4.48	
	100	44	52	44	54	42	50	55	60	45	50	60	80	58	78	73	—	35	58	54	77	
	6.90	3.03	3.57	3.03	3.72	2.90	3.45	3.79	4.14	3.10	3.45	4.14	5.52	4.00	5.38	5.03	—	2.41	4.00	3.72	5.31	
	125	46	56	46	58	44	55	60	70	50	55	64	90	64	90	82	—	42	68	62	—	
	8.62	3.17	3.86	3.17	4.00	3.03	3.79	4.14	4.83	3.45	3.79	4.41	6.21	4.41	6.21	5.66	—	2.90	4.69	4.28	—	
	150	48	62	48	62	46	60	65	80	55	62	68	—	69	—	90	—	45	78	68	—	
	10.34	3.31	4.27	3.31	4.28	3.17	4.14	4.48	5.52	3.79	4.28	4.69	—	4.76	—	6.21	—	3.10	5.38	4.69	—	

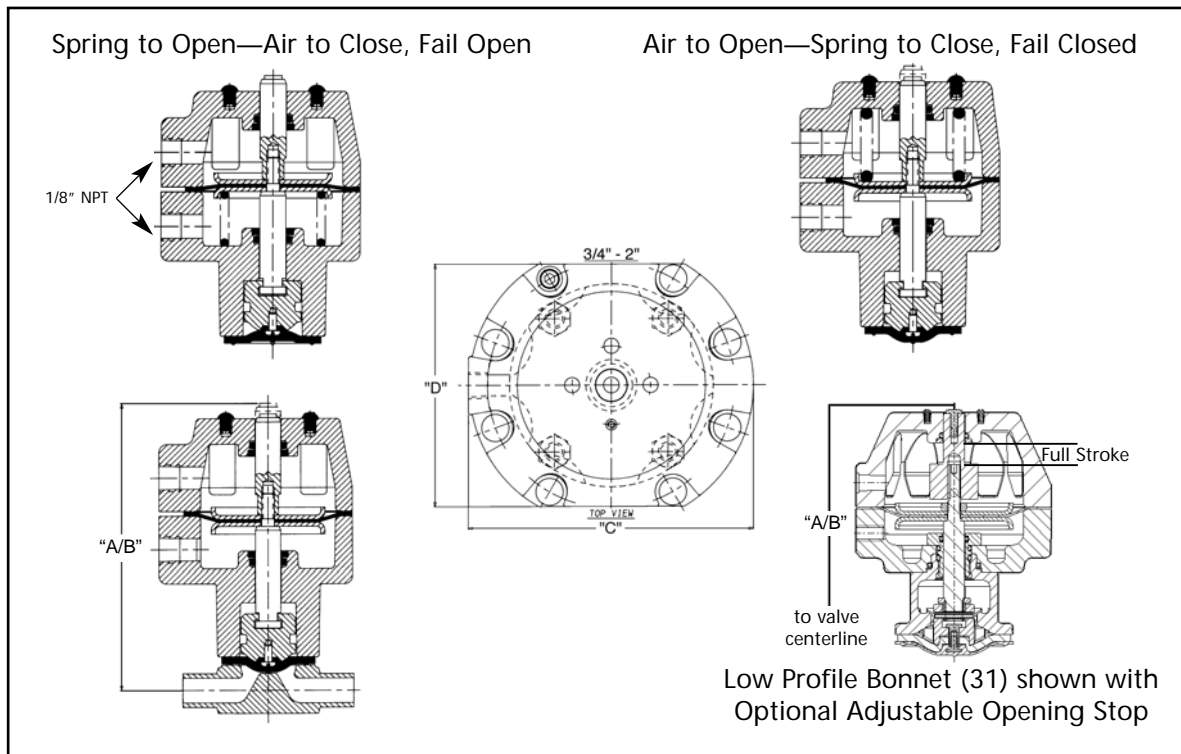
Legend 

psig
bar

Note: See page 14 for ΔP Pressure Drop definition  
 \* The exposure of the diaphragm to steam may increase the air requirements to close by as much as 30%.  
 \*\* Bio-Tek includes size 0.25" (DN8), 0.38" (DN10), and 0.50" (DN15).

