ProMinent® Product Catalog

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“product overview” T.O.C. II

CATALOG SECTION TABS

Introduction

Pump Installation Guide

Selection, installation, operation & accessories guidelines

When selecting, installing and operating a pump with accessories, the following guidelines should be followed:

When selecting a pump, make allowances for extra capacity and working pressure, especially if the *fluid viscosity* is higher than that of water (note: Capacities in manuals pertain specifically to water at fixed pressures).

If in doubt about the *chemical compatibility* of the liquid end materials, valves, valve balls, O-rings, suction and discharge lines and accessories, refer to the Chemical Resistance List (page 6).

For varying, *corrosive media*, the corrosiveness of which is unknown, select the highest rated PVDF (PVT) version. For *abrasive fluids*, or for use in the *food processing* industry, select the stainless steel (SS) version if compatible with the media.

The site of the metering pump should be easily accessible. The metering pump should be protected against the risk of being damaged mechanically. *High ambient temperatures, radiating heat and direct sunlight* should be avoided, if possible.

The metering pump should be provided with a *power supply* of its own. If connected in parallel to other equipment, the metering pump should be switched on and off by separate contacts, e.g. by relays or contactors. If the metering pump is paced externally, the maximum input pulse rate should match the maximum stroking rate.

All pumps are *self-priming.* The suction lift varies between 5 and 20 ft. (1.5 and 6 m), depending on the pump type (refer to Technical Data). The reduced suction lift for media having a specific gravity (density) higher than 1 can be evaluated as follows:

Effective suction lift = Rated (from "capacity data") suction lift of water in ft / S.G. of chemical

Note: Suction lift decreases with high altitude. Contact factory for pump selection.

Accessories and tips. . .

– The suction line should be. . .

- as short as possible.
- sloping upwards to eliminate vapor pockets.

– The discharge line should have. . .

- a drain valve when corrosive media is to be handled.

Installation Tip:

- Draining is achieved by means of a tee and bleed valve, or an adjustable pressure relief valve in the discharge line.

– A foot valve with ball check valve, ceramic weight and strainer facilitates. . .

- priming.
- prevents loss of prime.
- protects the liquid end against coarse impurities.

Installation Tip:

- Must install vertically, slightly above the bottom of the tank; directly under pump taking pump maximum suction lift into account.

Note: Pump capacity is effected if not installed properly or if plugged.

– Postive suction head (flooded suction)

- Recommended with media which tend to develop gases.
- Recommended with media which has high viscosity.

Installation Tips:

- Degassing pump must be used on suction lift applications, not flooded suction.
- Metering pump can be located at and fed from the foot of the supply tank.

– A ball-check-type injection valve

- Prevents back flow.

Installation Tip:

- Should be at the end of the discharge line; Teflon injection valves are not spring-loaded and must be oriented vertically into bottom of pipe for ball to seat.

Note: Pumps will not give consistent results without backpressure; our injection valve provides minimum backpressure when pumping into atmosphere.

– Backpressure valve

- Adjustable spring tension on a diaphragm.
- Ensures accurate metering and prevents siphoning.

Installation Tips:

- Must be in the discharge line or mounted onto the pump in the following cases:
  - √ When the discharge head is negligible (open-end discharge).
  - √ The metering pump discharges into a vacuum system or the positive suction head exceeds the discharge head.

Note: At least 15 psig differential pressure is required to provide repeatability of metering.

Introduction

Pump Installation Guide

– Pulsation dampener

- Bladder type cavity with pressure gauge.
- Required for very long discharge lines.
- Required when high-viscosity media are handled.
- Required when a smooth flow profile is required.

Installation Tips:

- Should be as close to the pump as possible.
- Set pressure at 90% of discharge line pressure.
- No further than 12 inches from the metering pump discharge, in direction of flow.

Note: Backpressure valve is required at point of injection, downstream of pulsation dampener. Consult ProMinent for verifications when discharge lines are greater than 100 feet.

– Pressure relief valve

- In form of an adjustable backpressure valve or 3-port relief valve.
- Protects metering pump against "dead head" (pumping against a closed valve).

Installation Tip:

- Must be close to the pump, upstream of the backpressure valve, for system protection.

Application Suggestions:

- Where the discharge line is hard piped.
- When pumping into high pressures.
- Where the discharge line has several check valves installed.

Note: Recommended for all motor-driven pumps.

– Viscous fluids

- Require valve springs to ensure balls seat properly.

Installation Tips:

- Should be spring-loaded for viscous media.
- Operation at a greater stroke length is better than operation at a higher stroking rate.
- The suction piping should be sized up by one pipe size and a pulsation dampener used.
- Select PP4/PP5 series pumps with special liquid ends for extremely high viscosities. Positive suction recommended.

– Calibration column

- Draw down, graduated cylinder.
- Useful for setting up metering pump to reach desired capacity.
- Single pump dosing package can be equipped with a self-filling calibration assembly for application where the pump is installed above the tank (eliminates chemical handling).

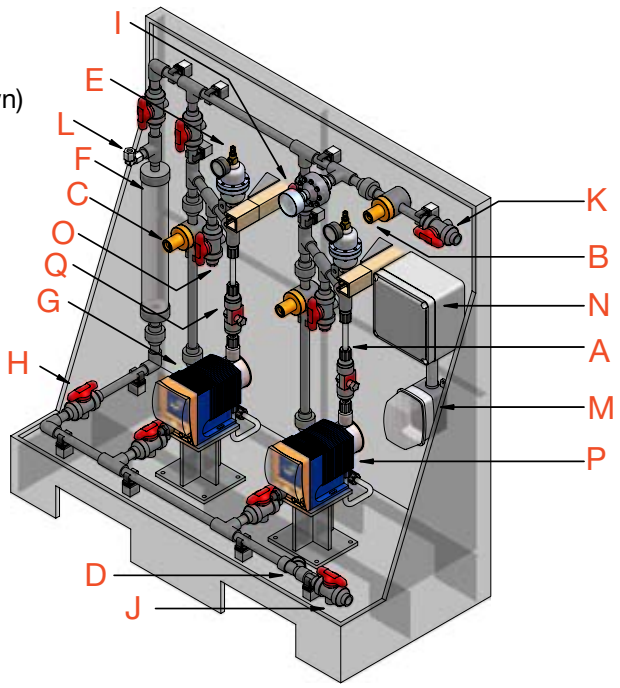
Installation Tip:

- Easy to install off the suction side of the metering pump with a ball valve to isolate from the tank.

Standard System Configuration

A: Reinforced PVC tubing
B: Backpressure/anti-siphon valve
C: Pressure relief valve
D: Location of "Y" strainer (not shown)
E: Pulsation Dampener
F: Calibration Column
G: Metering Pump
H: Ball Valve
I: Pressure Gauge
J: Product Inlet
K: Product Outlet
L: Vent to Tank
M: Duplex Receptacle*
N: Termination Box*
O: Flush Valve
P: Backup Pump
Q: Flow Monitor

* (M) & (N) are **not** standard: Items shown for layout purposes only.



Introduction

Pump Selection by Capacity

ProMinent Pump Model	Capacity GPD	gph	cc/Min	Max. PSIG	Std. MNPT Fittings (in.)	Manual Freq Adj	Pulse 1:1	Pulse M/D	Analog 4-20mA
gamma/4b 1000	1	0.05	3	145	1/4” x 3/16”	0-120	STD	OPT	OPT
beta/4a 1000	5	0.19	12	145	1/4” x 3/16”	0-180	STD	N/A	N/A
gamma/L 1000	5	0.19	12	145	1/4” x 3/16”	0-180	STD	OPT	OPT
beta/4a 1601	7	0.29	18	232	1/4” x 3/16”	0-180	STD	N/A	N/A
gamma/L 1601	7	0.29	18	232	1/4” x 3/16”	0-180	STD	OPT	OPT
beta/4a 1602	13	0.55	35	232	1/4” x 3/16”	0-180	STD	N/A	N/A
gamma/L 1602	13	0.55	35	232	1/4” x 3/16”	0-180	STD	OPT	OPT
ProMus (17) 3/8" Plunger	24	1.0	63	3500	1/4" FNPT	29-58	N/A	N/A	OPT
beta/5a 1605	26	1.1	69	232	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 1605	26	1.1	69	232	1/2” x 3/8”	0-180	STD	OPT	OPT
gamma/L 1005	26	1.1	69	145	1/2” x 3/8”	0-180	STD	OPT	OPT
beta/4a 1005	26	1.1	69	145	1/2” x 3/8”	0-180	STD	N/A	N/A
ProMus (17) 7/16" Plunger	33	1.38	87	3500	1/4" FNPT	29-58	N/A	N/A	OPT
beta/5a 1008	43	1.8	114	145	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 1008	43	1.8	114	145	1/2” x 3/8”	0-180	STD	OPT	OPT
beta/4a 0708	46	1.9	120	101	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 0708	46	1.9	120	101	1/2” x 3/8”	0-180	STD	OPT	OPT
ProMus (17) 3/8" Plunger	59	2.4	151	3500	1/4" FNPT	29-138	N/A	N/A	OPT
beta/5a 0713	70	2.9	183	101	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 0713	70	2.9	183	101	1/2” x 3/8”	0-180	STD	OPT	OPT
ProMus (30) 5/8" Plunger	72	3	189	2080	1/4" FNPT	29-58	N/A	N/A	OPT
delta 1612	77	3.2	202	232	1/2” x 3/8”	0-200	STD	OPT	OPT
ProMus (17) 7/16" Plunger	80	3.3	208	3500	1/4" FNPT	29-138	N/A	N/A	OPT
ProMus (30) 13/16" Plunger	91	3.8	240	1230	3/8" FNPT	29-43	N/A	N/A	OPT
beta/5a 0420	108	4.5	284	58	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 0420	108	4.5	284	58	1/2” x 3/8”	0-180	STD	OPT	OPT
Sigma/1 HM 12017	124	5.2	334	145	1/2”	0-88	STD	OPT	OPT
delta 1020	127	5.3	334	145	1/2” x 3/8”	0-200	STD	OPT	OPT
Sigma/1 HM 10022	164	6.8	434	145	1/2”	0-88	STD	OPT	OPT
ProMus (30) 5/8" Plunger	173	7.2	454	2080	1/4" FNPT	29-138*	N/A	N/A	OPT
delta 730	190	7.9	498	102	1/2” x 3/8”	0-200	STD	OPT	OPT
beta/5a 0232	202	8.4	530	29	1/2” x 3/8”	0-180	STD	N/A	N/A
gamma/L 0232	202	8.4	530	29	1/2” x 3/8”	0-180	STD	OPT	OPT
Sigma/1 HM 12035	266	11.1	700	145	1/2”	0-172	STD	OPT	OPT
delta 450	317	13.2	833	58	1/2"	0-200	STD	OPT	OPT
Sigma/1 HM 10044	336	14	884	145	1/2”	0-172	STD	OPT	OPT
Sigma/2 HM 12050	382	15.9	1003	145	1/2”	0-87	STD	OPT	OPT
delta 280	506	21.1	1331	29	1/2"	0-200	STD	OPT	OPT
ProMus (30) 1-1/8" Plunger	506	21.1	1331	640	3/8" FNPT	29-115**	N/A	N/A	OPT
ProMus (40) 1-3/4" Plunger	614	25.6	1615	265	3/4" FNPT	29-58**	N/A	N/A	OPT
Sigma/2 HM 12090	686	28.6	1804	145	3/4”	0-156	STD	OPT	OPT
Sigma/2 HM 07120	912	38	2397	100	3/4”	0-87	STD	OPT	OPT
Sigma/3 HM 120190	1445	60.2	3798	145	1”	0-124	STD	OPT	OPT
ProMus (40) 2" Plunger	1603	66.8	4214	200	3/4" FNPT	29-115**	N/A	N/A	OPT
Sigma/2 HM 07220	1673	69.7	4397	100	3/4”	0-156	STD	OPT	OPT
ProMus (40) 2-1/4" Plunger	2030	84.6	5337	160	3/4" FNPT	29-115**	N/A	N/A	OPT
Sigma/3 HM 120270	2054	85.6	5400	145	1”	0-173	STD	OPT	OPT
Sigma/2 HM 04350	2200	92.5	5833	58	1”	0-232	STD	OPT	OPT
ProMus (40) 2-1/4" Plunger	2436	101.5	6404	160	3/4" FNPT	29-138**	N/A	N/A	OPT
Sigma/3 HM 070410	3120	130	8200	100	1-1/2”	0-86	STD	OPT	OPT
Sigma/3 HM 070580	4416	184	11600	100	1-1/2”	0-124	STD	OPT	OPT
Sigma/3 HM 040830	6336	264	16670	58	1-1/2”	0-173	STD	OPT	OPT

* For capacities greater than 264 gph please consult factory
** available only with 4-20mA control (optional)
Abbreviations: STD = Standard Feature N/A = Not Available OPT = Optional M/D = multiplier/divider

Introduction

Chemical Resistance List

Resistance of liquid end materials against common chemicals **at standard temperature 68°F (20°C).** (May differ at other temperatures)

s = saturated aqueous solution
+/0 = conditional resistance
+ = good resistance
0 = limited resistance
– = no resistance
+(x%) = good resistance to x% concentration
* = With glued fittings, please check the resistance of the glue.

n = unknown resistance
=> = refer to . . .
A.C. = any concentration
S = saturated solution
Conc. = concentrated
D = weak solution

resp. to aqueous solutions

These classifications are the results of practical experience of the manufacturers of the raw materials. Since the resistance of the materials depends also on other factors (operating conditions, surface quality, etc.), this list cannot be more than a general information for which no responsibility is accepted. It should be particularly noted that, as a rule, the aggressiveness of a mixture is different from that of its individual components. In cases of doubt, suitable tests should be performed.

N.B. PTFE is resistant against most chemicals and solvents (excluding fluorine, metallic sodium and other alkali metals).
PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Acetaldehyde	CH_3CHO	100%	–	–	+	+	0	–	+/0	+	+
Acetamide	CH_3CONH_2	S	+	+	+	+	+	0	+	+	+
Acetic Acid	CH_3COOH	100%	–	+(50%)	+	+(70%)	+	–	0	+	+
Acetic Anhydride	$(CH_3CO)_2O$	100%	–	–	+	0	0	–	+/0	–	+
Acetone	CH_3COCH_3	100%	–	–	+	+	+	–	–	0	+
Acetophenone	$C_6H_5COCH_3$	100%	–	n	+	+	+	–	+	+	+
Acetyl Chloride	CH_3COCl	100%	–	+	0	–	–	+	–	–	+
Acetylacetone	$C_5H_8O_2$	100%	–	–	+	+	+	–	+	–	+
Acetylene Dichloride=>	Dichloroethylene										
Acetylene Tetrachloride=>	Tetrachloroethane										
Acrylonitrile	CH_2=CH-CN	100%	–	–	+	+	+	–	–	+	+
Adipic Acid	$C_6H_{10}O_4$	S	+	+	+	+	+	+	+	+	+
Allyl Alcohol	CH_2CHCH_2OH	96%	–	0	+	+	+	–	+	+	+
Aluminum Acetate	$Al(CH_3COO)_3$	S	+	+	+	+	+	+	+	+	+
Aluminum Bromide	$AlBr_3$	S	+	+	n	+	+	+	+	+	+
Aluminum Chloride	$AlCl_3$	S	+	+	–	+	+	+	+	+	+
Aluminum Fluoride	AlF_3	10%	+	+	–	+	+	+	+	+	+
Aluminum Hydroxide	$Al(OH)_3$	S	+	+	+	+	+	+	+	+	+
Aluminum Nitrate	$Al(NO_3)_3$	S	+	+	+	+	+	+	+	+	+
Aluminum Phosphate	$AlPO_4$	S	+	+	+	+	+	+	+	+	+
Aluminum Sulfate	$Al(SO_4)_3$	S	+	+	+	+	+	+	+	+	+
Ammonium Acetate	CH_3COONH_4	S	+	+/0	+	+	+	+	+	+	+
Ammonium Aluminum Sulfate	$NH_4Al(SO_4)_2$	S	+	+	+	+	+	+	+	+	+
Ammonium Bicarbonate	NH_4HCO_3	S	+	+	+	+	+	+	+	+	+
Ammonium Carbonate	$(NH_4)_2CO_3$	40%	+	+	+	+	+	+	+	+	+
Ammonium Chloride	NH_4Cl	S	+	+	–	+	+	+	+	+	+
Ammonium Fluoride	NH_4F	S	+	0	0	+	+	+	+	+	+
Ammonium Hydrogen Carbonate	NH_4HCO_3	A.C.	+	+	+	+	+	+	+	+	+
Ammonium Hydroxide	NH_4OH	S	+	+	+	+	+	–	+	+	+
Ammonium Nitrate	NH_4NO_3	S	+	+	+	+	+	+	+	+	+
Ammonium Oxalate	$(NH_4)_2C_2O_4$	S	+	+	+	+	+	+	+	+	+
Ammonium Perchlorate	NH_4ClO_4	10%	+	+	+	+	+	+	+	+	+
Ammonium Peroxodisulfate	$(NH_4)_2S_2O_8$	S	+	+	+(5%)	+	+	+	+	+	+
Ammonium Persulfate	$(NH_4)_2S_2O_8$	A.C.	+	+	+	+	+	+	+	+	+
Ammonium Phosphate	$(NH_4)_3PO_4$	A.C.	+	+	+(10%)	+	+	+	+	+	+
Ammonium Sulfate	$(NH_4)_2SO_4$	A.C.	+	+	+(10%)	+	+	+	+	+	+
Ammonium Sulfide	$(NH_4)_2S$	S	+	+	n	+	+	+	+	+	+
Amyl Alcohol	$C_5H_{11}OH$	100%	+	+	+	+	+	–	+	+	+
Aniline	$C_6H_5NH_2$	100%	–	–	+	+	+	–	+/0	+	+
Aniline Hydrochloride	$C_6H_5NH_2HCl$	S	n	+	–	+	+	+/0	+/0	+	+
Antimony Trichloride	$SbCl_3$	S	+	+	–	+	+	+	+	+	+
Aqua Regia	$3HCl+HNO_3$	100%	–	+	–	–	–	–	0	+	+
Arsenic Acid	H_3AsO_4	S	+	+	+	+	+	+	+	+	+
Barium Carbonate	$BaCO_3$	S	+	+	+	+	+	+	+	+	+
Barium Chloride	$BaCl_2$	S	+	+	–	+	+	+	+	+	+
Barium Hydroxide	$Ba(OH)_2$	S	+	+	+	+	+	+	+	+	+
Barium Nitrate	$Ba(NO_3)_2$	A.C.	+	+	+	+	+	+	+	+	+
Barium Sulfate	$BaSO_4$	A.C.	+	+	+	+	+	+	+	+	+
Barium Sulfide	BaS	A.C.	+	+	+	+	+	+	+	+	+
Beer	–	100%	+	+	+	+	+	+	+	+	+

