ProMinent® gamma/b series metering pumps

This pump has been replaced by the gamma/L series for most applications; except the following models which are not convertible to the gamma/L: gamma/4b 1000, 1001 and gamma/5b 1310 and 0813.

The gamma/b series is a microprocessor-controlled, diaphragm-type, solenoid driven metering pump for low flow applications.

The basic version allows manual or external pulse control. Pump options, accept nearly any customer-specific control signal. The operational reliability of the pump can be increased by a variety of monitoring equipment.

The LCD display is illuminated for visibility in low light areas and provides simple and concise user guidance. The LCD also displays the actual operating status and warns the operator of possible faults.

The pump housing

Attractive, functional construction of fiberglass-reinforced PPE plastic, the NEMA 4x housing offers maximum protection against corrosion, dust and water.

The solenoid drive

The solenoid drive has only one moving part, the armature. The power end consists of a short-stroke solenoid with a maximum stroke length of 0.05" (1.25 mm), and is equipped with a noise suppressing mechanism for quiet operation.

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

The pump diaphragm

The DEVELOPAN® composite diaphragm consists of high-quality, nylon-fabric reinforced EPDM vulcanized onto a steel core, and is PTFE-faced on the liquid contact surface for extremely long service life. The DEVELOPAN diaphragm is chemically resistant against virtually all process fluids, and can be used over a wide temperature range.

An air gap behind the diaphragm, created by a back plate with weep hole, followed by a secondary safety diaphragm prevents chemical intrusion into the solenoid housing in the event of main diaphragm failure.

The liquid end

Liquid ends for the gamma/b metering pump are available in 4 standard material versions:

- Polypropylene (PP/PS)
- Acrylic/PVC (NP/NS)
- PTFE (TT)
- 316 Stainless steel (SS)

The suction and discharge ports are equipped with double ball check valves for maximum repeatability (except high viscosity models PP4 and PP5). Versions PP1, PP2, PP3, and NP1, NP2, NP3 liquid ends provide a coarse bleed valve for easy priming and a fine bleed valve for continuous bleeding of fluids that tend to off-gas to prevent airlock.

High viscosity liquid ends (PP4 and PP5) are available on versions 1310 and 0813. These are equipped with an increased flow profile and larger spring-loaded single ball valves for high viscosity fluids.

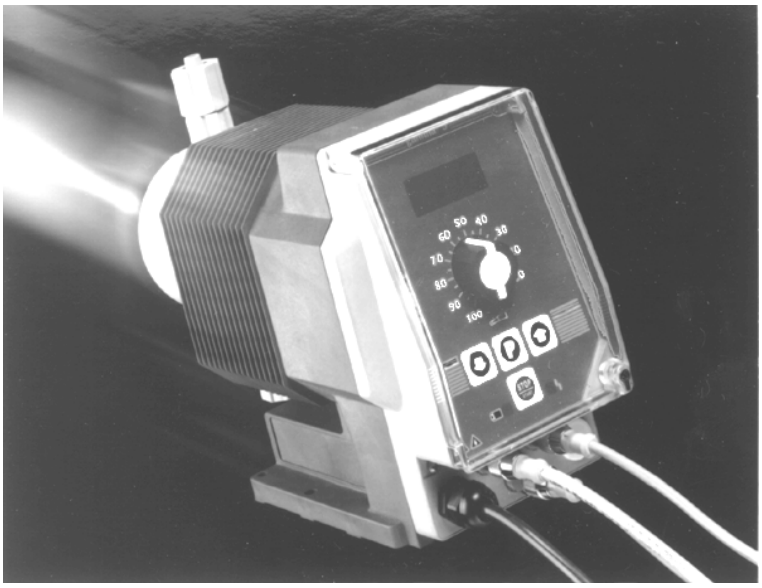
Wide margin of power supply voltage

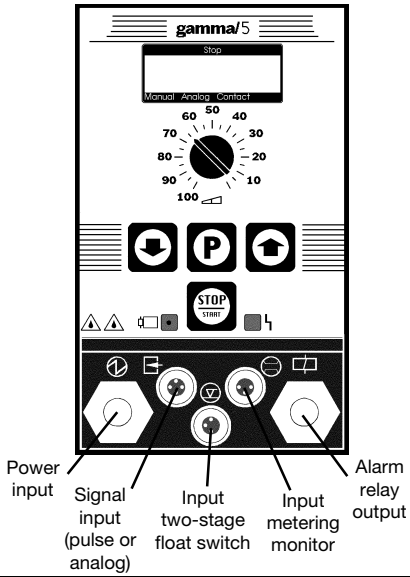
The gamma/b metering pumps accept either 115 or 230 volt power, single phase, 50/60 Hz, with a 1.15 service factor. Performance is identical whether operated on 50 Hz or 60 Hz power.

CE Approved

CSA® Available (Standard in Canada)

The gamma/b metering pumps are registered according to DIN-VDE 0700 and protected against radio interference class B according to DIN-VDE 0871.





gamma/b microprocessor control - basic to any process.

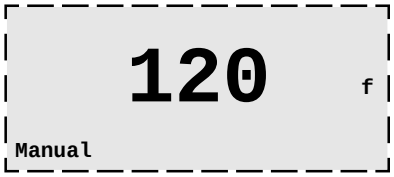
THE BASIC VERSION

Note: The capabilities listed on this page are common to all gamma/b pumps. The cable for external pacing or remote pause is an optional accessory, as are the float switch, flow monitor and relay outputs.

Stroke frequency control

Continuous operation – "Manual"

The pump capacity can be varied via the stroke length knob (from 0 to 100% stroke length), and by varying the stroking rate via the up/down arrows on the keypad. See the Technical Data for a particular model's maximum stroking rate, (e.g. 100, 120, or 180 strokes per minute). The selected stroking rate is shown on the LCD display and is performed with quartz-like accuracy. The gamma/b manual control range permits 1000:1, 1200:1, or 1800:1 turndown, depending on maximum stroke rate. The simulated LCD display below shows manual control with frequency of 120 strokes per minute.



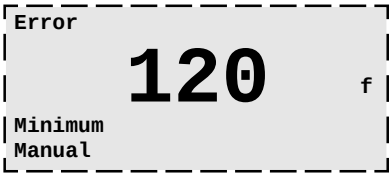
External pacing – "Contact"

The gamma/b series can be paced externally (e.g. by means of a pulse-type water meter for proportional chemical feed). The pulse signals are fed into the contact input of the pump by an optional control cable. Every pulse from a water meter or pulse-type controller produces one pump stroke, up to the pump's maximum stroke rate. Over-stroking the pump is not possible. LCD display shows "E" for external contact pacing.

Ensure fluid flow

Chemical tank float switch – "Minimum"

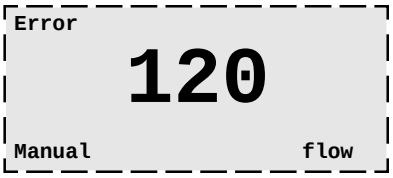
An optional two-stage ProMinent float switch can be plugged into the pump to monitor chemical levels in the source tank. An early warning will be issued when the allowable minimum level is reached. The pump continues to operate while the display flashes "Minimum," a red LED lights and an optional collective fault relay changes state to issue an alarm. If the liquid level in the supply tank drops another 3/4" (20 mm), the pump automatically shuts down and the LCD displays "Error" and "Minimum" as shown below. The optional fault relay remains activated.



Flow monitor – "Flow"

The gamma/5b 0813 and 1310 metering pumps will monitor their own output, with the optional adjustable flow monitor connected to the discharge valve and plugged into the front of the pump. Every fluid discharge is sensed and fed back to the electronic control circuit of the pump.

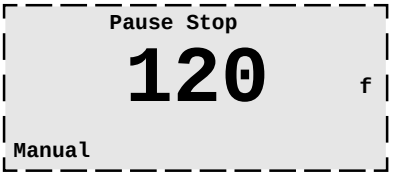
If insufficient fluid is discharged for 8 consecutive strokes, the pump automatically stops, the display flashes "Error" and "Flow" as shown below, and the red LED lights. The optional fault relay changes state to issue an alarm or activate a standby pump.



