ProMinent® D4a Metering Pumps with built-in proportional controllers

A series of solenoid-driven metering pumps with built-in pH controller, oxidation-reduction potential (Redox) controller or chlorine controller. Eliminates the need for a separate controller and pump, with all features built into a compact, NEMA 4X enclosure. A sensor (pH. ORP or chlorine). sensor housing and cable must be ordered with the pump for an operational system. See the DULCOMETER® section of the catalog for ProMinent® DULCOTEST® sensors and accessories.

The pump offers modified proportional control; the feed rate is proportional to the deviation from set point; however, the stroke rate decreases exponentially as the deviation from setpoint approaches zero to prevent overshooting. For example, with a D4a pH pump, if the incoming water pH is 5 and you are feeding caustic to achieve a setpoint of pH 7, the pump stroke rate will initially be high, then will slow down and eventually stop as it approaches pH 7. The proportional bandwidth (the distance from setpoint to achieve maximum stroke frequency) is spannable on the D4a pH from 1 to 3 pH units (on the D4a RH 50 to 150 mV; on the



Fig. 1 Frequency response to minimum and maximum proportional bandwidth in D4a pH.



Note: A chart recorder can be used, but is not included with the pump.

D4a CA from 0.1 to 0.3 ppm chlorine; and on the D4a CB, 1 to 3 ppm chlorine). See Fig. 1 below for the proportional bandwidth on the D4a pH pump.

To operate the system: calibrate the sensor, input the desired setpoint and proportional bandwidth, and set into automatic operation.

Proportional control is best suited for batch operations or for flowthrough using tanks with at least 10 minutes residence time. Application in flow-through systems without any residence time may be possible if both the controlled variable and the flow rate are reasonably constant. Typical applications include swimming pools, cooling towers, RO pretreatment, caustic scrubbers, commercial laundries and industrial wastewater treatment.

Technical Data: D4a Pumps

D4a	Maximum	Capacity at mail	х.		Capacity at 1/2 m	nax.		Connections
Pump	Pressure	Backpressure	mL/		Backpressure	mL/		O.D. x I.D.
Version	psig (bar)	US GPH (L/h)	stroke	mL/min	US GPH (L/h)	stroke	mL/min	(inches)
1601	232 16	0.22 (0.84)	0.14	14.0	0.26 (0.99)	0.16	16.5	1/4 x 3/16
1201	174 12	0.38 (1.45)	0.24	24.2	0.42 (1.59)	0.26	26.5	1/4 x 3/16
0803	101 7	0.76 (2.86)	0.48	47.7	0.84 (3.17)	0.53	52.9	1/4 x 3/16
1002	145 10	0.50 (1.91)	0.32	31.8	0.58 (2.18)	0.36	36.3	1/2 x 3/8
0308	43.5 3	1.85 (7.00)	1.17	116.6	2.01 (7.60)	1.27	126.6	1/2 x 3/8
0215	22 1.5	3.25 (12.30)	2.05	205.0	3.49 (13.20)	2.20	220.0	1/2 x 3/8

D4a with NS liquid end

D4a NS			Capacity Back	at Maxi pressur	mum e	Max. Stroking	Connections	Su	Suction	
Pump			U.S.		mL/	mL/	Rate	O.D. x I.D.	L	_ift
Version	psig	(bar)	GPH	(L/h)	stroke	min	spm	(inches)	ft.	(m)
1601	232	(16)	0.14	(0.54)	0.09	9	100	1/4 x 3/16	5.9	(1.8)
1201	174	(12)	0.22	(0.84)	0.14	14	100	1/4 x 3/16	6.6	(2.0)
0803	116	(8)	0.52	(1.98)	0.33	33	100	1/4 x 3/16	9.2	(2.8)
1002	145	(10)	0.40	(1.50)	0.25	25	100	1/4 x 3/16	6.6	(2.0)

Liquid end materials

Material Version	Liquid End	Suction and Discharge	Seals	Ball valves (1/4"-1/2" connection)
NP	Acrylic	PVC	Viton®	Ceramic
PP	Polypropylene	Polypropylene	EPDM	Ceramic
TT	PTFE	PTFE	PTFE	Ceramic
SS	316 Stainless Steel	316 Stainless Steel	PTFE	Ceramic
NS*	Acrylic	PVC	Viton®	Ceramic