Viton® is a registered trademark of Dupont Dow Elastomers

Introduction

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resp. to aqueous solutions

N.B. PTFE is resistant against most chemicals and solvents (excluding fluorine, metallic sodium and other alkali metals).
PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PDVF	Teflon
Benzaldehyde	C_6H_5CHO	100%	–	–	+	0	+	+	+	+	+
Benzene	C_6H_6	100%	–	–	+	0	0	0	–	+	+
Benzene Sulfonic Acid	$C_6H_5SO_3H$	10%	n	n	+	n	+	+	–	+	+
Benzoic Acid	C_6H_5COOH	S	+	+	+	+	+	+	+	+	+
Benzoyl Chloride	C_6H_5COCl	100%	–	n	0	0	0	+	+	n	+
Benzyl Alcohol	$C_6H_5CH_2OH$	100%	–	–	+	+	+	+	–	+	+
Benzyl Benzoate	$C_6H_5COOC_7H_7$	100%	–	–	+	0	+	+	–	0	+
Benzyl Chloride	$C_6H_5CH_2Cl$	90%	–	n	+	0	0	+	–	+	+
Bleach=>	Sodium Hypochlorite										
Bleaching Powder	$Ca(OCl)_2$	S	+	+	–	+	+	+	+	+	+
Borax	$Na_2B_4O_7$	A.C.	+	+	+	+	+	+	+	+	+
Boric Acid	H_3BO_3	S	+	+	+	+	+	+	+	+	+
Brine		S	+	+/0	+/0	+	+	+	+	+	+
Bromine	Br_2	100%	–	–	–	–	–	–	–	+	+
Bromine Liquid	Br_2	100%	–	–	–	–	–	–	–	+	+
Bromine Water	–	S	–	+	–	–	–	–	–	+	+
Bromo Benzene	C_6H_5Br	100%	n	n	+	0	0	0	–	+	+
Bromochloro Methane	CH_2BrCl	100%	–	–	+	0	–	n	+/0	+	+
Bromochlorotrifluoroethane	$HCClBrCF_3$	100%	–	–	+	0	0	+	–	+	+
Butanediol	HOC_4H_8OH	10%	n	+	+	+	+	0	+	+	+
Butanetroil	$C_4H_{10}O_3$	S	+	+	+	+	+	0	+	+	+
Butanol	C_4H_9OH	100%	–	+	+	+	+	0	+/0	+	+
Butyl Acetate	$CH_3COOC_4H_9$	100%	–	–	+	–	0	–	+/0	+	+
Butyl Acrylate	$C_7H_{13}O_2$	100%	–	–	+	+	+	–	–	+	+
Butyl Amine	$C_4H_9NH_2$	100%	n	n	+	+	n	–	–	0	+
Butyl Benzoate	$C_6H_5COOC_4H_9$	100%	–	–	+	0	0	+	+	n	+
Butyl Ether	$(C_4H_9)_2O$	100%	–	–	+	+	+	–	0	+	+
Butyl Mercaptan	C_4H_9SH	100%	n	n	n	n	n	+	–	+	+
Butyl Oleate	$C_{22}H_{42}O_2$	100%	n	n	+	n	n	+	+/0	+	+
Butyl Stearate	$C_{22}H_{44}O_2$	100%	0	n	+	n	n	+	–	+	+
Butylaldehyde	C_3H_7CHO	100%	–	n	+	+	+	–	+/0	n	+
Butyric Acid	C_3H_7COOH	100%	+(5%)	+(20%)	+	+	+	+	+	+	+
Calcium Acetate	$(CH_3COO)_2Ca$	S	+	+	+	+	+	+	+	+	+
Calcium Bisulfite	$Ca(HSO_3)_2$	S	+	+	+	+	+	+	+	+	+
Calcium Carbonate	$CaCO_3$	A.C.	+	+	+	+	+	+	+	+	+
Calcium Chloride	$CaCl_2$	S	+	+	–	+	+	+	+	+	+
Calcium Cyanide	$Ca(CN)_2$	S	+	+	n	+	+	+	+	+	+
Calcium Hydrogen Sulfite	$CaHSO_3$	S	+	+	+	+	+	+	+	+	+
*Calcium Hydroxide	$CA(OH)_2$	S	+	+	+	+	+	+	+	+	+
Calcium Hypochlorite	$Ca(OCl)_2$	S	+	+	–	+	0	0	+	+	+
Calcium Nitrate	$Ca(NO_3)_2$	S	+	+(50%)	+	+	+(50%)	+	+	+	+
Calcium Phosphate	$Ca_3(PO_4)_2$	S	+	+	+	+	+	+	+	+	+
Calcium Sulfate	$CaSO_4$	S	+	+	+	+	+	+	+	+	+
Calcium Sulfide	CaS	S	+	+	n	+	+	+	+	+	+
Calcium Sulfite	$CaSO_3$	S	+	+	+	+	+	+	+	+	+
Calcium Thiosulfate	CaS_2O_3	S	+	+	–	+	+	+	+	+	+
Camphor	$C_{10}H_{16}O$	100%	–	–	+	–	+	0	–	+	+
Carbolic Acid (see Phenol)	C_6H_5OH	100%	–	0	+	0	+	+	–	+	+
Carbon Disulfide	CS_2	100%	–	–	+	0	0	+	–	+	+
Carbon Tetrachloride	CCl_4	100%	0	–	+	0	–	+	–	+	+
Carbonic Acid	H_2CO_3	S	+	+	+	+	+	+	+	+	+

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Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Caustic Soda=>	Sodium Hydroxide										
Chloric Acid	$HClO_3$	20%	+	+	–	+10%	–	0	0	+	+
Chlorine Dioxide Solution	ClO_2+H_2O	0.5%	0	+	–	0	0	0	–	+	+
Chloroacetic Acid	$CH_2ClCOOH$	A.C.	–	–	–	–	+	+	+	+	+
Chlorine Water	Cl_2+H_2O	S	+	+	–	0	0	+	+	+	+
Chlorobenzene	C_6H_5Cl	100%	–	–	+	0	+	+	–	+	+
Chloroethanol	$ClCH_2CH_2OH$	100%	–	–	+	+	+	–	0	0	+
Chloroethylbenzene	$C_6H_4ClC_2H_5$	100%	–	–	+	0	0	0	–	n	+
Chlorophenol	C_6H_4OHCl	100%	n	n	+	+	+	n	–	+	+
Chlorotoluene	C_7H_8Cl	100%	–	–	+	n	n	+	–	+	+
Chloroacetone	$ClCH_2COCH_3$	100%	–	–	+	n	n	–	+	n	+
Chlorobutadiene	C_4H_5Cl	100%	–	–	+	n	n	+	–	n	+
Chloroform	$CHCl_3$	100%	–	–	+	–	0	+	–	+	+
Chlorohydrin	$C_3H_7O_2Cl$	100%	n	n	+	+	+	+	0	–	+
Chloroprene=>	Chlorobutadiene										
Chlorosulfonic Acid	$SO_2(OH)Cl$	100%	–	–	–	–	–	–	–	–	+
Chrome Sulfate	$Cr_2(SO_4)_3$	S	+	+	+	+	+	+	+	+	+
Chromic Acid	H_2CrO_4	50%	–	+	+(10%)	+	0	+	–	+	+
Chromic Sulfuric Acid	$K_2CrO_4+H_2SO_4$	S	–	+	n	–	–	n	n	+	+
Citric Acid	$C_6H_8O_7$	S	+	+	+	+	+	+	+	+	+
Cobalt Chloride	$CoCl_2$	S	+	+	–	+	+	+	+	+	+
Copper II Acetate	$Cu(CH_3COO)_2$	S	+	+	+	+	+	+	+	+	+
Copper II Arsenite	$Cu_3(AsO_3)_2$	S	+	+	+	+	+	+	+	+	+
Copper II Carbonate	$CuCO_3$	S	+	+	+	+	+	+	+	+	+
Copper II Chloride	$CuCl_2$	S	+	+	+(1%)	+	+	+	+	+	+
Copper II Cyanide	$Cu(CN)_2$	S	+	+	+	+	+	+	+	+	+
Copper II Fluoride	CuF_2	S	+	+	+	+	+	+	+	+	+
Copper II Nitrate	$Cu(NO_3)_2$	S	+	+	+	+	+	+	+	+	+
Copper II Sulfate	$CuSO_4$	S	+	+	+	+	+	+	+	+	+
Cresole	$C_6H_4CH_3OH$	100%	0	0	+	+	+	+	–	+	+
Crotonaldehyde	$CH_3C_2H_2CHO$	100%	n	–	+	+	+	–	+	+	+
Cyclohexane	C_6H_{12}	100%	+	–	+	+	+	+	–	+	+
Cyclohexanol	$C_6H_{11}OH$	100%	0	+/0	+	+	+	+	–	+	+
Cyclohexanone	$C_6H_{10}O$	100%	–	–	+	+	+	–	+/0	+	+
Cyclohexyl Alcohol=>	Cyclohexanol										
Cyclohexylamine	$C_6H_{13}N$	100%	0	0	+	n	n	–	n	n	+
Decahydronaphthaline	$C_{10}H_{18}$	100%	–	+/0	n	0	0	0	–	+	+
Decalin=>	Decahydronaphthaline										
Diisononyl Phthalate	$C_{26}H_{42}O_4$	100%	–	–	+	+	+	n	n	+	+
Diacetone Alcohol	$C_6H_{12}O_2$	100%	–	–	+	+	+	–	+	+	+
Diamine Ethylene	$(CH_2NH_2)_2$	100%	n	0	0	+	+	–	+	+	+
Dibromoethane	$C_2H_4Br_2$	100%	–	–	+	–	n	+	–	+	+
Dibutyl Ether	$C_4H_9OC_4H_9$	100%	0	–	+	0	0	–	0	+	+
Dibutyl Phthalate	$C_{16}H_{22}O_4$	100%	–	–	+	0	+	+	+/0	+	+
Dibutylamine	$(C_4H_9)_2NH$	100%	n	n	+	+	+	–	–	+	+
Dichloro Acetic Acid	$Cl_2CHCOOH$	100%	–	+	+	+	+	–	+	+	+
Dichloro Benzene	$C_6H_4Cl_2$	100%	–	–	+	0	0	+	–	+	+
Dichloro Butane	$C_4H_8Cl_2$	100%	–	–	+	0	0	+	–	+	+
Dichloro Butene	$C_4H_6Cl_2$	100%	–	–	+	0	0	0	–	+	+
Dextrose	$C_6H_{12}O_6$	A.C.	+	+	+	+	+	+	+	+	+
Dichloroethane	$C_2H_4Cl_2$	100%	–	–	+	–	0	+	–	+	+
Dichloroethylene	$C_2H_2Cl_2$	100%	–	–	+	–	0	0	–	+	+
Dichloroisopropyl Ether	$(C_3H_6Cl)_2O$	100%	–	–	+	0	0	0	0	n	+
Dicyclohexylamine	$C_{12}H_{23}N$	100%	0	0	+	+	+	–	+	n	+

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PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Diethylamine	$(C_2H_5)_2NH$	100%	–	–	+	0	+	–	+	+	+
Diethylene Glycol	$C_4H_{10}O_3$	100%	+	+	+	+	+	+	+	+	+
Diethyleneglydolethyl Ether	$C_8H_{18}O_3$	100%	n	n	+	+	+	n	+/0	+	+
Diethyl Ether	$(C_2H_5)_2O$	100%	–	–	+	0	0	–	–	+	+
Diglycolic Acid	$C_4H_6O_5$	30%	+	+	+	+	+	+	n	+	+
Dihexyl Phthalate	$C_{20}H_{26}O_4$	100%	–	–	+	+	+	–	n	+	+
Diisobutylketone	$C_9H_{18}O$	100%	–	–	+	+	+	–	+	+	+
Diisopropylketone	$C_7H_{14}O$	100%	–	–	+	+	+	–	+	+	+
Dimethyl Carbonate	$(CH_3O)_2CO$	100%	n	n	+	–	+	+	–	+	+
Dimethyl Phthalate	$C_{10}H_{10}O_4$	100%	–	–	+	+	+	–	+/0	+	+
Dimethylformamide	$HCON(CH_3)_2$	100%	–	–	+	+	+	–	+	–	+
Dimethylhydrazine	$H_2NN(CH_3)_2$	100%	n	n	+	+	+	–	+	+	+
Dioctyl Phthalate	$C_6H_4(COOC_8H_{17})_2$	100%	–	–	+	+	+	–	+/0	+	+
Dioxane	$C_4H_8O_2$	100%	–	–	+	+	0	–	+/0	0	+
Dimethyl Formic Amide	$HCON(CH_3)_2$	100%	–	–	–	0	+	0	0	–	+
Disodium Hydrogen Phosphate	Na_2HPO_4	S	+	+	+	+	+	+	+	+	+
Disulfur Dichloride	S_2Cl_2	100%	+	+	+	+	+	+	–	+	+
DMF=>	Dimethylformamide										
Engine Oils		100%	n	+/0	+	+	+	+	–	+	+
Ethanol	C_2H_5OH	100%	–	+	+	+	+	–	+	+	+
Ethanol Amine	$HOC_2H_4NH_2$	100%	0	n	+	+	+	–	+/0	+	+
Ethyl Acetate	$CH_3COOC_2H_5$	100%	–	–	+	+	+35%	–	+/0	–	+
Ethyl Acrylate	$C_2H_3COOC_2H_5$	100%	–	–	+	+	+	–	+/0	0	+
Ethyl Benzene	$C_6H_5C_2H_5$	100%	–	–	+	0	0	0	–	+	+
Ethyl Benzoate	$C_6H_5COOC_2H_5$	100%	n	–	+	+	+	+	–	0	+
Ethyl Bromide	C_2H_5Br	100%	n	n	n	+	+	+	–	+	+
Ethyl Chloride	C_5H_5Cl	100%	–	–	+	–	–	+	–	+	+
Ethyl Chloroacetate	$ClCH_2COOC_2H_5$	100%	–	0	+	+	+	+	–	+	+
Ethyl Chlorocarbonate	$ClCO_2C_2H_5$	100%	n	n	n	n	n	+	–	n	+
Ethylacetylacetate	$C_6H_{10}O_3$	100%	n	–	+	+	+	+	–	+	+
Ethylacrylic Acid	C_4H_7COOH	100%	n	n	+	+	+	n	+/0	+	+
Ethylene Dibromide	$C_2H_4Br_2$	100%	–	–	+	–	0	+	–	+	+
Ethylene Dichloride	$C_2H_4Cl_2$	100%	–	–	+	–	0	+	–	+	+
Ethylene Glycol	$C_2H_4(OH)_2$	100%	+	+	+	+	+	+	+	+	+
Ethylenglycol Ethylether	$HOC_2H_4OC_2H_5$	100%	n	n	+	+	+	n	+/0	+	+
Ethylhexanol	$C_8H_{16}O$	100%	n	+/0	+	+	+	+	+	+	+
Fatty Acids	-	100%	0	0	+	+	+	+	0	+	+
Ferric Chloride	$FeCl_3$	S	+	+	–	+	+	+	+	+	+
Ferric Nitrate	$Fe(NO_3)_3$	S	+	+	+	+	+	+	+	+	+
Ferric Phosphate	$FePO_4$	S	+	+	+	+	+	+	+	+	+
Ferric Sulfate	$Fe_2(SO_4)_3$	S	+	+	0	+	+	+	+	+	+
Ferrous Chloride	$FeCl_2$	S	+	+	–	+	+	+	+	+	+
Ferrous Sulfate	$FeSO_4$	S	+	+	+	+	+	+	+	+	+
Fluoro Benzene	C_6H_5F	100%	–	–	+	0	+	0	–	+	+
Fluoroboric Acid	HBF_4	35%	+	+	0	+	+	+	+	+	+
Formaldehyde	CH_2O	40%	+	+	+	+	+	–	+/0	+	+
Formamide	$HCONH_2$	100%	+	–	+	+	+	+	+	+	+
Formic Acid	HCOOH	S	–	+/0	+	+	+	–	–	+	+
Freon 12,13,22,114,115	–	100%	–	+	–	–	–	–	–	0	+
Furan	C_4H_4O	100%	–	–	+	+	+	–	n	–	+
Furane Aldehyde	$C_5H_5O_2$	100%	n	n	n	n	n	–	+/0	0	+
Furfuryl Alcohol	$OC_4H_3CH_2OH$	100%	–	–	+	+	+	n	+/0	0	+

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Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Gallic Acid	$C_6H_2(OH)_3COOH$	5%	+	+	+	+	+	+	+/0	+	+
Gasoline	–	100%	–	–	+	+	+	+	–	+	+
Glucose	$C_6H_{12}O_6$	S	+	+	+	+	+	+	+	+	+
Glycerol Triacetate	$C_3H_5(CH_3COO)_3$	100%	n	n	+	+	+	–	+	+	+
Glycerol	$C_3H_5(OH)_3$	100%	+	+	+	+	+	+	+	+	+
Glycine	NH_2CH_2COOH	10%	+	+	+	+	+	+	+	+	+
Glycol	$C_2H_4(OH)_2$	100%	+	+	+	+	+	+	+	+	+
Glycolic Acid	CH_2OH COOH	70%	+	+(37%)	–	+	+	+	+	+	+
Heptane	C_7H_{16}	100%	+	+	+	+	+	+	–	+	+
Hexanal	$C_5H_{11}CHO$	100%	n	n	+	+	+	–	+/0	+	+
Hexane	C_6H_{14}	100%	+	+	+	+	+	+	–	+	+
Hexanol	$C_6H_{11}OH$	100%	–	–	+	+	+	n	+	+	+
Hexene	C_6H_{12}	100%	n	+	+	+	+	+	–	+	+
Hydrazine Hydrate	$N_2H_4*H_2O$	S	+	+	+	+	+	n	+	+	+
Hydrazine	N_2H_4	Conc.	0	0	+	+	+	+	+	+	+
Hydrobromic Acid	HBr	50%	+	+	–	+	+	–	+	+	+
Hydrochloric Acid	HCl	38%	+(32%)	+*	–	+	+	–	+	+	+
Hydrofluoric Acid	HF	80%	–	+(40%)*	–	+(40%)	+(40%)	+	0	+	+
Hydrofluosilicic Acid	H_2SiF_6	30%	+	+	0	+	+	+	+	+	+
Hydrogen Cyanide	HCN	S	+	+	+	+	+	+	+	+	+
Hydrogen Peroxide	H_2O_2	90%	+(40%)	+(40%)	+	+	+(30%)	+(30%)	+(30%)	+	+
Hydroiodic Acid	HI	S	+	+	–	+	+	–	n	+	+
Hydroquinone	$C_6H_4(OH)_2$	S	+	+	+	+	+	+	–	+	+
Hydrogen Sulfide	H_2S	S	+	+	0	+	+	+	+	+	+
Hydroxylamine Sulfate	$(NH_2OH)_2*H_2SO_4$	10%	+	+	+	+	+	+	+	+	+
Hypochlorous Acid	HOCl	S	+	+	–	0	0	+	+/0	+	+
Iodine	I_2	S	0	–	–	0	+	+	+/0	+	+
Isobutyl Alcohol	$C_2H_5CH(OH)CH_3$	100%	–	+	+	+	+	+	+	+	+
Isopropyl Chloride	$CH_3CHClCH_3$	80%	–	–	+	0	0	+	–	+	+
Isopropyl Acetate	$CH_3COOCH(CH_3)_2$	100%	–	–	+	+	+	–	+/0	+	+
Isopropyl Alcohol	$(CH_3)_2CHOH$	100%	0	+/0	+	+	+	+	+	+	+
Isopropyl Benzene	$C_6H_5CH(CH_3)_2$	100%	–	–	+	0	0	+	–	+	+
Isopropyl Ether	$C_6H_{14}O$	100%	–	–	+	0	0	–	–	+	+
Isopropanol=>	Isopropyl Alcohol										
Lactic Acid	$C_3H_6O_3$	100%	–	+	+/0	+	+	+	+(10%)	+	+
Lead II Acetate	$Pb(CH_3COO)_2$	S	+	+	+	+	+	+	+	+	+
Lead Nitrate	$Pb(NO_3)_2$	50%	+	+	+	+	+	+	+	+	+
Lead Sulfate	$PbSO_4$	S	+	+	+	+	+	+	+	+	+
Lead Tetraethyl	$Pb(C_2H_5)_4$	100%	0	+	+	+	+	+	–	+	+
Lime Milk=>	Calcium Hydroxide										
*Lime Slurry	$Ca(OH)_2$	S	+	+	+	+	+	+	+	+	+
Lithium Bromide	LiBr	S	+	+	+	+	+	+	+	+	+
Lithium Chloride	LiCl	S	+	+	+	+	+	+	+	+	+
Magnesium Carbonate	$MgCO_3$	S	+	+	+	+	+	+	+	+	+
Magnesium Chloride	$MgCl_2$	S	+	+	0	+	+	+	+	+	+
*Magnesium Hydroxide	$Mg(OH)_2$	S	+	+	+	+	+	+	+	+	+
Magnesium Nitrate	$Mg(NO_3)_2$	S	+	+	+	+	+	+	+	+	+
Magnesium Sulfate	$MgSO_4$	S	+	+	+	+	+	+	+	+	+
Maleic Acid	$C_4H_4O_4$	S	+	+	+	+	+	+	+	+	+
Malic Acid	$C_4H_6O_5$	S	+	+	+	+	+	+	+	+	+
Manganese II Chloride	$MnCl_2$	S	+	+	+	+	+	+	+	+	+