Remote pause

Remote on/off control – "Pause"

The gamma/b series can be switched on or off via a form-C dry contact through the optional control cable. The pump operates on a closed contact; if the contact is open, the pump stops and the display shows "Pause" and "Stop".



Problem identification

Auto-fault diagnosis

The electronic control circuit of the gamma/b series monitors itself continuously. Any fault of the microprocessor stops the pump and issues an alarm (with fault annunciating relay option). The LCD readout flashes and the red LED lights.

Lighting

The backlit LCD screen makes the display easy to read, even in poorly lit locations.

Customize the gamma/b.
You select the control versions and options required.

ProMinent®

CONTROL VERSIONS AND OPTIONS

Control versions and options can be selected to suit your system's specific needs.

Analog control

With this option, the stroking rate of the gamma/b is directly proportional to the analog signal. The maximum number of strokes per minute corresponding to the analog signal range can be selected by the operator. Input signals can be specified when ordering with the "Identity code" (e.g. 0-20 mA, 4-20 mA, 0-60 mV, 0-1 V, 0-10 V). Inverse analog (20-4 mA/20-0 mA) is also available.

Pulse multiplier/divider

This feature is used to "tune" the gamma/b to contact generators of any kind (e.g. pulse-type water meter or process controller), and eliminate the need for a costly external control unit. The following functions can be selected by means of the keypad.

Pulse step-up (multiply) and step-down (divide)

By simply entering a factor in the 0.01-9999 range, the step-up or step-down ratio is set.

For example:

Step-up Factor:
9999 1 pulse = 9999 pump strokes
10 1 pulse = 10 pump strokes

Step-down Factor:
0.25 4 pulses = 1 pump stroke
0.01 100 pulses = 1 pump stroke

Predetermining counter – "N ↔"

The pulse multiplier/divider feature is used as a predetermining counter for batch applications. Up to 9999 strokes can be predetermined. The LCD screen displays the number of strokes yet to be completed. The countdown starts by a voltage-free contact on the optional external control cable or by pressing the "P" key. Larger batches up to 65,535 strokes are also possible; for example, 59,994 strokes may be performed by providing six contacts (6 x 9999) in memory mode.

Memory – "Mem."

Should the pump receive contact signals faster than the selected stroking rate, these pulses can be stored in the gamma's memory (to a maximum limit of 65,535) and worked off at the preset stroking rate.

Stroke counter – "N"

This feature totalizes pump strokes that have been performed. The counter resets itself to 1 and a cursor appears on the LCD screen when 9999 strokes have been accumulated. This totalizer can be used in manual, contact, and analog modes.

Timer

The optional integrated timer function allows up to 31 variable on-off times to be programmed daily, or over the course of a 7-day period. The "on-time" can be selected between 1 minute and 24 hours. Typical applications include time feeding of biocides for cooling towers, brewery pasteurizers, etc. The timer can be used in conjunction with manual, contact or analog controls such that those functions only operate when the timer is activated. The screen below shows the time as 12:00 p.m. on a 24-hour clock.

RS Interface

Gamma/4b with serial interface RS 232 or RS 485 for external computer control is available. Contact ProMinent for compatibility with computer hardware/software.

Relay outputs. . .

are employed to transmit alarm messages, to start a back-up pump, indicate pump status, or to pace a second ProMinent metering pump synchronously. Selectable as:

Fault annunciating relay
For low tank level (flow switch), loss of flow (flow monitor), system faults and fuse/power supply failure. Function: relay drops out with an alarm.

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.

Alarm relay
For low tank level (flow switch), loss of flow (flow monitor) and system faults. Function: relay pulls in when an alarm condition exists.

Timer relay
Function: relay pulls in to indicate when the pump is running. Only available with 7-day timer.

ProMinent®

Technical Data: gamma/4b, gamma/5b

Pump version	Capacity at Maximum Backpressure					Capacity at 1/2 Maximum Backpressure					Maximum Stroking Rate**	Standard Suction/ Discharge Connectors*** O.D. x I.D.	Pre-Primed Suction Lift		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	spm	inches	ft.	(m)	lbs.	(kg)
g/4b																
1000	145	(10)	0.05	(0.20)	0.027	73	(5)	0.07	(0.27)	0.038	120	1/4 x 3/16	4.9	(1.5)	6.0-7.1	(2.7-3.4)
1001	145	(10)	0.09	(0.30)	0.027	73	(5)	0.11	(0.42)	0.038	180	1/4 x 3/16	4.9	(1.5)	6.0-7.1	(2.7-3.4)
g/5b																
1310	188	(13)	2.5	(9.54)	1.59	87	(6)	2.8	(10.8)	1.80	100	1/2 x 3/8	19.7	(6)	15-19	(6.9-8.5)
0813	116	(8)	3.5	(13.3)	2.21	58	(4)	3.8	(14.6)	2.44	100	1/2 x 3/8	19.7	(6)	16-19	(6.9-8.5)
PP4 and PP5 gamma metering pumps are for **high viscosity fluids.**																
g/5b (DN 15 valve size)																
1310	145	(10)	2.5	(9.5)	1.59	73	(5)	2.8	(10.8)	1.80	100	1/2 5/8"	†		17	(7.4)
0813	116	(8)	3.5	(13.3)	2.21	58	(4)	3.8	(14.6)	2.44	100	1/2 5/8 "	†		17	(7.4)

** 180 spm pumps are recommended for water-like fluids only.
***For SS2 pump heads, 1/4" FNPT fittings are standard; SS1 (0423 and 0230) are 3/8" FNPT.
† Positive suction recommended.

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.

Capacity at maximum pressure on all pumps is tested prior to shipment.

Liquid end materials

	Pump head	Suction/Discharge valves	Seals	Valve balls	Features
PP1*	Polypropylene	Polypropylene	EPDM	Ceramic	Bleed valve
PP2*	Polypropylene	Polypropylene	Viton®	Ceramic	Bleed valve
PP3*	Polypropylene	Polypropylene	Viton®	Ceramic	Bleed valve
PP4	Polypropylene	Polypropylene	EPDM	Ceramic	High viscosity w/springs
PP5	Polypropylene	Polypropylene	Viton®	Ceramic	High viscosity w/springs
NP1*	Acrylic	PVC	Viton®	Ceramic	Bleed valve
NP2*	Acrylic	PVC	EPDM	Ceramic	Bleed valve
NP3*	Acrylic	PVC	Viton®	Ceramic	Bleed valve
TT1	Carbon-loaded PTFE	Carbon-loaded PTFE	PTFE	Ceramic	
SS2	316 Stainless steel	316 Stainless steel	PTFE	Ceramic	(DN standard)

* Standard - injection valves, foot valves, tubing included with pump.
Acrylic (NP), Viton® and Duran (laboratory glass) are registered trademarks.

gamma/b Liquid End Options

Type		Valve Size	PP1*	PP2*	PP3*	PP4	PP5	NP1*	NP2*	NP3*	TT1	SS2
g/4b	1000/01	4.7	√		√				√	√	√	√
g/5b	1310	9.2				DN15	DN15	√	√			√
g/5b	0813	9.2	√	√		DN15	DN15	√	√		√	√

Identity code: gamma/b metering pumps

Series:

g/4b	gamma/ 4 version b
g/5b	gamma/ 5 version b

Pump version:

G/4b (120 strokes)	G/4b (180 strokes)	G/5b (100 strokes)
1000	1001	0813
		1310*

Liquid end materials: *Consult the "Liquid End Options" table for liquid ends available on selected pump version.*

PP1	Polypropylene/EPDM (1000, 1001, 0813)
PP2	Polypropylene/Viton® (0813)
PP3	Polypropylene/Viton® (1000, 1001)
PP4	Polypropylene/EPDM high viscosity 1 psig Hast. C valve springs (1310, 0813)
PP5	Same as PP4 but Viton® O-rings (1310, 0813)
NP1	Acrylic/PVC Viton® (1310, 0813)
NP2	Acrylic/PVC/EPDM (ALL)
NP3	Acrylic/PVC/Viton® (1000, 1001)
TT1	PTFE/PTFE (1000, 1001, 0813)
SS2	316 SS/PTFE 1/4" FNPT (ALL)

Viton® is a registered trademark of DuPont Dow Elastomers

Valve springs:

0	Without springs
1	With 2 springs (1 psig) (1/4" valves: 316 SS; 1/2" valves: Hast. C)

Connector:

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

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.

