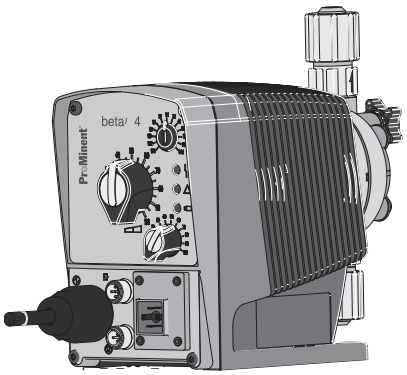
ProMinent® Beta b
Solenoid Diaphragm Metering Pumps

Overview: Beta b



Ideal for basic chemical feed applications
(see page 141 for spare parts and page 151 for control cables)

- Capacity range 8.4 gph (32 l/h) max, 363 psi (25 bar) max
- Standard external control via potential-free contacts with pulse step-up and step-down to adapt to existing signal transducers of 64:1 to 1:64
- (Optional) external control via standard 4-20 mA and potential-free contacts with pulse step-up and step-down of 32:1 to 1:32
- Continuous stroke length adjustment from 0-100% (recommended 30-100%)
- Supplied in PP, Acrylic/PVC, PTFE, PVDF, SS
- Patented coarse/fine deaeration for PP, and Acrylic/PVC
- Auto-degassing liquid end in Acrylic/PVC
- HV liquid end for highly viscous media (suitable for viscosities to 3000 cPs)
- 10-setting stroke frequency adjustment from 10-100%
- External control via voltage-free contacts
- Connector for two-stage level switch
- 12-24 V DC, 24 V AC low voltage version
- LED's for operation status
- NSF/ANSI 61 approved

ProMinent® solenoid-driven metering pumps consist of two main components: the pump drive unit and the liquid end. The Beta b series offers two drive (solenoid) sizes: Beta/4 (BT4b) and Beta/5 (BT5b). Operating principles and options are identical, and both units offer maximum backpressure up to 363 psig (17.5 bar). Capacity range for the Beta/4 is 0.19 to 5 gph (0.74 to 19 l/h); Beta/5 is 0.80 to 8.4 gph (2.9 to 32 l/h).

Feed rate is determined by stroke length and stroking rate: stroke length can be varied from 0 to 100% with an adjustment ratio of 10:1. The stroke length is set manually by the adjustment knob on the front of the pump.

Stroke rate can be adjusted in 10% increments between 10 and 100% via the multifunction switch. This switch is also used to select voltage-free On/Off external pulse contact, pump stop, or test (for priming).

Specifications

Drive Unit

The pump housing is constructed of fiberglass-reinforced PPE plastic to protect against corrosion, dust, and water.

The solenoid drive unit houses a short-stroke solenoid with a maximum stroke length of 0.05" (1.25 mm). It is equipped with a noise suppressing mechanism for quiet operation and the armature is the only moving part.

Operating on pulse action, each pulse generates a magnetic field in the solenoid coil. This magnetic field moves the armature, which in turn moves the diaphragm. The diaphragm pushes into the dosing head and cavity forces chemical out of the discharge valve. When the magnetic field is de-energized, a spring returns the armature and diaphragm to their original position. This return movement draws chemical into the dosing head cavity through the suction valve.

In the event of a diaphragm rupture, the liquid end has a weep hole on the bottom of the backplate to direct chemical out of the pump and away from the solenoid. An optional diaphragm failure detector can be used to stop the pump and indicate a fault.

The stroke-length adjusting mechanism is connected directly to the solenoid. Adjustment results in an accurate self-locking stroke-length setting.

Diaphragm

The diaphragm is constructed of fabric-reinforced EPDM elastomer with a plastic core and PTFE-facing. It is chemically resistant to virtually all process fluids and can be used over a wide temperature range. The Beta b pump is designed with a convex diaphragm. The curved shape provides precise metering and alleviates stress placed on the diaphragm by reducing liquid end dead volume.

ProMinent® Beta b
Solenoid Diaphragm Metering Pumps

Specifications (Cont.)