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Manganese Sulfate	$MnSO_4$	S	+	+	+	+	+	+	+	+	+
Mercuric Chloride	$HgCl_2$	S	–	+	–	+	+	+	+	+	+
Mercury	Hg	100%	+	+	+	+	+	+	+	+	+
Mercury II Chloride	$HgCl_2$	S	+	+	–	+	+	+	+	+	+
Mercury II Cyanide	$Hg(CN)_2$	S	+	+	+	+	+	+	+	+	+
Mercury II Nitrate	$Hg(NO_3)_2$	S	+	+	+	+	+	+	+	+	+
Mesityl Oxide	$C_6H_{10}O$	100%	–	–	+	n	n	–	+/0	n	+
Methacrylic Acid	C_3H_5COOH	100%	n	n	+	+	+	0	+/0	+	+
Methanol	CH_3OH	100%	–	+	+	+	+	+	+	+	+
Methoxybutanol	$CH_3O(CH_2)_4OH$	100%	–	–	+	+	+	+	0	+	+
Methyl Acetate	CH_3COOCH_3	60%	–	–	+	+	+	–	+/0	+	+
Methyl Acrylate	$C_2H_3COOCH_3$	100%	–	–	+	+	+	–	+/0	+	+
Methyl Benzoate	$C_6H_5COOCH_3$	100%	–	–	+	+	+	+	–	0	+
Methyl Catechol	$C_6H_3(OH)_2CH_3$	S	+	+	+	+	+	+	–	+	+
Methyl Cellulose		S	+	+	+	+	+	+	+	+	+
Methyl Chloroacetate	$ClCH_2COOCH_3$	100%	–	0	+	+	+	0	–	+	+
Methyl Cyclopentane	$C_5H_9CH_3$	100%	+	+	+	+	+	+	–	+	+
Methyl Dichloroacetate	$Cl_2CHCOOCH_3$	100%	–	–	+	+	+	–	n	n	+
Methyl Ethyl Ketone (MEK)	$CH_3COC_2H_5$	100%	–	–	+	+	+	–	+	–	+
Methyl Glycol	$C_3H_8O_2$	100%	+	+	+	+	+	–	+/0	+	+
Methyl Isobutyl Ketone	$CH_3COC_4H_9$	100%	–	–	+	+	+	–	0	–	+
Methyl Isopropyl Ketone	$CH_3COC_3H_7$	100%	–	–	+	+	+	–	+/0	–	+
Methyl Methacrylate	$C_3H_5COOCH_3$	100%	–	–	+	+	+	–	–	+	+
Methyl Oleate	$C_{17}H_{33}COOCH_3$	100%	n	n	+	+	+	+	+/0	+	+
Methyl Salicylate	$HOC_6H_4COOCH_3$	100%	–	–	+	+	+	n	+/0	+	+
Methylacetyl Acetate	$C_5H_8O_3$	100%	–	–	+	+	+	–	+/0	+	+
Methylamine	CH_3NH_2	32%	+	0	+	+	+	–	+	0	+
Methylene Chloride	CH_2Cl_2	100%	–	–	0	–	0	+	–	0	+
Milk	–	–	+	+	+	+	+	+	+	+	+
Morpholine	C_4H_9NO	100%	–	–	+	+	+	n	n	+	+
Naphthalene	$C_{10}H_8$	S	–	–	+	–	+	+	–	+	+
Nickel II Acetate	$(CH_3COO)_2Ni$	S	+	+	+	+	+	–	+	+	+
Nickel Chloride	$NiCl_2$	S	+	+	–	+	+	+	+	+	+
Nickel Nitrate	$Ni(NO_3)_2$	S	+	+	+	+	+	+	+	+	+
Nickel Sulfate	$NiSO_4$	S	+	+	+	+	+	+	+	+	+
Nitric Acid	HNO_3	99%	n	+(50%)	+(90%)	+(50%)	+(50%)	+(65%)	+(40%)	0	+
Nitro Benzene	$C_6H_5NO_2$	100%	–	–	+	–	+	–	–	+	+
Nitro Methane	CH_3NO_2	100%	–	–	+	+	+	–	+/0	0	+
Nitro Propane	$(CH_3)_2CHNO_2$	100%	–	–	+	+	+	–	+/0	n	+
Nitro Toluene	$C_6H_4NO_2CH_3$	100%	–	–	+	+	+	0	–	+	+
Oxalic Acid	$(COOH)_2$	S	+	+	+(10%)	+	+	+	+	+	+
Octane	C_8H_{18}	100%	+	+	+	+	+	+	–	+	+
Octanol	$C_8H_{17}OH$	100%	–	–	+	+	+	+	+	+	+
Octyl Cresole	$C_{15}H_{24}O$	100%	–	–	+	+	+	0	n	+	+
Oleum	$H_2SO_4+SO_3$	10%	n	–	+	–	–	+	–	–	+
Perchloric Acid	$HClO_4$	70%	–	+(10%)	–	+	+(10%)	+	+/0	+	+
Pentane	C_5H_{12}	100%	+	+	+	+	+	+	–	+	+
Pentanol=>	Amyl Alcohol										
Peracetic Acid	$C_2H_4O_3$	50%	–	0	+	0	+	+	0	+	+
Petroleum Ether	C_nH_{2n+2}	100%	+	+/0	+	+	+	+	–	+	+
Phenol	C_6H_5OH	100%	–	–	+	+	+	+	–	+	+
Phenyl Ethyl Ether	$C_6H_5OC_2H_5$	100%	–	–	+	+	+	–	–	n	+
Phenyl Hydrazine	$C_6H_5NHNH_2$	100%	–	–	+	0	0	0	–	+	+
Phosphoric Acid	H_3PO_4	85%	+(50%)	+	+	+	+	+	+	+	+

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D = weak solution

resp. to aqueous solutions

N.B. PTFE is resistant against most chemicals and solvents (excluding fluorine, metallic sodium and other alkali metals).
PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Phosphorous Oxychloride	$POCl_3$	100%	–	–	n	+	+	+	+	+	+
Phosphorous Trichloride	PCl_3	100%	–	–	+	+	+	0	0	+	+
Phthalic Acid	$C_6H_4(COOH)_2$	S	+	+	+	+	+	+	+	+	+
Picric Acid	$C_6H_2(NO_3)_3OH$	S	+	+	+	+	+	+	+	+	+
Piperidine	$C_5H_{11}N$	100%	–	–	+	n	n	–	–	n	+
Polyphosphate=>	Sodium Tripolyphosphate										
Potassium Acetate	CH_3COOK	S	+	+	+	+	+	+	+	+	+
Potassium Aluminum Sulfate	$KAl(SO_4)_2$	S	+	+	+	+	+	+	+	+	+
Potassium Bicarbonate	$KHCO_3$	40%	+	+	+	+	+	+	+	+	+
Potassium Bifluoride	KHF_2	S	n	+	+	+	+	+	+	+	+
Potassium Bisulfate	$KHSO_4$	5%	+	+	+	+	+	+	+	+	+
Potassium Bitartrate	$KC_4H_5O_6$	S	+	+	+	+	+	+	+	+	+
Potassium Borate	KBO_2	S	+	+	+	+	+	+	+	+	+
Potassium Bromate	$KBrO_3$	S	+	+	+	+	+	+	+	+	+
Potassium Bromide	KBr	S	+	+	+(10%)	+	+	+	+	+	+
Potassium Carbonate	K_2CO_3	S	+	+	+	+	+	+	+	+	+
Potassium Chlorate	$KClO_3$	S	+	+	+	+	+	+	+	+	+
Potassium Chloride	KCl	S	+	+	–	+	+	+	+	+	+
Potassium Chromate	K_2CrO_4	10%	+	+	+	+	+	+	+	+	+
Potassium Chrome Sulfate	$KCr(SO_4)_2$	S	+	+	+	+	+	+	+	+	+
Potassium Cyanate	KOCN	S	+	+	+	+	+	+	+	+	+
Potassium Cyanide	KCN	S	+	+	+(5%)	+	+	+	+	+	+
Potassium Cyanoferrate II	$K_4Fe(CN)_6$	S	+	+	+	+	+	+	+	+	+
Potassium Cyanoferrate III	$K_3Fe(CN)_6$	S	+	+	+	+	+	+	+	+	+
Potassium Dichromate	$K_2Cr_2O_7$	S	+	+	+25%	+	+	+	+	+	+
Potassium Ferricyanide	$K_3Fe(CN)_6$	S	+	+	+	+	+	+	+	+	+
Potassium Ferrocyanide	$K_4Fe(CN)_6$	S	+	+	+	+	+	+	+	+	+
Potassium Fluoride	KF	S	+	+	+	+	+	+	+	+	+
Potassium Hydroxide	KOH	50%	n	+	+	+	+	–	+	+	+
Potassium Iodide	KI	S	+	+	+	+	+	+	+	+	+
Potassium Nitrate	KNO_3	S	+	+	+	+	+	+	+	+	+
Potassium Perchlorate	$KClO_4$	S	+	+	n	+	+	+	+	+	+
Potassium Permanganate	$KMnO_4$	S	+	+	+	+	+	+	+	+	+
Potassium Persulfate	K_2SO_4	S	+	+	+	+	+	+	+	+	+
Potassium Phosphate	KH_2PO_4	S	+	+	+	+	+	+	+	+	+
Potassium Sulfate	K_2SO_4	S	+	+	+	+	+	+	+	+	+
Potassium Sulfite	K_2SO_3	S	+	+	+	+	+	+	+	+	+
Propanol	C_2H_7OH	100%	–	+	+	+	+	+	+	+	+
Propionic Acid	C_2H_5COOH	100%	0	+	+	+	+	+	+	+	+
Propionitrile	CH_3CH_2CN	100%	n	n	+	+	+	+	–	+	+
Propyl Acetate	$CH_3COOC_3H_7$	100%	–	–	+	+	+	–	+/0	+	+
Propylene Glycol	$CH_3CHOHCH_2OH$	100%	+	+	+	+	+	+	+	+	+
Pyridine	C_6H_5N	100%	–	–	+	+	0	–	–	–	+
Pyrrole	C_4H_4N	100%	n	n	+	+	+	–	–	n	+
Salicylic Acid	HOC_6H_4COOH	S	+	+	+	+	+	+	+	+	+
Sea Water	–		+	+	0	+	+	+	+	+	+
Silic Acid	SiO_2+H_20	S	+	+	+	+	+	+	+	+	+
Silver Bromide	AgBr	S	+	+	+/0	+	+	+	+	+	+
Silver Chloride	AgCl	S	+	+	–	+	+	+	+	+	+
Silver Nitrate	$AgNO_3$	S	+	+	+	+	+	+	–	+	+
Soda Ash=>	Sodium Carbonate										
Sodium Acetate	CH_3COONa	S	+	+	+	+	+	+	+	+	+
Sodium Benzoate	C_6H_5COONa	S	+	+	+	+	+	+	+	+	+
Sodium Bicarbonate	$NaHCO_3$	S	+	+	+	+	+	+	+	+	+
Sodium Bisulfate	$NaHSO_4$	S	+	+	+	+	+	+	+	+	+

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resp. to aqueous solutions

N.B. PTFE is resistant against most chemicals and solvents (excluding fluorine, metallic sodium and other alkali metals).
PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Sodium Borate	$NaBO_2$	S	+	+	+	+	+	+	+	+	+
Sodium Bromate	$NaBrO_3$	S	+	+	+	+	+	+	+	+	+
Sodium Bromide	NaBr	S	+	+	+	+	+	+	+	+	+
Sodium Carbonate	Na_2CO_3	S	+	+	+/0	+	+	+	+	+	+
Sodium Chlorate	$NaClO_3$	S	+	+	+	+	+	+	+	+	+
Sodium Chloride	NaCl	S	+	+	–	+	+	+	+	+	+
Sodium Chlorite	$NaClO_2$	24%	+	+	+(10%)	+	+	+	+	+	+
Sodium Chromate	Na_2CrO_4	S	+	+	+	+	+	+	+	+	+
Sodium Cyanide	NaCN	S	+	+	+	+	+	+	+	+	+
Sodium Dichromate	$NaCr_2O_7$	S	+	+	+	+	+	+	+	+	+
Sodium Dithionite	$Na_2S_2O_4$	S	+	+10%	+	+10%	+10%	n	n	+	+
Sodium Fluoride	NaF	S	+	+	+(10%)	+	+	+	+	+	+
Sodium Hydrogen Sulfate	$NaHSO_4$	S	+	+	+	+	+	+	+	+	+
Sodium Hydrogen Sulfide	$NaHSO_3$	S	+	+	+	+	+	+	+	+	+
Sodium Hydroxide	NaOH	50%	+	+	+	+	+	–	+	+	+
Sodium Hypochlorite	NaOCl	12-15%	+	+	–	+	0	0	+	+	+
Sodium Iodide	NaI	S	+	+	+	+	+	+	+	+	+
Sodium Metaphosphate	$(NaPO_3)n$	S	+	+	+	+	+	+	+	+	+
Sodium Nitrate	$NaNO_3$	S	+	+	+	+	+	+	+	+	+
Sodium Nitrite	$NaNO_2$	S	+	+	+	+	+	+	+	+	+
Sodium Oxalate	$Na_2C_2O_4$	S	+	+	+	+	+	+	+	+	+
Sodium Perborate	$NaBO_2$+*H_2O_2	S	+	+/0	+	+	+	+	+	+	+
Sodium Perchlorate	$NaClO_4$	S	+	+	+(10%)	+	+	+	+	+	+
Sodium Peroxide	Na_2O_2	S	+	+	+	–	+	+	+	+	+
Sodium Persulfate	$Na_2S_2O_8$	S	n	+	+	+	+	+	+	+	+
Sodium Pyrosulfite	$Na_2S_2O_5$	S	+	+	+	+	+	n	n	+	+
Sodium Salicylate	$C_6H_4(OH)COONa$	S	+	+/0	+	+	+	+	+	+	+
Sodium Silicate	Na_2SiO_3.	S	+	+	+	+	+	+	+	+	+
Sodium Sulfate	Na_2SO_4	S	+	+	+	+	+	+	+	+	+
Sodium Sulfide	Na_2S	S	+	+	+	+	+	+	+	+	+
Sodium Sulfite	Na_2SO_3	S	+	+	+(50%)	+	+	+	+	+	+
Sodium Tetraborate	$Na_2B_4O_7$*$10H_2O$	S	+	+	+	+	+	+	+	+	+
Sodium Thiosulfate	$Na_2S_2O_3$	S	+	+	+(25%)	+	+	+	+	+	+
Sodium Tripolyphosphate	$Na_5P_3O_{10}$	S	+	+	+	+	+	+/0	+	+	+
Stannic Chloride	$SnCl_4$	100%	+	+	–	+	+	+	+	+	+
Stannous Chloride	$SnCl_2$	S	+	+	–	+	+	+	+	+	+
Starch	$(C_6H_{10}O_5)n$	S	+	+	+	+	+	+	+	+	+
Stearic Acid	$C_{17}H_{35}COOH$	100%	+	+	+	+	+	+	–	+	+
Styrene	$C_6H_5CHCH_2$	100%	–	–	+	0	0	0	–	+	+
Succinic Acid	$C_4H_6O_4$	S	+	+	+	+	+	+	+	+	+
Sugar Syrup		S	+	+	+	+	+	+	+	+	+
Sulfuric Acid	H_2SO_4	98%	+30%	+50%	+20%	+50%	+85%	+	+	+	+
Sulfurous Acid	H_2SO_3	A.C.	+	+	+(10%)	+	+	+	+	+	+
Sulfuryl Chloride	SO_2Cl_2	100%	–	–	n	–	–	+	0	n	+
Tannic Acid	$C_{76}H_{52}O_{46}$	50%	+	+	+	+	+	+	+	+	+
Tartaric Acid	$C_4H_6O_6$	S	+(50%)	+	+	+	+	+	+/0	+	+
Tetrachloroethane	$C_2H_2Cl_4$	100%	–	–	+	0	0	0	–	+	+
Tetrachloroethene	C_2Cl_4	100%	–	–	+	0	0	0	–	+	+
Tetrahydrofuran	C_4H_8O	100%	–	–	+	0	0	–	–	–	+
Tetrahydro Naphthalene	$C_6H_4C_4H_8$	100%	–	–	+	0	–	+	–	+	+
Thionyl Chloride	$SOCl_2$	100%	–	–	n	–	–	+	+	–	+
Thiophene	C_4H_4S	100%	n	–	+	0	0	–	–	n	+
Tin II Chloride	$SnCl_2$	S	+	0	–	+	+	+	+	+	+
Tin II Sulfate	$SnSO_4$	S	+	+	+	+	+	+	+	+	+
Tin IV Chloride	$SnCl_4$	S	n	+	–	+	+	+	+	+	+

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resp. to aqueous solutions

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PVDF is resistant against most chemicals (excluding ketones, esters).

Chemical	Formula	Concentration	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Titanium Tetrachloride	$TiCl_4$	100%	n	n	n	n	n	0	–	+	+
Toluene	$C_6H_5CH_3$	100%	–	–	+	0	0	0	–	+	+
Toluene Diisocyanate	$C_7H_6(NCO)_2$	100%	n	n	+	+	+	–	+/0	n	+
Tributyl Phosphate	$(C_4H_9)_3PO_4$	100%	n	–	+	+	+	–	+	+	+
Trichloroacetaldehyde Hydr.	$CCl_3CH(OH)_2$	S	–	–	+	+	0	0	0	–	+
Trichloroethane	CCl_3CH_3	100%	–	–	+	0	0	+	–	+	+
Trichloroethene	C_2HCl_3	100%	–	–	+/0	0	0	0	–	+	+
Trichloroethylene	C_2HCl_3	100%	–	–	+	0	0	0	–	+	+
Trichloroacetic Acid	CCl_3COOH	50%	–	+	–	+	+	–	0	+	+
Tricresyl Phosphate	$(C_7H_7O)_3PO$	90%	n	–	+	+	+	0	+	n	+
Triethanolamine	$N(C_2H_4OH)_3$	100%	–	0	+	+	+	–	+/0	+	+
Trioctyl Phosphate	$(C_8H_{17})_3PO_4$	100%	n	–	+	+	+	0	+	+	+
Trisodium Phosphate	Na_3PO_4	S	+	+	+	+	+	+	+	+	+
Urea	$CO(NH_2)_2$	S	+	+/0	+	+	+	+	+	+	+
Vinyl Acetate	$CH_2CHOOCCH_3$	100%	–	–	+	0	–	0	–	+	+
Xylene	$C_6H_4(CH_3)_2$	100%	–	–	+	0	–	0	–	0	+
Zinc Acetate	$(CH_3COO)_2Zn$	S	+	+	+	+	+	–	+	+	+
Zinc Chloride	$ZnCl_2$	S	+	+	–	+	+	+	+	+	+
Zinc Sulfate	$ZnSO_4$	S	+	+	+	+	+	+	+	+	+

Introduction

ProMinent® Warranty

1) WARRANTY, REMEDY, DISCLAIMER: The warranties set out in this clause shall be conditional upon fulfillment of the Purchaser's contractual obligations, including all terms of payment. For sales of completed pumps and controllers, the warranty shall be conditional upon the Purchaser completing and returning the attached Warranty Validation Card. Seller warrants that the Drive Units and DULCOMETER Controllers will be of good workmanship and material for two (2) years from the date of purchase by owner of new equipment from an authorized distributor of manufacturer, but no longer than two and one-half (2-1/2) years from the date of shipment by manufacturer. All Dulcotest sensors are warranted for (6) months from the date of shipment by manufacturer. For sales of liquid ends, Bello Zon, Bono Zon, pump accessories, standard engineered products, custom designed items and items not manufactured by ProMinent, Seller warrants that the products will be of good workmanship and material for one (1) year from the date the goods are shipped by Seller. If purchaser claims that the goods are defective, he must permit Seller's personnel at Seller's option to inspect the goods on Purchaser's property. Purchaser shall not return the goods to Seller unless Purchaser obtains prior written approval of such from Seller. If, after inspection, Seller determines that the goods are defective, Seller will repair or replace goods at Seller's option and at Seller's cost. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED AND STATUTORY INCLUDING THE WARRANTIES OF FITNESS FOR PURPOSE AND MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. The warranty provided for herein shall not apply to any goods that become defective for the following reason:

(a) unsuitable or unreasonable use
(b) faulty assembly, installation or servicing by the Purchaser or any third party
(c) faulty or careless handling

2) DISCLAIMER OF TORT LIABILITY: purchaser specifically understands and agrees that seller shall not be liable in tort, whether based on negligence, strict liability or any other theory of tort liability, for any action or failure to act in respect to the manufacture, preparation for sale, or delivery of the goods. It is the parties' intent and the intent of this paragraph to absolve and protect seller from any and all tort liability.