Transparent, hinged dust cover version:

0	Standard, without lock, with logo
1	With lock, with logo (not for gamma 5)
2	Without lock, without logo
3	With lock, without logo

Electrical connection: (With 6 ft. (2 m) power cord single phase)

A	230 V	50/60 Hz	Euro plug
D	115 V	50/60 Hz	N. American plug
U	230 V	50/60 Hz	N. American plug
	(6-15 P NEMA configuration)		

Control type: (**Note:** *May be ordered without illumination upon request.)*

2	Standard with LCD illumination

Control version:

0	Manual + pulse (1:1) + remote pause
1	0 - 20 mA and 4 - 20 mA
2	0 - 60mV / 0 - 1V / 0 - 10V
3	20 - 0 mA and 20 - 4 mA

NOTE: Control versions 1, 2 and 3 (analog input) include features of control version 0.

Pulse multiplier/divider:

0	Without pulse control
1	With pulse control

7 Day, 31 event timer/RS interface:

0	Without timer or RS interface
1	With timer

Switching mode relay:

0	Without relay
1	Fault annunciating relay, drops out
2	Pacing relay, pulls in
3	Alarm relay, pulls in
4	Timer relay, pulls in

(**Note:** *Cannot be used if RS interface is selected.)*

g/4b	1000	PP1	0	0	0	D	2	0	0	0	0

Specifications: gamma/b

Maximum stroke length:	0.05" (1.25 mm) [except 0.026" (0.65 mm) on pump version 1000]
Materials of construction	
Housing:	Glass-filled Luranyl™ (PPE)
Diaphragm:	PTFE faced EPDM with steel core and Nylon reinforcement
Liquid end options:	Polypropylene, Acrylic/PVC, PTFE, 316 SS
Enclosure rating:	NEMA 4X (IP 65), transparent front cover standard
Insulation class:	F
Check valves:	Double ball (except single ball on PP4, PP5 models)
Standard production test:	**Capacity at maximum pressure on all pumps is tested prior to shipment.**
Capacity test criteria:	-5% to +15%
Repeatability of the metering:	When used according to the operating instructions ±2%
Power cord:	6 foot (2 m) 2 wire + ground
Relay cable (optional):	6 foot (2 m) 3 wire (SPDT)
Relay load:	250 V / 2 A
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)

Average power drain at maximum stroking rate (Watts) / peak current drain at pump stroke (Amps)

g/4b: 115 VAC, 50/60 Hz: 16W/1.5A (120 spm models); 24W/1.5A (180 spm)
230 VAC, 50/60 Hz: 25W/0.9A (120 spm models); 38W/0.9A (180 spm)

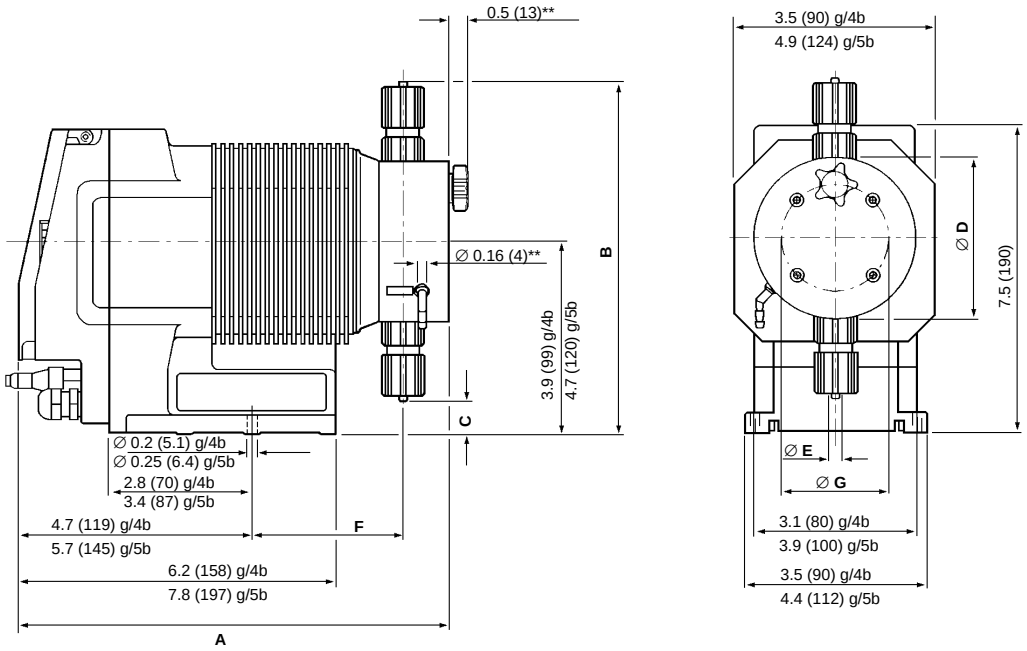
g/5b: 115 VAC, 50/60 Hz: 47W/4.1A (120 spm models), 65W/6.7A (100 spm)
230 VAC, 50/60 Hz: 61W/2.1A (120 spm models), 83W/3.1A (100 spm)

Remote pause and/or Contact input	
Voltage level with open contact:	Approximately +5 VDC supply voltage
Impedance:	10 kOhm
Pulse Contact/ Remote Pause Contact:	With form-C dry 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).
Max. pulse input frequency:	40 pulses/sec
Max. pulse memory:	65,535 pulses
Necessary pulse contact duration:	20 ms
Analog - Current input burden:	Approximately 70 Ohm
Max. allowable input current:	50 mA
Service factor:	1.15 (98-132 VAC or 195 to 264 VAC) *Note:* performance is the same on 50 or 60 Hz power
Warranty:	Two years on drive, one year on liquid end
Industry standards:	CSA (available standard in Canada); CE (approved)
Max. solids size in fluid:	Pumps with 1/4" valves: 15µ - Pumps with 1/2" valves: 50µ
Valve threads:	✓ NP, PP and TT (except PP4/PP5); M20 x 1.5 (tubing adapter supplied) ✓ PP4/PP5 1310 and 0813; DN15 (1/2" MNPT adapter supplied) ✓ SS; 1/4" FNPT

Dimensions: gamma/4b, gamma/5b

Dimensions are in inches, rounded to nearest 1/10". Dimensions within brackets ( ) are in millimeters.

gamma/4b		A	B	C	D	E	F	G
1000/1001	PP	9.1 (232)	7.3 (186)	0.7 (17)	2.8 (70)	1/4 x 3/16	3.2 (81)	1.5 (38)
gamma/5b								
a) 1310	PP	10.5 (267)	8.3 (212)	1.1 (28)	3.5 (90)	1/2 x 3/8	3.7 (93)	2.6 (66)
	NP	10.5 (267)	8.5 (215)	1.0 (25)	3.9 (100)	1/2 x 3/8	3.7 (93)	2.6 (66)
b) 0813	TT	10.2 (258)	9.3 (237)	0.1 (3.5)	3.7 (94.5)	1/2 x 3/8	3.7 (95)	2.6 (66)
	SS	10.2 (258)	9.0 (230)	0.4 (10.5)	3.7 (94.5)	1/4 FNPT	3.7 (95)	2.6 (66)
1310	PP4/5	10.6 (270)	7.6 (193)	1.9 (47)	3.3 (85)	1/2 MNPT	4.1 (104)	2.6 (66)
0813	PP4/5	10.5 (269)	7.9 (200)	1.6 (40)	3.9 (100)	1/2 MNPT	4.1 (104)	2.6 (66)



* This dimension extends below the pump baseline by the value shown.

** Bleed valve and bypass available on sizes 1000 through 0417 PP and NP only; not available on PP4/5 liquid ends.

ProMinent® gamma/b Accessory kits

Description	Part No.

Accessory kits

PP1, PP2, PP3, NP1, NP2, NP3 pumps include tubing, foot valve and injection valve as standard.

