



# Pure-Flo<sup>®</sup> & EnviZion<sup>®</sup> High Purity Diaphragm Valves

Product Selection Guide



**ITT**

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Diaphragm Valves



These symbols are used throughout this catalog to indicate information that is applicable to either the standard Pure-Flo valve or the EnviZion valve.



## Global presence ... local feel

World class manufacturing facilities and engineering resources located throughout the world allows Pure-Flo to support customers with local expertise backed up by the strength and reliability of a global corporation. Manufacturing locations are located in Lancaster, Pennsylvania, Axminster, UK, and Mumbai, India. Please contact us for more information about our manufacturing locations.

## Partnership for success

Consistently atop the Forbes lists for best run companies, ITT is a strong, ethical company with visions and values that reflect those of our customers and our employees. By forming partnerships with our customers based on respect, responsibility and integrity your success will be our success.



Engined Valves, LLC  
Lancaster, Pennsylvania



ITT Industries Ltd.  
Axminster, UK



Tecnik Fluid Controls Pvt. Ltd.  
Mumbai, India

# Standard Pure-Flo<sup>®</sup> & EnviZion<sup>®</sup> Valves

## P Standard Pure-Flo Valve

The Pure-Flo valve has earned a reputation for innovation, quality and performance. Providing products from standard forged valves to the most innovative block technology, each and every Pure-Flo valve is engineered to the highest standards. ITT Pure-Flo offers high quality hygienic valves and process components. Through both standard and custom valve assemblies, ITT is committed to helping the industry operate more effectively, efficiently and safely.

## E EnviZion Valve

ITT's breakthrough technology, the EnviZion valve, sets a new standard for the future of hygienic diaphragm valves. The EnviZion valve is designed specifically to help customers install, operate, and maintain their valves more efficiently. This unique design provides a significant reduction in total cost of ownership while supporting the industries' goals to increase productivity, improve reliability and enhance cleanability.

	Pure-Flo	EnviZion
Size Range	.25-4" (DN 6-100)	.5-2" (DN 15-50)
Valve Body	Forged, Cast, Wrought	Forged, Wrought
Surface Finish	10 – 25 Ra (.25µm - 0.6 µm) Interior & exterior Electropolish available	10 – 25 Ra (.25µm - 0.6 µm) Interior & exterior Electropolish available
Diaphragms	E1, TME, B, P, W1	TMZ
Topworks	Manual and Pneumatic	Manual and Pneumatic
Standard Features	<ul style="list-style-type: none"> <li>• Working parts are isolated from process fluids</li> <li>• Top entry design allows for in-line maintenance</li> <li>• Diaphragm and weir assures positive closure</li> <li>• Hygienic design complies to industry standards (FDA, USDA, ASME BPE, USP)</li> <li>• Resists alcohol and most caustic washdowns</li> </ul>	Pure-Flo features plus: <ul style="list-style-type: none"> <li>• Fasteners eliminated, no tools required</li> <li>• Thermal compensation system provides an active 360° seal</li> <li>• Quick change bonnet</li> <li>• Safety lock-pin</li> <li>• No loss of seal integrity during thermal cycling</li> </ul>



# Pure-Flo<sup>®</sup> Valve

The Pure-Flo brand is synonymous with the highest quality, precision engineered hygienic diaphragm valves. Pure-Flo valves offers superior hygienic processing components for the global hygienic processing industries (Pharmaceutical, Bioprocessing and Fine Chemical). Through both standard and custom designed valve assemblies, ITT Pure-Flo is committed to providing the best quality and value in engineered solutions for your unique flow-control needs.

The Pure-Flo valve product line began in 1978 as an extension to the venerable Dia-Flo product line. Since then ITT has been delivering to the Biopharm industry a reliable and process proven stainless steel hygienic diaphragm valve.



## Process Proven Hygienic Diaphragm Valve

Providing products from standard forged valves to the most innovative block technology, each and every Pure-Flo valve is engineered to the highest standards.

- Bonnet isolation: The diaphragm isolates the working parts of the valve from process fluids.
- Streamlined fluid passage: The smooth contoured body, streamlined flow path, and high quality interior surface prevents accumulation of process fluids or contaminants.
- Minimal contact surface: The process contact surfaces (i.e. body and diaphragm) are minimal, enhancing the ease of cleaning and sterilization.
- Positive closure: The resilient diaphragm bead in contact with the metal weir assures positive closure.
- Ideal for CIP and SIP: Clean in place and steam in place operations may be performed in line without valve disassembly or operation.
- In-line maintenance: The top entry design allows for in-line maintenance.



# EnviZion<sup>®</sup> Valve

## Experience the Future with EnviZion

The Biopharm industry relies on hygienic diaphragm valves for demanding process applications due to their unique balance of clean-ability, drain-ability and pressure/temperature capability. For more than 40 years the technology of these valves has changed very little. Advances in performance have been nominal as the basic design concept has remained the same: body, diaphragm, topworks, and four fasteners. This design requires experienced personnel and stringent maintenance practices to assure consistent, reliable valve performance. All while the industry is forced to increase productivity, extend preventative maintenance intervals, and reduce operating costs.

The EnviZion valve utilizes a breakthrough mount and turn design that allows for quick and easy valve disassembly.