3) EXCLUSIVE REMEDY: Purchaser specifically understands and agrees that purchaser's sole and exclusive remedy for breach of warranty, tortious conduct or any other cause of action against seller shall be the remedy provided in paragraph two (2) above.

4) EXCLUSION OF CONSEQUENTIAL DAMAGES: purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for
economic, special incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of the non-operation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

5) ALL TERMS AND CONDITIONS OF SALE CONTAINED IN SELLER'S ACKNOWLEDGMENT/OFFER TO SELL APPLY AND ARE IN NO WAY ALTERED BY THIS WARRANTY VALIDATION CARD.

ProMinent Fluid Controls
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
(412)787-2484

Solenoid-Driven Metering Pump Overview

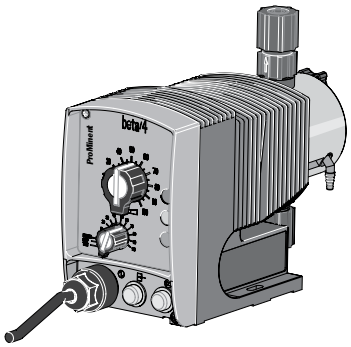
Concept^{PLUS}

Ideal for basic chemical feed applications

(see page 31 for complete details)

- Solenoid driven diaphragm pump
- Capacities: 0.20 gph (0.74 lph) to 3.9 gph (14.9 lph)
- Maximum pressure: 232 psi
- Turndown: 40:1
- Manual, external contact pulse 1:1 operation
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: 5 distinct settings (0, 25%, 50%, 75% and 100%)
- Liquid ends: NP, PP and PVT
- Adjustable bleed valve with fine adjustment for continuous degassing

Beta®

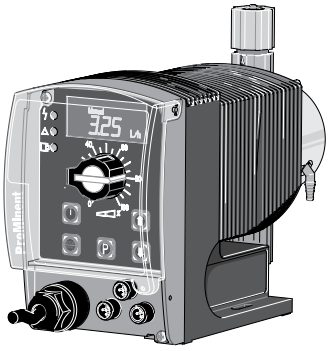


Ideal for basic chemical feed applications

(see page 35 for complete details)

- Solenoid driven diaphragm pump
- Capacities: 0.19 gph (0.74 lph) to 8.4 gph (32 lph)
- Maximum pressure: 232 psi
- Turndown: 100:1
- Manual, external contact pulse 1:1 operation
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: 10 distinct settings @ 10% increments
- Liquid ends: NP, PP, PVT, TT and SST
- Auto degassing and high viscosity (HV) available

gamma/ L



Ideal for applications requiring automation, large turndown and/or feed verification

(see page 41 for complete details)

- Solenoid driven diaphragm pump
- Capacities: 0.19 gph (0.74 lph) to 8.4 gph (32 lph)
- Maximum pressure: 232 psi
- Turndown: 1,800:1
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: digital from 1 to 180 spm
- Liquid ends: NP, PP, PVT, TT and SST
- Auto degassing and high viscosity (HV) available
- Flow verification
- 14-day programmable timer
- Profibus interface

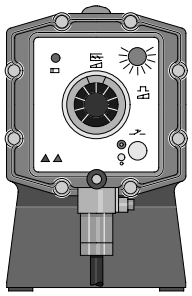
Solenoid-Driven Metering Pump Overview

delta®

Ideal for applications requiring metering pump accuracy with minimal pulsation *(see page 51 for complete details)*

- Solenoid driven diaphragm pump driven by optoDrive® and protected by OptoGuard®
- Capacities: 2.99 gph (11.3 lph) to 19.8 gph (75.0 lph)
- Maximum pressure: 232 psi
- Turndown: 36,000:1
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: digital from 1 to 200 spm
- Adjustable suction and discharge stroke duration to minimize pulsation
- Liquid ends: PVT and SST
- Flow verification
- 14-day programmable timer
- Profibus and CAN-bus interface
- Integrated hydraulic monitoring identifies air lock and pressure changes

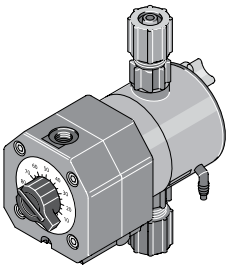
EXtronic®



Ideal for explosion proof applications
(see page 57 for complete details)

- Solenoid driven diaphragm pump designed for ex-proof applications
- Capacities: 0.05 gph (0.19 lph) to 15.9 gph (60 lph)
- Class 1, Div 1, Groups B, C and D
- Maximum pressure: 363 psi
- Turndown: 1,200:1
- Manual, external contact pulse and analog operation
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: 0 to 120 spm via potentiometer
- Liquid ends: NP, PP, TT and SST
- Auto degassing and high viscosity (HV) available

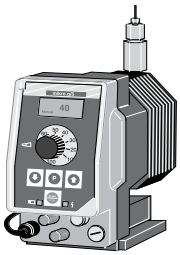
Pneumados



Ideal for applications where only compressed air is available
(*Call factory for more information*)

- Pneumatically driven diaphragm pump requiring compressed air
- Capacities: 0.24 gph (0.9 lph) to 3.9 gph (14.8 lph)
- Maximum pressure: 232 psi
- Manual operation only
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: 1 to 120 spm via the use of a pneumatic pulser
- Liquid ends: NP, PP, TT and SST

mikro g/5a

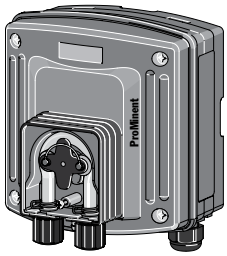


Ideal for applications requiring extremely low flow rates
(*Call factory for more information*)

- Microprocessor based plunger pump
- Capacities: 150 ml/hr to 1500 ml/hr
- Maximum pressure: 580 psi
- Turndown: 500:1
- Manual, external contact pulse with multiplier/divider and analog operation
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: digital from 1 to 50 spm
- Liquid ends: SS, TT

Solenoid-Driven Metering Pump Overview

DULCO®flex

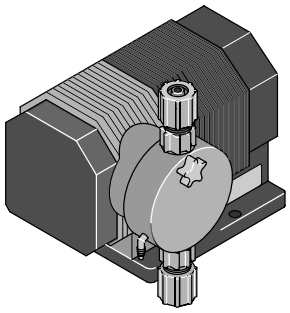


Ideal for swimming pool applications
(*Call factory for more information*)

- Peristaltic metering pump
- Capacities: 0.10 gph (0.4 lph) to 0.64 gph (2.4 lph)
- Maximum pressure: 21 psi
- Manual operation only
- Tygon or PharMed tubing
- Minimum order quantity of 20 pcs
- Self priming
- NEMA 4X enclosure

Motor-Driven Metering Pump Overview

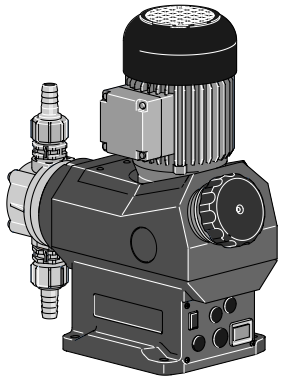
alpha®



Designed for simple applications requiring limited adjustability
(*Call factory for more information*)

- Motor driven diaphragm pump
- Capacities: 0.37 gph (1.4 lph) to 5.7 gph (21.5 lph)
- Mechanically actuated
- Maximum pressure: 145 psi
- Turndown: 10:1
- Stroke length: 0-100% (adjustable in 10% increments)
- Stroke Frequency: fixed
- Liquid ends: PP and NP
- Power: 115 V 60 Hz
- Motor: single phase

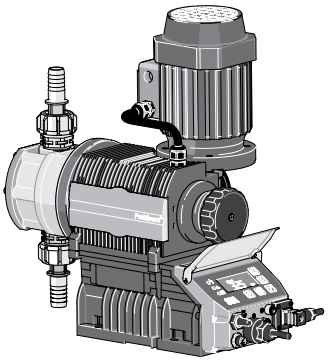
Vario C



Ideal for basic chemical feed applications
(see page 67 for complete details)

- Motor driven diaphragm pump
- Capacities: 2.5 to 20.3 gph (9.6 to 76.8 l/h)
- Mechanically actuated
- Maximum pressure: 145 psig (10 bar)
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: fixed
- Liquid ends: SST and PVT
- Power: 115 V 60 Hz
- Motor: single or three phase available

Sigma/1



Economical mid-range applications
(see page 71 for complete details)

- Mechanical diaphragm pump
- Includes 115/230 V motor
- Maximum pressure: 174 psi
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Liquid ends: PVT and SST

Basic Version

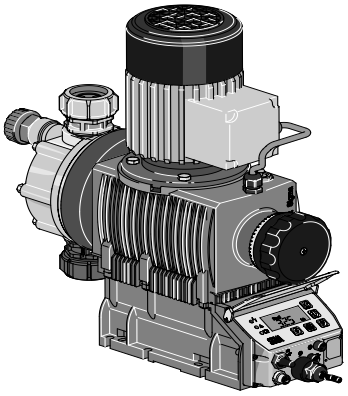
- Capacities: 5.2 gph (20 lph) to 38 gph (144 lph)
- Maximum pressure: 174 psi
- Turndown: 10:1

Control Version

- Microprocessor driven
- Capacities: 5.2 gph (20 lph) to 31.7 gph (120 lph)
- Turndown: up to 2000:1
- Stroke Frequency varies by model: digital from 1 to 90, 170, 200 spm
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Flow verification
- 14-day programmable timer
- Profibus interface

Motor-Driven Metering Pump Overview

Sigma/2



Economical mid-range applications

(see page 81 for complete details)

- Mechanical diaphragm pump
- Maximum pressure: 174 psi
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Liquid ends: PVT and SST

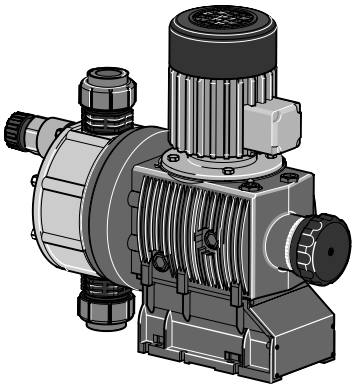
Basic Version

- Capacities: 15.9 gph (60 lph) to 111 gph (420 lph)
- Standard 56-C flange. Motor not included
- Turndown: 100:1 with variable speed motor
- Stroke Frequency: Only with SCR or VFD

Control Version

- Capacities: 15.9 gph (60 lph) to 92.5 gph (350 lph)
- Includes 115/230 V motor
- Turndown: up to 2000:1
- Stroke Frequency varies by model: digital from 1 to 90, 160, 200 spm
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Flow verification
- 14-day programmable timer
- Profibus interface

Sigma/3



Ideal for applications requiring automation, large turndown and/or Flow verification

(see page 99 for complete details)

- Capacities: 46 gph (174 lph) to 264 gph (1000 lph)
- Mechanical diaphragm pump
- Maximum pressure: 174 psi
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Liquid ends: PVT and SST

Basic Version

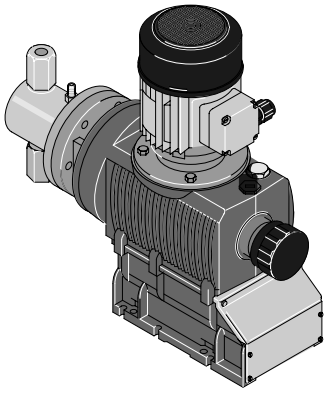
- Standard 56-C flange. Motor not included
- Capacities: 46 gph (174 lph) to 264 gph (1000 lph)
- Turndown: 100:1 with variable speed motor
- Stroke Frequency: Only with SCR or VFD

Control Version

- Includes 115/230 V motor
- Capacities: 46 gph (174 lph) to 264 gph (1000 lph)
- Turndown: up to 2000:1
- Stroke Frequency varies by model: digital from 1 to 90, 160, 200 spm
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Flow verification
- 14-day programmable timer
- Profibus interface

Motor-Driven Metering Pump Overview

Sigma/2 HK



Ideal for high pressure applications requiring significant turndown

(see page 91 for complete details)

- Motor driven packed plunger pump
- Maximum pressure: 4600 psi
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Liquid ends: SST

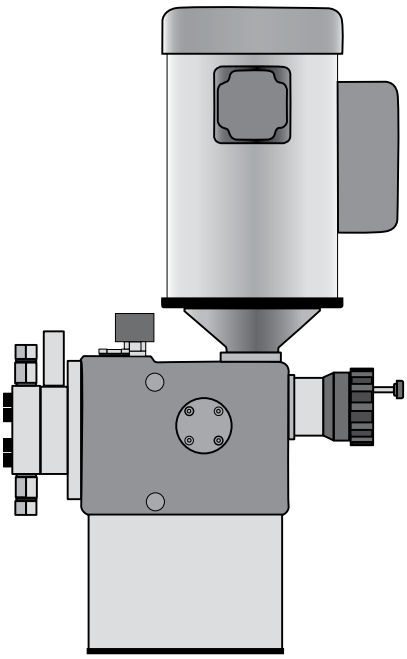
Basic Version

- Capacities: 0.6 gph (2.3 lph) to 20.1 gph (76 lph)
- Standard 56-C flange. Motor not included.
- Turndown: 100:1 with variable speed motor
- Stroke Frequency: Only with SCR or VFD

Control Version

- Capacities: 0.6 gph (2.3 lph) to 17.3 gph (65.4 lph)
- Includes 115/230 V motor
- Turndown: up to 2000:1
- Stroke Frequency varies by model: digital from 1 to 90, 160, 200 spm
- Manual, external contact pulse with multiplier/divider and analog operation
- Displays gph (lph) and totalized flow (gallons or liters)
- Flow verification
- 14-day programmable timer
- Profibus interface

ProMus



High pressure chemical process metering

(see page 107 for complete details)

- Hydraulic diaphragm pump
- Capacities: 0.61 gph (2.3 lph) to 101.5 gph (384.2 lph)
- Maximum pressure: 3500 psi
- Built in accordance to API 675
- Turndown: 100:1 with variable speed motor
- 115/60/1 motor included
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: Only with SCR or VFD
- Liquid ends: PVT, SST, Hastelloy C and Alloy 20

Motor-Driven Metering Pump Overview

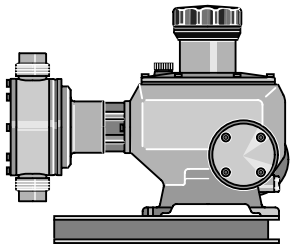
Meta

Predecessor to the Sigma series pump
(*Call factory for more information*)

- Mechanical diaphragm pump
- Capacities: 20.6 to 168 gph (78 to 636 l/h)
- Maximum pressure: 174 psi
- Turndown: 100:1 with variable speed motor
- Standard 56-C flange. Motor not included.
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: Only with SCR or VFD
- Liquid ends: PP, PVC, TT and SST

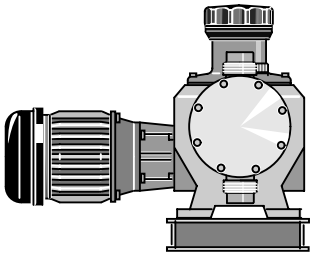
Makro TZb

Ideal for high volume and high pressure applications
(see page 119 for complete details)



- Available with add-on and multi-head designs
- Capacities: 2.6 gph (10 lph) to 529 gph (2004 lph)
- Turndown: 100:1 with variable speed motor
- Motor not included
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: Only with SCR or VFD
- Liquid ends: PP, PVC, TT, SST

TZMb

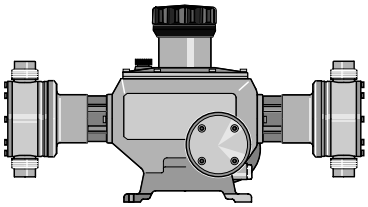


- Mechanical diaphragm pump
- Models: 82 gph (312 lph) to 529 gph (2004 lph)
- Maximum pressure: 174 psi

TZHb
(*Call factory for more information*)

- Hydraulic diaphragm pump
- Models: 112 gph (424 lph) to 318 gph (1204 lph)
- Maximum pressure: 232 psi

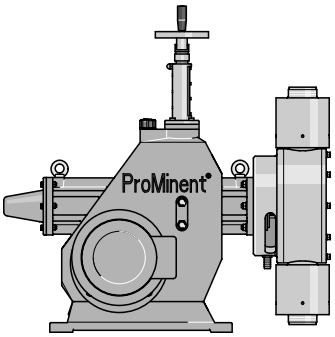
TZKb
(*Call factory for more information*)



- Mechanical packed plunger pump
- Models: 2.6 gph (10 lph) to 301 gph (1141 lph)
- Maximum pressure: 4627 psi
- SST only

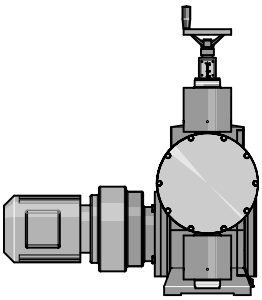
Motor-Driven Metering Pump Overview

Makro/ 5



Ideal for high volume/ high pressure applications
(*Call factory for more information*)

- Capacities: 11 gph (44 lph) to 1618 gph (6108 lph)
- Available with add-on and multi-head designs
- Turndown: 100:1 with variable speed motor
- Motor included
- Stroke length: 0-100% (30% minimum recommend for most repeatable accuracy)
- Stroke Frequency: Only with SCR or VFD
- Liquid ends: PP, PVC, TT, SST

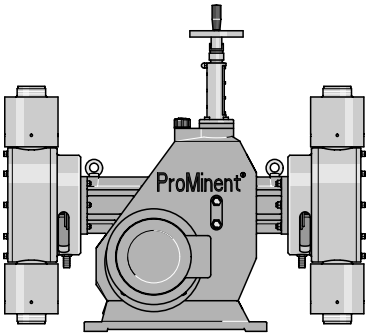


M5Ma

- Mechanical diaphragm pump
- Models: 482 gph (1812 lph) to 1076 gph (4064 lph)
- Maximum pressure: 58 psi

M5Ha

- Hydraulic diaphragm pump
- Models: 142 gph (537 lph) to 1618 gph (6108 lph)
- Maximum pressure: 362 psi

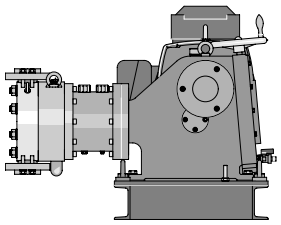


M5Ka

- Mechanical packed plunger pump
- Models: 11 gph (44 lph) to 1593 gph (6014 lph)
- Maximum pressure: 4640psi
- SST only

Motor-Driven Metering Pump Overview

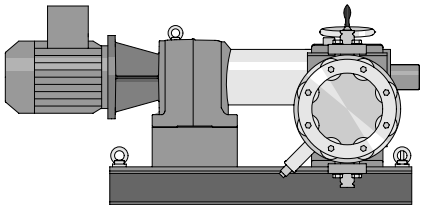
ORLITA®



Ideal for high volume applications
(*Call factory for more information*)

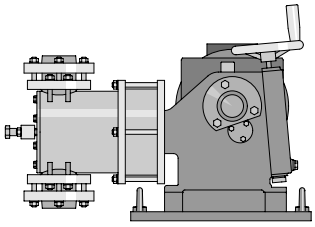
MfS

- Hydraulic diaphragm pump
- Capacities: 0.5 gph (2 l/h) to 7500 gph (28,400 l/h)
- Maximum pressure: 10,000 psi (700 bar)
- Built in accordance to API 675



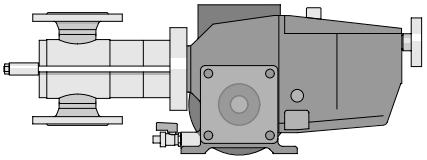
MhS

- Hydraulic diaphragm pump
- Capacities: 0.26 gph (1 l/h) to 200 gph (757 l/h)
- Maximum pressure: 44,000 psi (3000 bar)
- Stainless steel diaphragm
- Built in accordance to API 675