# Dimensional Charts

## Advantage Actuator 1/4"-2"



### Dimensional Data with Forged Body

Valve Size		A Valve Open		B With Limit Switch, SP 2		C		D	
Inch	DN	Inch	mm	Inch	mm	Inch	mm	Inch	mm
TC 25, .375, .5 <sup>2</sup>	8, 10, 15 <sup>2</sup>	4.33	110	9.23	234	2.84	72	2.5	63
BW 25, .375, .5 <sup>1</sup>	8, 10, 15 <sup>1</sup>	4.40	112	9.30	236	2.84	72	2.50	63
0.50	15	4.90	124	9.77	248	3.34	85	3.00	76
0.75	20	5.99	152	10.78	274	4.56	116	3.88	98
1.00	25	6.60	168	11.19	284	4.56	116	3.88	98
1.50	40	10.55	268	14.89	378	6.41	163	5.94	151
2.00	50	11.31	287	15.37	390	6.41	163	5.94	151

<sup>2</sup>Bio-Tek Valve series TC Ends  
<sup>1</sup>Bio-Tek Valve series BW Ends

## Actuator Weights

### Weights include Actuator and Forged Body

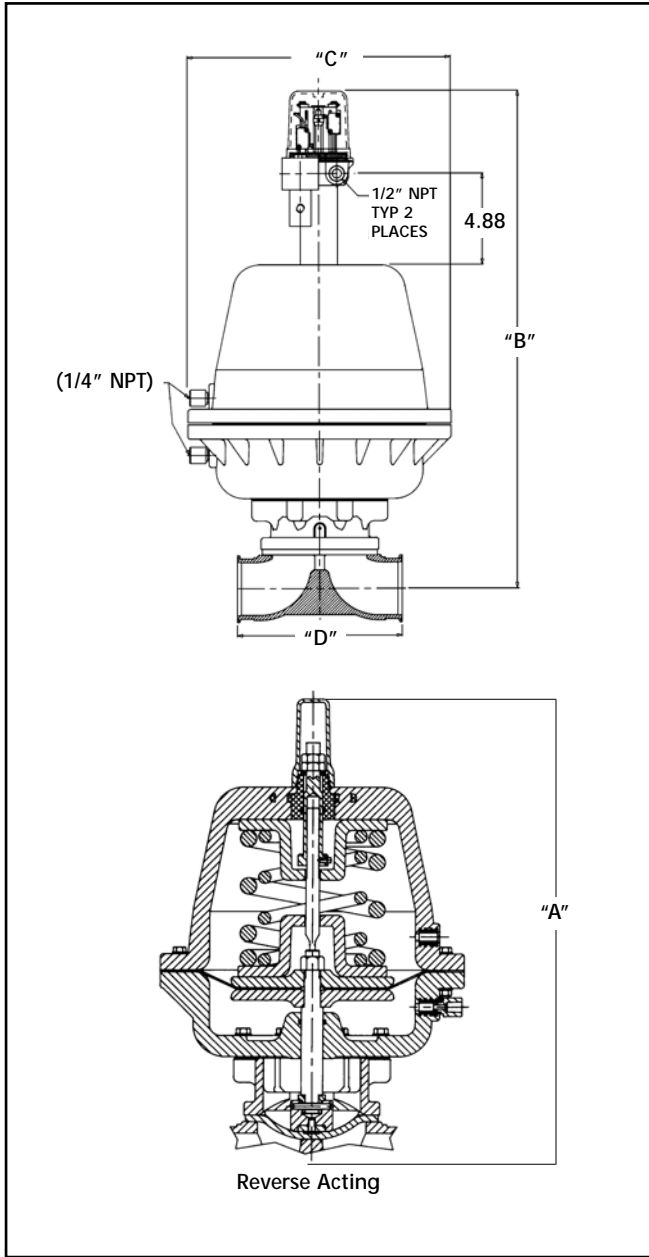
Valve Size		Double Acting		Spring-to-Open		Spring-to-Close	
Inch	DN	Lbs.	Kg	Lbs.	Kg	Lbs.	Kg
.25, .375, .50*	8, 10, 15	1.25	0.57	1.31	0.59	1.37	0.62
0.50	15	2.00	0.91	2.09	0.95	2.34	1.06
0.75	20	3.69	1.67	3.78	1.71	4.34	1.97
1.00	25	4.47	2.03	4.59	2.08	5.16	2.34
1.50	40	12.10	5.49	12.60	5.71	16.44	7.46
2.00	50	15.16	6.88	15.66	7.10	19.50	8.84