- Tool-less maintenance - no tools required for valve installation and diaphragm replacement, simplifying the maintenance process.
- Fasteners eliminated - no more handling loose parts or accessing fasteners in tight spaces.
- Save time - diaphragm changes reduced from an industry average of 23 minutes to 3 minutes, resulting in a 90% reduction in maintenance time.



## Reliable Sealing and Improved Cleanability with No Re-Torques

The EnviZion valve eliminates the effects of thermal cycling with an integrated thermal compensation system.

- Active sealing technology - the constant force of the thermal compensation system provides a reliable seal that does not degrade over time (unlike other diaphragm valve designs that use passive sealing technology).
- No retorquing - the seal is maintained over varying operating conditions, eliminating the need to adjust fasteners after thermal cycling.

The EnviZion valve improves clean-ability by reducing the potential for fluid entrapment.

- Diaphragm seal - the valve body and diaphragm create a seal on the leading edge of the D-section, preventing fluid from getting into areas which would be difficult to clean and possibly lead to process contamination.

**Net result - reduced maintenance hours, commissioning costs and potential for system contamination.**

# Product Details

## Diaphragm Valve Bodies







	 P	 E P	 P E	 P
Type	Forged (2-Way)	Forged (2-Way)	Wrought <sup>2</sup> (Block Bodies)	Cast
Size Range	0.25-4 in. DN6-100	0.5-2 in. DN15-50	0.25-4 in. DN6-DN100	0.5-4 in. DN15-100
End Connections	<ul style="list-style-type: none"> <li>Hygienic clamp ends</li> <li>14, 16, 18, 20 O.D. Gauge Tubing</li> <li>ISO Ends</li> <li>SMS 1146 Ends</li> <li>DIN 11850 Ends</li> </ul>	<ul style="list-style-type: none"> <li>Hygienic clamp ends</li> <li>14, 16, 18, 20 O.D. Gauge Tubing</li> <li>SMS 1146 Ends</li> <li>DIN 11850 Ends</li> </ul>	<ul style="list-style-type: none"> <li>Hygienic clamp ends</li> <li>14, 16, 18, 20 O.D. Gauge Tubing</li> <li>Schedule 5, 10, 40 Piping</li> <li>ISO Ends</li> <li>SMS 1146 Ends</li> <li>DIN 11850 Ends</li> </ul>	<ul style="list-style-type: none"> <li>Hygienic clamp ends</li> <li>14, 16, 18, 20 O.D. Gauge Tubing</li> <li>Schedule 5, 10, 40 Piping</li> <li>ISO Ends</li> <li>DIN 11850 Ends</li> </ul>
Material	316L Stainless Alloy Tri Certified to ASTM A182 Grade 316L,S9, EN 10222-5 EN 1.4435, BN2	316L Stainless Alloy Tri Certified to ASTM A182 Grade 316L,S9, EN 10222-5 EN 1.4435, BN2	316L Stainless Alloy ASTM A479, A240, A276, 316L	316L Stainless Alloy ASTM A351 Grade CF 3M
Special Alloys <sup>1</sup>			C22, C276, AL6XN	
Dimensional Standards	USOD Tubing, ISO/DIN/SMS	USOD Tubing, DIN/SMS	USOD Tubing, Pipe, ISO/DIN	USOD Tubing, Pipe, ISO/DIN

1 Other materials available upon request

2 Standard on tank bottom valves, divert valves and any block bodied fabrications.

# Product Details

## Diaphragms

	 P	 P	 P	 P	 P	 E
Type	B	P	W1	E1	TME	TMZ
Material	Black Butyl Rubber	Buna N	White Butyl Rubber	EPDM <sup>1</sup>	PTFE Enhanced Backing	PTFE Enhanced Backing
Size Range						
0.25" (DN6)				•	•	
0.375" (DN10)				•	•	
0.5" (DN15)	•	•	•	•	•	•
0.75" (DN20)	•	•	•	•	•	•
1" (DN25)	•	•	•	•	•	•
1.5 (DN32/40)	•	•	•	•	•	•
2" (DN50)	•	•	•	•	•	•
2.5" (DN65)	•	•	•	•	•	
3" (DN80)	•	•	•	•	•	
4" (DN100)	•	•	•	•	•	
Temperature	-20–250°F -29–121°C	10–180°F -12–82°C	0–225°F -18–107°C	-22–302°F <sup>2</sup> -30–150°C <sup>2</sup>	-4–329°F -20–165°C	-4–329°F -20–165°C
Compliance	FDA USDA	FDA USDA	FDA USDA	FDA USP	FDA USP	FDA USP

<sup>1</sup> For high temperature and/or high cycle applications, contact ITT.