*Auto degassing liquid end

Measured Variables:

- pH value (0 14 pH)
- Redox potential (0 999 mV)
- Chlorine concentration (0 5* ppm or 0 20 ppm) (*Control range is 0-2 ppm)

Features:

- Solenoid-driven metering pump and controller integration in a chemically-resistant plastic casing rated NEMA 4X (IP65)
- Connection for single-stage level switch to monitor chemical tank level
- Various liquid end material options (PP, NP, TT, SS)
- Easy operation with 6 position selector switches (manual/OFF/measure/setpoint display/automatic mode/ automatic mode with control time) and setting potentiometer for setpoint simulation
- 3-digit LC display
- LEDs to indicate metering, setpoint reached and alarm

Identity code: D4a Pumps

	Meas	ured va	ariable	:						
PH	pH: n	neasurii	ng rang	ge 0-14	рН					
RH CA	Redo	edox: measuring range 0-999 mV hlorine: measuring range 0-5 ppm; control range 0-2 ppm hlorine: Measuring range 0-20 ppm								
СВ	Chlori									
	1601	Pump version:								
	1201									
	0803									
	0308									
	0215									
		NP	Acry	lic with	n Viton®	o-rin	g			
		PP TT	Poly PTF	propyle E + 259	ene witl % carbo	า EPD วก wit	M O-ri h PTFI	ng E seal		
		SS	316	Stainle	ss stee	l with	PTFE	seal		Viton [®] is a registered trademark
		NS	Auto	b-degas	ssing A	crylic .	with Vi	ton [®] sea	I (Not for 0308 or 0215)	
			A	230	ver sup V 50/6	i ply: 60 Hz	Euro p	olug		
			D	115	V 50/6	60 Hz	N. Am	ierican p	lug	
				2	Sen	sor co	onnec	tion:		
				6	4-pi	n coni	nector	for chlor	ine sensor (CA/CB)	
					SINC		lempe			
					0	No	ne	on variat	ble:	
	1 Temperature (SN6) pH					э) pH				
						1	Ra	ontrol dii iise meas	rection: sured value	
						2	Lo	wer mea	sured value	
								Sign		
							0	Non	e	
							1	0/4-	20 mA ≤ pH 1-12; 0-999 mV; 0-2 ppm (CA) 20 mA ≤ 0-20 ppm (CB)	
									Relay:	
								0	None	
								A	Relay output, low tank level (pulls in)	
								C	Relay output, pump stop (pulls in)	
								D	Relay output, setpoint reached (pulls in)	
								F	Safety and power failure signaling relay (drop:	s out)
	1601	DD		0	1	1	1	-		

Specifications: D4a Pumps (see individual specifications for pH, RH and CA/CB)

Maximum stroke length:	0.05" (1.25 mm)							
Materials of construction Housing: Diaphragm:	Glass-filled Luranyl tm (PPE) 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	F						
Check valves:	Double ball							
Repeatability of the metering:	When used acco	rding to operating ins	structions, ±2%					
Power cord:	6 ft. (2 m)							
Ambient temperature range:	14°F (-10°C) to 1	13°F (45°C)						
Max. fluid operating temperatures:	<u>Material</u> Acrylic/PVC Polypropylene PTFE 316 SS	<u>Constant</u> 113°F (45°C) 122°F (50°C) 122°F (50°C) 122°F (50°C)	<u>Short Term</u> 140°F (60°C) 212°F (100°C) 248°F (120°C) 248°F (120°C)					
Average power drain at maximun stroking rate (Watts) / peak current drain at pump stroke (Amps):	15 W average (any voltage or frequency) / 1.5 A							
Service factor:	1.15 (Note: perfo	rmance is the same of	on 50 or 60 Hz power)					
Control method:	Proportional (in manual mode, frequency adjustable from 0 to 100 spm by potentiometer)							
Read-out:	3-digit liquid crystal display of measured value, set value or simulated measured value.							
LED displays:	Stroke indication, set value reached (no error) Low tank level (functions with optional single-stage float switch) Relay output (optional) Time check (optional)							
Signal current output:	4-20 mA (internal to measured varia	ly changeable to 0-2 able.	0 mA), burden 750 Ohm, proportional					
Connector, sensor input:	Socket for SN6 plug, moisture protected to connect a combination probe (pH/RH). Pin socket for optional solution ground (pH/RH). Terminal block for hard wiring optional PT 100 resistance thermometer for temperature compensation (pH). Moisture protected. 4-pole connector for CA/CB.							
Maximum stroke rate:	100 strokes per n	ninute						
Relay output:	Contact load: max. 250 V/3 A/1100 VA							
Warranty:	Two years on drive; one year on liquid end							
Factory testing:	Each pump is tested for rated flow and pressure							