\*Bio-Tek sizes

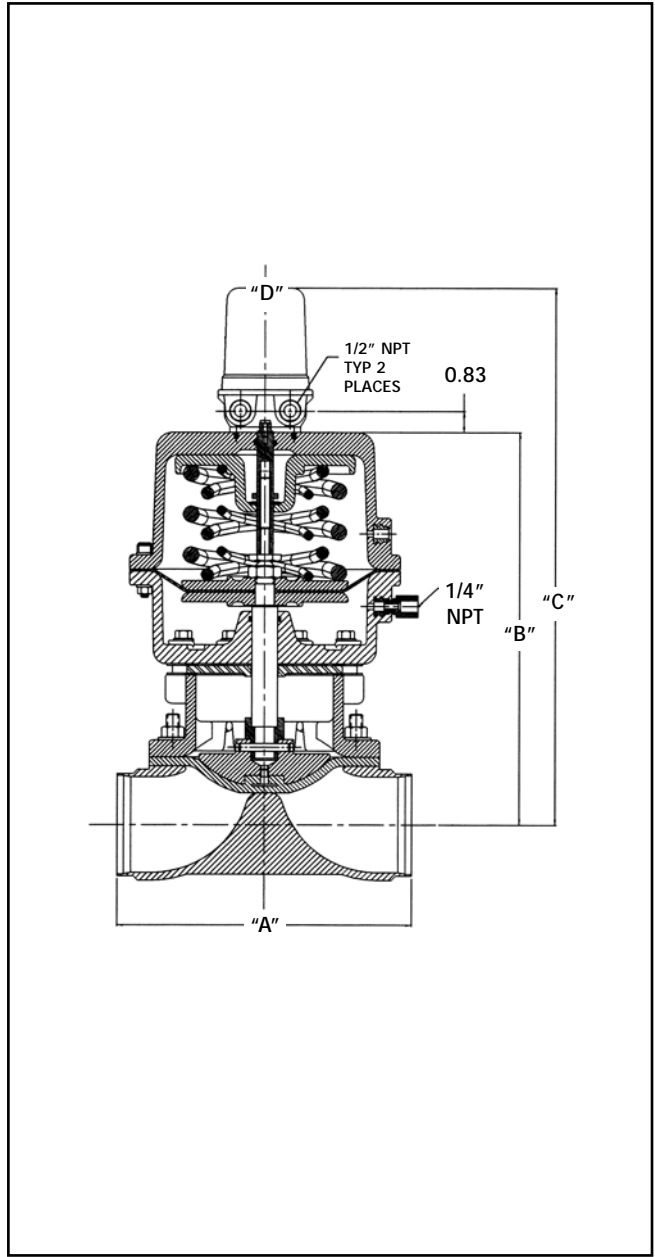
# Dimensional Charts

## Advantage Actuators 3" & 4"

**Series 47**



**Series 33**



**Series 47 Dimensional Data**

Valve Size		A		B With Limit Switch, SP 2		C		D	
Inch	DN	Inch	mm	Inch	mm	Inch	mm	Inch	mm
3.00	80	21.51	546	27.08	688	14.00	356	8.75	222
4.00	100	22.90	582	28.47	723	14.00	356	11.50	292

**Series 33 Dimensional Data**

Valve Size		A		B		C*		D	
Inch	DN	Inch	mm	Inch	mm	Inch	mm	Inch	mm
3.00	80	10.00	254.0	14.44	366.7	19.64	498.8	10.57	268.5
4.00	100	13.00	230.2	15.82	401.7	21.02	533.8	10.57	268.5

\* With Limit Switch SP2

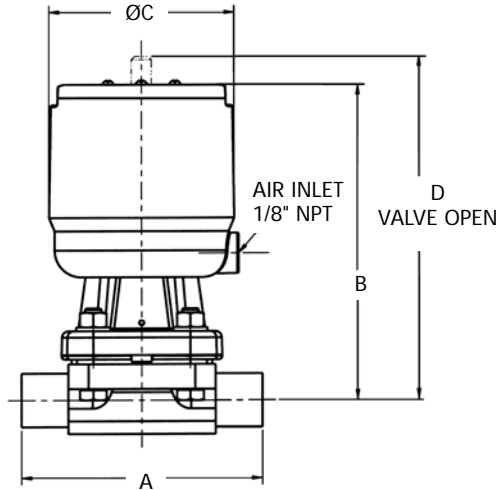
# Advantage Actuator Weights 33 & 47 Series

Advantage Actuator Weights (including Actuator and Forged Body*)							
Valve Size		Double Acting		Spring-to-Open		Spring-to-Close	
Inch	DN	Lbs.	Kg	Lbs.	Kg	Lbs.	Kg
3.00 (47)	80	72.09	32.70	75.39	34.20	107.49	48.76
4.00 (47)	100	82.50	37.42	85.80	38.92	117.50	53.30