PS

- Plunger metering pump
- Capacities: 0.26 gph (1 l/h) to 9,800 gph (2,600 l/h)
- Maximum pressure: 5,800 psi (400 bar)
- Stainless steel only
- Built in accordance to API 675

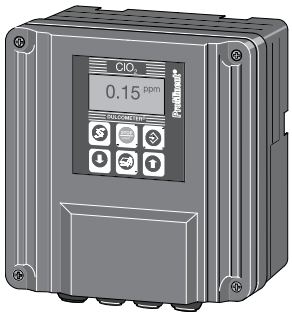


DR

- Valveless rotary piston pump
- Capacities: 0.26 gph (1 l/h) to 1,100 gph (4,000 l/h)
- Maximum pressure: 5800 psi (400 bar)
- Stainless steel only

Analytical Instrumentation Overview

D1C

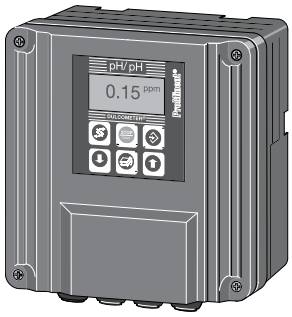


Microprocessor based single process variable analyzer

(see page 230 for complete details)

- Controls or measures one of 14 different variables
- Menu driven calibration with limit and control settings
- Sensor diagnostics alarms upon sensor failure
- Programmable access code
- Non-volatile memory
- Two current analog signal outputs
- Feed forward for compound loop control
- pH and temperature correcting variables
- Proportional or PID control
- Wall or panel mount available

D2C

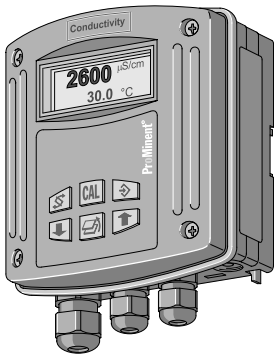


Microprocessor based dual process variable analyzer

(see page 230 for complete details)

- Controls or measures two variables in one of the following combinations: Free and Total chlorine, pH/chlorine, pH/pH, Cl02/pH, pH/ORP
- Menu driven calibration with limit and control settings
- Sensor diagnostics alarms upon sensor failure
- Programmable access code
- Non-volatile memory
- Two current analog signal outputs
- pH and temperature correcting variables
- Proportional or PID control
- Wall or panel mount available

DMT



PROFI PROCESS FIELD BUS

Single process variable transmitter

(see page 244 for complete details)

- Measures pH, ORP, chlorine, conductivity and temperature
- Menu driven calibration
- Automatic buffer recognition (pH)
- Two-wire technology
- 12-40 VDC, loop powered
- One current analog signal output
- NEMA 4X wall mounted unit

Analytical Instrumentation Overview

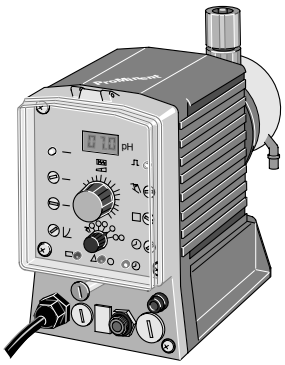
DDC

Microprocessor based multi-variable disinfection analyzer

(see page 246 for complete details)

- Controls or measures up to 5 different variables
  Free chlorine, Total chlorine, pH, ORP, temperature
- Display of combined chlorine
- Menu driven calibration with limit and control settings
- Integrated videographic recorder
- LAN interface
- OPC server
- 64MB SD card
- CAN bus chlorine sensors
- Intelligent analyzer with dosing time restrictions
- 5 contact inputs

D_4a



Solenoid pump with built-in process variable analyzer

(see page 255 for complete details)

- Analyzes pH or ORP
- NEMA 4X enclosure
- Proportional control
- Temperature correction for pH
- Single analog output
- Available relay outputs
- 6 pump models to choose from
- Liquid end materials to match chemical compatibility
- Auto-degassing liquid end available
- Single stage level switch option

Aquatrac Cooling Tower and Boiler Controllers

Wide range of controllers for water treatment applications

(see page 257 for complete details)

- Controls pH, ORP and Conductivity
- NEMA 4X enclosure
- Web Browser accessible
- Trackster 3 software
- Analog inputs and outputs
- Relay output and digital input options
- MODBUS
- Ethernet
- Control multiple Towers and Boilers
- Aquatrac flow switch
- CSA, CE, and UL rated

“solenoid-driven metering pumps” T.O.C. III

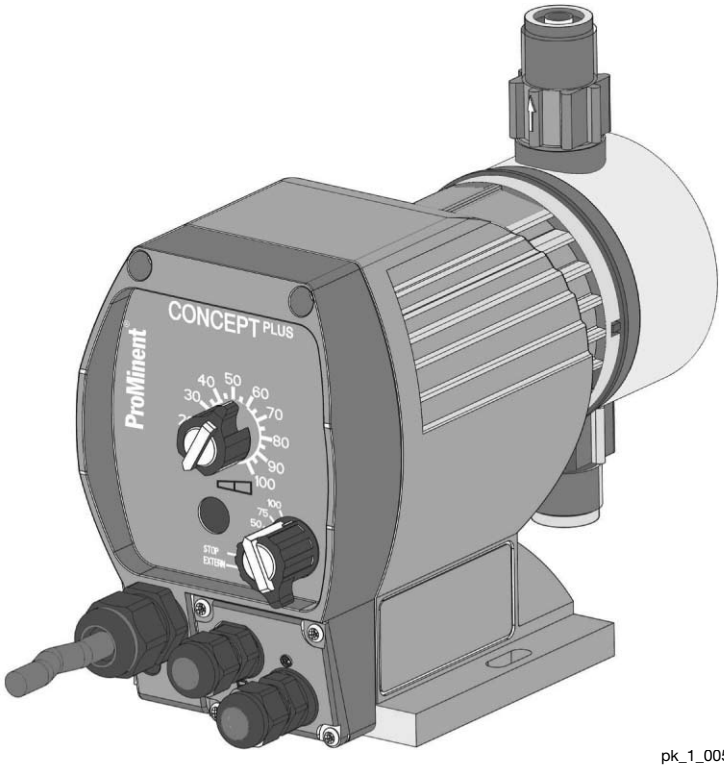
CATALOG SECTION TABS

ProMinent® Concept PLUS
Solenoid Diaphragm Metering Pumps

Overview: Concept PLUS

Ideal for basic chemical feed applications
(*see page 125 for spare parts AND page 138 for accessory kits*)

- Capacity range of 0.20 to 3.94 GPH (0.74 to 14.9 LPH) at pressures up to 232 psi (16 bar).
- Continuous stroke length adjustment from 0-100 % (recommended 30-100 %)
- Fixed frequency settings @ 0, 25, 50, 75 and 100%.
- Low cost opens up opportunities in the most basic applications
- NP, PP and PVT liquid ends
- Integral bleed valve simplifies priming and prevents “loss of prime” prevents “loss of prime”
- Lowest maintenance costs in its class
- Common applications: Cooling towers, chlorination and metal finishing



pk_1_005

ProMinent® Concept PLUS
Solenoid Diaphragm Metering Pumps

Capacity Data

Pump Type CNPA	Pump Capacity at Maximum Stroke Back Pressure psig	(bar)	U.S. GPH	(L/h)	Output Suction Stroke mL/ stroke	Max per Rate Stroke/ min	Max. Preprimed Lift (water) ft.	(m)	Suction/ Discharge Connector O.D. x I.D. (in.)	Shipping Weight (approx.) lbs.	(kg)
1000	145	(10)	0.20	(0.9)	0.07	180	20	(6)	1/4” x 3/16”	3.97	(1.8)
1601	232	(16)	0.29	(1.2)	0.10	180	20	(6)	1/4” x 3/16”	3.97	(1.8)
1002	145	(10)	0.55	(2.4)	0.19	180	16	(5)	1/4” x 3/16”	3.97	(1.8)
0704	102	(7)	1.03	(3.9)	0.36	180	13	(4)	1/4” x 3/16”	3.97	(1.8)
0308	43	(3)	2.25	(9.0)	0.79	180	20	(6)	3/8” x 1/4”	3.97	(1.8)
0215	21	(2)	3.94	(14.1)	1.40	180	5	(1.5)	3/8” x 1/4”	3.97	(1.8)

External pulse contact retrofit available as an option (P/N 1022000)

Materials In Contact With Chemicals

	Pump head	Valves	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

Pump diaphram with PTFE-coating.

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

ProMinent® Concept PLUS
Solenoid Diaphragm Metering Pumps

Identcode Ordering System

CNPa **Concept PLUS**

1000 1601 1002	0704 0308 0215	pump version:

	Liquid end materials:
PP	Polypropylene
NP	Acryllic/PVC
PV	PVDF

	O-rings:
B	Viton/b
E	EPDM
T	PTFE

Viton® is a registered trademark of DuPont Dow Elastomers

	Liquid end version:
2	With bleed valve, w/o valve springs (except 0704 models)
3	With bleed valve, w/ valve springs

	Hydraulic Connector:
0	Standard (In accordance with technical data)

	Labeling:
0	Standard with logo

			Electrical connection:
A	1 ph	230 V	50/60 Hz (Euro plug)
D	1 ph	115 V	50/60 Hz (US plug)
U	1 ph	230 V	50/60 Hz (US plug) (consult factory for pricing)

	Control Option:
0	Standard (w/o external control)
B	Pulse control

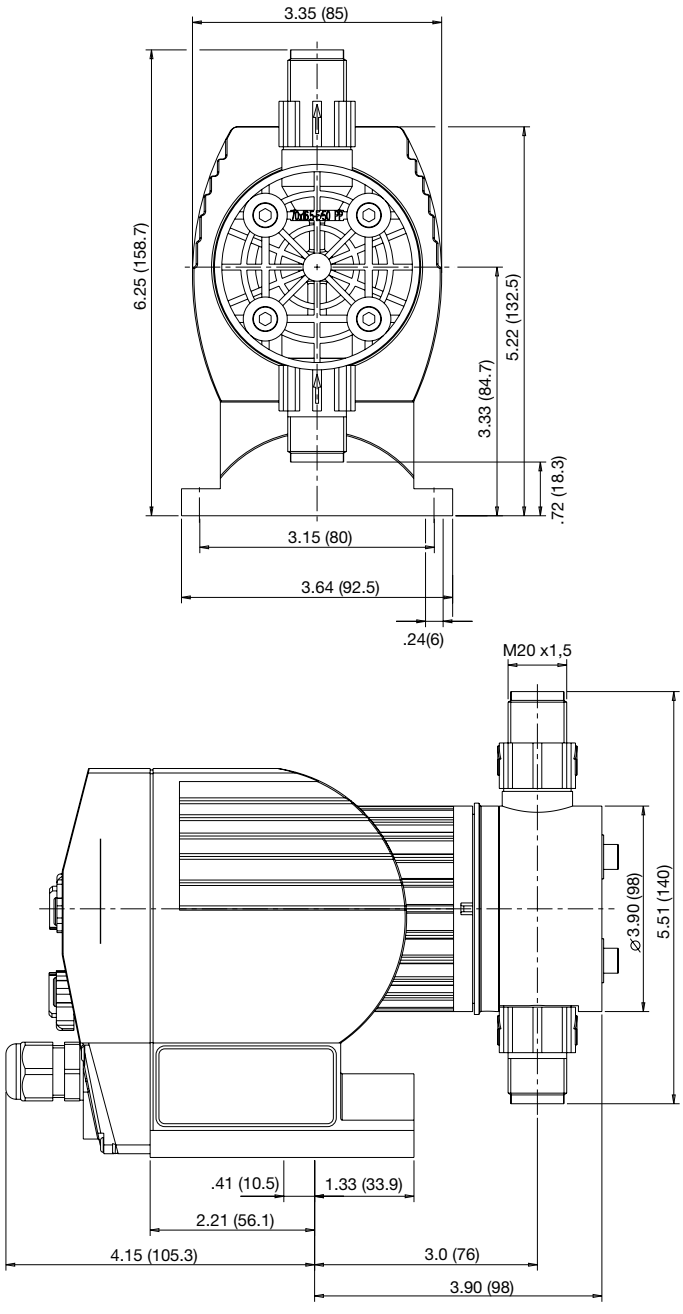
	Accessories:
1	With accessories (foot valve, injection valve, tubing)

CNPa	0215	PV	T	2	0	0	D	0	1

ProMinent® Concept^{PLUS} Solenoid Diaphragm Metering Pumps

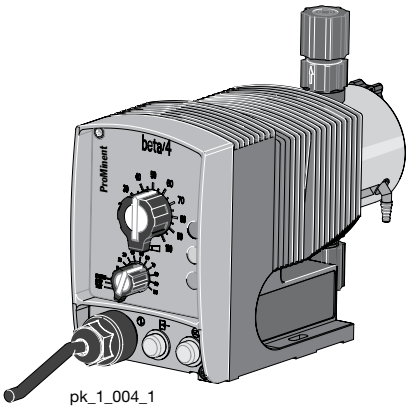
Dimensional Drawings

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



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.

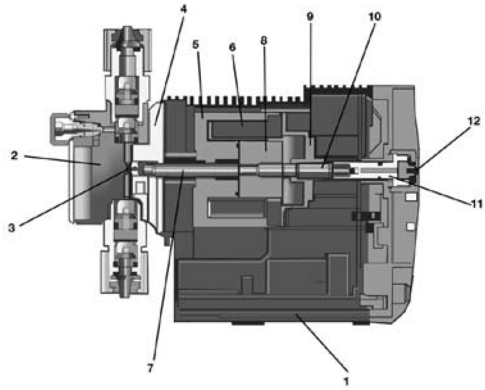
In the event of a diaphragm rupture, the liquid end has a weep hole on the bottom of the backplate to direct chemical out of the pump and away from the solenoid. An optional diaphragm failure monitor can be used to stop the pump and indicate a problem.

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®
Solenoid Diaphragm Metering Pumps

Specifications

The Liquid End

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

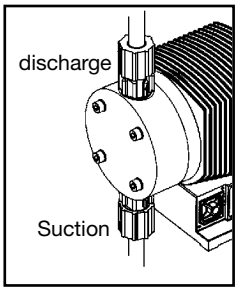
Some liquid ends are interchangeable between the BT4a and BT5a.

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 and NP liquid ends). Optionally this is available for the PVT versions.

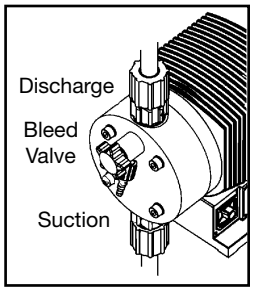
Automatic degassing liquid ends are available for PP and NP versions (except 1000 and 0232). This style liquid end discharges from the center and degasses from the top to prevent air build-up in the chamber.

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.

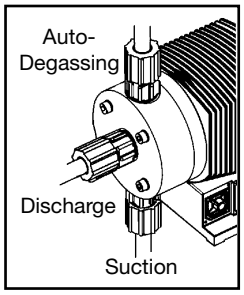
Suction and discharge ports are equipped with double ball check valves for superior repeatability.



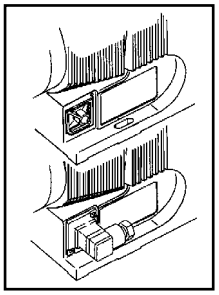
Liquid end without bleed valve



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.

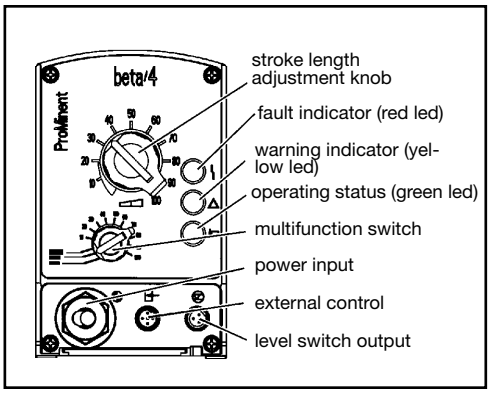
Fault Indicators

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					Capacity at 1/2 Maximum Backpressure					Pre-Primed Suction Lift		Max. Stroking Rate	Tubing Connectors** 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	inches	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.

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
NP	Acrylic/PVC
PV	PVDF
TT	PTFE
SS	SS

O-rings:

E	EPDM o-rings (PP, NP)
B	Viton® o-rings (PP, 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, NP, PVT; except version 0232 PP)
3	Wtih bleed valve, with springs (PP, 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)

Operating mode configuration:

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

Options:

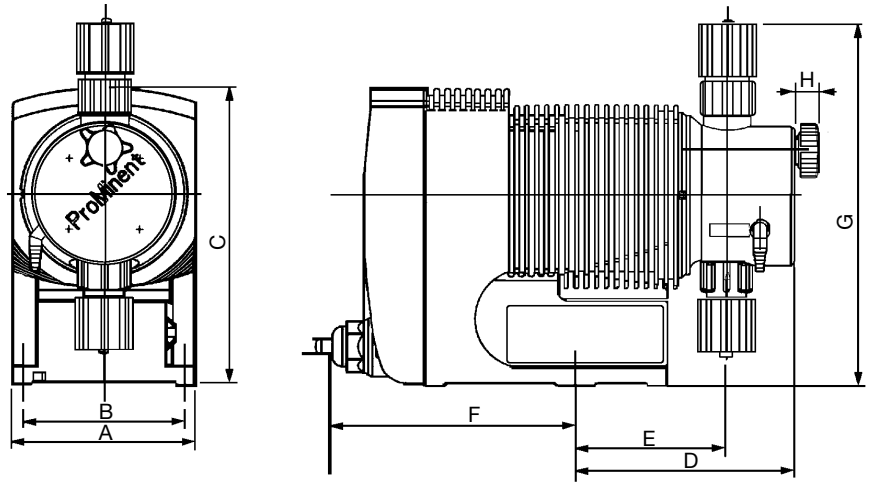
000	Standard

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

ProMinent® Beta®
Solenoid Diaphragm Metering Pumps

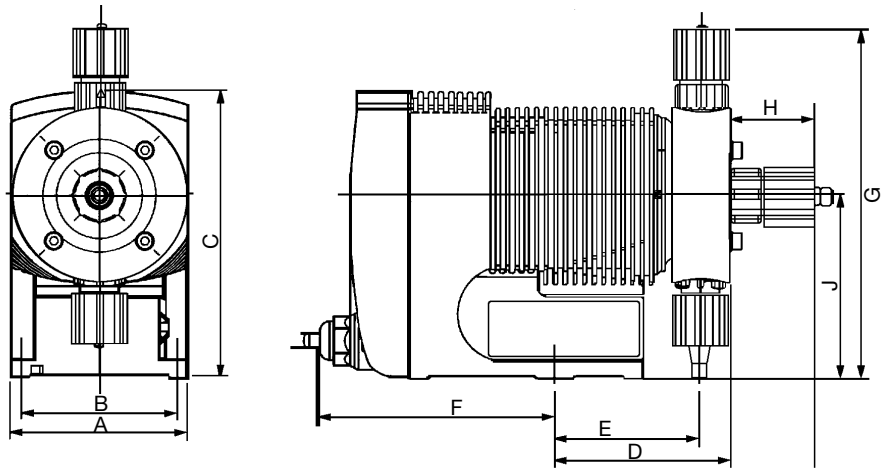
Dimensional Drawings

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)

ProMinent® gamma/ L
Solenoid Diaphragm Metering Pumps

Overview: gamma/ L

Ideal for applications requiring automation, large turndown and/or feed verification

(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 %
- Supplied in PP, Acrylic/PVC, PTFE, PVDF, stainless steel
- Patented bleeding on PP, PVDF and Acrylic/PVC versions
- Auto-degassing liquid end version in Acrylic/PVC
- HV liquid end for highly viscous media (Suitable for viscosities to 3000 cps)
- Digitally accurate stroking rate via keypad and large LCD display
- Select feed rate display in strokes/min. or gph
- Programmable pressure levels
- Flow monitor input
- External Control: Voltage free contact, pulse m/d and/or 4-20 mA input
- Interface for PROFIBUS® DP *(see page 138)*
- Two stage float switch connector
- Optional 14-day programmable timer with software for PC programming
- 12-24 V DC, 24 V AC low voltage version
- LED's for operational status
- Concentration entry option for proportional flow metering

pk_1_005

ProMinent® gamma/ L Solenoid Diaphragm Metering Pumps

Overview: gamma/ L

The gamma/L is a diaphragm-type, solenoid-driven, microprocessor based metering pump with maximum capacities to 8.4 gph (32.0 L/h) and maximum backpressure to 232 psig (16 bar).