<sup>2</sup> Temperature range is as follows:

-4–194°F (-20–90°C) for liquid applications

-22–285°F (-30–140°C) for continuous steam

-22–302°F (-30–150°C) for intermittent steam

# Product Details

## Manually Operated Topworks






Introduction

								
Type	Bio-Pure	Bio-Pure COP	Bio-Tek	903	913	963	970	ZH,ZHS
Size Range								
0.25 (DN6)	•	•	•					
0.38 (DN10)	•	•	•					
0.5" (DN15)	•	•	•	•	•	•	•	•
0.75" (DN20)				•	•	•	•	•
1" (DN25)				•	•	•	•	•
1.5 (DN32/40)				•	•	•	•	•
2" (DN50)				•	•	•	•	•
2.5" (DN65)				•	•	•		
3" (DN80)				•	•	•		
4" (DN100)				•	•	•		
Material	Bonnet: 316 Stainless Steel Handwheel: Polyethersulfone (PES)	Bonnet: 316 Stainless Steel Handwheel: Polyethersulfone (PES)	Bonnet: 316 Stainless Steel Handwheel: Polyethersulfone (PES)	Cast Iron coated White Epoxy or PVDF	Bonnet and Handwheel: Stainless Steel	Bonnet and Handwheel: Glass reinforced polyethersulfone (PES)	Bonnet: 316 Stainless Steel Handwheel: Glass reinforced polyethersulfone (PES)	Bonnet: Stainless Steel Handwheel/ Bonnet Cover: Polyethersulfone (PES)
Maximum Service Pressure	150 psi 10.34 bar	150 psi 10.34 bar	150 psi 10.34 bar	0.5–1": 200 psig 13.8 bar 1.5–2": 175 psig 12.1 bar 3–4": 150 psig 10.3 bar	0.5–1": 200 psig 13.8 bar 1.5–2": 175 psig 12.1 bar 3–4": 150 psig 10.3 bar	150 psig 10.34 bar	0.5–1": 200 psig 13.8 bar 1.5–2": 175 psig 12.1 bar	150 psig 10.34 bar
Maximum Service Temperature	329°F (165°C)	329°F (165°C)	329°F (165°C)	See page D-9	See page D-9	300°F (149°C)	See page D-9	See page D-9
Pressure/ Temperature Limitations	See page D-9							
Autoclavable	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Sealed Option	No	Yes	Yes	Yes	Yes	Yes	No	Yes






# Product Details

## Pneumatic Actuators

	 P	 P	 P	 P	 E
Type	Advantage 2.1 Actuator	Advantage Compact Stainless	Advantage Actuator Series 33	Dia-Flo Actuator	EnviZion Actuator
Size Range					
BP - 0.25-0.5 (DN6-15)		•			
BT - 0.25-0.5 (DN6-15)	•				
0.5" (DN15)	•	•		•	•
0.75" (DN20)	•	•		•	•
1" (DN25)	•	•		•	•
1.5 (DN32/40)	•	•		•	•
2" (DN50)	•	•		•	•
2.5" (DN65)			•	•	
3" (DN80)			•	•	
4" (DN100)			•	•	
Material	Bonnet: 316 Stainless Steel Actuator: Glass reinforced polyethersulfone (PES)	316 Stainless Steel	Bonnet: Nylon coated ductile iron (4 inch); Stainless Steel (3 inch); Actuator: Vinyl-Ester Thermoset	Bonnet: Ductile iron Actuator: Aluminum	316 Stainless Steel
Maximum Service Pressure	150 psig 10.34 bar	150 psig 10.34 bar	150 psig 10.34 bar	See Dia-Flo Catalog	150 psig 10.34 bar
Maximum Service Temperature	300°F (149°C)	300°F (149°C)	300°F (149°C)	See Dia-Flo Catalog	See page D-9
Autoclavable	Yes	Yes	No	No	Yes
Sealed Option	Yes	Yes	Yes	Yes	Yes

# Product Details

## Automation

			
Type	VSP & VSP+	73 Series Positioner	TMP-3000 Positioner
Size Range			
0.25" (DN6)	•		
0.375" (DN10)	•		
0.5" (DN15)	•		•
0.75" (DN20)	•	•	•
1" (DN25)	•	•	•
1.5 (DN32/40)	•	•	•
2" (DN50)	•	•	•
2.5" (DN65) <sup>1</sup>	•	•	
3" (DN80) <sup>1</sup>	•	•	
4" (DN100) <sup>1</sup>	•	•	
Cover Material	Polysulfone, FDA compliant	Aluminum Brass Stainless Steel	Polycarbonate
Base Housing Material	Polyamide, FDA compliant, Stainless Steel (cover extension for >2" valves)	Aluminum Brass Stainless Steel	PPS
Temperature Rating	140°F (60°C)	150°F (65°C)	140°F (60°C)
Autoclavable	No	No	No
Electric Connection	One M20 conduit port (1/2" NPT adapter available).	N/A	M16x1.5 (with screw terminals)
Rotation	360°	No	360°
Mechanics	Proximity and Mechanical Switches	Proportioned valve control	Proportioned valve control
Approvals	FM / CSA / Cenelec Zones 0, 1, 2 / UL	N/A	

<sup>1</sup> 33 Series Actuators only

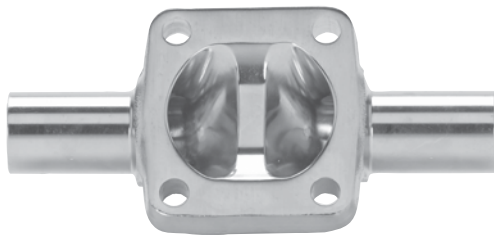
# Section B

# Diaphragm Valve Bodies

ITT Pure-Flo has developed a line of valve bodies that help address the needs of the Bioprocessing and Pharmaceutical industries for high quality, welded process systems.