\*3" & 4" (DN 80-100) include cast body weight

Advantage Actuator Weights (less Body and Diaphragm)									
Size		Double Act		Direct		Reverse			
						60		90	
Inch	DN	Lbs.	Kg	Lbs.	Kg	Lbs.	Kg	Lbs.	Kg
3.00 (33)	80	39.00	17.69	42.30	19.19	54.20	24.59	58.00	26.31
4.00 (33)	100	44.00	19.96	47.30	21.46	59.20	26.85	63.00	28.58

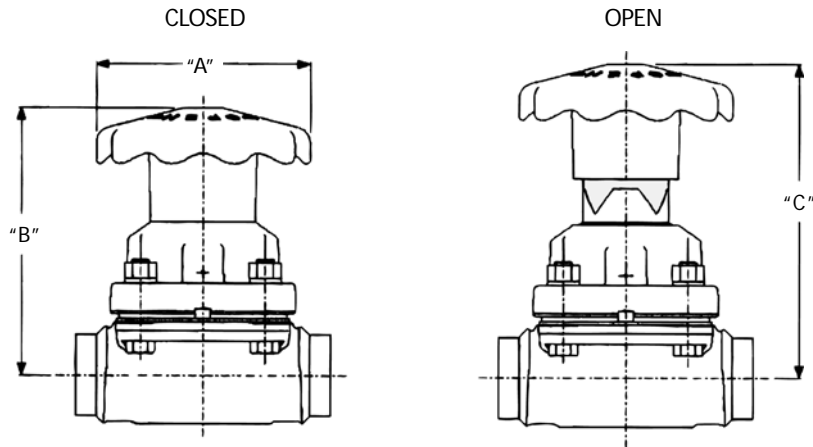
## Dimensional Charts Advantage Piston Actuators



Valve Size		A		B		C		D		Actuator Weight*	
Inch	DN	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lb	kg
0.50	15	3.50	89.8	4.53	115.0	2.75	69.9	4.90	124.4	1.80	0.81
0.75	20	4.00	101.6	5.34	135.6	3.38	85.9	5.80	147.3	3.23	1.46
1.00	25	4.50	114.3	5.90	149.8	3.38	85.9	6.42	163.0	3.62	1.64
1.50	40	5.50	139.7	9.53	242.0	5.00	127.0	10.34	262.7	11.75	5.32
2.00	50	6.25	158.7	10.07	255.8	5.00	127.0	11.18	284.1	13.3	6.03

\* Less body

# Dimensional Charts 970 Manual Bonnets

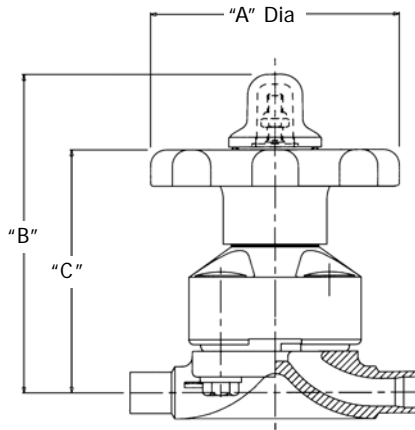


The following table gives handwheel diameter and assembly heights from body centerline to top of bonnet assembly.

Valve Size		A		B		C		Bonnet Weight*	
Inch	DN	Inch	mm	Inch	mm	Inch	mm	lb	kg
0.50	15	2.75	69.9	3.65	92.7	3.93	99.7	0.97	0.44
0.75	20	2.75	69.9	3.89	98.8	4.26	108.3	1.23	0.56
1.00	25	2.75	69.9	4.54	115.3	4.99	126.7	1.67	0.76
1.50	40	5.25	133.3	5.86	148.8	6.67	169.4	5.00	2.27
2.00	50	5.25	133.3	6.49	164.8	7.61	193.3	6.50	2.95