ProMinent® solenoid-driven metering pumps consist of two main components: the pump drive unit and the liquid end.

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. A removable hood covers the faceplate.

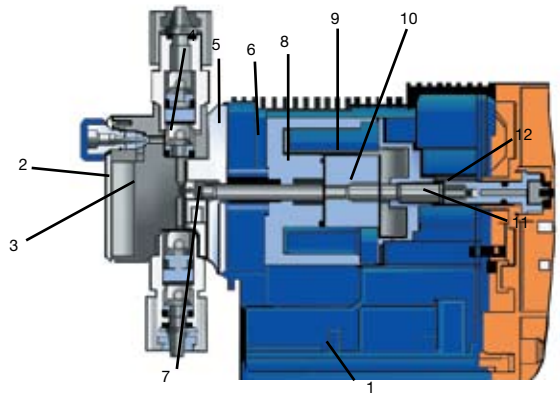
The solenoid drive unit houses a short-stroke solenoid with a maximum stroke length 0.05" (1.25mm). It is equipped with a noise suppressing mechanism for quiet operation and the armature is the only moving part. The gamma/L series offers two solenoid sizes.

Operating on pulse action, each pulse generates a magnetic field in the solenoid coil. This magnetic field moves the armature forward, which has the diaphragm attached to the end. The diaphragm moves 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 positions. 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 directly connected to the solenoid. Adjustment results in an accurate self-locking stroke length setting.

cutaway view of ProMinent gamma/L 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

Diaphragm

The diaphragm is constructed of fabric-reinforced EPDM elastomer with a plastic core and PTFE-facing. It is chemically resistant against virtually all process fluids and can be used over a wide temperature range.

The gamma/L diaphragm is convex. The curved shape contributes to more precise metering and alleviates stress placed on the diaphragm by reducing liquid end dead volume.

Overview: gamma/ L

The Liquid End

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

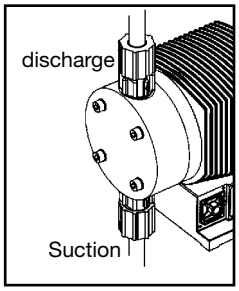
Some liquid ends are interchangeable.

Options include a manual bleed valve for easy priming and auto degassing for fluids that tend to off-gas (available with versions PP, NP). Optionally this is available for the PVT versions.

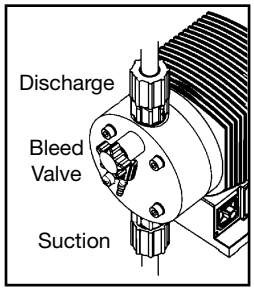
Automatic degassing liquid ends are available for PP and NP versions (except 1000 and 0232). This new-style liquid end discharges from the center and degasses from the top to prevent air build-up in the chamber.

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.

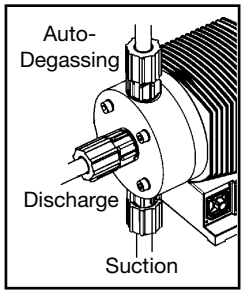
Suction and discharge ports are equipped with double ball check valves for superior repeatability.



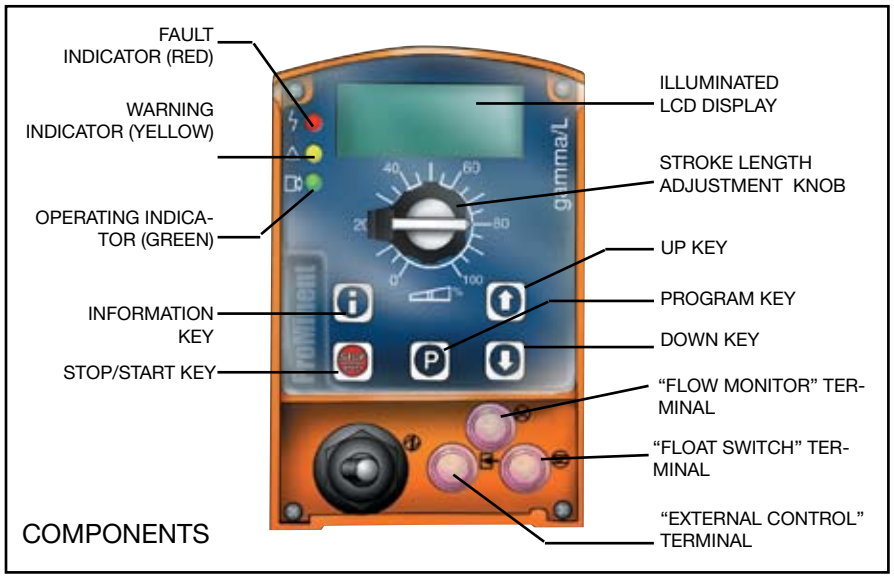
Liquid end without bleed valve



Liquid end with bleed valve



Auto-degassing liquid end



COMPONENTS

c UL us Recognized
CE Available

ProMinent® gamma/ L Solenoid Diaphragm Metering Pumps

Standard Modes and Functions

Feed rate is determined by stroke length and stroke rate. Stroke length is manually adjustable from 1 to 100% in increments of 1% via the stroke length knob. Optimum repeatability is between 30-100% or 50-100% when using an auto-degassing liquid end.

Stroke rate can be set to a maximum of 180 strokes per minute. An illuminated LCD displays stroke length, stroke rate and an accumulative stroke counter, which can be cleared and reset.

Pump capacity output is displayed in either U.S. gph or L/h, set by the operator. Totalized capacity is also displayed in either U.S. gallons or litres.

The "i" key is used to scroll information screens for stroke rate, stroke length, stroke counter, capacity and totalized capacity. Other information is available depending on options ordered.

Basic Control Modes

Four control modes are available with the gamma/L: manual, external contact 1:1, external contact with pulse control (multiplier/divider), batch or analog control. The basic version includes manual and external contact 1:1. The Profibus option includes all control modes, plus fieldbus connection.

In the "Manual" mode, stroke rate is controlled manually. The "Contact" external 1:1 mode allows adjustments to be made externally (e.g. by means of a pulse-type water meter for proportional chemical feed). Pulse signals are fed into the contact input of the pump by an optional control cable. Each 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.

Note: Universal Control Cable necessary for all Gamma/L control capabilities.
(See Accessories *page 138*)

Standard Functions

"Calibrate"

The pump can be directly calibrated in-line to determine output on standard liquid ends and 50% to 100% on auto-degassing liquid ends. A warning indicator flashes when adjustments to the stroke volume are made outside the calibrated range of +/- 10% of stroke length.

"Pressure Level"

Backpressure control can be adjusted depending on max. psig of pump version.

"Auxiliary Frequency"

An auxiliary frequency can be programmed. This default value can be enabled via an optional control cable.

"Flow"

The gamma/L series metering pumps will monitor their own output with the optional adjustable flow monitor connected to the discharge valve. Every fluid discharge is sensed and fed back to the electronic control circuit of the pump. If insufficient fluid is discharged for a predetermined number of strokes (up to 125), the pump automatically stops and the red LED lights. The optional fault relay changes state to issue an alarm or activate a standby pump.

"Float Switch"

An optional two-stage ProMinent float switch can be plugged into the pump to monitor chemical levels in the source tank. An early warning is issued when the allowable minimum level is reached. The pump continues to operate while the display flashes, the yellow LED lights and an optional 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, the LCD displays "Minim" and the red LED lights. The optional fault relay remains activated.

"Pause"

The gamma/L series can be switched on or off via a dry contact through the optional control cable. This function operates only via the "external control" terminal.

"Stop"

The gamma/L can be stopped by pressing the STOP/START key without disconnecting from the main power supply.

"Prime"

Priming is activated by pressing both arrow keys at the same time.

Function and Errors Indicators

Three LED lights on the pump faceplate signal operational status. The green light flashes during normal operation, and the yellow light warns of a situation that could lead to a fault (e.g. low chemical). If a fault occurs "error" will appear on the LCD screen and the red LED light appears.

Optional Modes and Functions

Optional Control Modes

"Analog" Mode

With this option, the stroking rate of the gamma/L 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 set to 4-20 mA , or custom curve.

"Contact" Mode with Pulse Control

This feature is used to "tune" the gamma/L 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 0.01-99.99 range, the step-up or step-down ratio is set.

For example:

Step-up Factor:
99.99 1 pulse = 99.99 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

"Batch" Mode

The Batch mode is a variation of the contact operating mode. A number of strokes can be entered up to 65,535 strokes (whole numbers) or the feed quantity can be entered. The batch is then initiated by either pressing the "P" key on the pump face or providing a contact to the external control cable. Note: Pulse control is needed to run the batch mode.

Access Code

A programmable access code to prevent unauthorized changes to settings is available as an option.

Relay outputs. . .

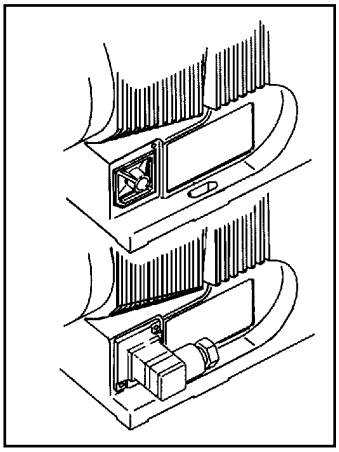
Fault annunciating relay

For low tank level (flow switch), loss of flow (flow monitor), system faults and fuse/power supply failure.

Fault annunciating and Pacing relay

In addition to the fault annunciating 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.

4-20 mA Analog Output



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

A 4-20 mA analog output option is available for use with pumps that operate in the manual mode or by a remote 4-20 mA analog signal. The 4-20 mA analog output signal is linear to pump frequency multiplied by the percentage of stroke length. The output signal is isloated and can drive up to 300 Ohms impedance. Analog output can be used for status feedback to higher level control systems for closed loop control or for monitoring chemical usage. This option is available in combination with either the fault annunciating or pacing relay.

Timer Relay

The optional integrated 14-day timer offers 81 programmable events. It can be set to hourly, daily, work days, weekend, weekly or two-week periods with switch-on times from 1 second to two weeks. The timer can be programmed to change operation mode, frequency and the function of two relays. All the functions can be programmed independently of one another. Up to 13 delay times can be programmed into the timer function.

The range of applications exceeds that of a "standard timer". Typical applications are disinfection in cooling towers, process water, etc., with the ability to automatically program shock dosages or increase the concentration at a certain interval.

Fieldbus connection

Monitor and control remotely via a SCADA/PLC system using the Profibus-DP system.

Note: Relay options not available with Profibus. Profibus is not field retrofittable.

iNFORMATION DISPLAYS

All modes
Stroke rate (frequency)
Stroke length (percent)
Stroke counter (N)
Capacity (gph or L/h)
Dosing quantity (gal or L)

Mode dependent
Accumulative strokes (*N)
Accumulative quantity (*gal or *L)
mA current (mA)
Pulse factor / Memory (*)
Indication of external mode (EXT)

ProMinent® gamma/ L 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:	100-230 VAC, 1 phase, 50/60 Hz, +/- 10%; 12-24 VDC or 24 VDC +/- 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. The minimum stroke length with auto-degassing liquid end is 50%.
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: 24 V, 2 A, 50/60 Hz Operating life: > 200,000 switch functions Residual impedance in ON-position (R_{DSOn}): < 8 W Residual current in OFF-position: <1mA Maximum voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: $15x10^9$ Contact closure: 100 ms (for pacing relay)
Analog output signal:	Max. impedence 300 W Isolated 4-20 mA output signal
Profibus - DP fieldbus options:	Transfer: RS - 485 Wiring: 2-wired, twisted, shielded Length: 3637 ft. (1200 m)/328 ft. (100 m) Baud rate: 9600 bits/s; 12 Mbits/s No. of participants: 32 with 127 repeaters Topology: Line Access procedure: Master/master with token ring
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)
PVDF	149°F (65°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) / current drain at pump stroke (Amps)	
1000, 1601, 1602, 1005, 0708, 0413, & 0220 :	**17W / 0.7 A or 15 A (peak current for approx. 1 ms)**
1605, 1008, 0713, 0420 & 0230 :	**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 in United States and Canada, CE available
Valve threads:	NP, PP, PVT, TT Versions: M20 x 1.5 (provided with tubing adapters)
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 <0.7 V, the contact load is approximately 0.5 mA at +5 VDC. (Note: Semiconductor contacts that require >0.7 V 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 liquid ends max. 3000 cPs for high-viscosity liquid ends

ProMinent® gamma/ L Solenoid Diaphragm Metering Pumps

Capacity Data

Pump Version	Capacity at Maximum Backpressure					Capacity at 1/2 Maximum Backpressure					Pre-Primed Suction Lift		Max. Stroking Rate	Suction/Discharge Tubing Connectors** 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	inches	lbs.	(kg)
GALa																
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	7.5-8.6	(3.4-3.9)
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	7.5-8.6	(3.4-3.9)
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	7.5-8.8	(3.4-4.0)
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	7.7-9.0	(3.5-4.1)
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	7.7-11.0	(3.5-5.0)
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	7.7-11.0	(3.5-5.0)
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	7.7-11.0	(3.5-5.0)
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	9.3-10.8	(4.2-4.9)
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	9.5-12.8	(4.3-5.8)
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	9.5-12.8	(4.3-5.8)
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	9.5-12.8	(4.3-5.8)
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	9.9-13.9	(4.5-6.3)
GALa with auto-degassing liquid ends																
1601	232	(16)	0.16	(0.59)	0.055	116	(8)	0.21	(0.78)	0.07	5.9	(1.8)	180	1/4 x 3/16	7.7	(3.5)
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	7.7	(3.5)
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	7.7	(3.5)
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	7.7	(3.5)
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	7.9	(3.6)
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	7.9	(3.6)
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	9.5	(4.3)
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	9.5	(4.3)
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	9.5	(4.3)
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	9.5	(4.3)

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.

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. Flooded suction is recommended.

* Not available with bleed valve in PP version.

** 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 Gamma/ L 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 diaphram with PTFE-coating.

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

ProMinent® gamma/ L Solenoid Diaphragm Metering Pumps

Identcode Ordering System

GALa — **gamma/L, Version a**

Pump version:

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

*Versions available with high viscosity liquid ends

Liquid end materials:

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

Seal:

E	EPDM o-rings (PP, NP)
B	Viton® o-rings (PP, NP)
T	PTFE o-rings (PVDF, TT, SS)
P	EPDM diaphragm with EPDM o-rings (PP, NP)
V	Viton® diaphragm with Viton® o-rings (PP, NP)

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)
1	W/o bleed valve, with springs (TT, SS and version 0232)
2	With bleed valve, w/o springs (PP, NP; PVT except version 0232 PP)
3	With bleed valve, with springs (PP, 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 (Required with Profibus)
1	Fault annunciating relay, drops out
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay
C	Option 1 + 4-20 mA analog output
D	Option 3 + 4-20 mA analog output
E	Pacing relay + 4-20 mA analog output

Accessories:

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

Control Variants: (Pulse control is needed to run the batch mode)

0	Manual + External 1:1
1	Manual + External with pulse control (multiplier/divider)
2	Manual + External 1:1 with analog control
3	Manual + External with pulse control & analog control
4	Option 0 + Timer
5	Option 3 + Timer
P	Option 3 + Profibus (Relay must be 0)

Access Code:

0	No Access Code
1	Access Code

Flow Monitor:

0	Input for metering monitor signal (pulse)
1	Input for maintained flow switch signal

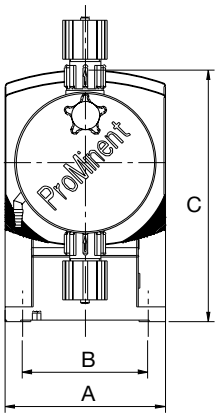
Pause/Float:

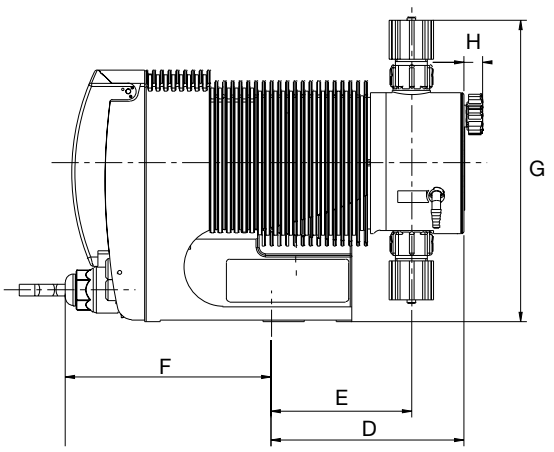
0	Standard

GALA 1602 NP B 2 0 0 U D 0 1 0 0 0 0

Dimensional Drawings

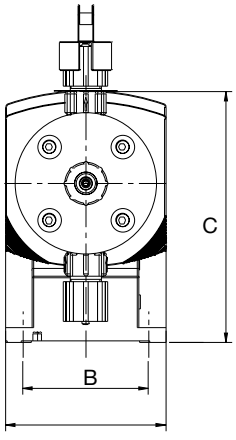
Dimensions in inches (mm).
Ranges given, actual dimension dependant on liquid end material.