Accessory kits for gamma pumps with tube fittings, including 5 ft. (1.5 m) of suction tubing, 10 ft. (3 m) of discharge tubing, foot valve and injection valve.

Tubing Size (in.) (select to fit pump)	Material Code	Suction Tubing	Discharge Tubing	
1/4 x 3/16	NP1/NP3	PE	PE	7809401
1/4 x 3/16	PP1	PE	PE	7809403
1/4 x 3/16	PP3	PE	PE	7809405
1/4 x 3/16	NP2	PE	PE	7809422
1/2 x 3/8	NP1/NP3	PVC	PE	7809402
1/2 x 3/8	PP1	PVC	PE	7809404
1/2 x 3/8	PP2	PVC	PE	7809406

PVC 1/2" x 3/8" suction tubing is pliable, allowing foot valve to sink. PE discharge tubing is rigid. Pressure ratings are:

PVC: 7 psig PE: 100 psig.

Tubing, foot valves and injection valves for TT and SS pumps are not available as kits and must be ordered as separate items.

ProMinent® gamma/b Control cables

Description	Part No.

External control cables for gamma/b

Universal control cable

For metering pump control via contact closure (pulse), standard process signal (analog), and voltage-free contact for remote pause control.

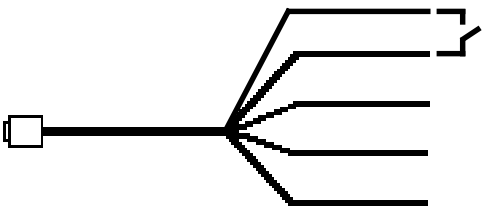
For gamma/b and gamma/a with 5-pole round plastic connector and 5-wire cable with loose end.

Universal control cable, 5-pole round connector, 5-wire, 6 ft. (2 m)	1001300
Universal control cable, 5-pole round connector, 5-wire, 16.4 ft. (5 m)	1001301
Universal control cable, 5-pole round connector, 5-wire, 32.8 ft. (10 m)	1001302

ON/OFF Control

BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. When the contact is closed between the BLACK & BROWN wires, the pump will run. When the contact is open, the pump will stop.

Note: If ON/OFF control is the only control feature being used, WHITE, BLUE & GREY wires are not used and should be cut.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Not used

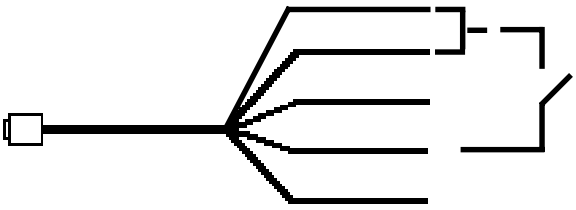
WHITE: Pulse (+)

BLUE: Analog (+)

Pulse Control

Pulse control will allow the pump to run in proportion off of a pulsing potentially free contact closure.

Note: BROWN and BLACK wires have to be connected together via an ON/OFF contact or shorted together. GREY wire is not used and should be cut.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Not used

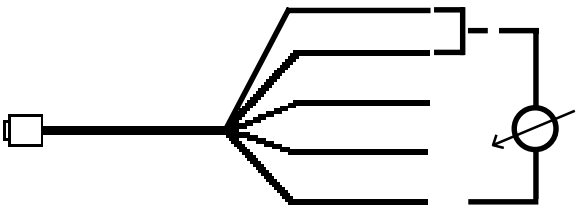
WHITE: Pulse (+)

BLUE: Analog (+)

Analog Control

Analog control runs in proportion to an analog signal such as 4 - 20 mA.

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. The BLACK wire is negative and the BLUE wire is positive. GREY wire is not used and should be cut.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Not used

WHITE: Pulse (+)

BLUE: Analog (+)

ProMinent® gamma/b
Metering monitors and Spare fuses

Description	Part No.

Metering monitor

Adjustable metering monitor “Flow Control”

For gamma/5b and with signal transmitter and connecting cable with 4-pole round connector for direct connection with the metering pump.

For monitoring the actual flow output per pump stroke using a plastic encapsulated metal poppet detected by the adjustable proximity sensor. A red LED flashes with each monitored stroke. If there is no flow monitored for eight strokes, the metering pump is shut down and an alarm signal is issued via optional fault relay on pump. Assemble directly on the discharge connector of the pump; plug cable into 4-pole round socket on pump. Materials: PP or PVC. Enclosure rating: NEMA 4X (IP 65). Maximum operating pressure is 232 psig (16 bar).

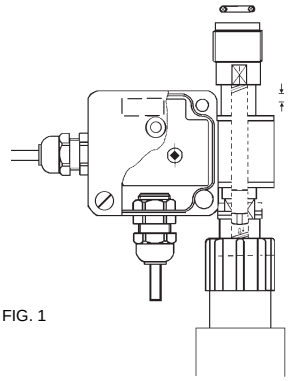


FIG. 1

Threads are M20 x 1.5 Female on inlet side for mounting directly on pump discharge valve, and M20 x 1.5 Male on discharge side for the standard tubing connector that comes with the pump.

Metering monitor for PP/NP/TT version pumps: (FIG. 1)

Flow Control type II PP, EPDM, m20 x 1.5	792077
Flow Control type III PP, EPDM, m20 x 1.5	792078
Flow Control type II PVC, Viton®, m20 x 1.5	792074
Flow Control type III PVC, Viton®, m20 x 1.5	792075

Type II = g/5 1310

Type III = g/5 0813

Note: Must mount the flow monitor vertically on the pump.

Adapter set to connect metering monitor for SS version pumps

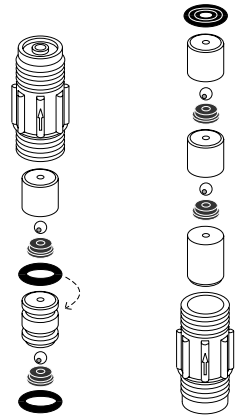
Adapter with seals, for use with SS2 liquid ends: 1/4" MNPT x Male M20 x 1.5 adapter, PVDF	7358651
Adapter with seals, for use with SS2 liquid ends: 3/8" MNPT x Male M20 x 1.5 adapter, PVDF	7358659

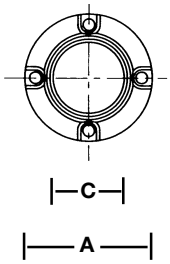
Spare fuses

gamma 4/b fuse, 115 VAC, 0.5 A, ATT	712037
gamma 4/b fuse, 230 VAC, 0.25 A, ATT	712035
gamma 5/b fuse, 115 VAC, 120 spm, 1.0 A, ATT	712052
gamma 5/b fuse, 115 VAC, 100 spm, 1.25 A, ATT	712038
gamma 5/b fuse, 230 VAC, 120 spm, 0.5 A, ATT	712037
gamma 5/b fuse, 230 VAC, 100 spm, 0.7 A, ATT	712051

ProMinent® gamma/b (new style) Spare Parts

Spare parts and Liquid ends





Pump Version	Dim A (mm)	Dim C (mm)
g/4b		
1000, 1001	31	10
1601, 1602	48	12.5
1201, 1203	48	16
0803, 0806	48	22
1002, 1003	60	22
0308, 0313	60	34
0215, 0223	76	42
g/5b		
1602	60	22
1605	60	34
1006	60	34
1310	76	42
0613	76	42
0813	76	51
0417	76	51
0423	126	70
0230	126	70

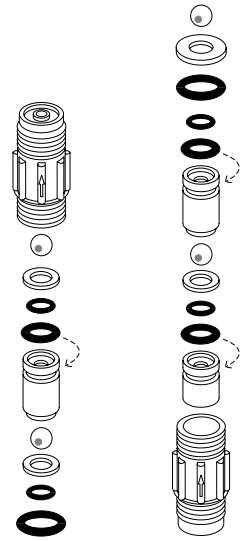
Complete liquid ends include pump head, valves, mounting screws, diaphragm and back plate. Spare parts kits include:

PP, NP & NE Liquid Ends	TT Liquid Ends	SS Liquid Ends	NS & ES Liquid Ends
1 Diaphragm	1 Diaphragm	1 Diaphragm	1 Diaphragm
1 Suction Valve	1 Suction Valve	4 Valve Balls	1 Suction Valve
1 Discharge Valve	1 Discharge Valve	1 Discharge Valve Inserts	1 Discharge Valve
2 Adapter Sets	2 Adapter Sets	2 Suction Valve Inserts	1 Vent Valve
2 Valve Balls	2 Valve Balls	1 Set of Seals	3 Adapter Sets
1 Set of Seals	2 Ball Seat Disks		1 Connector Part
	1 Set of Seals		2 Seals

Liquid End Version	Material Code	Complete Liquid End	Spare Parts Kit	Spare Valves Only (adapter sets not included) Suction	Discharge	Diaphragm
g/4b						
1000-1	PP1	740409	740357	792644	740350	811452
1001-1	PP3	740408	740356	792646	740351	811452
	NP2	740407	740355	792119	740349	811452
	NP3	740406	740354	792026	740348	811452
	TT1	911311	912674	809407	809406	811452
	SS2	911317	912675	809424	809423	811452
1601-1	PP1	740413	740361	792644	740350	811453
1602-1	PP3	740412	740360	792646	740351	811453
	NP2	740411	740359	792119	740349	811453
	NP3	740410	740358	792026	740348	811453
	TT1	911338	912678	809407	809406	811453
	SS2	911344	912679	809424	809423	811453
	NS2	792239	792122	792119	792120	811453
	ES1	792551	792654	792611	792643	811543
	NS3	791849	792033	792026	792025	811453
	ES3	792552	792650	792646	792645	811453
1201-1	PP1	740417	740380	792644	740350	811454
1203-1	PP3	740416	740364	792646	740351	811454
	NP2	740415	740363	792119	740349	811454
	NP3	740414	740362	792026	740348	811454
	TT1	911365	912682	809407	809406	811454
	SS2	911371	912683	809424	809423	811454
	NS2	792241	792123	792119	792120	811454
	ES1	792553	792653	792611	792643	811454
	NS3	791850	792034	792026	792025	811454
	ES3	792554	792649	792646	792645	811454
0803-1	PP1	740421	740384	792644	740350	1002510
0806-1	PP3	740420	740383	792646	740351	1002510
	NP2	740419	740382	792119	740349	1002510
	NP3	740418	740381	792026	740348	1002510
	TT1	911392	912686	809407	809406	1002510
	SS2	911398	912687	809424	809423	1002510
	NS2	792243	792124	792119	792120	1002510
	ES1	792555	792652	792611	792643	1002510
	NS3	791851	792035	792026	792025	1002510
	ES3	792556	792648	792646	792645	1002510
1002-1	PP1	740425	740388	792644	740350	811456
1003-1	PP3	740424	740387	792646	740351	811456
	NP2	740423	740386	792119	740349	811456
	NP3	740422	740385	792026	740348	811456
	TT1	911420	912690	809445	809444	811456
	SS2	911426	912691	809497	809496	811456
	PP4	910344	910174	7809456	7809456	811456
	PP5	7910344	910772	7809458	7809458	811456
	NS2	792245	792125	792119	792120	811456
	ES1	792557	792651	792611	792643	811456
	NS3	791852	792036	792026	792025	811456
	ES3	792558	792647	792646	792645	811456
0308-1	PP1	912227	912693	809439	809438	811457
0313-1	PP2	7912237	910770	809449	809448	811457
	NP1	912226	912692	809413	809412	811457
	NP2	740428	740391	740396	740395	811457
	TT1	911448	912694	809445	809444	811457
	SS2	911454	912695	809497	809496	811457

ProMinent® gamma/b (new style) Spare Parts

Spare parts and Liquid ends



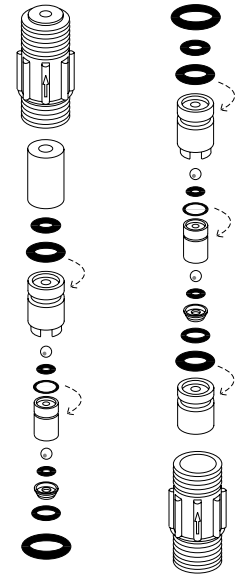
Discharge Valve 1/2"

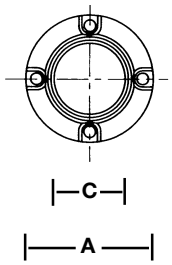
Suction Valve 1/2"

Pump Version	Material Code	Liquid End	Spare Parts Kit	Spare Valves Only (adapter sets not included) Suction	Discharge	Diaphragm
g/4b (cont.)						
0215-1	PP1	912232	912697	809439	809438	811458
0223-1	PP2	7912238	910771	809449	809448	811458
	NP1	912231	912696	809413	809412	811458
	NP2	740429	740392	740396	740395	811458
	TT1	911476	912698	809445	809444	811458
	SS2	911482	912699	809497	809496	811458
g/5b						
1602-1	NP1	740582	740385	792026	740348	811456
	NP2	740490	740386	792119	740349	811456
	SS2	910820	912691	809497	809496	811456
1605-1	NP1	910821	912692	809413	809412	811457
	NP2	740430	740391	740396	740395	811457
	SS2	910823	912695	809497	809496	811457
1006-1	PP1	910822	912693	809439	809438	811457
	PP2	7910822	910770	809449	809448	811457
	NP1	910821	912692	809413	809412	811457
	NP2	740430	740391	740396	740395	811457
	TT1	910805	912694	809445	809444	811457
	SS2	910823	912695	809497	809496	811457
	PP4	910910	910940	7809459	7809459	811457
	PP5	7910910	910928	7809400	7809400	811457
1310-1	NP1	910807	912696	809413	809412	811458
	NP2	740431	740397	740396	740395	811458
	SS2	910826	912699	809497	809496	811458
	PP4	910911	910942	7809459	7809459	811458
	PP5	7910911	910929	7809400	7809400	811458
0613-1	PP1	910825	912697	809439	809438	811458
	PP2	7910825	910771	809449	809448	811458
	NP1	910824	912696	809413	809412	811458
	NP2	740431	740397	740396	740395	811458
	TT1	910809	912698	809445	809444	811458
	SS2	910826	912699	809497	809496	811458
0813-1	PP1	910828	910976	809439	809438	811459
	PP2	7910828	7910976	809449	809448	811459
	NP1	910827	910974	809413	809412	811459
	NP2	740432	740393	740396	740395	811459
	TT1	910813	910978	809445	809444	811459
	SS2	910829	910980	809497	809496	811459
	PP4	910912	910944	7809459	7809459	811459
	PP5	7910912	910930	7809400	7809400	811459
0417-1	PP1	910828	910976	809439	809438	811459
	PP2	7910828	7910976	809449	809448	811459
	NP1	910827	910974	809413	809412	811459
	NP2	740432	740393	740396	740395	811459
	TT1	910813	910978	809445	809444	811459
	SS2	910829	910980	809497	809496	811459
0423-1	PP1	910816	910992	809457	809457	811460
	PP2	7910816	7910992	7809457	7809457	811460
	NP1	910815	910990	809456	809456	811460
	NP2	740493	740398	740396	740395	811460
	TT1	910817	910994	809458	809458	811460
	SS1	910818	910996	809459	809459	811460
0230-1	PP1	910816	910992	809457	809457	811460
	PP2	7910816	7910992	7809457	7809457	811460
	NP1	910815	910990	809456	809456	811460
	NP2	740493	740398	740396	740395	811460
	TT1	910817	910994	809458	809458	811460
	SS1	910818	910996	809459	809459	811460

ProMinent® gamma/a (old style) Spare Parts

Spare parts and Liquid ends





Pump Version	Dim A (mm)	Dim C (mm)
g/4a		
1000, 1001	31	10
1601, 1602	48	12.5
1201, 1203	48	16
0703, 0706	48	22
1002, 1003	60	22
0308, 0313	60	34
0215, 0223	76	42
g/5a		
1602	60	22
1605	60	34
1006	60	34
1310	76	42
0613	76	42
0813	76	51
0417	76	51
0423	126	70
0230	126	70