By providing valve bodies with controlled sulfur 316L/1.4435 stainless steel material and weld tangents long enough to accept the most common orbital weld heads in the industry, we have eliminated two of the most common concerns in valve-to-tube welding known today.

Automatic welding of 316L process components is greatly affected by the sulfur content of the mating process components. A disparity of sulfur content can result in reduced orbital weld quality and potentially incomplete fusion of the mating components. By controlling valve body sulfur content to the same chemistry as that required for ASME BPE fittings, welding problems due to material chemistry differences will be greatly reduced.



Diaphragm  
Valve Bodies

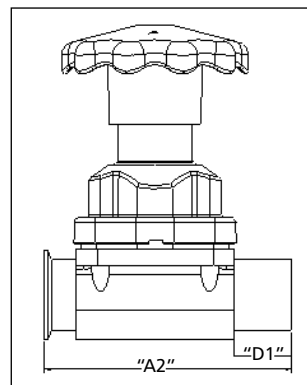
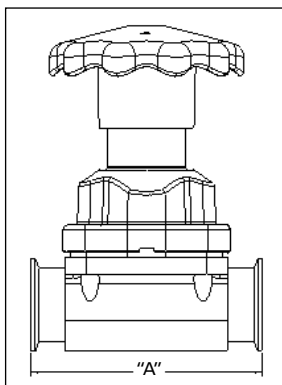
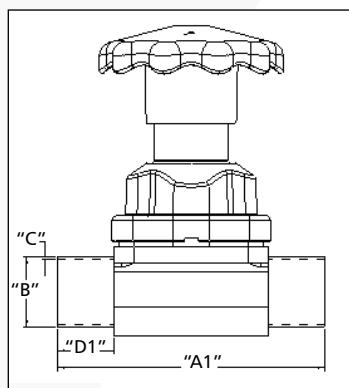
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# Body Dimension Charts

## Dimensions for Standard Pure-Flo Valve

P



Body Dimension Charts US & SMS

USOD (ANSI) Forgings & Castings										SMS	
B		A	A1	D1	A2	C				B	C
End Connection Size		Overall Length	Overall Length	Weld Tangent	Overall Length	20 GA. 0.035"	18 GA. 0.049"	16 GA. 0.065"	14 GA. 0.083"		
IN	DN	Tri Clamp	Extended BW Forging	Extended BW Forging	TC x BW	Extended BW Forging	Extended BW Forging ASME BPE	Extended BW Forging	Extended BW Forging ASME BPE	BW Forging	
<b>Forgings</b>											
BP/BT 0.25"	DN6	2.5" (64)	3.5" (89)	1" (25)	3.0" (76,2)	S	O				
BP/BT 0.375"	DN10	2.5" (64)	3.5" (89)	1" (25)	3.0" (76,2)	S	O				
BP/BT 0.5"	DN15	2.5" (64)	3.5" (89)	1" (25)	3.0" (76,2)		O	S			
0.5"	DN15	3.5" (89)	5.06" (128)	1.5" (38)	4.28" (108,7)	O	O	S	O		
0.75"	DN20	4" (102)	5.5" (140)	1.5" (38)	4.75" (120,7)	O	O	S	O		
1"	DN25	4.5" (114)	5.93" (151)	1.5" (38)	5.22" (132,6)		O	S	O	(25)	(1,2)
1.5"	DN40	5.5" (140)	6.8" (173)	1.5" (38)	6.15" (156,2)		O	S	O	(38)	(1,2)
2"	DN50	6.25" (159)	7.42" (188)	1.5" (38)	6.84" (173,7)			S	O	(51)	(1,2)
2.5" <sup>2</sup>	DN65	8.75" (222) <sup>1</sup>	9.94" (252)	1.75" (44,5)	9.34" (237,2)			S		(63,5)	(1,6)
3"	DN80	8.75" (222)	9.94" (252)	1.75" (44,5)	9.34" (237,2)			S	O	(76,1)	(2)
4"	DN100	11.5" (292)	13" (330)	2.0" (51)	12.25" (311,2)			O	S		
<b>Castings</b>											
0.5"	DN15	3.5" (89)	N/A	N/A	3.5" (89)	O	O	S	O		
0.75"	DN20	4" (102)	N/A	N/A	4" (102)	O	O	S	O		
1"	DN25	4.5" (114)	N/A	N/A	4.5" (114)		O	S	O	(25)	(1,2)
1.5"	DN40	5.5" (140)	N/A	N/A	5.5" (140)		O	S	O	(38)	(1,2)
2"	DN50	6.25" (159)	N/A	N/A	6.25" (159)			S	O	(51)	(1,2)
2.5"	DN65	7.62" (194) <sup>1</sup>	N/A	N/A	7.62" (194)			S	O	(63,5)	(1,6)
3"	DN80	8.75" (222)	N/A	N/A	8.75" (222)			S	O	(76,1)	(2)
4"	DN100	11.5" (292)	N/A	N/A	11.5" (292)			O	S		

<sup>1</sup> For 2.5" overall length does not comply with ASME BPE dimensions

<sup>2</sup> 2.5" size uses 3" topworks

Note: Extended Weld Tangents are available only with USOD (ANSI) end connections.