\* Less body

# 963/903/913 Manual Bonnets



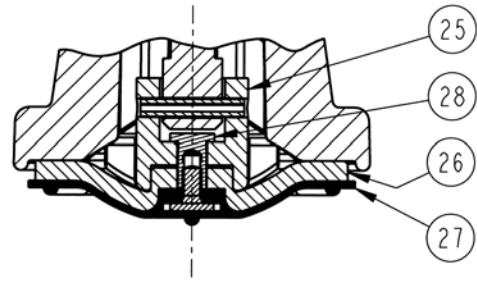
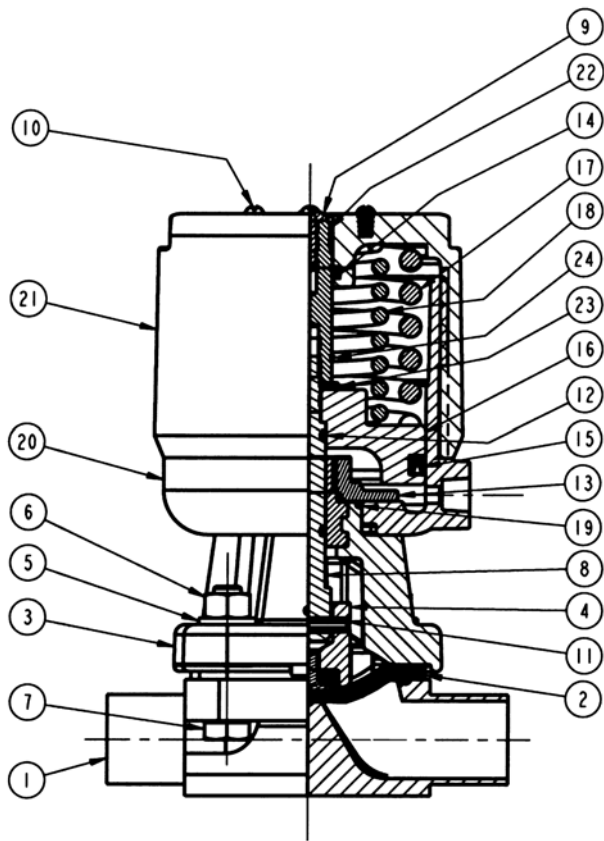
The following table gives handwheel diameter and assembly heights from body centerline to top of bonnet assembly.

VALVE SIZE		A		B		C	
Inch	DN	Inch	mm	Inch	mm	Inch	mm
0.50	15	3.00	76.2	3.65	92.7	2.78	70.6
0.75	20	3.00	76.2	4.57	116.0	3.44	87.2
1.00	25	3.00	76.2	5.54	140.8	4.21	107.0
1.50	40	5.50	139.7	8.44	214.2	5.34	135.5
2.00	50	5.50	139.7	9.06	230.0	5.96	151.3
2.50	65	7.75	196.8	11.85	300.9	7.77	197.4
3.00	80	7.75	196.8	11.85	300.9	7.77	197.4
4.00	100	10.00	254.0	14.90	378.6	10.24	260.2



# Bill of Materials

## Advantage Piston Actuator (APA)

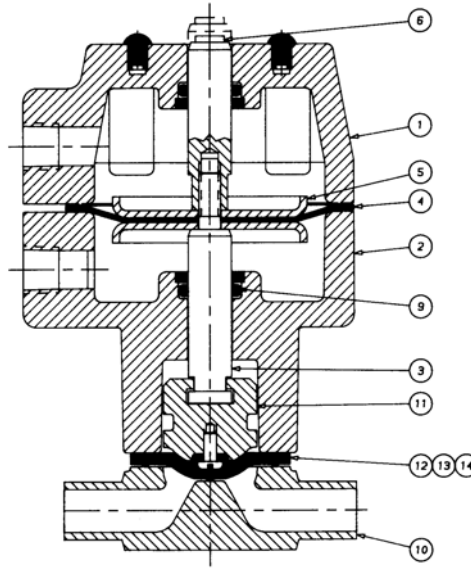


Materials of Construction			
Item	Description	Material	Quantity
1	Standard ITT Body	STN. STL. 316L	1
2	Standard ITT Elastomer Diaphragms	EPDM, BUNA-N	1
3	Bonnet	STN. STL.	1
4	Compressor	Zinc	1
5	Washer, Plain	STN. STL. 18-8	4
6	Nut, Hex	STN. STL. 18-8	4
7	Screw, Hex HD, Cap	STN. STL. 18-8	4
8	Spindle, Valve	STN. STL.	1
9	Plug	Plastic	1
10	Screw, Machine RD Head	STN. STL.	4
11	Pin, Compressor	STN. STL.	1
*12	"O" Ring	BUNA-N	2
13	Bushing	Brass	1
*14	"O" Ring	BUNA-N	1

Materials of Construction			
Item	Description	Material	Quantity
*15	Seal, Piston	BUNA-N	1
16	Piston	Zinc	1
17	Spring, Outer	Steel	1
18	Spring, Inner	Steel	1
19	"O" Ring	BUNA-N	2
20	Cylinder	Glass Reinforced PBT	1
21	Cover, Cylinder	Glass Reinforced PBT	1
22	Spindle, Indicating	STN. STL.	1
23	Washer	STN. STL.	1
24	Ring, Retaining	STN. STL.	1
25	Compressor	Zinc	1
26	Backing Cushion	EPDM	1
27	Standard ITT Plastic Diaphragms	PTFE, Grade TM	1
28	Tube Nut	Brass	1