Complete liquid ends include pump head, valves, mounting screws, diaphragm and back plate. Spare parts kits include:

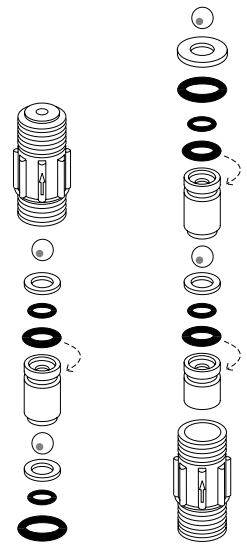
PP, NP

Liquid Ends	TT Liquid Ends	SS Liquid Ends	NS & PS Liquid Ends
1 Diaphragm	1 Diaphragm	1 Diaphragm	1 Diaphragm
1 Suction Valve	1 Suction Valve	4 Valve Balls	1 Suction Valve
1 Discharge Valve	1 Discharge Valve	1 Discharge Valve Inserts	1 Discharge Valve
2 Adapter Sets	2 Adapter Sets	2 Suction Valve Inserts	1 Vent Valve
2 Valve Balls	2 Valve Balls	1 Set of Seals	3 Adapter Sets
1 Set of Seals	2 Ball Seat Disks		1 Connector Part
	1 Set of Seals		2 Seals

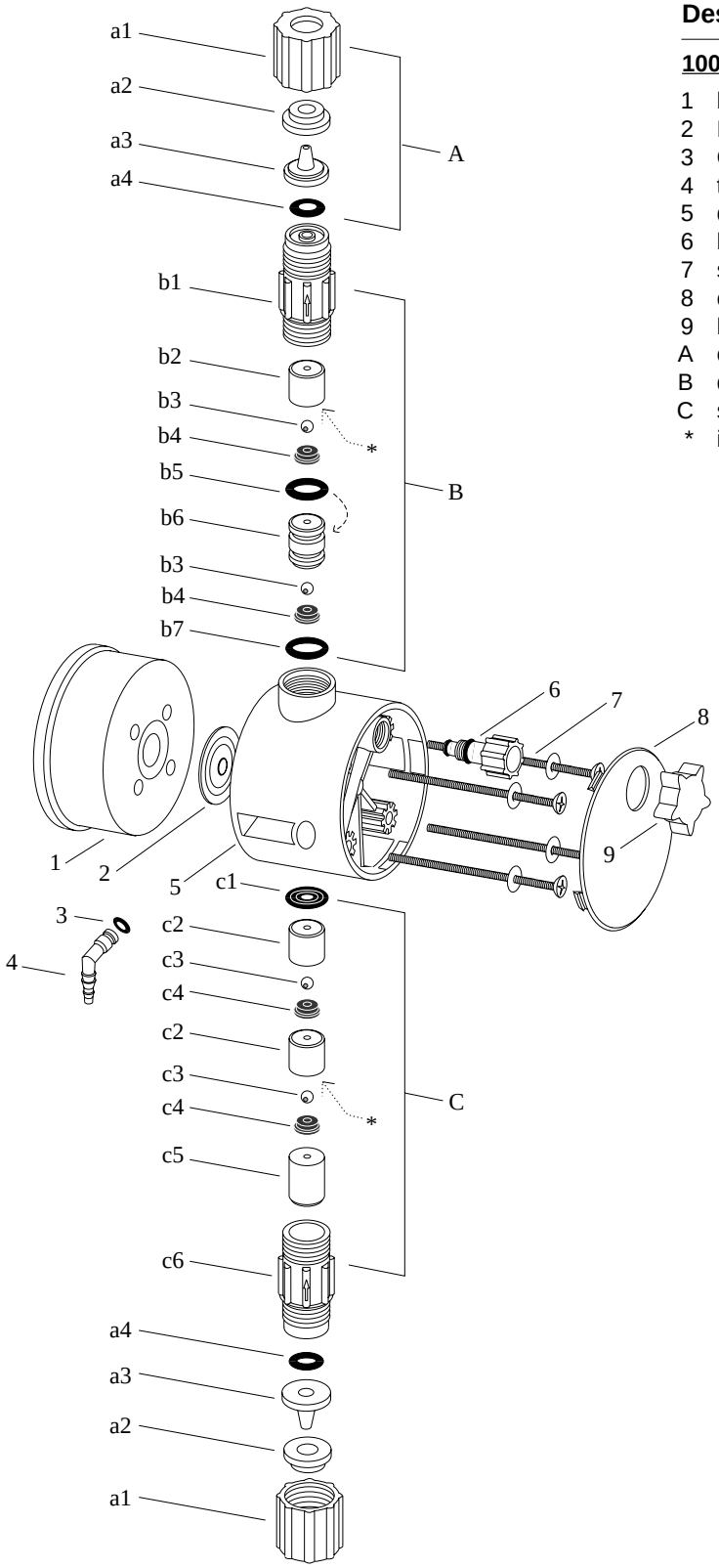
Pump Version	Material Code	Complete Liquid End	Spare Parts Kit	Spare Valves Only (adapter sets not included) Suction	Discharge	Diaphragm
g/4a						
1000	PP1	912202	912673	809429	809428	811452
1001	PP2	7912239	910765	7809429	7809428	811452
	NP1	912201	912672	809409	809408	811452
	TT1	911311	912674	809407	809406	811452
	SS2	911317	912675	809424	809423	811452
1601	PP1	912207	912677	809431	809430	811453
1602	PP2	7912233	910766	7809431	7809430	811453
	NP1	912206	912676	809411	809410	811453
	TT1	911338	912678	809407	809406	811453
	SS2	911344	912679	809424	809423	811453
	NS3	791849	792033	792026	792025	811453
	PS3	791853	792033	792026	792025	811453
1201	PP1	912212	912681	809431	809430	811454
1203	PP2	7912234	910767	7809431	7809430	811454
	NP1	912211	912680	809411	809410	811454
	TT1	911365	912682	809407	809406	811454
	SS2	911371	912683	809424	809423	811454
	NS3	791850	792034	792026	792025	811454
	PS3	791854	792034	792026	792025	811454
0703	PP1	912217	912685	809431	809430	811455
0706	PP2	7912235	910768	7809431	7809430	811455
	NP1	912216	912684	809411	809410	811455
	TT1	911392	912686	809407	809406	811455
	SS2	911398	912687	809424	809423	811455
	NS3	791851	792035	792026	792025	811455
	PS3	791855	792035	792026	792025	811455
1002	PP1	912222	912689	809439	809438	811456
1003	PP2	7912236	910769	809449	809448	811456
	NP1	912221	912688	809413	809412	811456
	TT1	911420	912690	809445	809444	811456
	SS2	911426	912691	809497	809496	811456
	PP4	910344	910174	809457	809457	811456
	PP5	7910344	910772	7809457	7809457	811456
	NS3	791852	792036	792026	792025	811456
	PS3	791856	792036	792026	792025	811456
0308	PP1	912227	912693	809439	809438	811457
0313	PP2	7912237	910770	809449	809448	811457
	NP1	912226	912692	809413	809412	811457
	TT1	911448	912694	809445	809444	811457
	SS2	911454	912695	809497	809496	811457