Dimensions in ( ) are mm

S = Standard, O = Optional, BT = Bio-Tek Body, BP = Bio-Pure

# Body Dimension Charts

## Dimensions for Standard Pure-Flo Valve

P

### ISO/DIN Forgings

End Connection Size	Topworks Size	ISO										DIN Series 1		DIN Series 2		DIN Series 3		
		A	D1	B	C								B	C	B	C	B	C
		mm	mm	mm	1	1,2	1,6	2	2,3	2,6	2,9	mm	mm	mm	mm	mm	mm	
DN6	Bio-Tek	89 <sup>1</sup>	25 <sup>1</sup>	8	S	O						8	1					
DN10	Bio-Tek	89 <sup>1</sup>	25 <sup>1</sup>	13,5	O		S	O				10	1					
DN15	Bio-Tek	89 <sup>1</sup>	25 <sup>1</sup>	17,2	O		S	O				12	1	13	1,5	14	2	
DN15	0.5"	106	25	21,3			S	O				18	1	19	1,5	20	2	
DN20	0.75"	118	25	26,9			S	O				22	1	23	1,5	24	2	
DN25	1"	127	25	33,7			O	S				28	1	29	1,5	30	2	
DN32	1.5"	174	35	42,4			O	S				34	1	35	1,5	36	2	
DN40	1.5"	174	35	48,3			O	S				40	1	41	1,5	42	2	
DN50	2"	191	35	60,3				S	O	O	Cast Only	52	1	53	1,5	54	2	
DN65	3"	254	44.5	76,1				O	S	O		70	2					
DN80	3"	254	44.5	88,9					S	O		85	2					
DN100	4"	330	51	114,3					S	O		104	2					

<sup>1</sup> BT TC x BW and TC x TC bodies are 64 mm overall length with 13 mm tangent

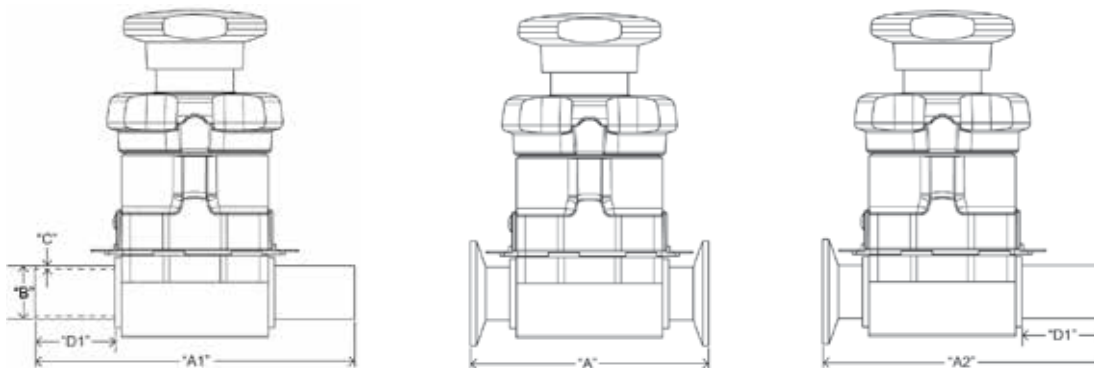
Note: All measurements are mm unless otherwise noted.

S = Standard, O = Optional

Diaphragm Valve Bodies

## Dimensions for Standard Pure-Flo EnviZion Valve

E



USOD (ANSI)						
B		A	A1	D1	A2	C
End Connection Size		Overall Length	Overall Length	Weld Tangent	Overall Length	16 GA.
IN	DN	Tri Clamp	Extended BW	Extended BW	TC x BW	Extended BW
Forgings						
0.5"	DN15	3.5" (89)	5.22" (133)	1.5" (38)	4.36" (111)	.065" (1,7)
0.75"	DN20	4" (102)	6.00" (152)	1.5" (38)	5.00" (127)	.065" (1,7)
0.75"R	DN20	4" (102)	6.00" (152)	1.5" (38)	5.00" (127)	.065" (1,7)
1"	DN25	4.5" (114)	6.00" (152)	1.5" (38)	5.25" (133)	.065" (1,7)
1.5"	DN40	5.5" (140)	7.08" (180)	1.5" (38)	6.29" (160)	.065" (1,7)
2"	DN50	6.25" (159)	7.14" (181)	1.5" (38)	6.70" (170)	.065" (1,7)

Dimensions in ( ) are mm

# Pure-Flo Valve Bodies

## Benefits of the new Pure-Flo Body:

- No welded tube extensions required for most welding equipment
- Less over-all valve body length compared to welded tube extensions
- Fewer welds in the process system
- Less validation paperwork due to fewer material certifications
- Higher quality field welds
- No narrow or off-set weld heads required.

All these benefits add up to lower installation costs and improved production schedules.

