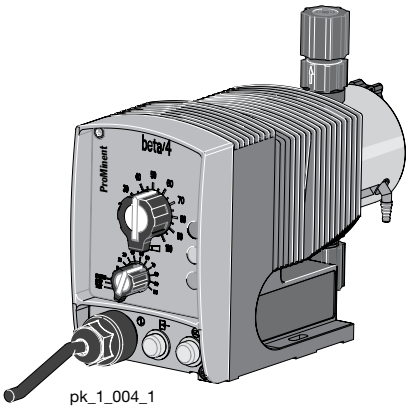
ProMinent® Beta®
Solenoid Diaphragm Metering Pumps

Overview: Beta®



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Ideal for basic chemical feed applications
(see page 127 for spare parts, page 138 for accessory kits and page 138 for control cables)

- Capacity range 0.2-8.4 gph, 232-29 psi (0.74-32 l/h, 16-2 bar)
- Continuous stroke length adjustment from 0-100 % (recommended 30-100 %)
- Supplied in PP, Acrylic/PVC, PTFE, PVDF, stainless steel
- 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

ProMinent® solenoid-driven metering pumps consist of two main components: the pump drive unit and the liquid end. The beta series offers two drive (solenoid) sizes: beta/4 (BT4a) and beta/5 (BT5a). Operating principles and options are identical, and both units offer maximum backpressure up to 232 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 1.1 to 8.4 gph (4.1 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. It 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, with a NEMA 4x enclosure rating 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 the diaphragm is attached to the end. The diaphragm pushes into the dosing head cavity forcing 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.

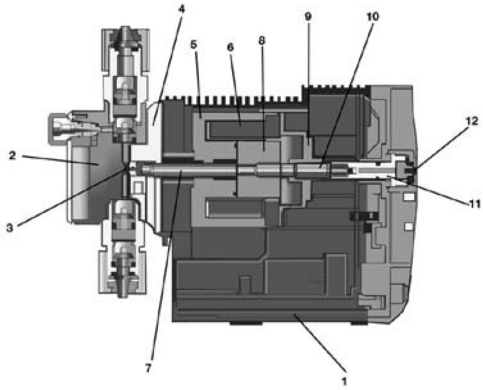
In the event of a diaphragm rupture, the liquid end has a weep hole on the bottom of the backplate to direct chemical out of the pump and away from the solenoid. An optional diaphragm failure monitor can be used to stop the pump and indicate a problem.

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 pump is designed with a convex diaphragm. The curved shape provides more precise metering and alleviates stress placed on the diaphragm by reducing liquid end dead volume.

cutaway view of ProMinent beta solenoid-driven metering pump



1 housing
2 liquid end
3 diaphragm
4 backplate
5 solenoid
6 solenoid coil
7 solenoid axle
8 armature
9 cover
10 stroke adjustment screw
11 stroke adjustment axle
12 stroke adjustment knob

ProMinent® Beta®
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Specifications

The Liquid End

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

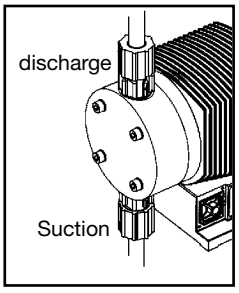
Some liquid ends are interchangeable between the BT4a and BT5a.

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

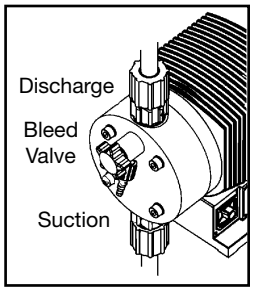
Automatic degassing liquid ends are available for PP and NP versions (except 1000 and 0232). This style liquid end discharges from the center and degasses from the top to prevent air build-up in the chamber.

High viscosity PVDF liquid ends are available for pump versions 1005, 0708, 0413, 0220, 1605, 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 so flooded suction is recommended.

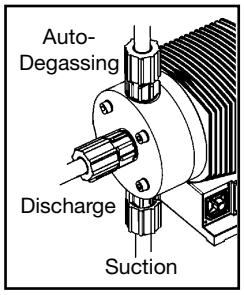
Suction and discharge ports are equipped with double ball check valves for superior repeatability.



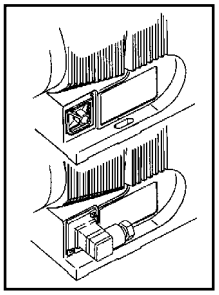
Liquid end without bleed valve



Liquid end with bleed valve



Auto-degassing liquid end


an external panel in the base of the pump enables optional relays to be installed on-site.