Dimensions: D4a Pumps



Dimensions in inches (mm)

Liquid End Type		А		I	3	С		D
1601	PP NP TT SS	10.2 10.2 9.5 9.4	(259) (259) (241) (239)	7.0 6.7 6.5 6.2	(178) (170) (165) (157)	9.0 9.0 8.9 8.9	(229) (229) (226) (226)	1/4 x 3/16 1/4 x 3/16 1/4 x 3/16 1/4 FNPT
1201	PP NP TT SS	10.2 10.2 9.5 9.4	(259) (259) (241) (239)	7.0 6.7 6.5 6.2	(178) (170) (165) (157)	9.0 9.0 8.9 8.9	(229) (229) (226) (226)	1/4 x 3/16 1/4 x 3/16 1/4 x 3/16 1/4 FNPT
0803	PP NP TT SS	10.2 10.2 9.5 9.4	(259) (259) (241) (239)	7.0 6.7 6.7 6.4	(178) (170) (170) (163)	9.0 9.0 8.9 8.9	(229) (229) (226) (226)	1/4 x 3/16 1/4 x 3/16 1/4 x 3/16 1/4 FNPT
1002	PP NP TT SS	10.0 9.9 9.6 9.5	(254) (251) (244) (241)	7.0 7.1 7.8 7.8	(178) (180) (198) (198)	8.8 8.8 8.9 8.8	(224) (224) (226) (224)	1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/4 FNPT
0308	PP NP TT SS	10.0 9.9 9.6 9.5	(254) (251) (244) (241)	7.0 7.1 7.8 7.8	(178) (180) (198) (198)	8.8 8.8 8.9 8.8	(224) (224) (226) (224)	1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/4 FNPT
0215	PP NP TT SS	10.0 9.9 9.6 9.5	(254) (251) (244) (241)	7.5 7.4 8.1 7.9	(191) (188) (206) (201)	8.8 8.8 8.9 8.8	(224) (224) (226) (224)	1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/2 x 3/8 1/4 FNPT

ProMinent[®]

ProMinent® D4a pH Pumps



The power end is enclosed in a splash/waterproof, chemical resistant plastic housing accommodating the short-stroke solenoid and the electronic measurement and control circuits.

Part No.

The operator panel comprises the following controls: Stroke length adjustment knob, 6-position selector switch: MANUAL MODE/OFF/MEASUREMENT/SET VALUE DISPLAY/AUTOMATIC MODE/AUTOMATIC MODE WITH TIME MONITOR - controls for set value, zero and slope calibration, proportional bandwidth, adjustment of the stroking rate in the manual mode and with option "Time Monitor," for infinite adjustment of the monitoring time from 1 minute to 6 hours in 8 time ranges. Time monitor actuates alarm relay if setpoint is not achieved within a set time period. As an option, the system can be equipped with an automatic temperature correction by means of a PT 100 resistance thermometer.

Features include LED indicating lights, 3-digit LCD display of measured value, switchable to read the set value for setting or checking the setpoint. Internal facilities included are for selecting direction of control, standard output signal (4 - 20 mA) and time range of time monitor.