The Liquid End

The Beta b metering pump liquid ends are available in five material versions: Polypropylene (PP), Kynar (PVDF), Acrylic/PVC (NP), PTFE (TT), and 316 Stainless steel (SS).

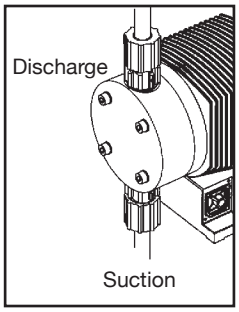
Some liquid ends are interchangeable between the BT4b and BT5b.

Options include a manual bleed valve with needle valve for easy priming, and continuous bleed of fluids that tend to off-gas (available with versions PP, PVT, and NP liquid ends).

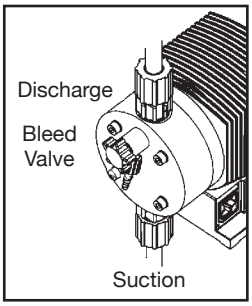
Automatic degassing liquid ends are available for PP and NP versions (except 1000 and 0232). This style liquid end discharges from the center and degasses from the top to prevent air build-up in the chamber.

High viscosity PVDF liquid ends are available for pump versions 1005, 0708, 0413, 0220, 1008, 0713, and 0420. Their metering capacity is 10-20% less than standard pump versions and recommended viscosity is up to 3000 cPs. The HV liquid ends are not self-priming; flooded suction is recommended.

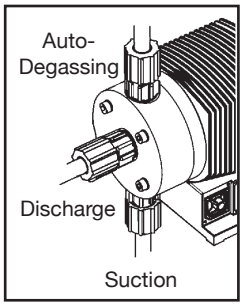
Suction and discharge ports are equipped with double-ball check valves for superior repeatability.



Liquid end without bleed valve



Liquid end with bleed valve



Auto-degassing liquid end

Power Supply

The Beta b metering pumps accept a universal 100-230 volt power supply (+/- 10%), single phase, 50/60 Hz, with a 1.15 service factor. Performance is identical whether operated on 50 Hz or 60 Hz power. The power cord is detachable.

Fault Indicators

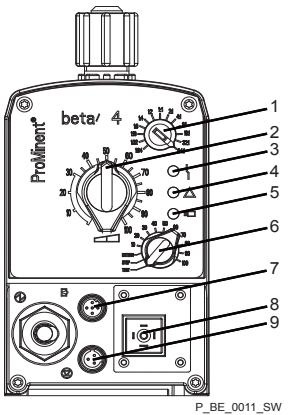
Three LED lights indicate operational status. A green light flashes during normal operation; a yellow light warns of low chemical; and a red light indicates lack of chemical or an operational error.

Relay Outputs

Fault annunciating relay
For low tank level (level switch), processor fault, and fuse/ power supply failure.

Pacing relay
A contact closure is issued with every pump stroke (contact duration 150 ms). This allows a second ProMinent metering pump to be paced synchronously, or to totalize flow with an external stroke counter.

1 Pulse Control Switch
2 Stroke Length Adjustment Knob
3 Fault Indicator (red)
4 Warning Indicator (yellow)
5 Operating Indicator (green)
6 Multifunctional Switch
7 "External Control" Terminal
8 Relay Connection (optional)
9 "Level Switch" Terminal



c UL us Recognized
CE Available

ProMinent® Beta b
Solenoid Diaphragm Metering Pumps

Specifications (Cont.)

Maximum stroke length:	0.05” (1.25 mm)
Materials of construction	
Housing:	Fiberglass reinforced PPE
Diaphragm:	PTFE-faced EPDM with plastic core
Liquid end options:	Polypropylene, PVDF, Acrylic/PVC, PTFE, 316 SS
Enclosure rating:	IP 65
Motor insulation class:	F
Power supply:	100-230 VAC, 1 phase, 50/60 Hz, +/- 10%; 12-24 VDC or 24VDC (+/- 10%)
Check valves:	Double ball
Metering repeatability:	When used according to operating instructions, ±2% under constant conditions and at minimum 30% stroke length
Power cord:	6 ft (2 m)
Relay cable (optional):	6 ft (2 m)
Relay load	
Fault relay only (options 1 & 3):	Contact load: 250 VAC, 2 A, 50/60 Hz Operating life: > 200,000 switch functions
Fault and pacing relay (options 4 & 5):	Contact load: 250 VAC/DC, 2 A, 50/60 Hz Operating life: > 200,000 switch functions Residual impedance in ON-position $R_{DS(on)}$: < 8 Ω Residual current in OFF-position: <1µA Maximum current: < 100 mA Maximum voltage: 24 VDC Switch functions: $15x10^9$ Contact closure: 100 µs (for pacing relay)
Ambient temperature range:	14°F (-10°C) to 113°F (45°C)