Power Supply

The beta metering pumps accept 100-115, 200-230 or 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.

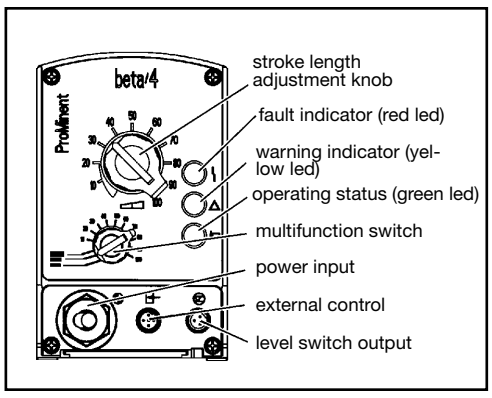
Fault Indicators

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.



c UL us Recognized
CE Available

ProMinent® Beta®
Solenoid Diaphragm Metering Pumps

Specifications

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, PVC, Acrylic/PVC, PTFE, 316 SS
Enclosure rating:	NEMA 4X (IP 65)
Motor insulation class:	F
Power supply:	100-115 VAC, 200-230 VAC or 100-230 VAC, 1 phase, 50/60 Hz, +/- 10%; 12-24 VDC or 24VDC +/- 10%
Check valves:	Double ball
Repeatability of the metering:	When used according to operating instructions, ±2% under constant conditions and at minimum 30% stroke length
Power cord:	6 foot (2 m)
Relay cable (optional):	6 foot (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_{DSOn}): < 8 Ω Residual current in OFF-position: <1µA Maximum current: < 100 mA Maximum voltage: 24 VDC Switch functions: $15x10^9$ Contact closure: 100 ms (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)
PVC	113°F (45°C)	140°F (60°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)	
BT4a:	***17W / 0.7 A or 15 A (peak current for approx. 1 ms)***
BT5a:	***22W / 1.0 A or 15 A (peak current for approx. 1 ms)***
Service factor:	1.15
Warranty:	2 years on drive, 1 year on liquid end
Industry standards:	UL recognized, CE available for U.S.A. and Canada
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, and will not remember.
Necessary contact duration:	20 ms
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® Solenoid Diaphragm Metering Pumps

Capacity Data

Pump Version	Capacity at Maximum Backpressure psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	Capacity at 1/2 Maximum Backpressure psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	Pre-Primed Suction Lift ft.	(m)	Max. Stroking Rate spm	Tubing Connectors** O.D. x I.D. inches	Shipping Weight (higher weights are for SS) lbs.	(kg)
BT4a																
1000	145	(10)	0.19	(0.74)	0.07	73	(5)	0.21	(0.82)	0.08	19.6	(6)	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)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
1602	232	(16)	0.55	(2.1)	0.19	116	(8)	0.66	(2.5)	0.24	19.6	(6)	180	1/4 x 3/16	6.4-7.9	(2.9-3.6)
1005	145	(10)	1.1	(4.4)	0.41	73	(5)	1.32	(5.0)	0.46	19.6	(6)	180	1/2 x 3/8	6.8-8.6	(3.1-3.9)
0708	101	(7)	1.9	(7.1)	0.66	50.5	(3.5)	2.22	(8.4)	0.78	19.6	(6)	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)	180	1/2 x 3/8	6.8-8.6	(3.1-3.9)
0220	29	(2)	5.0	(19.0)	1.76	14.5	(1)	5.52	(20.9)	1.94	6.5	(2)	180	1/2 x 3/8	7.3-9.7	(3.3-4.4)
BT5a																
1605	232	(16)	1.1	(4.1)	0.38	116	(8)	1.29	(4.9)	0.45	19.6	(6)	180	1/2 x 3/8	9.9-11.7	(4.5-5.3)
1008	145	(10)	1.8	(6.8)	0.63	73	(5)	2.19	(8.3)	0.76	19.6	(6)	180	1/2 x 3/8	9.9-11.7	(4.5-5.3)
0713	101	(7)	2.9	(11.0)	1.02	50.5	(3.5)	3.46	(13.1)	1.21	13.1	(4)	180	1/2 x 3/8	9.9-11.7	(4.5-5.3)
0420	58	(4)	4.5	(17.1)	1.58	29	(2)	5.04	(19.1)	1.77	9.8	(3)	180	1/2 x 3/8	10.4-12.8	(4.7-5.8)
0232*	29	(2)	8.4	(32.0)	2.96	14.5	(1)	9.56	(36.2)	3.35	6.5	(2)	180	1/2 x 3/8	11.2-14.6	(5.1-6.6)
With auto-degassing liquid ends																
BT4a																
1601	232	(16)	0.16	(0.59)	0.06	116	(8)	0.21	(0.78)	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)	0.45	(1.7)	0.16	6.9	(2.1)	180	1/4 x 3/16	6.4	(2.9)
1005	145	(10)	0.95	(3.6)	0.33	73	(5)	1.05	(4.0)	0.37	8.8	(2.7)	180	1/2 x 3/8	6.8	(3.1)
0708	101	(7)	1.74	(6.6)	0.61	50.5	(3.5)	1.98	(7.5)	0.69	6.5	(2.0)	180	1/2 x 3/8	6.8	(3.1)
0413	58	(4)	2.8	(10.8)	1.00	29	(2)	3.3	(12.6)	1.17	6.5	(2.0)	180	1/2 x 3/8	6.8	(3.1)
0220	29	(2)	4.3	(16.2)	1.50	14.5	(1)	4.7	(18.0)	1.67	6.5	(2.0)	180	1/2 x 3/8	7.3	(3.3)
BT5a																
1605	232	(16)	0.87	(3.3)	0.31	116	(8)	1.00	(3.8)	0.35	9.8	(3)	180	1/2 x 3/8	9.9	(4.5)
1008	145	(10)	1.66	(6.3)	0.58	73	(5)	1.98	(7.5)	0.69	9.8	(3)	180	1/2 x 3/8	9.9	(4.5)
0713	101	(7)	2.77	(10.5)	0.97	50.5	(3.5)	3.2	(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)