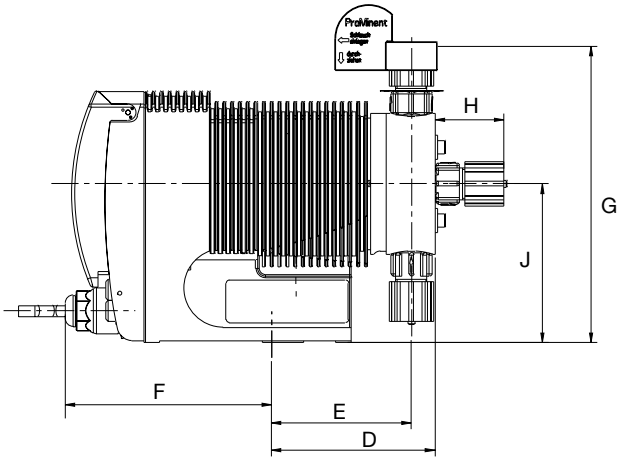




Pump	A	B	C	D	E	F	G	H
GALa	4.0 (102)	3.1 (80)	6.3 (160)	3.3-4.3 (85-110)	2.8-3.1 (71-80)	5.8 (147)	6.4-8.5 (162-217)	0.5-0.6 (12-14)

With Auto-Degassing Liquid Ends





Pump	A	B	C	D	E	F	G	H	J
GALa	4.0 (102)	3.1 (80)	6.3 (160)	3.5-3.6 (89-92)	2.9-3.0 (74-77)	5.8 (147)	6.7-7.4 (177-189)	1.7 (44)	4.0 (101)

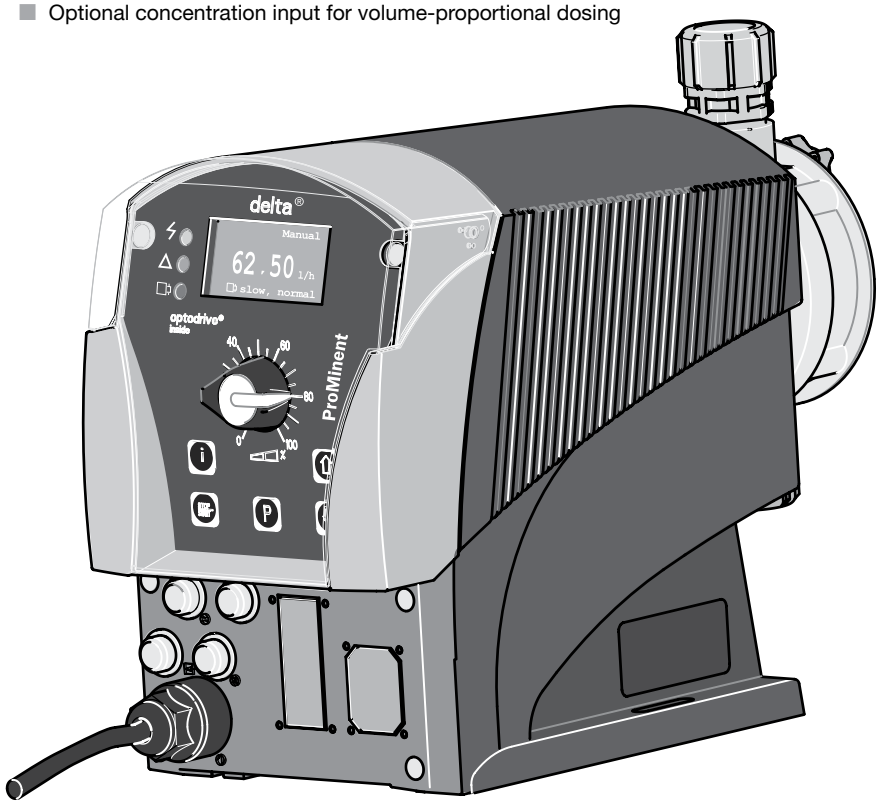
ProMinent® delta®
Solenoid Diaphragm Metering Pumps

Overview: delta®

Ideal for applications requiring metering pump accuracy with minimal pulsation

(see page 131 for spare parts, page 138 for accessory kits and page 138 for control cables)

- Continuous or pulsating dosing
- Configurable suction and delivery stroke duration
- Pump can be adapted to the dosing media
- Integrated optoGuard monitoring detects blocked dosing points, broken dosing lines and air or gas bubbles trapped in the dosing head
- Capacities: 2.0 gph (7.5 lph) to 19.8 gph (75.0 lph)
- Stroke length continuously adjustable from 0 - 100% (recommended range 30 - 100%)
- Acrylic, PVDF and stainless steel material versions
- Patented coarse/fine ventilation
- Optional detection and indication of diaphragm failure
- Adjustment and display of pump delivery from the keypad with choice of display in l/h or strokes/min
- Optional external auto-degassing solenoid kit available for outgassing media
- Large backlit graphic display
- External control options via voltage-free contacts with optional increase/reduce speed pulse
- Optional external control via standard 0/4-20 mA signal
- Interfaces for PROFIBUS® DP *(see page 138)* or CAN bus system
- 14-day process timer option for time and event-dependent dosing duties
- Connections for 2 stage level switch and flow monitor
- 3 LED displays for operation and warning and error message in plain text
- Optional concentration input for volume-proportional dosing



pk_1_131_2

ProMinent® delta®
Solenoid Diaphragm Metering Pumps

Capacity Data

Capacity at Maximum Backpressure

delta® Pump Type	gph	(l/h)	psig	(bar)	strokes/ min.	Pre-primed suct. lift ft.	(m)	Suction/Discharge connectors in.	lbs.	Shipping weights** (kg)
2508	2.0	(7.5)	363	(25)	200	19.6	(6)	3/8" x 1/2" (1/2" MNPT dis. only)	22-24	(10-11)
1608	2.1	(7.8)	232	(16)	200	16.4	(5)	3/8" x 1/4"	22-24	(10-11)
1612	3.0	(11.3)	232	(16)	200	19.6	(6)	3/8" x 1/4"	22-24	(10-11)
1020	5.0	(19.1)	145	(10)	200	16.4	(5)	1/2" x 3/8"	22-24	(10-11)
0730	7.7	(29.2)	102	(7)	200	16.4	(5)	1/2" x 3/8"	22-24	(10-11)
0450	12.9	(49.0)	58	(4)	200	9.8	(3)	5/8" ID hose barb standard*	22-24	(10-11)
0280	19.8	(75.0)	29	(2)	200	6.7	(2)	5/8" ID hose barb standard*	22-24	(10-11)

* (1/2" MNPT optional)

** Higher values are for SS

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

Materials In Contact With Chemicals

Version	Dosing head	Suction/discharge connector	O-rings	Ball valves
PVT	PVDF	PVDF	PTFE	Ceramic
SST	Stainless steel	Stainless steel	PTFE	Ceramic
NPE	Acrylic	PVC	EPDM	Ceramic
NPB	Acrylic	PVC	Viton®	Ceramic

PTFE-coated dosing diaphragm

Dosing repeatability ± 2% when used in accordance with the operating instructions

Permissible ambient temperature –10°C to +45°C

Viton® is a registered trademark of DuPont Dow Elastomers.

ProMinent® delta®
Solenoid Diaphragm Metering Pumps

Identcode Ordering System

DLTA — **ProMinent® delta® series**

Version:	Capacity:
2508	2.0 gph (7.5 l/h), 363 psi (16 bar)
1608	2.1 gph (7.8 l/h), 363 psi (25 bar)
1612	3.0 gph (11.3 l/h), 232 psi (16 bar)
1020	5.0 gph (19.1 l/h), 145 psi (10 bar)
0730	7.7 gph (29.2 l/h), 102 psi (7 bar)
0450	12.9 (49.0 l/h), 58 psi (4 bar)
0280	19.8 (75.0 l/h), 29 psi (2 bar)

Liquid end materials:

PV	PVDF (for models 1608, 1612, 1020, and 0730)
SS	SS
NP	Acrylic glass/PVC (for pump type 2508, 1608, 1612, 1020 & 0730)

Seals:

T	PTFE seals
E	EPDM o-rings (NP only)
B	Viton® o-rings (NP only)

Liquid end version:

0	W/o bleed valve, w/o springs (for SS liquid ends)
1	W/o bleed valve, with springs (for SS liquid ends)
2	With bleed valve, w/o springs
3	With bleed valve, with springs
4	W/o bleed valve, with springs (for high viscosity only)

Connection:

0	1/2" x 3/8" tubing (for models 1020 & 0730); 5/8" hose barb (for models 0450 & 0280); 3/8" x 1/4" tubing (for models 1608 and 1612)
6	1/2" MNPT Connections (for models 0450 & 0280 and 2508)

Diaphragm failure indicator:

0	Without diaphragm failure indiactor
1	With diaphragm failure indicator

Labeling:

0	Standard, with ProMinent logo

Electrical connection (± 10%):

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

Relay:

0	Without relay (Required with Profibus)
1	Fault annunciating relay, drops out
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay
A	Alarm indication + pump shut off
C	Option 1 + 4-20 mA analog output + fault output (24V 100 mA max.)
F	Auto-degassing valve (not available for version 2508)*
G	Auto-degassing valve + fault relay (not available for version 2508)*

Accessory kit:

0	Not included
1	FV, IV, 15' Tubing (3/8" x 1/4") PVC (for model 1608)
1	FV, IV, 15' Tubing (3/8" x 1/4") PVDF (for model 1612)
1	FV, IV, 15' Tubing (1/2" x 3/8") PVC (for model 1020)
1	FV, IV, 15' Tubing (1/2" x 3/8") PVDF (for model 0730)
1	FV, IV, 5' Suction Tubing (1/2" x 3/8") PVC (1/2" MNPT on Discharge) (for model 2508)
1	FV, IV, 15' Hose (5/8" ID) PVDF (for models 0450 & 0280)

Control Versions:

0	Manual + External contact (multiplier/divider)
3	Manual + External with pulse control & analog control
4	Option 0 + 14 day Timer*
5	Option 3 + 14 day Timer*
P	Option 3 + Profibus d Sub 9 (Relay must be 0)*
R	Option 3 + Profibus M12 (Relay must be 0)*
C	CANopen

Security:

0	No Access Code
1	Access Code

Language:

EN	English

Pause/Float:

0	Standard

* Available April 2008

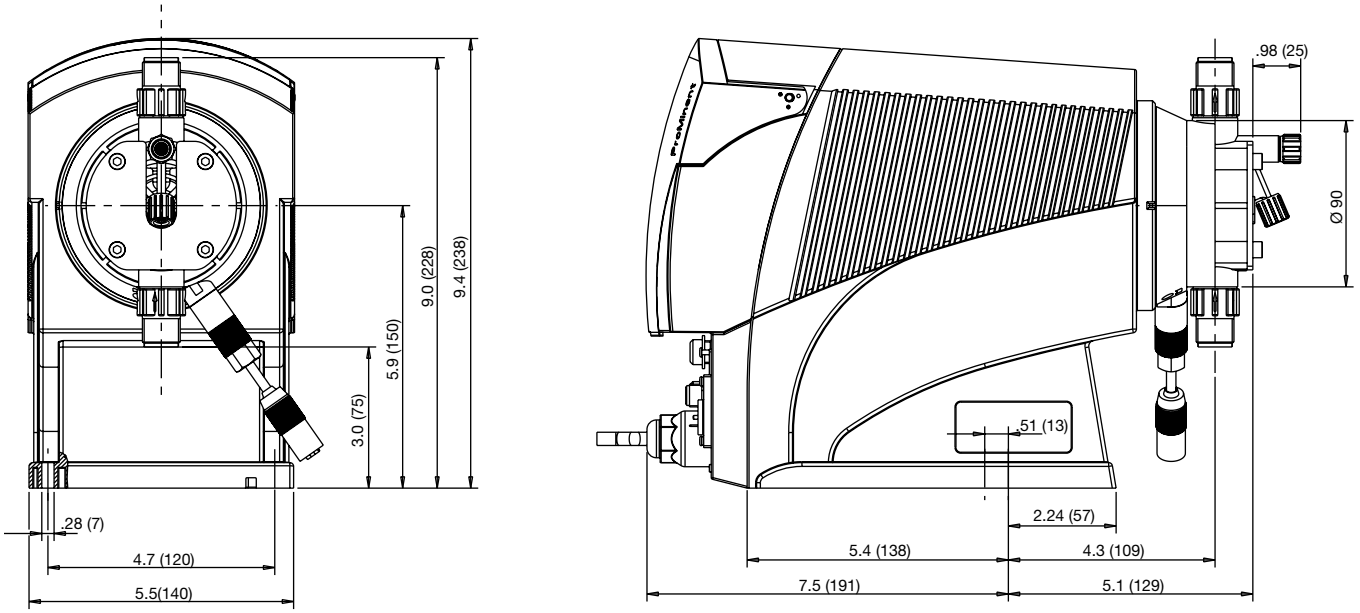
DLTA	1612	PV	T	2	0	0	0	U	D	0	0	0	1	EN	0

ProMinent® delta®
Solenoid Diaphragm Metering Pumps

Dimensional Drawings

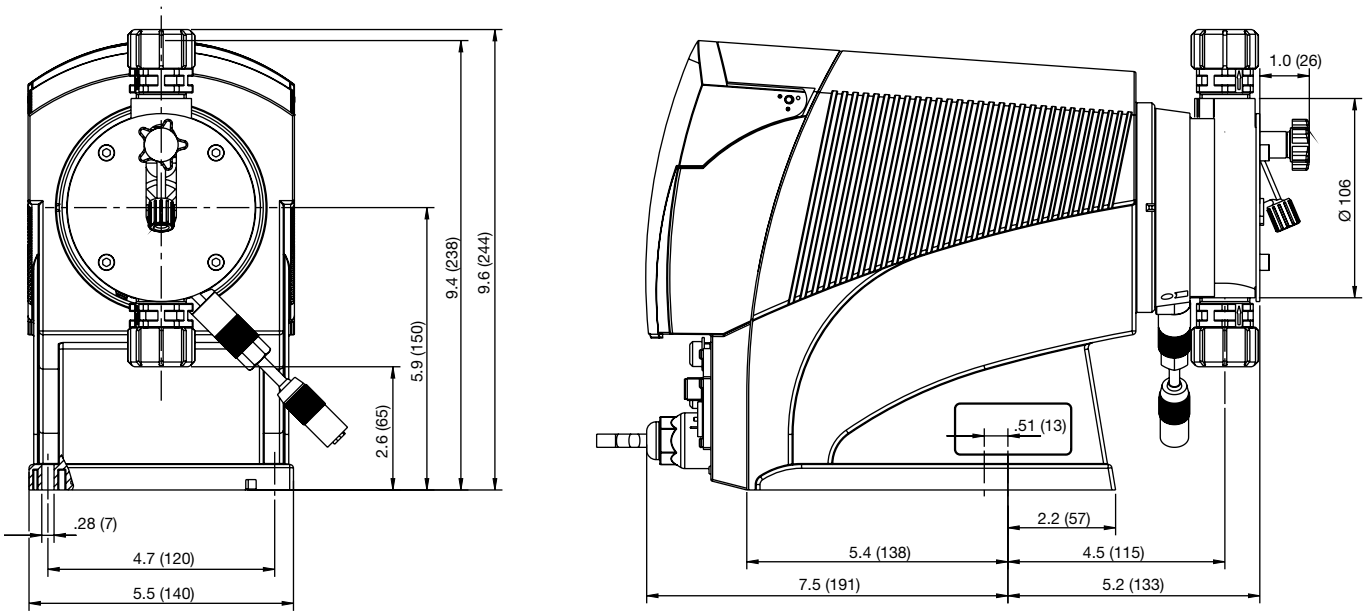
Dimensions in inches (mm).
Ranges given, actual dimension dependant on liquid end material.

Dimensions of delta® type 1612 - 0730 PVT



dimensions in inches (mm)

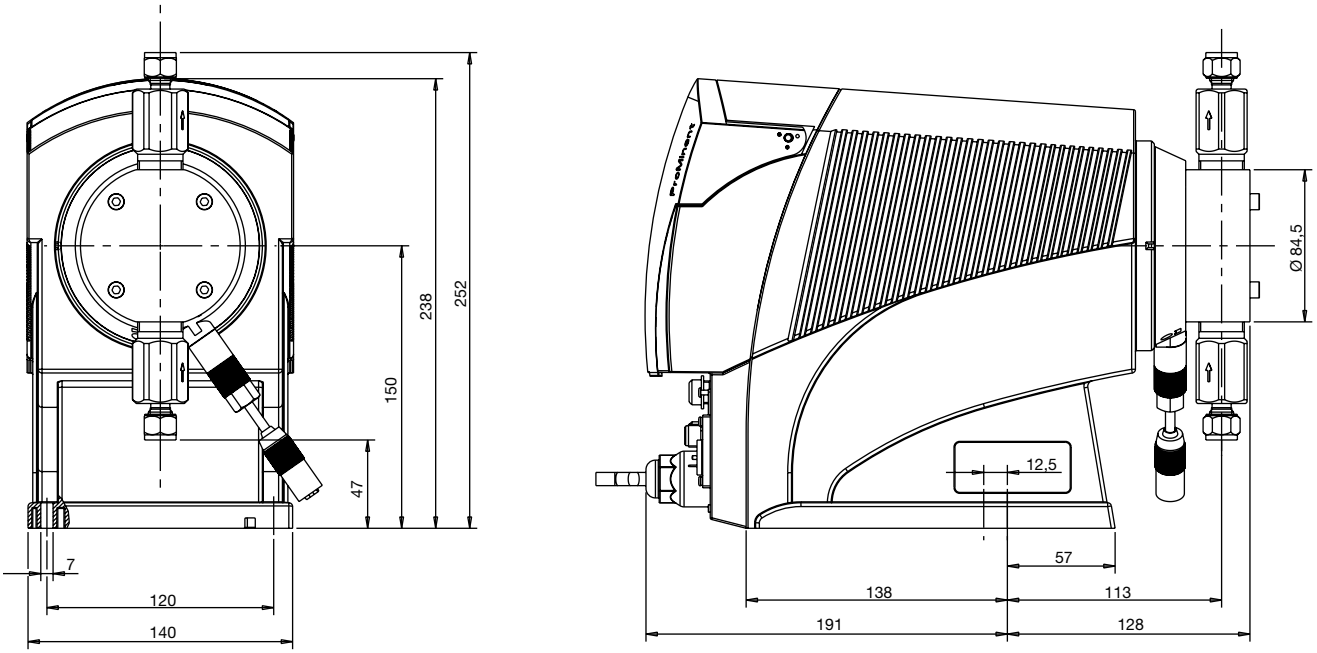
Dimensions of delta® type 0450 - 0280 PVT



dimensions in inches (mm)

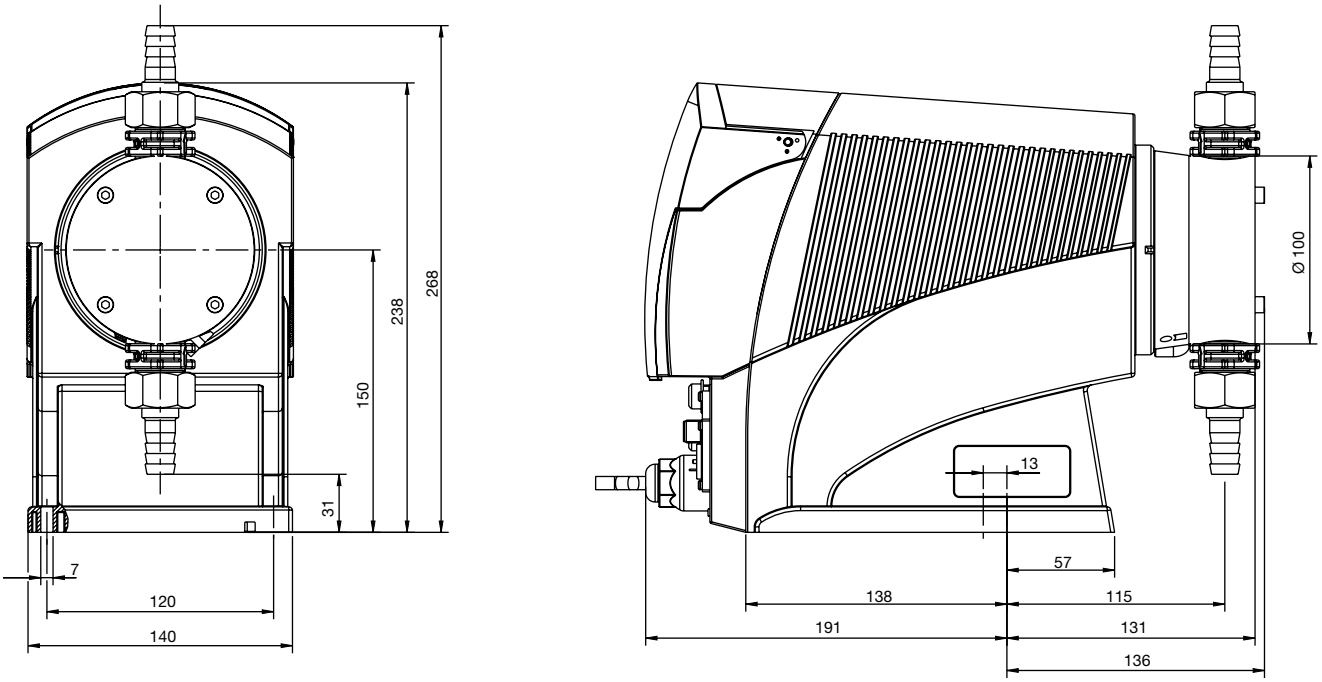
Dimensional Drawings

Dimensions of delta® type 1612 - 0730 SST



dimensions in inches (mm)

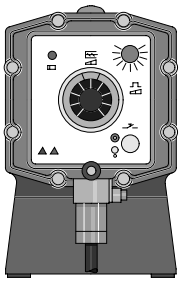
Dimensions of delta® type 0450 - 0280 SST



dimensions in inches (mm)

ProMinent® EXtronic®
Solenoid Diaphragm Metering Pumps

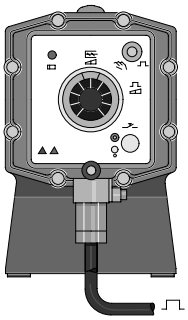
Overview: EXtronic®



pk_1_020

Control type “Internal”

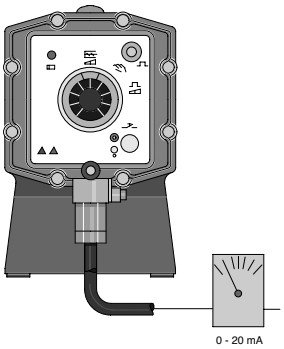
Stroke length adjustment 1:10, stroking rate adjustment 1:25, total adjustment range 1:250.



pk_1_019

Control type: “External Contact”

Stroke length adjustment 1:10, stroking rate control 0-100 % dependant upon external switch contacts. *)



pk_1_018

Control type: “Analogue”

Stroke length adjustment 1:10, Stoke frequency control 0-100 % proportional to analogue signal 0/4-20 mA. *)

*) The electrical cables for mains connection, contact or analogue control are already connected to the pump. Observe all instructions concerning connecting and activating electrical systems.