Max. fluid operating temperatures:

Material	Constant	Short Term
Acrylic/PVC	113°F (45°C)	140°F (60°C)
Polypropylene	122°F (50°C)	212°F (100°C)
PTFE	122°F (50°C)	248°F (120°C)
316 SS	122°F (50°C)	248°F (120°C)
PVDF	149°F (65°C)	212°F (100°C)

Average power drain at maximum stroking rate (Watts) / current drain at pump stroke (Amps)	
BT4b:	17W / 0.7 A or 15 A (peak current for approx. 1 µs)
BT5b:	22W / 1.0 A or 15 A (peak current for approx. 1 µs)
Service factor:	1.15
Warranty:	2 years on drive, 1 year on liquid end (extended warranties available)
Industry standards:	UL recognized, CE available for U.S.A. and Canada, NSF/ANSI 61
Valve threads:	Metric thread for PP, NP, PVT, and TT versions. 1/2” MNPT connections are available in all materials.
Standard Production Test:	**All pumps are tested for capacity at maximum pressure prior to shipment.**
Max. solids size in fluid:	Pumps with 1/4” valves: 15µ - Pumps with 1/2” valves: 50µ
Controlling contact (pulse):	With voltage free contact, or with semiconductor sink logic control (NPN), not source logic (PNP). With a residual voltage of <700 mV, the contact load is approximately 0.5 mA at +5 VDC. (Note: Semiconductor contacts that require >700 mV across a closed contact should not be used.) Pump ignores contacts exceeding maximum input rate.
Necessary contact duration:	20 µs
Recommended Viscocity:	max. 200 cPs for standard liquid end max. 500 cPs for valve with springs max. 50 cPs for auto-degassing metering pumps max. 3000 cPs for high viscosity