2179/4

Display range:	0.0 - 14.0 pH
Measurement and control range:	0.0 - 14.0 pH
Direction of control:	Factory set according to identity code. Internal selection switch for changing direction. External direction switch optional.
Proportional bandwidth:	1 - 3 pH units
Output signal:	4 - 20 mA corresponding to pH 0 - 14
Input amplifier:	Differential amplifier with high common mode rejection; sample reference potential.
Input impedance:	>5 x 10 ¹² Ohm
Zero shift, zero calibration:	±1.5 pH
Slope calibration range:	47 - 85 mV/pH
Recommended sensor:	ProMinent DULCOTEST combination probe models PHE, PHEX, PHED, PHEP, or PHER.
Maximum sensor cable length without impedance converter: Recommended liquid end materials:	30 ft. (10 m). Use optional impedence converter, part no. 305350.1, for cable lengths from 30 to 300 feet, to minimize electrical noise.PP1 for most acids and bases. TT1 for sulfuric acid, regardless of concentration.

ProMinent® D4a RH Pumps

Description



The power end is enclosed in a splash/waterproof, chemical resistant plastic housing accommodating the short-stroke solenoid and the electronic measurement and control circuits.

The operator panel comprises the following controls: Stroke length adjustment knob, 6-position selector switch: MANUAL MODE/OFF/MEASUREMENT/SET VALUE DISPLAY/AUTOMATIC MODE/AUTOMATIC MODE WITH TIME MONITOR - controls for set value, proportional bandwidth, adjustment of the stroking rate in the manual mode and with option "Time Monitor," for infinite control of the monitoring time from 1 minute to 6 hours in 8 time ranges. Time monitor actuates alarm relay if setpoint is not achieved within a set time period.

Features include LED indicating lights, 3-digit LCD display of measured value, switchable to read the set value for setting or checking the setpoint. Internal facilities included are for selecting direction of control, standard output signal (4 - 20 mA) and time range of time monitor.

2353/4

Display range:	0 - 999 mV
Measurement and control range:	0 - 999 mV
Direction of control:	Factory set according to identity code. Internal selection switch for changing direction. External direction switch optional.
Proportional bandwidth:	5 - 150 mV
Output signal:	4 - 20 mA corresponding to 0 - 1000 mV
Input amplifier:	Differential amplifier with high common mode rejection; sample reference potential.
Input impedance:	>5 x 10 ¹² Ohm
Recommended sensor:	ProMinent DULCOTEST RHE, RHEX, RHEP, or RHER.
Maximum probe cable length without impedance converter: Recommended liquid end materials:	30 ft. (10 m). Use optional impedence converter, part no. 305350.1, for cable lengths from 30 to 300 feet. NP1/NP3 (not PP1) for sodium hypochlorite. NP1/NP3 or PP1 for sodium bisulfite.

Part No.

ProMinent[®] D4a CA/CB Pumps **ProMinent**



The power end is enclosed in a splash/waterproof, chemical resistant plastic housing accommodating the short-stroke solenoid and the electronic measurement and control circuits.

The operator panel comprises the following controls: Stroke length adjustment knob, 6-position selector switch: MANUAL MODE/OFF/MEASUREMENT/SET VALUE DISPLAY/AUTOMATIC MODE/AUTOMATIC MODE WITH TIME MONITOR - controls for set value, zero and slope calibration, proportional bandwidth, adjustment of the stroking rate in the manual mode and with option "Time Monitor," for infinite control of the monitoring time from 1 minute to 6 hours in 8 time ranges. Time monitor actuates alarm relay if setpoint is not achieved within a set time period.

Features include LED indicating lights, 3-digit LCD display of measured value, switchable to read the set value for setting or checking the setpoint. Internal facilities included are for selecting the direction of control, standard output signal (4 - 20 mA) and time range of time monitor.

2354/4

Control range:	CA with CLE 2.2 - 4P. Free chlorine sensor: 0 - 2 ppm. CB with CLE 2.2 - 4P. Free chlorine sensor: 0 - 20 ppm. CB with CGE 2 - 4P. Total chlorine sensor: 0 - 10 ppm.
Direction of control:	Factory set for feeding oxidants. Internal selecting switch.
Proportional bandwidth:	CA: 0.1 - 0.3 mg/L CB: 1 - 3 mg/L
Output signal:	4 - 20 mA corresponding to 0 - 2 mg/L (CA) or 20 mg/L (CB)
Recommended sensor:	ProMinent DULCOTEST CLE 2.2-4P (measures hypochlorous acid component of free chlorine) or CGE 2-4P (measures total chlorine).
Temperature compensation:	Automatic, built-in to chlorine sensor.
Maximum sensor cable length:	30 ft. (10 m)
Recommended liquid end materials:	NP1/NP3 (not PP1) for sodium hypochlorite. NP1/NP3 or PP1 for sodium bisulfite.