ProMinent® gamma/a (old style) Spare Parts

Spare parts and Liquid ends



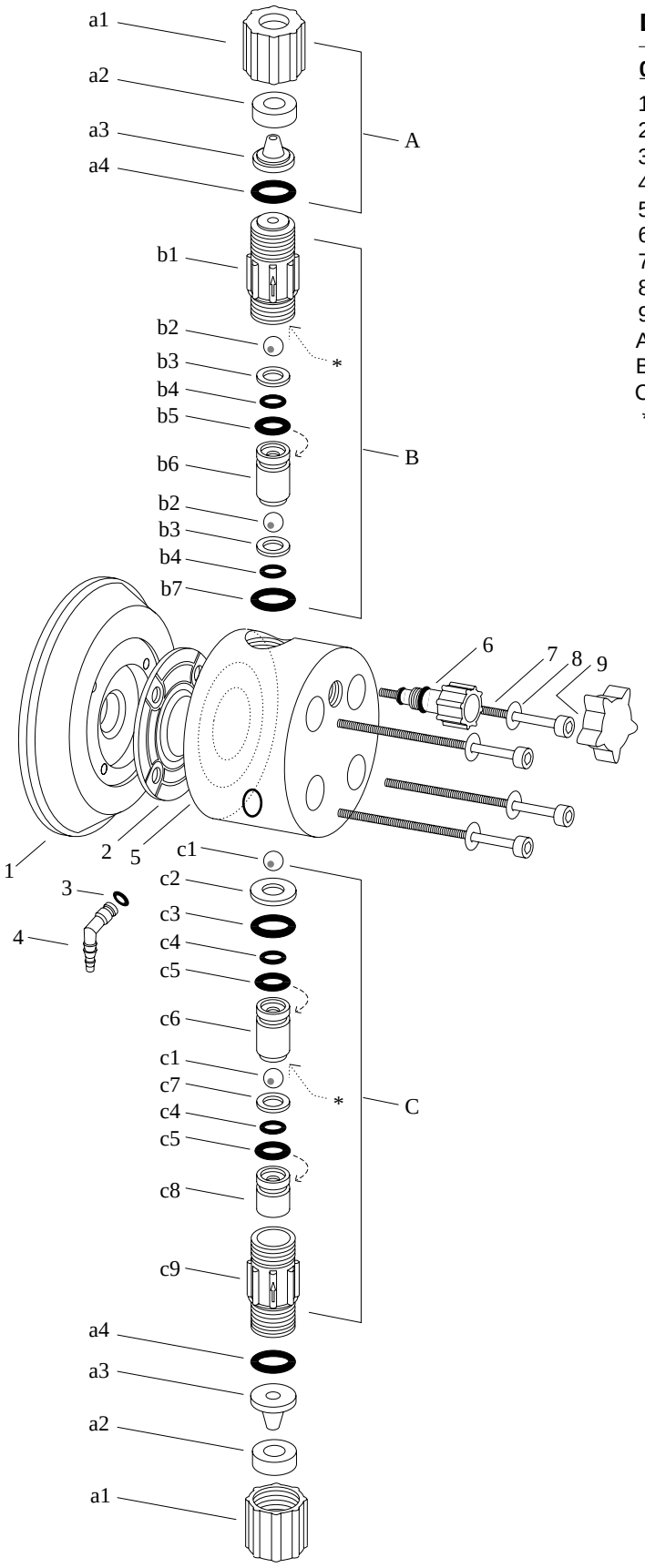
Pump Version	Material Code	Liquid End	Spare Parts Kit	Spare Valves Only (adapter sets not included) Suction	Discharge	Diaphragm
g/4a (cont.)						
0215	PP1	912232	912697	809439	809438	811458
0223	PP2	7912238	910771	809449	809448	811458
	NP1	912231	912696	809413	809412	811458
	TT1	911476	912698	809445	809444	811458
	SS2	911482	912699	809497	809496	811458
g/5a						
1602	NP1	910819	912688	809413	809412	811456
	SS2	910820	912691	809497	809496	811456
1605	NP1	910821	912692	809413	809412	811457
	SS2	910823	912695	809497	809496	811457
1006	PP1	910822	912693	809439	809438	811457
	PP2	7910822	910770	809449	809448	811457
	NP1	910821	912692	809413	809412	811457
	TT1	910805	912694	809445	809444	811457
	SS2	910823	912695	809497	809496	811457
	PP4	910910	910940	809402	809402	811457
	PP5	7910910	910928	7809400	7809400	811457
1310	NP1	910824	912696	809413	809412	811458
	SS2	910826	912699	809497	809496	811458
	PP4	910911	910942	809402	809402	811458
	PP5	7910911	910929	7809400	7809400	811458
0613	PP1	910825	912697	809439	809438	811458
	PP2	7910825	910771	809449	809448	811458
	NP1	910824	912696	809413	809412	811458
	TT1	910809	912698	809445	809444	811458
	SS2	910826	912699	809497	809496	811458
0813	PP1	910828	910976	809439	809438	811459
	PP2	7910828	7910976	809449	809448	811459
	NP1	910827	910974	809413	809412	811459
	TT1	910813	910978	809445	809444	811459
	SS2	910829	910980	809497	809496	811459
	PP4	910912	910944	809402	809402	811459
	PP5	7910912	910930	7809400	7809400	811459
0417	PP1	910828	910976	809439	809438	811459
	PP2	7910828	7910976	809449	809448	811459
	NP1	910827	910974	809413	809412	811459
	TT1	910813	910978	809445	809444	811459
	SS2	910829	910980	809497	809796	811459
0423	PP1	910816	910992	809457	809457	811460
	PP2	7910816	7910992	7809457	7809457	811460
	NP1	910815	910990	809456	809456	811460
	TT1	910817	910994	809458	809458	811460
	SS1	910818	910996	809459	809459	811460
0230	PP1	910816	910992	809457	809457	811460
	PP2	7910816	7910992	7809457	7809457	811460
	NP1	910815	910990	809456	809456	811460
	TT1	910817	910994	809458	809458	811460
	SS1	910818	910996	809459	809459	811460



Description		Qty.	Part No.
1000-1/1001-1 PP1 liquid end complete		**1**	**740409.8**
1	backplate g1000 (blue)	1	800701.5
2	DEVELOPAN diaphragm	1	811452.2
3	O-ring 3.68 x 1.78 EPDM	1	480403.5
4	tube nozzle bypass PP	1	800613.2
5	dosing head body only 1000-1 PP	1	792628.0
6	bleed valve complete EPDM	1	809490.6
7	screw M4 x 65 (with washer)	4	468641.6
8	cover plate with print PP	1	800674.4
9	bleed valve knob PP	1	800832.8
A	connector set 1/4" PP1	1	817150.6
B	discharge valve g/b 1/4" PP1	1	740350.4
C	suction valve g/b 1/4" PP1	1	792644.7
*	indicates location of spring if needed		
A	**connector set 1/4" PP1**	**1**	**817150.6**
a1	union nut M20 x 1.5 PP	2	800608.2
a2	clamp ring 1/4" PP	2	800617.3
a3	tube nozzle 3/16" PP	2	800609.0
a4	O-ring 9 x 2.5 EPDM	2	791495.5
B	**discharge valve g/b 1/4" PP1**	**1**	**740350.4**
b1	dis. valve body g/b 1/4" PP	1	791876.6
b2	valve insert 4.7-1 PP	1	791872.5
b3	valve ball 4.7mm Ceramic	2	404201.6
b4	ball seat 3 x 9.5 EPDM	2	791870.9
b5	O-ring 9 x 2.5 EPDM	1	791495.5
b6	valve insert (dis.) 4.7-1 PP	1	791875.8
b7	O-ring 14 x 2 EPDM	1	791641.4
C	**suction valve g/b 1/4" PP1**	**1**	**792644.7**
c1	sealing gasket 18 x 2.5 EPDM	1	791871.7
c2	valve insert 4.7-1 PP	2	791872.5
c3	valve ball 4.7mm Ceramic	2	404201.6
c4	ball seat 3 x 9.5 EPDM	2	791870.9
c5	distance sleeve (suction) PP	1	791873.3
c6	suction valve body g/b PP	1	800671.0
Spare Parts Set 1000-1/1001-1 PP1		**1**	**740357.9**
A	connector set 1/4" PP1	1	817150.6
B	discharge valve g/b 1/4" PP1	1	740350.4
C	suction valve g/b 1/4" PP1	1	792644.7
2	DEVELOPAN diaphragm	1	811452.2
3	O-ring 3.68 x 1.78 EPDM	3	480403.5
6	O-ring (bleed valve) EPDM	1	480408.4
b5	O-ring 9 x 2.5 EPDM	3	791495.5
b7	O-ring 14 x 2 EPDM	1	791641.4
c1	sealing gasket 18 x 2.5 EPDM	1	791871.7
c3	valve ball 4.7mm Ceramic	2	404201.6
c4	ball seat 3 x 9.5 EPDM	4	791870.9