ProMinent® Beta b Solenoid Diaphragm Metering Pumps

Capacity Data

Pump Version	Capacity at Max. Backpressure					Capacity at 1/2 Max. Backpressure					Pre-Primed Suction Lift		Max. Stroking Rate	Tubing Connectors[2] O.D. x I.D.	Shipping Weight (higher weights are for SS)	
	PSIG	(bar)	U.S. GPH	(L/h)	mL/ stroke	PSIG	(bar)	U.S. GPH	(L/h)	mL/ stroke	ft	(m)	spm	in	lbs	(kg)
BT4b: with standard liquid ends																
1000	145	(10)	0.20	(0.74)	0.07	72.5	(5)	0.22	(0.82)	0.08	19.6	(6.0)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
2001[3]	290	(20)	0.25	(0.96)	0.10	145	(10)	0.40	(1.5)	0.13	19.6	(6.0)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
1601	232	(16)	0.29	(1.1)	0.10	116	(8)	0.37	(1.4)	0.13	19.6	(6.0)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6
2002[3]	290	(20)	0.45	(1.70)	0.20	145	(10)	0.74	(2.8)	0.24	19.6	(6.0)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
1602	232	(16)	0.58	(2.2)	0.20	116	(8)	0.66	(2.5)	0.24	19.6	(6.0)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
1604	232	(16)	0.95	(3.6)	0.33	116	(8)	1.14	(4.3)	0.40	19.6	(6.0)	180	1/4 x 3/16	6.8-8.6	(3.1-3.9)
0708	101	(7)	1.88	(7.1)	0.66	50.8	(3.5)	2.22	(8.4)	0.78	19.6	(6.0)	180	1/2 x 3/8	6.8-8.6	(3.1-3.9)
0413	58	(4)	3.2	(12.3)	1.14	29	(2)	3.75	(14.2)	1.31	9.8	(3.0)	180	1/2 x 3/8	6.8-8.6	(3.1-3.9)
0220	29	(2)	5.02	(19.0)	1.76	14.5	(1)	5.52	(20.9)	1.94	6.5	(2.0)	180	1/2 x 3/8	7.3-9.7	(3.3-4.4)
BT5b: with standard liquid ends																
2504[3]	363	(25)	0.77	(2.9)	0.27	145	(10)	1.3	(5.0)	0.46	19.6	(6.0)	180	(8 x 4mm)	9.9-11.7	(4.5-5.3)
1008	145	(10)	1.8	(6.8)	0.63	72.5	(5)	2.19	(8.3)	0.76	19.6	(6.0)	180	1/2 x 3/8	9.9-11.7	(4.5-5.3)
0713	101	(7)	2.91	(11.0)	1.02	50.8	(3.5)	3.46	(13.1)	1.21	13.1	(4.0)	180	1/2 x 3/8	9.9-11.7	(4.5-5.3)
0420	58	(4)	4.52	(17.1)	1.58	29	(2)	5.05	(19.1)	1.77	9.8	(3.0)	180	1/2 x 3/8	10.4-12.8	(4.7-5.8)
0232[1]	29	(2)	8.45	(32.0)	2.96	14.5	(1)	9.56	(36.2)	3.35	6.5	(2.0)	180	1/2 x 3/8	11.2-14.6	(5.1-6.6)
BT4b: with auto-degassing liquid ends, 3-port (NPB9/NPE9)																
1601	232	(16)	0.16	(0.6)	0.06	116	(8)	0.21	(0.8)	0.07	5.9	(1.8)	180	1/4 x 3/16	6.4	(2.9)
1602	232	(16)	0.37	(1.4)	0.13	116	(8)	0.46	(1.7)	0.174	6.9	(2.1)	180	1/4 x 3/16	6.4	(2.9)
1604	232	(16)	0.71	(2.7)	0.25	116	(8)	0.95	(3.6)	0.33	8.8	(2.7)	180	1/4 x 3/16	6.8	(3.1)
0708	101	(7)	1.74	(6.6)	0.61	58	(4)	1.98	(7.5)	0.69	6.5	(2.0)	180	1/2 x 3/8	6.8	(3.1)
0413	58	(4)	2.85	(10.8)	1	29	(2)	3.33	(12.6)	1.17	6.5	(2.0)	180	1/2 x 3/8	6.8	(3.1)
0220	29	(2)	4.28	(16.2)	1.5	14.5	(1)	4.76	(18.0)	1.67	6.5	(2.0)	180	1/2 x 3/8	7.3	(3.3)
BT5b: with auto-degassing liquid ends, 3-port (NPB9/NPE9)																
1008	145	(10)	1.66	(6.3)	0.58	72.5	(5)	1.98	(7.5)	0.69	9.8	(3.0)	180	1/2 x 3/8	9.9	(4.5)
0713	101	(7)	2.6	(10.5)	0.911	58	(4)	3.25	(12.3)	1.14	8.2	(2.5)	180	1/2 x 3/8	9.9	(4.5)
0420	58	(4)	4.12	(15.6)	1.44	29	(2)	4.6	(17.4)	1.61	8.2	(2.5)	180	1/2 x 3/8	10.4	(4.7)
BT4b: with self-bleeding liquid ends, 2-port without bypass (PVT7)																
1602	145	(10)	0.37	(1.4)	0.13	16	(8)	0.45	(1.7)	0.16	5.9	(1.8)	180	1/4 x 3/16	6.3	(2.9)
1604	145	(10)	0.71	(2.7)	0.25	16	(8)	0.95	(3.6)	0.33	5.9	(1.8)	180	1/4 x 3/16	6.8	(3.1)
0708	101	(7)	1.8	(6.6)	0.61	50.8	(3.5)	2	(7.5)	0.69	5.9	(1.8)	180	1/2 x 3/8	6.8	(3.1)
0413	58	(4)	2.8	(10.8)	1	29	(2)	3.3	(12.6)	1.17	5.9	(1.8)	180	1/2 x 3/8	6.8	(3.1)
0220	29	(2)	4.4	(16.2)	1.5	14.5	(1)	4.7	(18.0)	1.67	5.9	(1.8)	180	1/2 x 3/8	7.2	(3.3)
BT5b: with self-bleeding liquid ends, 2-port without bypass (PVT7)																
1008	145	(10)	1.7	(6.3)	0.58	72.5	(5)	2	(7.5)	0.69	5.9	(1.8)	180	1/2 x 3/8	9.9	(4.5)
0713	101	(7)	2.8	(10.5)	0.97	58	(3.5)	3.2	(12.3)	1.14	5.9	(1.8)	180	1/2 x 3/8	9.9	(4.5)
0420	58	(4)	4.1	(15.6)	1.44	29	(2)	4.6	(17.4)	1.61	5.9	(1.8)	180	1/2 x 3/8	10.4	(4.7)