## End Connections

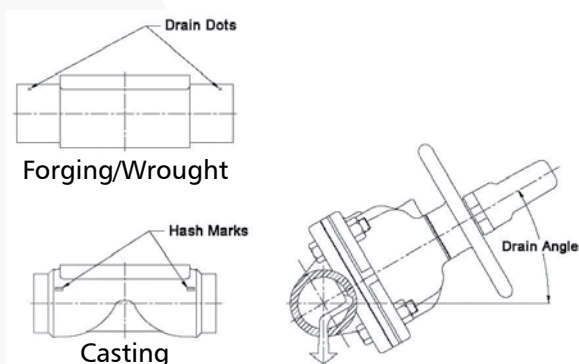
Pure-Flo Diaphragm Valve bodies are available in a variety of end connections:

- Hygienic Tri-Clamp
- 14, 16, 18, 20 O.D. Gauge Tubing
- Schedule 5, 10, 40 Piping
- ISO Ends
- SMS 1146 Ends
- DIN 11850 Ends

## Drainability

Pure-Flo diaphragm valves may be installed in vertical or horizontal lines as required. Drain marks are provided as standard on cast and forged bodies to facilitate installation and optimize drainability. One mark must be located in the vertical plane, cutting the centerline of the pipe.

The slope of process piping must be designed to provide proper pitch in order to optimize drainability. Drainability in a process system is ultimately the responsibility of the system designer end user.



Note: Wrought bodies are machined from bar stock.

## Weld Installation

Bio-Pure and Bio-Tek valves, 1/4"–1/2" (DN 6–15) and ISO End valves have minimum 1" (25 mm) cutbacks and generally do not require tube extensions for standard TIG orbital welding equipment.

Pure-Flo valves, 0.5–4" (DN15–100) have ASME BPE fitting compatible cutbacks and generally can be welded without disassembly using most standard TIG orbital welding equipment.

## Drain Angles

Valve Size		Standard Pure-Flo Forging			Standard Pure-Flo Investment Casting		EnviZion
		ANSI <sup>5</sup>	ISO	DIN	ANSI	ISO	ANSI
0.25 <sup>1</sup>	8 <sup>1</sup>	30 <sup>2</sup>	20°	20°	N/A	N/A	N/A
0.375 <sup>1</sup>	10 <sup>1</sup>	30 <sup>2</sup>	20°	20°	N/A	N/A	N/A
0.50 <sup>1</sup>	15 <sup>1</sup>	30 <sup>2</sup>	20°	20°	N/A	N/A	N/A
0.50	15	30°	13°	16°	30°	17°	27°
0.75	20	30°	21°	25°	30°	18°	36°
0.75R	20	N/A	N/A	N/A	N/A	N/A	16°
1.00	25	30°	22°	26°	31°	20°	30°
1.25	32	N/A	22°	25°	N/A	28°	N/A
1.50	40	28°	17°	22°	30°	20°	25°
2.00	50	23°	16°	19°	25°	19°	19°
2.50	65	28 <sup>3</sup>	23°	23°	19°	N/A	N/A
3.00	80	23°	14°	18°	25°	N/A	N/A
4.00	100 <sup>4</sup>	16°	11°	14°	20°	N/A	N/A

<sup>1</sup> Bio-Pure and Bio-Tek sizes.

<sup>2</sup> Bodies manufactured prior to 2010 have a 20° drain angle for the Bio-Tek butt-welded bodies with 1" (25.4 mm) cutbacks and a 30° drain angle for Bio-Tek TC bodies. Consult engineering drawings for drain angles on Bio-Tek fabrications. Bio-Pure and Bio-Tek forgings have been standardized on 30° draining angle regardless of body type.

<sup>3</sup> 3" forged body with 2.5" end connection.

<sup>4</sup> DN 100 bodies to DIN/ISO dimensions are wrought.

<sup>5</sup> Forging drain angles apply to all end connections.

Note: As a rule of thumb drain angle tolerances of +/- 2° will assure optimal drainability.

# Manufacturing Methods

## Ferrite

The selection of process components in the Pharmaceutical/Bioprocessing Industry, especially in cell culture applications, demonstrates a distinct movement toward lower ferrite materials. However, in many applications the use of higher ferrite content components may have no effect on the product, service life, or performance of the component and the inherent cost of the component is reduced. The nature of the process, utility protocols (i.e. passivation, cleaning, sterilization, fabrication), as well as additional surface preparation of the material such as electropolishing, will impact the extent of the components corrosion resistance. ITT provides customers a choice in body types based on the needs and requirements of the customers process application.

Ferrite can be defined as the ferromagnetic, body-centered, microstructural constituent of variable chemical composition in iron-chromium-nickel alloys. This may be formed upon solidification from molten metal (delta ferrite) or by transformation from austenite or sigma phase on cooling in the solid state (alpha ferrite). The formation of ferrite is therefore a natural occurrence in stainless alloy products. Ferrite levels can be determined utilizing several techniques including chemical analysis, metallographic examination and magnetic attraction. Ferrite is depleted as the material is worked, i.e. castings having the highest content and forgings having the lowest. Free delta ferrite contained in components in a process system may or may not be of concern to the end user.

## Metallurgy

ITT Pure-Flo customers have a choice of valve body types based on the needs and requirements of the process application. Pure-Flo standard body material for forged bodies is 316L, 1.4435 sulfur controlled to ASME BPE standards.

Wrought bodies are available in 316L, 1.4435 or other special materials. Biopharmaceutical applications may require special alloys or materials to provide a desired performance. Consult a Pure-Flo representative for availability and application information.

All valve bodies are fully material heat traceable to EN 10204 3.1B. Certified Mill Test Reports are provided as standard.