ProMinent® D4a Pumps Accessory kits

Description

Accessory kits

Pump **does not** include tubing, foot valve or injection valve as standard.

Accessory kits for D4a pumps, 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	NP3	PE	PE	7809401
1/4 x 3/16	PP1	PE	PE	7809403
1/2 x 3/8	NP1	PVC	PE	7809402
1/2 x 3/8	PP1	PVC	PE	7809404

PVC 1/2" x 3/8" suction tubing is pliable, allowing foot valve to sink. PE discharge tubing is rigid, not as flexible. 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.

Part No.

ProMinent[®] Spare Parts Description Spare Parts and Lique **ProMinent**[®] D4a Pumps

Part No.

Spare Parts and Liquid Ends

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Suction

Valve

Spare parts kits for ProMinent D4a series metering pumps.

Discharge Valve

	—c—
	— A ——

Pump	Dim A	Dim C		
Type	<u>(mm)</u>	<u>(mm)</u>		
1601	48	12.5		
1201	48	16		
0803	48	22		
1002	60	22		
0308	60	34		
0215	76	42		

PP, NP Liquid E	nds		TT Liquid Ends	SS L	iauid Ends	
1 Diaphragm 1 Suction Valve 1 Discharge Valve 2 Adapter Sets 2 Valve Balls 1 Set of Seals			1 Diaphragm 1 Suction Valve 1 Discharge Valve 2 Adapter Sets 2 Valve Balls 2 Ball Seat Disks 1 Set of Seals	1 Diaphragm 4 Valve Balls 1 Discharge Valve Inserts 2 Suction Valve Inserts 1 Set of Seals		
Liquid End Version	Material Code	Liquid End	Spare Parts Kit	Spare Va (adapter sets Suction	alves Only s not included) Discharge	Diaphragm
1601	PP1 NP3 NS2 NS3 TT1 SS2	740413 740410 792239 791849 911338 911344	740361 740358 792122 792033 912678 912679	792644 792026 792119 792026 809407 809424	740350 740348 792120 792025 809406 809423	811453 811453 811453 811453 811453 811453 811453
1201	PP1 NP3 NS2 NS3 TT1 SS2	740417 740414 792241 791850 911365 911371	740380 740362 792123 792034 912682 912683	792644 792026 792119 792026 809407 809424	740350 740348 792120 792025 809406 809423	811454 811454 811454 811454 811454 811454 811454
0803	PP1 NP3 NS2 NS3 TT1 SS2	740421 740418 792243 791851 911392 911398	740384 740381 792124 792035 912686 912687	792644 792026 792119 792026 809407 809424	740350 740348 792120 792025 809406 809423	811455 811455 811455 811455 811455 811455 811455
1002	PP1 NP3 NS2 NS3 TT1 SS2 PP4	740425 740422 792245 791852 911420 911426 910344	740388 740385 792125 792036 912690 912691 910174	792644 792026 792119 792026 809445 809497 809457	740350 740348 792120 792025 809444 809496 809457	811456 811456 811456 811456 811456 811456 811456 811456
0308	PP1 NP1 TT1 SS2	912227 912226 911448 911454	912693 912692 912694 912695	809439 809413 809445 809497	809438 809412 809444 809496	811457 811457 811457 811457
0215	PP1 NP1 TT1	912232 912231 911476	912697 912696 912698	809439 809413 809445	809438 809412 809444	811458 811458 811458

809497

809496

Spare fuses

Fuse, 115 V, 0.5 ATT, 6.3 x 32 mm Fuse, 230 V, 0.25 ATT, 6.3 x 32 mm

71	2037
71	2035

811458

911482

912699

SS2