Above capacities and suction lift refer to pumps tested on water at 115 VAC, 60 Hz, and an ambient temperature of 70°F (20°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.

* Not available with bleed valve.
** SS versions use 1/4" female threads except models 0220, 0420, and 0232 which use 3/8" female threads.

Note: Universal control cable necessary for external Beta control. (see *page 138*)

Materials In Contact With Chemicals

	Pump Head	Suction/Pressure Connector	O-rings	Balls
PPE	Polypropylene	Polypropylene	EPDM	ceramic
PPB	Polypropylene	Polypropylene	Viton®	ceramic
NPE	Acrylic	PVC	EPDM	ceramic
NPB	Acrylic	PVC	Viton®	ceramic
PVT	PVDF	PVDF	PTFE	ceramic
TTT	PTFE with carbon	PTFE with carbon	PTFE	ceramic
SST	stainless steel no. 1.4404	stainless steel no. 1.4404	PTFE	ceramic

Auto-degassing version available in PP and NP only. Supplied with Hastelloy valve springs, PVDF valve core.
Pump diaphragm with PTFE-coating.

Note: Viton® is a registered trademark of DuPont Dow Elastomers.

ProMinent® Beta®
Solenoid Diaphragm Metering Pumps

Identcode Ordering System

BT4a **Beta® Version a**

BT4a	BT5a
1000	1605*
1601	1008*
1602	0713*
1005*	0420*
0708*	0232
0413*	
0220*	

Pump version:

*Versions available with high viscosity liquid ends

Liquid end material:

PP	Polypropylene
PC	PVC
NP	Acrylic/PVC
PV	PVDF
TT	PTFE
SS	SS

O-rings:

E	EPDM o-rings (PP, PC, NP)
B	Viton® o-rings (PP, PC, NP)
T	PTFE o-rings (PVDF, TT, SS)

Viton® is a registered trademark of DuPont Dow Elastomers

Liquid end version:

0	W/o bleed valve, w/o springs (TT, SS and version 0232 PP)
1	W/o bleed valve, with springs (TT, SS and version 0232 PP)
2	With bleed valve, w/o springs (PP, PC, NP; except version 0232 PP)
3	Wtih bleed valve, with springs (PP, PC, NP; except version 0232 PP)
4	W/o bleed valve, with springs (for high viscosity only)
9	With auto-degassing (PP, NP - except versions 1000, 0232)

Connection:

0	Standard according to technical data
6	1/2" x 3/8" tube fittings

NOTE: Connector option 6 **must** be used on all pumps with standard 1/2" x 3/8" tubing connections, and it may be used on pumps with 1/4" x 3/16" tubing connectors. Use option 0 on all pumps with standard NPT connections and for high viscosity.