# Manufacturing Methods

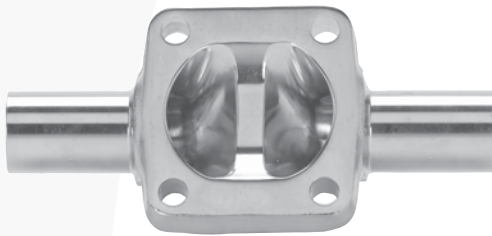
## Forged

Pure-Flo bodies are produced from round stock or plate which has been processed from an ingot. The round stock or plate is compressed between two halves of a forging tool at elevated temperatures. The result is a shape which is then machined to create the shape required. Machining required is more extensive than a casting. Ferrite content for the ANSI Pure-Flo and ISO/DIN forged product lines is 0.5%.

## Wrought

The tank bottom valves, divert valves and block body fabrications are produced from wrought material. Wrought material is worked material such as plate or round stock. Rather than forging a shape between two halves of a tool, as in the case of a forged body, the shape required is machined directly from wrought material. Ferrite content in wrought material may vary depending primarily on the metallurgy of the material used.

Diaphragm  
Valve Bodies



## Cast

Pure-Flo bodies are produced utilizing the lost wax or investment cast method. A wax impression is created for the shape required. The wax impression is dipped or sprayed with ceramic material and then fired in a kiln. The wax evaporates leaving behind a hard ceramic shell into which molten material is poured. The solidification of molten metal may cause sub-surface porosity, which varies in occurrence depending on casting techniques, machining and interior finish specifications. The result is a product complete with flow path, bolt holes, drain marks and body identification marks cast into the required shape. Machining is, therefore, minimal. Pure-Flo castings go through a rigorous qualification program to ensure the highest attainable quality is achieved. The levels of porosity are the absolute minimum possible. Conformance to ASME BPE surface finish requirements are not guaranteed.





# Surface Finish

Pure-Flo valve bodies are available in a complete range of mechanically polished and electropolished internal surface finishes to satisfy system design requirements. Pure-Flo valves are available in a complete range of ASME BPE compliant internal surface finishes.

ITT Pure-Flo provides a complete range of both internal and external electropolish options. Electropolish surface finishing creates a superior surface finish for biopharmaceutical applications. Electropolishing improves corrosion resistance, removes inclusions and contaminants, and improves the over-all surface for cleaning and sterilization.

## Mechanical Polish Surface Finish (Interior Only)

Code	Non-EU Service Microinch Max	EU Service Micron Max
0	No Mechanical Polish	No Mechanical Polish
2	35 Ra	0.8 Ra
6	25 Ra	0.6 Ra
8	20 Ra	0.5 Ra
7	15 Ra	0.38 Ra
9	11 Ra	0.28 Ra
10	10 Ra	0.25 Ra

## Electropolish Surface Finish (Interior & Exterior)

Code	Surface Finish
0	No Electropolish
2	Exterior Electropolish only
3	Both Interior and Exterior Electropolish
4	Interior Electropolish only

## Surface Finishes per ASME BPE

### Mechanical Polished Surface Finish (Interior Only)

Code	R <sub>a</sub> , MAX	
	μ-in	μm
SF1	20	0.51
SF2	25	0.64
SF3	30	0.76

### Mechanical Polished & Electropolished Surface Finish (Interior Only)

Code	R <sub>a</sub> , MAX	
	μ-in	μm
SF4	15	0.38
SF5	20	0.51
SF6	25	0.64

#### General Notes:

1. All Ra readings are taken across the lay, wherever possible.
2. No single Ra reading shall exceed the Ra max. value in this table.
3. Other Ra readings are available if agreed upon between owner/user and manufacturer, not to exceed values in this table.

# Electropolishing

Electropolishing is the electrochemical method of removing metal from a surface. Formally, electropolishing is defined as anodic dissolution in the presence of an electrolyte and an imposed current potential.

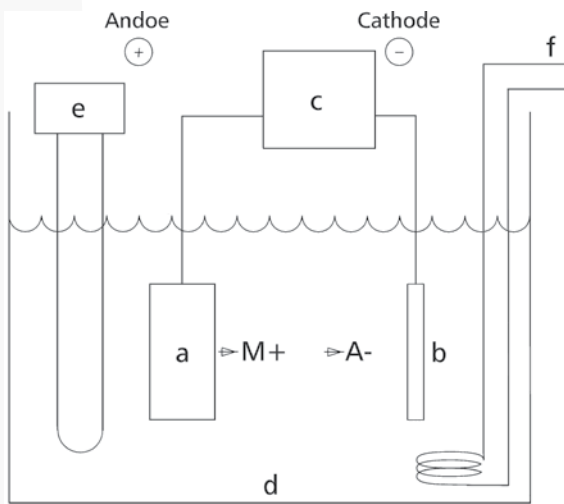
The inherent benefits derived from electropolishing are as follows:

- Provides a continuous, tenacious, chromium-rich oxide layer on the surface resulting in an excellent passive film enhancing corrosion resistance
- Surface leveling reduces the total surface height and relieves much of the surface tension inherent in mechanical polishing
- Enhances the optimization of cleanability and sterilization

- Provides a quality control mechanism exposing surface pits and defective welds
- Exposes and removes impurities within the surface layer
- Provides a lustrous, aesthetically pleasing appearance

For the reasons mentioned, the use of electropolishing over a mechanically polished surface is becoming more prevalent on the surfaces of system components in critical pharmaceutical and bioprocessing applications. The Pure-Flo product line is available with electropolished interior and exterior surfaces, sizes 0.25–4" (DN 6–100).