Above capacities and suction lift refer to pumps tested on water at 115 VAC, 60 Hz, and an ambient temperature of 70°F (21°C).
Higher specific gravity fluids will reduce suction lift. Higher viscosity fluids will reduce capacity.
Liquid ends for highly viscous media have 10-20% less metering capacity and are not self-priming. Standard connectors are 1/2" MNPT or 5/8" hose barb. Positive suction recommended.

[1] Not available with bleed valve.

[2] SS versions use 1/4" female threads except models 0220, 0420, and 0232 which use 3/8" female threads.

[3] Only available in SS and Acrylic liquid ends

Universal control cable necessary for external Beta control. (see page 151)

Materials In Contact With Chemicals

Liquid end materials in contact with media

Version	Liquid End	Suction/Discharge valves	Seals	Valve balls	Diaphragm*
*PVT	*PVDF	*PVDF	PTFE	Ceramic	PTFE
PPT	Polypropylene	*PVDF	PTFE	Ceramic	PTFE
NPT	Acrylic	*PVDF	PTFE	Ceramic	PTFE
TTT	PTFE with Carbon	PTFE with Carbon	PTFE	Ceramic	PTFE
SST	316 Stainless Steel	316 Stainless Steel	PTFE	Ceramic	PTFE

*Highly compatible material suitable for most fluids.