#G4B1PP1-1/97NA

Exploded View



Description		Qty.	Part No.
0813-1 NP1 liquid end complete		**1**	**910827**
1	backplate g0813 (blue)	1	800769
2	DEVELOPAN diaphragm	1	811459
3	O-ring 3.68 x 1.78 Viton®	1	481003
4	tube nozzle bypass PVC	1	800519
5	dosing head body only 0813 Acrylic	1	810760
6	bleed valve complete Viton®	1	809491
7	screw M5 x 60	4	468077
8	washer	4	462228
9	bleed valve knob PP	1	800632
A	connector set 1/2" PC1	1	817055
B	discharge valve g/b 1/2" PC1	1	809412
C	suction valve g/b 1/2" PC1	1	809413
*	indicates location of spring if needed		
A	**connector set 1/2" PC1**	**1**	**817055**
a1	union nut M20 x 1.5 PVC	2	800518
a2	clamp ring 1/2" PVC	2	800715
a3	tube nozzle 3/8" PVC	2	800530
a4	O-ring 9 x 2.5 Viton®	2	791421
B	**discharge valve g/b 1/2" PC1**	**1**	**809412**
b1	dis. valve body g/b 1/2" PVC	1	800568
b2	valve ball 9.2mm Ceramic	2	404281
b3	ball seat disc PVC	2	140554
b4	O-ring 3.68 x 1.78 Viton®	2	481007
b5	O-ring 8.3 x 2.4 Viton®	1	481008
b6	valve insert 9.2 x 23 PVC	1	800527
b7	O-ring 13 x 2.5 Viton®	1	481013
C	**suction valve g/b 1/2" PC1**	**1**	**809413**
c1	valve ball 9.2mm Ceramic	2	404281
c2	ball seat disc (suction) PVC	1	811525
c3	O-ring 13 x 2.5 Viton®	1	481013
c4	O-ring 3.68 x 1.78 Viton®	2	481007
c5	O-ring 8.3 x 2.4 Viton®	2	481008
c6	valve insert 9.2 x 23 PVC	1	800527
c7	ball seat disc PVC	1	140554
c8	valve insert 13 x 18 PVC	1	800517
c9	suct. valve body g/b PVC	1	800569
Spare Parts Set 0813-1 NP1		**1**	**910974**
A	connector set 1/2" PC1	1	817055
B	dis. valve g/b 1/2" PC1	1	809412
C	suction valve g/b 1/2" PC1	1	809413
2	DEVELOPAN diaphragm	1	811459
c1	valve ball 9.2mm Ceramic	2	404281
c2	ball seat disc (suction) PVC	1	811525
c3	O-ring 13 x 2.5 Viton®	2	481013
c4	O-ring 3.68 x 1.78 Viton®	4	481007
c5	O-ring 8.3 x 2.4 Viton®	3	481008
c7	ball seat disc PVC	3	140554

#G5B6NP1-1/97NA

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))
PROMINENT FLUID CONTROLS, INC. - GAMMA/4b and 5/b (for flow rates up to 3.5 gph)

SECTION _____- CHEMICAL METERING PUMPS

1.1 APPLICATION

A. Quantity:_____
B. Chemical Service:_____
C. Tag. Nos.:_____
D. Capacity (US gallons per hour)_____
E. Backpressure (psig):_____

1.2 DESCRIPTION

A. The chemical metering pump(s) shall be a microprocessor-controlled, simplex, solenoid-driven, reciprocating, mechanically-actuated diaphragm type. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD. The housing shall be rated NEMA 4X.
B. The manufacturer shall provide a two year warranty on the pump drive and one year warranty on the pump liquid end, including diaphragm and O-rings. The pump shall be fully tested to meet rated flow and pressure by the manufacturer.
C. The power supply shall be ____ VAC, ____ Hz, single phase. The microprocessor is to automatically compensate for supply voltage variations within 15% of the rated voltage such that frequency of the pump remains constant.
D. The liquid end shall be physically separated from the drive unit by back plate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the sole noid if the primary diaphragm fails. The diaphragm shall be nylon-reinforced EPDM with PTFE-faced fluid contact surface.

1.3 LIQUID END ((SELECT ONE))

- The liquid end shall be glass-filled polypropylene, with built coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. The suction and discharge valve shall be of the double ball check design.
- The liquid end shall be glass-filled polypropylene, suitable for pumping high viscosity fluids, with spring-loaded single ball check valves.
- The liquid end shall be Plexiglas® (acrylic) with built coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. The suction and discharge valve shall be PVC, with double ball check design.
- The liquid end shall be constructed of carbon-filled PTFE. The suction and discharge valve shall be of the double ball check design.
- The liquid end shall be constructed of 316 stainless steel. The suction and discharge valve shall be of the double ball check design.

1.4 CONTROL

A. Stroke length control shall be manually adjusted between 100% and 0% with a stroke adjusting knob on the pump control face.

B. Stroke frequency control shall be manually adjusted by touch key pads, with the set stroke rate displayed on the LCD. The metering pump shall be capable of receiving a pulse input via optional external control cable such that 1 pulse gives 1 pump stroke. The metering pump shall be capable of remote ON-OFF operation using the PAUSE function via a voltage-free contact relay through an optional control cable.
((OPTIONAL)) PULSE MULTIPLIER/DIVIDER - The metering pump shall allow factoring to issue from 1 to 9,999 strokes per pulse input or to issue 1 stroke per 1 to 9,999 input pulses.
((OPTIONAL)) ANALOG - The pump shall accept an analog signal such that stroke frequency is proportional to a ((SELECT ONE: 0/4-20 mA, 20-4/0 mA, 0/12-60 mV, 0/0.2-1V, 0/2-10V) signal. The pump shall allow setting of a maximum stroke rate which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Analog-to-digital converters external to the pump shall not be allowed.

1.5 FLOW ASSURANCE ((OPTIONAL))

A. Low Level Control - A 2-stage Float Switch shall be supplied to stop the pump prior to losing prime and annunciate low level on the pump LCD.

B. Flow Monitor - A Flow Monitor shall be installed on the discharge line to automatically stop pumping and annunciate a fault condition on the pump LCD upon loss of discharge flow.

C. Relay Output - An SPDT relay shall be installed on the pump for: ((SELECT ONE))

- Fault Indication - ((OPTIONAL)) the metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low supply solution early warning/lack of supply solution shut down, flow monitor, system faults, and fuse/power supply failure).
- Pacing Relay - ((OPTIONAL)) the metering pump shall have an integral relay to issue a contact closure with every pump stroke to pace a second PROMINENT metering pump.

1.6 ACCEPTABLE MANUFACTURER:

A. ProMinent Fluid Controls, model _____

B. Or pre-approved equal.

1.7 ACCESSORIES ((ALL ARE OPTIONAL AND MAY BE INCLUDED AS SEPARATE ITEMS OR AS COMPONENTS OF A PUMP STAND))

A. The pump shall be mounted on a ((CHOOSE ONE: Fiberglass Reinforced Plastic / Stainless Steel)) support stand suitable for wall, floor or top-of-tank mounting, and including the following accessories pre-piped and factory tested:

B. A foot valve and strainer shall be provided with each pump.

C. An injection check valve shall be provided with each pump.

D. A universal control cable with 4 pole round plastic connector and 4-wire cable with loose ends shall be provided with each pump.

E. A two stage float switch compatible with the chemical metering pump shall be provided for monitoring tank level.

F. An adjustable discharge flow monitoring device shall be provided. The flow monitor shall be capable of signaling a fault condition to the metering pump.

G. A diaphragm failure detector shall be provided to ((open/close)) a contact in the event of diaphragm failure.

H. An adjustable-pressure, diaphragm-type back pressure/antisiphon valve shall be provided with each metering pump.
I. An in-line, adjustable-pressure, diaphragm-type pressure relief valve shall be provided with each metering pump.
J. A pump-mounted, multi-function, fixed-spring pressure diaphragm-type valve for backpressure/antisiphon protection, pressure relief, priming and discharge line drain shall be provided with each metering pump.
K. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.
L. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump.
M. Fifteen feet of tubing compatible with the fluid pumped shall be provided with each pump.

END OF SECTION