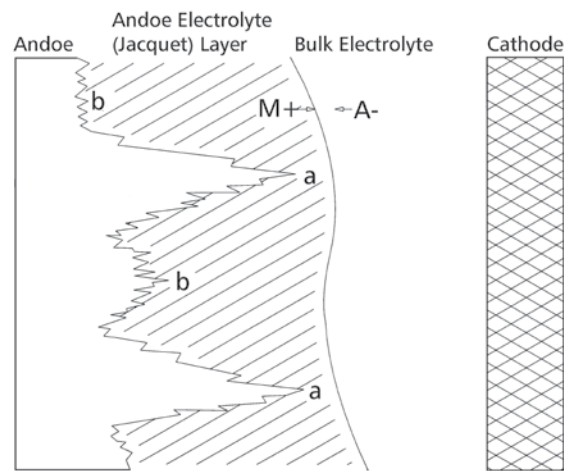
Diagram of a Typical Electropolishing Cell



Legend

- a Anode
- b Cathode
- c Power Source
- d Electrolyte
- e Heater and Temperature Regulator
- f Cooling Coil
- M+ Metal Ion
- A- Anion

Diagram Illustrating Micropolishing and Macropolishing



Legend

- a Region of Macropolishing
- b Region of Micropolishing
- M+ Metal Ion
- A- Anion

# Marking

Pure-Flo valve bodies are marked directly on the valve body, typically on the bottom of the valve or underside of the bonnet flange. Additional information such as customer tag number is available upon request.

## Validation

ITT provides critical validation information to meet the needs of the Pharmaceutical and Bioprocessing industries.

## Certified Mill Tests Reports

All Pure-Flo Valve bodies contain a permanently etched heat number traceable per EN 10204 3.1. Certified Mill Test Reports (CMTRS) are provided as standard on all Pure-Flo valves.

## Certificate of Compliance to Specifications

A Certificate of Compliance to customer specification is provided as a standard on all Pure-Flo valves.

- Certification of compliance to CFR Title #21 section 177
- Certification to USP Class VI compliance and/or physical testing document

Additional Validation information available on request

- Interior Surface Characterization documentation
- Quality assurance manual
- ISO 9001 certification
- Certification of testing to MSS-SP-88

Certificate and document packages can be downloaded from [www.engvalves.com](http://www.engvalves.com)

## Standard Marking (Old Generation)

HC  
S-N 665902-002-002  
1-316L-RA25MAX-CWP-150  
XV109

## Standard Marking (New Generation)

HC  
S-N 300002567-190000136  
1-316L-RA25MAX-CWP-150  
XV109

## European Union Service Valve Marking

HC  
S-N 6677002-001-001  
DN25-316L-RA0.5MAX-PN16  
Group 1 GAS TEST 16 BARG  
XV109

## Standard Marking (India)

HC  
S-N 1700001-10-1  
DN25-316L-RA0.5MAX-PN16  
XV109

Legend:

Heat Code	Material	PED Class (EU only)
Serial Number	Max Surface Finish	Test Pressure (EU only)
Size	Cold Working Pressure	Customer Tag# (optional)
Order Number		

# Process Fabrications

Process fabrications consist of multiple 2-way valves ported in various ways to fit the application. The intent is to reduce hold up volume and improve drainability versus using standard valves and fittings. Process fabrications minimize the distance between valves improving cleanability and reducing risk of contamination. Fabrications are utilized when hold up volumes are a consideration but not critical. Many process fabrication combinations can comply with the cGMP requirements.

There are three styles of standard two valve fabrications:

## GMP Option:

The GMP fabrication is typically oriented in the vertical position. The design is utilized to reduce dead legs on point-of-use outlets in a typical WFI distribution loop.

## Sterile Access Option:

The Sterile Access orientation is designed for use when the orientation of the main valve is horizontal and the secondary or purge valve or outlet is in the vertical position. The main valve is ported at the low point of the main valve waterway to achieve optimum drainability when the main valve is on its drain angle.

## Horizontal Sterile Access Option:

The Horizontal Sterile Access orientation is similar in configuration to the Sterile Access configuration, but is employed when both the main valve and secondary valve have horizontal orientation.

## Typical Applications:

Sampling, steam condensate drain, divert port, and block and bleed.

## Size Range

0.25–4" (DN6–100) main valve  
0.25–4" (DN6–100) purge valve

## Body Material

316L Stainless Steel Forging, ASTM A-182 (Standard on EnviZion 0.5-1.5" main valve; Standard on Pure-Flo 4")

316L Stainless Steel Wrought, ASTM A479 (Standard for main valve Bio-Pure and Bio-Tek up to Pure-Flo 3")

Other materials available upon request

## End Connections

Buttweld:

- 14, 16, 18, 20 Gauge O.D. Tubing
- Schedule 5, 10, and 40 Pipe
- DIN/ISO Ends

Hygienic clamp ends:



Note: Available in standard Pure-Flo and Pure-Flo EnviZion bodies. Body types can be the same or different.