ProMinent® Beta b
Solenoid Diaphragm Metering Pumps

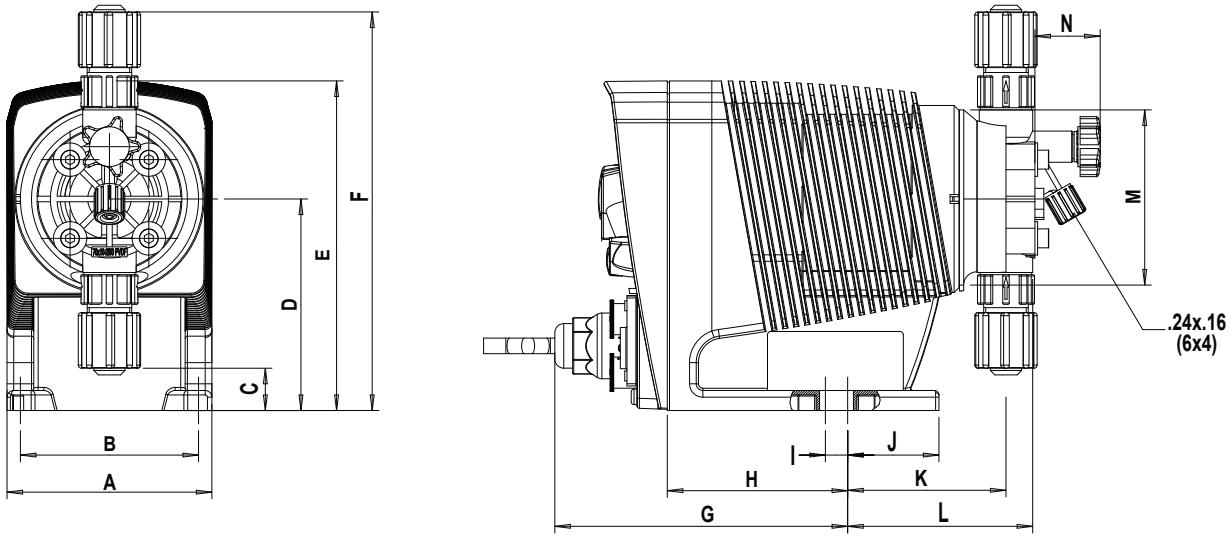
Identcode Ordering System

BT4b	Beta 4b																Beta 5b	
	Version	Capacity															Version	Capacity
	1000	0.20 gph (0.74 l/h), 145 psi (10 bar)															2504	0.77 gph (2.9 l/h), 363 psi (25 bar)
	2001	0.25 gph (0.96 l/h), 290 psi, (20 bar)															1008	1.8 gph (6.8 l/h), 145 psi (10 bar)
	1601	0.29 gph (1.10 l/h), 232 psi (16 bar)															0713	2.91 gph (11.0 l/h), 102 psi (7 bar)
	2002	0.45 gph (1.70 l/h), 290 psi (20 bar)															0420	4.52 gph (17.1 l/h), 58 psi (4 bar)
	1602	0.58 gph (2.2 l/h), 232 psi (16 bar)															0232	8.45 gph (32.0 l/h), 29 psi (2 bar)
		Liquid end material:																
		PP	Polypropylene/PVDF, for self-degassing version Polypropylene/Polypropylene															
		NP	Acrylic glass/PVDF, for self-degassing version Acrylic glass/PVC															
		PV	PVDF/PVDF															
		TT	PTFE/PTFE															
		SS	Stainless steel															
			O-rings:															
			E	EPDM/PTFE coated, only for PP and NP self-degassing														
			B	FPM-B/PTFE coated, only on PP and NP self-degassing														
			T	PTFE/PTFE coated														
			P	Diaphragm and seal EPDM														
				Liquid end version:														
				0	Non-bleed version, no valve spring, for TT, SS and type 0232 only													
				1	Non-bleed version, with valve spring, for TT, SS and type 0232 only													
				2	With deaerator, no valve spring, PP, PV, NP only, not type 0232													
				3	With deaerator, with valve spring, PP, PV, NP only, not type 0232													
				4	Version for highly viscous media, only PVT, types 1005, 1605, 0708, 1008, 0413, 0713, 0220, 0420													
				7	Self-bleeding without bypass, only with PV, not for versions 2504 and 0245													
				9	Auto-degassing for PP, NP only, not for types 1000 and 0232													
					Hydraulic connections:													
					0	Standard according to technical data												
					B	special-connection 3/8" x 1/4"												
						Labeling:												
						0	Standard Housing											
							Logo:											
							0	With ProMinent® logo										
								Power supply:										
								U	Universal 100-240 V									
								M	12-24 VDC									
									Cable and plug:									
									1	6 ft Open end								
									A	6 ft European								
									D	6 ft USA 115 V								
									U	6 ft USA 230 V								
										Relay:								
										0	No relay							
										1	Fault annunciating relay, drops out							
										4	Option 1 + pacing relay							
										5	Option 3 + pacing relay							
											Accessories:							
											0	No accessories						
											1	With foot and injection valve, 5 ft PVC suction tubing, 10 ft PE discharge tubing						
												Control type:						
												0	No lock					
												1	With lock: manual operation locked when external cable plugged in					
													Control variants:					
													0	External contact 1:1				
													A	External analog 0-20mA/4-20mA				
														Remote stop:				
														0	External controllable frequency			
															Auxilliar frequency:			
															0	External controllable frequency =180max		
																Approval:		
																01	CE	
BT4b	**1000**	**PP**	**E**	**0**	**0**	**0**	**0**	**U**	**D**	**0**	**0**	**0**	**0**	**0**	**0**	**01**		