Labeling:

0	Standard, with logo

Electrical connection (± 10%):

M	12-24 VDC (versions 1000-0220)
N	24 VDC (versions 1605-0232)
U	115-230 V, 50/60 Hz

Cable and plug with 6 ft (2 m) power cord, single phase:

A	European plug
D	N. American plug, 115 V
U	N. American plug, 230 V
1	Open ended (for low voltage options M and N)

Relay:

0	Without relay
1	Fault annunciating relay, drops out
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay

Accessories:

0	Not included (for TT, SS)
1	Standard (for PP, NP, PVT and PC)

Operating mode configuration:

0	Standard operating mode
1	With lock for one operating mode: external or manual

Options:

000	Standard

BT4a 1602 NP B 2 0 0 U D 0 1 0 000

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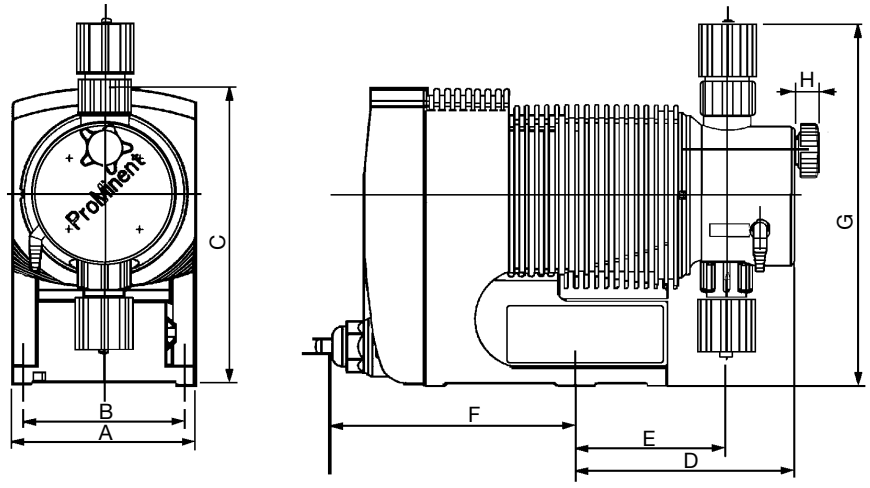
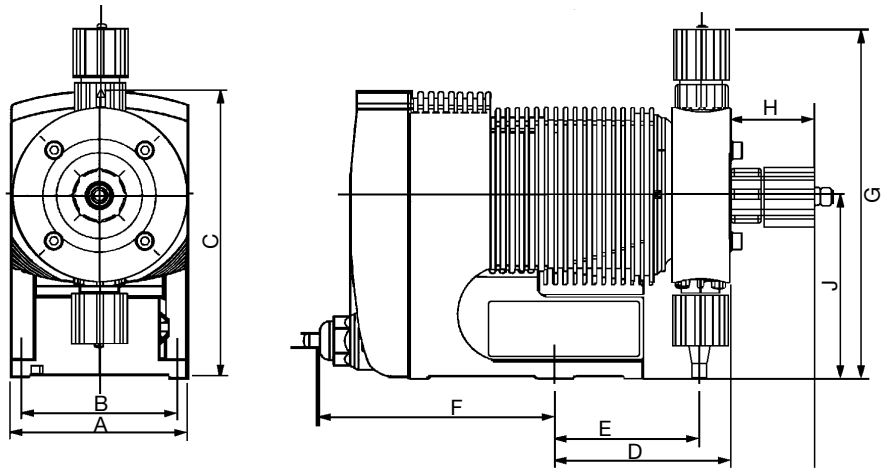
Dimensional Drawings

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



Pump	A	B	C	D	E	F	G	H
BT4	3.6 (92)	3.1 (80)	5.8 (148)	3.5-4.2 (88-108)	2.8-3.3 (71-83)	5.2 (132)	6.1-7.4 (156-187)	0.5-0.6 (12-14)
BT5	4.0 (102)	3.1 (80)	6.3 (160)	3.5-4.3 (88-110)	2.8-3.3 (71-83)	5.7 (144)	6.7-8.5 (171-217)	0.5-0.6 (12-14)

With Auto-Degassing Liquid Ends



	A	B	C	D	E	F	G	H	J
BT4	3.6 (92)	3.1 (80)	5.8 (148)	3.5-3.6 (89-92)	2.9-3.0 (74-76)	5.2 (132)	6.7-7.1 (171-181)	1.7 (44)	3.7 (95)
BT5	4.0 (102)	3.1 (80)	6.3 (160)	3.5-3.6 (89-91)	2.9-3.0 (74-76)	5.7 (144)	7.3-7.4 (186-187)	1.7 (44)	4.0 (101)