\* Recommended service parts

# Bill of Materials Advantage Actuator



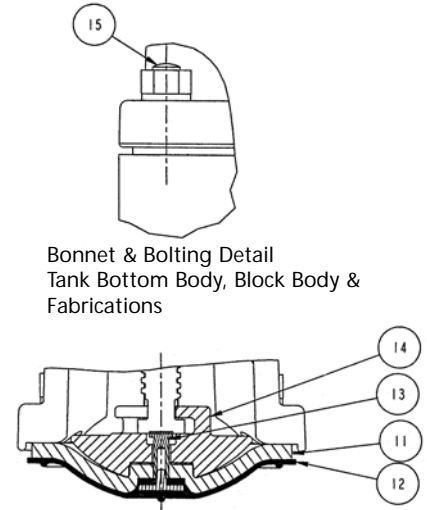
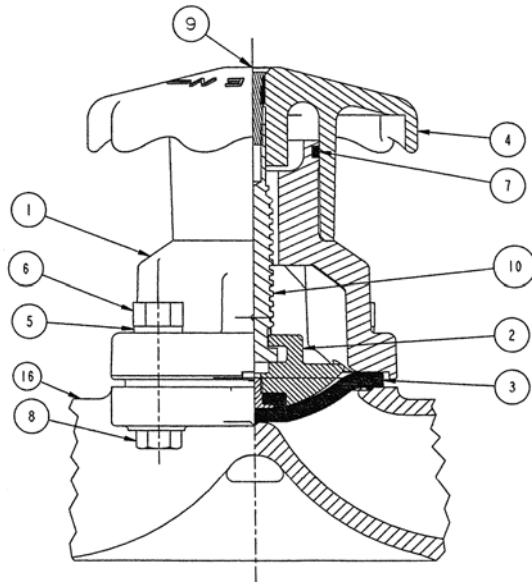
**Air to Open—Air to Close Shown**

Materials of Construction 1/4"—2", DN 6—50			
Item	Description	Material	Quantity
1	Cover, Upper Actuator	PAS, Cmpl with FDA Cfr #21	1
2	Cover, Lower Actuator	PAS, Cmpl with FDA Cfr #21	1
3	Spindle	Stn. Stl.	1
4	Diaphragm, Actuator	Buna N	1
5	Plate, Actuator	Stn.Stl. or Car Stl Nickel Pl.	2
6	Spindle, Indicating	Stn. Stl.	1
7	Spring	Steel Nickel Pl.	1
8	Spring	Steel Nickel Pl.	1
*9	"O" Ring	Viton, Cmpl with FDA Cfr #21	2
10	Body, Weir 1/4"—2"	Stn. Stl., Forge, or Inv. Cast	1
11	Compressor	Stn. Stl., C.I., Zinc or Bronze	1
*12	Diaphragm, Elastomer	EPDM	1
*13	Diaphragm, Plastic	PTFE Grade TM	1
*14	Cushion, Backing	EPDM	1
15	Washer, Plain	Stn. Stl., 18-8	4
16	Nut, Hex	Stn. Stl., 18-8	4
17	Screw, Hex HD, Cap	Stn. Stl., 18-8	4