ProMinent® Beta b
Solenoid Diaphragm Metering Pumps

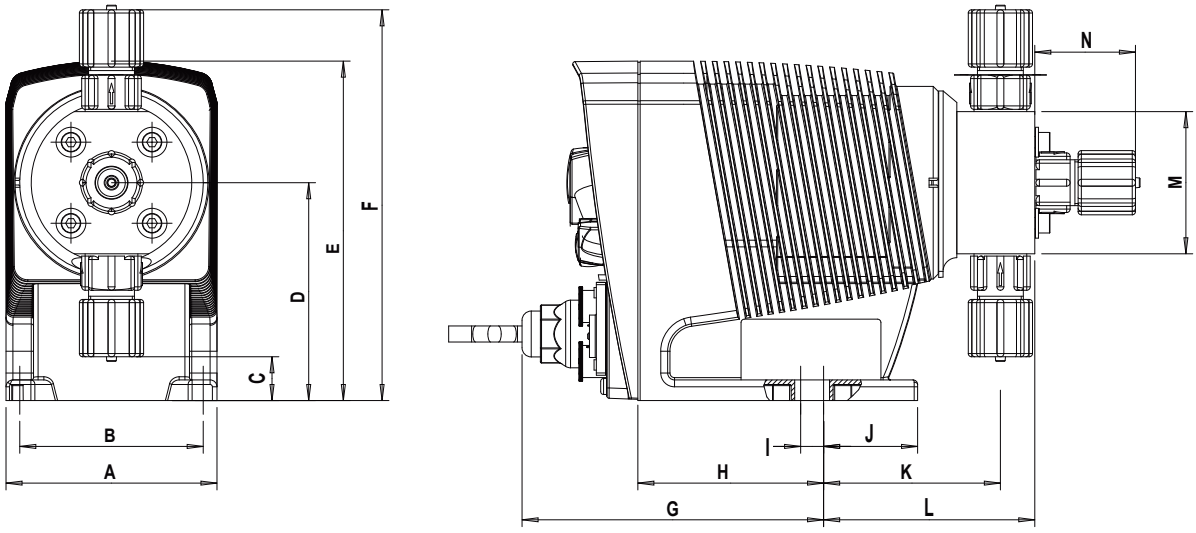
Dimensional Drawings

Dimensions in inches (mm).
Ranges given, actual dimension dependent on liquid end material.



Pump	A	B	C	D	E	F	G	H	I	J	K	L	M	N
BT4	3.6 (92)	3.1 (80)	.13-.75 (3.2-19)	3.7 (95)	5.8 (148)	7.0-7.8 (179-199)	5.2 (131.5)	3.2 (81)	.39 (10)	1.4 (36)	2.8-3.0 (71-76)	3.2-3.7 (83-93)	2.8-4.3 (Ø 90-Ø 110)	1.1 29.3
BT5	4.0 (102)	3.1 (80)	.13-.75 (3.2-19)	4.0 (101)	6.0 (153)	7.0-7.8 (179-199)	5.3 (135.5)	3.3 (85)	.59 (15)	1.6 (41)	2.8-3.0 (71-76)	3.2-3.7 (83-93)	2.8-4.3 (Ø 90-Ø 110)	1.1 29.3

With Auto-Degassing Liquid Ends



Pump	A	B	C	D	E	F	G	H	I	J	K	L	M	N
BT4	3.6 (92)	3.1 (80)	.30-.75 (7.5-19)	3.7 (95)	5.8 (148)	6.7-7.42 (170.5-188.5)	5.2 (131.5)	3.2 (81)	.39 (10)	1.4 (36)	2.9-3.0 (74-77)	3.5-4.2 (89-105.5)	2.8-3.5 (Ø 90-Ø 70)	1.73 43.9
BT5	4.0 (102)	3.1 (80)	.30-.75 (7.5-19)	4.0 (101)	6.0 (153)	6.7-7.42 (170.5-188.5)	5.3 (135.5)	3.3 (85)	.59 (15)	1.6 (41)	2.9-3.0 (74-77)	3.5-4.2 (89-105.5)	2.8-3.5 (Ø 90-Ø 70)	1.73 43.9