*\*Recommended spare parts*

# Bill of Materials

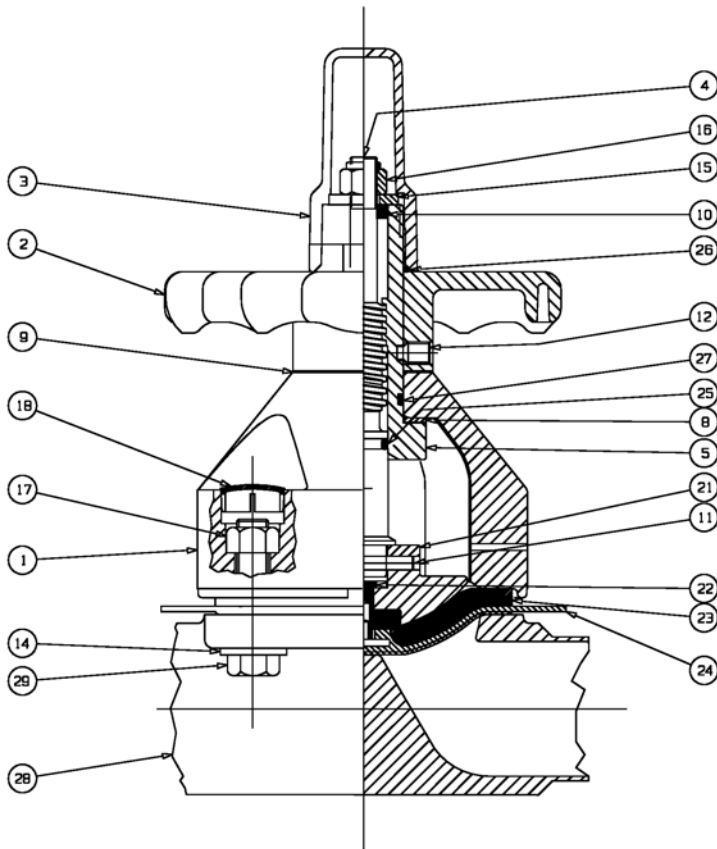
## 970 Stainless Steel Bonnet



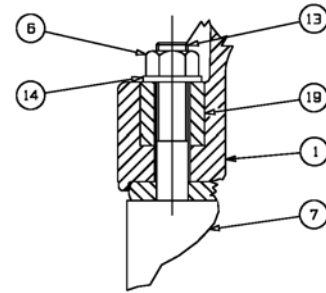
Materials of Construction			
Item	Description	Material	Quantity
1	Bonnet	316 Stainless Steel	1
2	Compressor	Bronze	1
3	Standard ITT Elastomer Diaphragms	EPDM	1
4	Handwheel	PAS	1
5	Washer, Plain	Stn., Stl., 18-8	4
6	Nut, Hex	Stn., Stl., 18-8	4
7	"O" Ring	FKM (FDA)	1
8	Scr., Hex Hd, Cap	Stn., Stl., 18-8	4
9	Travel Stop Screw	Stn., Stl., 18-8	1
10	Spindle	Stn. Stl.	1
11	Backing Cushion	EPDM	1
12	Standard ITT Plastic Diaphragms	PTFE, Grade TM	1
13	Tube Nut	Brass	1
14	Compressor	Bronze	1
15	Stud	Stn. Stl., 18-8 or SA-193-B8*	AR
16	Standard ITT Body	Stn. Stl., 316L	1

\*ASME Grade fasteners available on Tank Bottom Valve

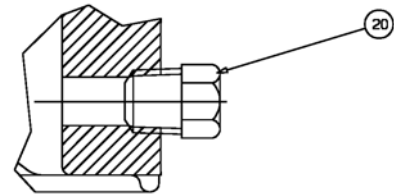
# Bill of Materials 963 Bonnet



Bonnet and Bolting Detail for Fabrications with Studs



V-Notch Vent Plug for Sealed Bonnet



## Materials of Construction

Item	Description	Material	Quantity
1	Bonnet	Polyarylsulfone	1
2	Handwheel	Polyarylsulfone	1
3	Cap	Acrylic, Clear	1
	Cap	Polyphenylsulfone, Clear	1
4 <sup>1</sup>	Spindle	Stn. Stl. (1/2" - 2")	1
	Spindle	Carbon Steel (3" & 4")	1
5	Bushing	Brass	1
6 <sup>2</sup>	Nut, Hex	Stn. Stl. SA-194-8	4
7	Body	Stn. Stl. 316L	1
8	Bearing, Thrust	Stn. Stl.	1
9	Washer, Shim	Polyethylene	AR
10	Seal, Wiper	Viton	1
	Seal, Wiper	Polyolefin Foam	1
11	Pin, Spirol	Stn. Stl. Type 302	1
12	Scr, Set Hex Soc.	Stn., Stl.	1 or 2
13 <sup>2</sup>	Stud	Stn., Stl., SA-193-B8	4
14	Washer, Plain	Stn., Stl., 18-8	4

## Materials of Construction

Item	Description	Material	Quantity
15	Washer	Stn., Stl.	1
16	Locknut, Hex, Lt	Stn., Stl., 18-8	4
17	Nut, Hex	Stn., Stl. 18-8	4
18	Cap, Nut Cover	Polyarylsulfone	4
19	Spacer	Stainless Steel	4
20	Plug, Vent "V" Notch	Stn. Stl.	1
21	Compressor	Zinc or Cast Iron	1
22	Nut, Tube	Brass, B-16	1
23	Cushion, Backing	EPDM	1
24	Diaphragm, PTFE	PTFE, GR	1
25	"O" Ring	Buna N or Viton	1
26	"O" Ring	Buna N or Viton	1
27	"O" Ring	Buna N or Viton	1
28	Body, Metal	Stn. Stl. 316L	1
29	Scr., Hex HD, Cap	Stn. Stl. 18-8	4

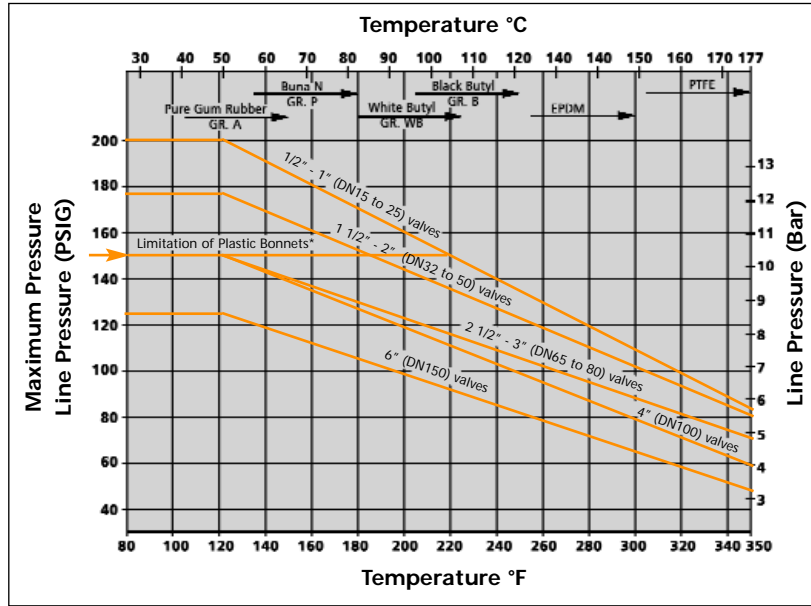
## Sanitary Internals

Item	Description	Material	Quantity
4	Spindle	Stn. Stl.	1
21	Compressor	Bronze	1

Notes:

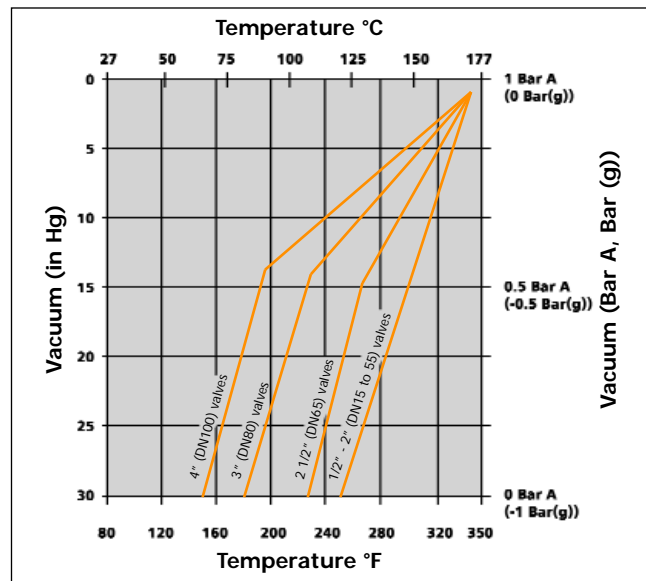
- 3" and 4" Sanitary internals optional.
- ASME Grade fasteners available on Tank Bottom Valve.

# Pressure/Temperature Recommendations



\* This line shows the limitation of the PAS bonnets, as well as the Advantage with 36-bonnets.  
 Note: The above chart does not pertain to steam or corrosive services. For services exceeding these pressure/temperature recommendations, consult the factory.

## PTFE Diaphragms for Vacuum Service



- Notes:
1. Service conditions falling to the right of these lines will require bonnet evacuation.
  2. PTFE-Diaphragms, 6" (DN 150) size and larger, will not withstand full vacuum at any temperature unless bonnets are evacuated.
  3. With evacuated bonnets any size PTFE-Diaphragms can be used up to 350°F (176°C).

For more information, please contact:

**Pure-Flo Headquarters**

33 Centerville Road  
Lancaster, PA 17603-2064 USA  
Phone +1 (800) 787-3561  
Phone +1 (717) 509-2200  
Fax +1 (800) 239-9402

Website: [www.ittpureflo.com](http://www.ittpureflo.com)  
E-mail: [pureflo.custserv@itt.com](mailto:pureflo.custserv@itt.com)

**Valve Office Locations:**

Pure-Flo  
110-B West Cochran  
Simi Valley, CA 93065 USA  
Phone +1 (800) 926-8884  
Phone +1 (805) 520-7200  
Fax +1 (805) 520-7205

Pure-Flo  
Richards Street  
Kirkham, Lancashire  
PR4 2HU, England  
Phone +44-1772-682696  
Fax +44-1772-686006