Ideal for explosion-proof applications

(*see page 129 for spare parts)*

The ProMinent EXtronic series represents a proven technology for metering liquid media in hazardous areas classified in accordance with Zone 1 and in fire-damp-endangered mining applications.

- The new microprocessor control compensates for fluctuations in the power supply. Automatic switchover from 50 Hz to 60 Hz operation with no change in capacity.
- Operating voltage of 500V increases the scope of application for ProMinent EXtronic (e.g. in conjection with the new EXBb M version for fire-damp-endangered areas in mining applications).
- The short-stroke solenoid drive is combined with liquid ends from the ProMinent gamma series. The material version SB material is recommended for use with flammable media.
- The control inputs “External Contact”, “Analog”, and “Zero Volts ON/OFF”are intrinsically safe for the EXBb-registered in accordance with EN 50020.
- The 2501 SSM/SBM type is available with diaphragm failure detection
- The capacity range extends from 0.06 gph (0.19 L/h) to 15.8 gph (60 L/h) at backpressures of up to maximum 363 psig (25 bar).

Factory Mutual Hazard Classification

Factory Mutual Research Corporation has certified that EXtronic series pumps are in compliance with explosion-proof classifications Class 1, Division 1, Groups B, C and D indoor hazardous locations; and with intrinsically safe output connections for Class 1, Division 1, Groups A, B, C, and D hazardous locations. Installation must be in accordance with manufacturer’s instructions and the National Electrical Code.

CSA Approval

CSA approved for Class 1, Division 1, Groups B, C and D locations.

ProMinent EXtronic metering pumps are tested and classified in compliance with harmonized European Standards EN 50014/50018 for “flame-proof enclosure.” They have the highest degree of protection in this type of enclosure class. This approval is recognized by many other countries outside the EC member states.

The short-stroke solenoid and electronic control are integrated in the pump housing. The enclsoure rating in accordance with DIN 40050, even with the front cover open, is NEMA 4.

The liquid end is equipped with a registered multi-layer (Teflon coated) pump diaphragm. The liquid end is made of Acrylic, Polypropylene (PP), PTFE-Teflon, 316 stainless steel and SB for flammable chemicals to ensure maximum operating safety.

Self-bleeding liquid ends made of Acrylic (NS) and PVC (PS) are available for off-gassing fluids.

The micrometering adjusting knob for the stroke length enables precision setting of the capacity and ensures a high degree of repeatability. A comprehensive range of explosion-proof ancillary equipment and pump accessories is available.

EXBb G for use in gas and fire damp hazardous areas
Degree of protection EEx [i,a] d IIC T6

EEX - Explosion-proof equipment built in accordance with European standards

[i,a] - Intrinsically safe control input in the case of two independent faults occurring

d - Flameproof enclosure protection

IIC - Explosion Group II for all hazardous areas apart from mines (includes IIA and IIB)

T6 - Temperature class approval for gases and vapours with ignition temperature > 85ºC

EXBb M for use in hazardous mining operations
Degree of protection EEX d I/IIC T6

EEX - Explosion-proof equipment built in accordance with European standards

d- Flameproof enclosure protection

IC - Explosion Group I for firedamp-endangered mines

IIC - Explosion Group II for all other hazardous areas apart from mines (includes IIA and IIB)

T6 - Temperature class approval for gases and vapors with ignition temperature > 85ºC. This is the highest temperature class; it includes T1 to T5.

ProMinent® EXtronic® Solenoid Diaphragm Metering Pumps

Specifications

Maximum stroke length:	0.026” (0.65 mm) for pump models 1000 0.049” (1.25 mm) for all other models
Materials of construction	
Housing:	Epoxy coated die cast aluminum
Diaphragm:	PTFE faced EPDM with steel core
Liquid end options:	Polypropylene, Acrylic/PVC, PTFE, 316 SS, high-viscosity Polypropylene
Enclosure rating:	NEMA 4X (IP 65); insulation class F
Power supply:	500V ±6%, 50/60 Hz 230V ±10%, 50/60 Hz 115V ±10%, 50/60 Hz
	Mean power input at max. stroke frequency (W)/peak current consumption for metering stroke (A) at 230V, 50/60 Hz EXBb Type 1000, 1601, 1201, 0803, 1002, 0308: 23/25 W/0.9 A at 120 strokes/min. EXBb Type 2502, 1006, 0613, 0417: 54/61 W/2.1 A at 120 strokes/min. EXBb Type 2505, 1310, 1014, 0430, 0260: 77/83 W/3.1 A at 110 strokes/min.
Thermal protection:	Yes
Check valves:	all models double ball except single ball on PP4 (HV) models
Repeatability:	When used according to operating instructions, ±2%; For type 1601 with self-degassing liquid end, ±5%.
Power cord:	6 ft. (2 m) 2 wire plus ground (no plug)
External control cable:	6 ft. (2 m) 2 wire
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)

Max. allowable input current:	50 mA
Warranty:	Two years on drive; one year on liquid end.
Industry standards:	Factory mutual (explosion-proof, intrinsically safe), CSA approved and CE approved. EN 50014/50018; VDE 0170/0171-5.78
Standard Production Test:	**100% tested for rated pressure and volume**
Max. solids size in fluid:	Pumps with 1/4” valves: 15µ; pumps with 1/2” valve: 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 20 mA at +10 VDC. (*Note*: Semiconductor contacts that require >700 mV across a closed contact should not be used).
Necessary contact duration:	100 ms

ProMinent® EXtronic® Solenoid Diaphragm Metering Pumps

Capacity Data

Pump Version	Capacity at max. backpressure psig (bar)	GPH (L/h)	mL/ stroke	Max. stroke rate spm	Connectors Tube/NPT fitting PP/ NP/NS/PS/TT inches	Capacity at 1/2 max. backpressure psig (bar)	gph (L/h)	mL/ stroke	SS1	SS2	SB1	Suction lift ft. (m)	PP/NP/TT-S weight lbs. (kg)
1000	145 (10)	0.05 (0.19)	0.027	120	1/4 x 3/16	72.5 (5)	0.07 (0.27)	0.038	6mm Swage	1/4" FNPT	1/4" FNPT	4.9 (1.5)	27-36 (12-16)
2501	363 (25)	0.26 (1.0)	0.15	120	1/4 x 3/16	290 (20)	0.29 (1.1)	0.17	6 mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	39 (18)
1601	232 (16)	0.26 (1.0)	0.14	120	1/4 x 3/16	116 (8)	0.34 (1.3)	0.18	6mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	27-36 (12-16)
1201	174 (12)	0.45 (1.7)	0.23	120	1/4 x 3/16	87 (6)	0.53 (2.0)	0.28	6mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	27-36 (12-16)
0803	116 (8)	0.98 (3.7)	0.51	120	1/4 x 3/16	58 (4)	1.03 (3.9)	0.54	6mm Swage	1/4" FNPT	1/4" FNPT	9.8 (3)	27-36 (12-16)
1002	145 (10)	0.61 (2.3)	0.31	120	1/2 x 3/8	72.5 (5)	0.71 (2.7)	0.38	8mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	27-36 (12-16)
0308	43.5 (3)	2.27 (8.6)	1.2	120	1/2 x 3/8	21.8 (1.5)	2.72 (10.3)	1.43	8mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	27-36 (12-16)
2502	363 (25)	0.53 (2.0)	0.28	120	1/2 x 3/8	290 (20)	0.58 (2.2)	0.31	8mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	29-38 (13-17)
1006	145 (10)	1.59 (6.00)	0.83	120	1/2 x 3/8	72.5 (5)	1.90 (7.2)	1.00	8mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	29-34 (13-15)
0613	87 (6)	3.46 (13)	1.82	120	1/2 x 3/8	43.5 (3)	3.94 (14.9)	2.07	8mm Swage	1/4" FNPT	1/4" FNPT	18.0 (5.5)	29-38 (13-17)
0417	50.8 (3.5)	4.60 (17.4)	2.42	120	1/2 x 3/8	29.0 (2)	4.73 (17.9)	2.49	12mm Swage	1/4" FNPT	1/4" FNPT	14.0 (4.5)	29-38 (13-17)
2505	363 (25)	1.11 (4.2)	0.64	110	1/2 x 3/8	290 (20)	1.27 (4.8)	0.73	12mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	36-45 (16-20)
1310	189 (13)	2.77 (10.5)	1.59	110	1/2 x 3/8	87 (6)	3.14 (11.9)	1.80	12mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	36-45 (16-20)
0814	116 (8)	3.70 (14.0)	2.12	110	1/2 x 3/8	58 (4)	4.07 (15.4)	2.33	12mm Swage	1/4" FNPT	1/4" FNPT	19.7 (6)	36-45 (16-20)
0430	50.8 (3.5)	7.13 (27.0)	4.09	110	1/2" MNPT	29.0 (2)	7.79 (29.5)	4.47	3/8" FNPT		3/8" FNPT	16.4 (5)	36-45 (16-20)
0260	21.8 (1.5)	15.8 (60.0)	9.09	110	3/4" MNPT				1/2" FNPT		1/2" FNPT	4.9 (1.5)	36-45 (16-20)
EXtronic Models for High Viscosity Fluids													
1002	145 (10)	0.61 (2.3)	0.31	120	1/2" MNPT	72.5 (5)	0.71 (2.7)	0.38				0 (0)	27 (12)
1006	145 (10)	1.59 (6.0)	0.83	120	3/4" MNPT	72.5 (5)	1.90 (7.2)	1.00				0 (0)	29 (13)
1310	145 (10)	2.77 (11.0)	1.59	110	3/4" MNPT	72.5 (5)	3.14 (11.9)	1.80				0 (0)	36 (16)
0814	116 (8)	3.70 (14.0)	2.12	110	3/4" MNPT	58 (4)	4.07 15.4)	2.33				0 (0)	36 (16)

EXtronic Models with Auto-degassing Liquid Ends

Pump Version NS/PS EXBb	Capacity at Maximum Backpressure psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	Max. Stroking Rate spm	Connectors Tube/NPT fitting PP/ NP/NS/PS/TT inches	Suction Lift ft.	(m)	Shipping Weight lbs.	(kg)
1601	232	(16)	0.17	(0.7)	0.09	120	1/4 x 3/16	5.9	(1.8)	27	(12)
1201	174	(12)	0.26	(1.0)	0.14	120	1/4 x 3/16	6.6	(2.0)	27	(12)
0803	116	(8)	0.63	(2.4)	0.33	120	1/4 x 3/16	9.2	(2.8)	27	(12)
1002	145	(10)	0.48	(1.8)	0.25	120	1/4 x 3/16	6.6	(2.0)	27	(12)

Shipping Weight for EXBb Fireproof M Version is an additional 32 lbs. (14 kg).

ProMinent® EXtronic® Solenoid Diaphragm Metering Pumps

Materials in Contact With Chemicals

	Liquid End	Suction/Discharge Connector	O-rings	Valve Balls (6 - 12 mm)	Balls (DN 10 and DN 15)
PP1	Polypropylene	Polypropylene	EPDM	ceramic	Borosilicate glass
PP4*	Polypropylene	Polypropylene	EPDM	-	ceramic
NP1	Acrylic	PVC	Viton®	ceramic	Borosilicate glass
NP3	Acrylic	PVC	Viton®	ceramic	-
NS3**	Acrylic	PVC	Viton®	ceramic	-
PS3**	PVC	PVC	Viton®	ceramic	-
TT1	PTFE with carbon	PTFE with carbon	PTFE	ceramic	ceramic
SS..	316 stainless steel	316 stainless steel	PTFE	ceramic	316 stainless steel

* PP4 with Hastelloy C valve springs.
** NS3 and PS3 with Hastelloy C valve springs, PVDF valve core.

Note: Viton® is a registered trademark of DuPont Dow Elastomers.
Metering pump comes with 6 ft. power cable (plug not included)

Factory Mutual System approved

Approved
(standard in Canada)

Approved

The EXtronic metering pumps are registered according to DIN-VDE 0170/0171-5.78.

ProMinent® EXtronic® Solenoid Diaphragm Metering Pumps

Identcode Ordering System

EXBb EXtronic Version b

Type of enclosure:

G	Explosion protection
M	Fire and explosion protection: permissible liquid end material - PTFE & Stainless Steel

Pump version:

1000	2502*	2505*
1601	1006	1310**
1201	0613	0814
0803	0417	0430†
1002	2501	0260†
0308		

*Type 2502 & 2505 only available in SS and SB
**Type 1310 only available in NP, PP4, SS and SB
***Type 2501 available in SSM and SBM only
†Type 0430 & 0260 not available in SS2

Liquid end materials:

PP1	Polypropylene with EPDM O-rings
PP4	Polypropylene for high viscosity fluid with enlarged ports, with EPDM O-rings & Hastelloy C valve springs (Only for type 1002, 1006, 1310 & 0814)
NP1	Arcylic with PVC check valves & Viton® O-rings
NP3	Arcylic with PVC check valves & Viton® O-rings
NS3	Auto-degassing Arcylic with Viton® O-rings (Only for type 1601, 1201, 0803 & 1002)
PS3	Auto-degassing PVC with Viton® O-rings (Only for type 1601, 1201, 0803 & 1002)
TT1	Carbon-reinforced PTFE with PTFE o-rings
SS1	316 SS with PTFE o-rings (Only for types 0430 & 0260)
SS2	316 SS with PTFE o-rings, 1/4" FNPT thread
SB1	316 SS with PTFE o-rings, R 1/4" internal thread, R 1/2" for type 0260 (Recommended for combustible media)
SSM	as SS1, with diaphragm failure indicator, type 2501 only
SBM	as SB1, with diaphragm failure indicator, type 2501 only

Valve springs:

0	Without springs
1	With 2 springs, 316 SS, 1.4 psig (0.1 bar)

Electrical connection:

A	230 V 50/60 Hz 1 phase
B	115 V 50/60 Hz 1 phase
E	500 V 50/60 Hz 1 phase
	Cable length: 6 ft (2 m) open end

Control type:

0	Stroke rate adjustment via potentiometer
1	External contact
2	Analog 0-20 mA
3	Analog 4-20 mA
4*	External contact, intrinsically safe [i,a]
5*	Analog 0-20 mA, intrinsically safe [i,a]
6*	Analog 4-20 mA, intrinsically safe [i,a] * Intrinsically safe only with E=Ex protection
7	manual with zero volts ON/OFF
8	manual with zero volts ON/OFF, intrinsically safe [i,a]

Control variant:

0	With potentiometer (Only for control type 0)
1	With momentary contact push-button switch for maximum stroke rate (Not for control type 0)
2	With spring-return change-over switch for maximum frequency rate (Not for control type 0)

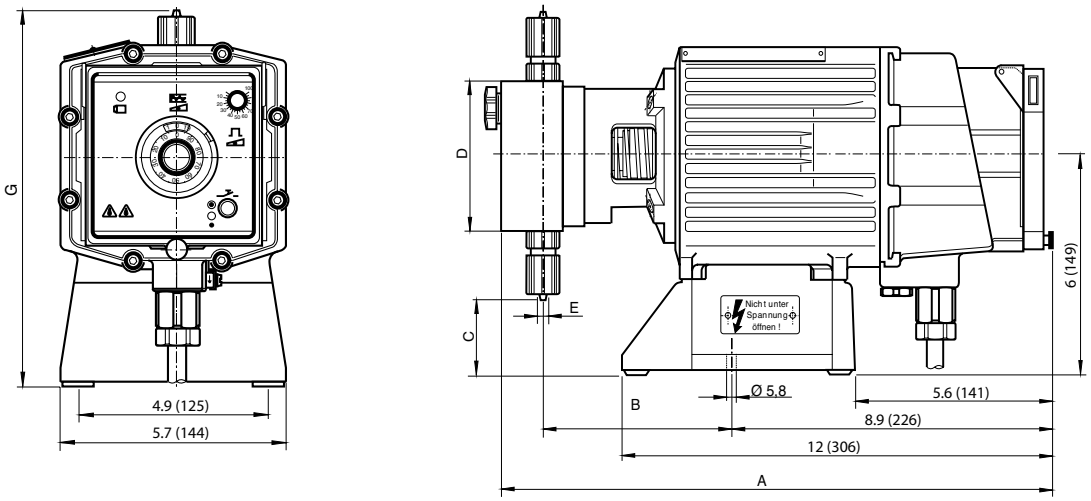
Approval/Language:

0	BVS - Europe, German, 100 V - 500 V
1	BVS - Europe, English, 100 V - 500 V
2	FM - USA, English, 115 V, 230 V
3	CSA - Canada, English, 115 V, 230 V

EXBb G 1006 PP1 1 A 3 1 2

ProMinent® EXtronic® Solenoid Diaphragm Metering Pumps

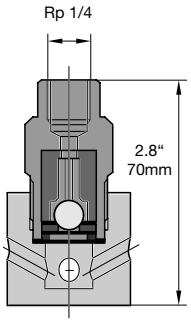
Dimensional Drawings



Dimensions in inches (mm)

Pump		A	B	C	D	E	F	G
1000, 1601, 1201, 0803	NP1	15.4 (391)	5.4 (136)	2.7 (69)	ø70	6 x 4	ø38	9.0 (229)
1002, 0308, 2502/05, 1006	NP1	15.4 (391)	5.4 (136)	2.4 (61)	ø85	8 x 5	ø50	9.3 (237)
1310, 0613	NP1	15.4 (391)	5.4 (136)	2.0 (52)	ø100	8 x 5	ø66	9.6 (244)
0814, 0417	NP1	15.4 (391)	5.4 (136)	2.0 (52)	ø100	12 x 9	ø66	9.6 (244)
0430	NP1	15.0 (381)	5.4 (137)	1.8 (46)	ø135	DN 10	ø117	12.0 (304)
0260	NP1	15.7 (398)	5.6 (142)	.63 (16)	ø135	DN 15	ø117	12.4 (314)
1000, 1601, 1201, 0803	PP1	15.5 (393)	5.4 (136)	2.6 (67)	ø70	6 x 4	ø38	9.3 (236)
1002, 0308, 1006	PP1	15.5 (393)	5.4 (136)	2.6 (67)	ø70	8 x 5	ø50	9.3 (236)
0613	PP1	15.5 (393)	5.4 (136)	2.2 (57)	ø90	8 x 5	ø66	9.7 (246)
0814, 0417	PP1	15.5 (393)	5.4 (136)	2.2 (57)	ø90	8 x 5	ø66	9.7 (246)
0430	PP1	15.0 (381)	5.4 (137)	1.8 (46)	ø135	DN 10	ø117	12.0 (304)
0260	PP1	15.7 (398)	5.6 (142)	.63 (16)	ø135	DN 15	ø117	12.4 (314)
1002	PP4	15.3 (389)	5.4 (138)	1.8 (46)	ø85	DN 10	ø50	8.7 (222)
1006	PP4	15.3 (398)	5.7 (145)	3.0 (76)	ø85	DN 15	ø50	8.7 (222)
1310	PP4	15.3 (398)	5.7 (145)	3.0 (76)	ø85	DN 15	ø50	8.7 (222)
1014	PP4	15.3 (398)	5.7 (145)	2.7 (69)	ø100	DN 15	ø66	9.1 (229)
1000, 1601, 1202	TT1	14.9 (378)	5.3 (134)	2.9 (75)	ø60	6 x 4	ø38	8.8 (223)
0803	TT1	14.9 (378)	5.3 (134)	2.8 (70)	ø70	6 x 4	ø38	9.0 (228)
1002, 0308, 1006	TT1	15.3 (388)	5.3 (138)	1.3 (32)	ø95	8 x 5	ø66	10.5 (266)
0613	TT1	15.3 (388)	5.4 (138)	1.3 (32)	ø95	8 x 5	ø66	10.5 (266)
0814, 0417	TT1	15.3 (388)	5.4 (138)	1.3 (32)	ø95	12 x 9	ø66	10.5 (266)
0430	TT1	15.3 (388)	5.4 (137)	1.4 (35)	ø135	DN 10	ø117	10.4 (263)
0260	TT1	15.7 (398)	5.6 (142)	1.2 (31)	ø135	DN 15	ø117	10.6 (268)
1000, 1601, 1202	SS1	14.8 (376)	5.3 (134)	3.3 (84)	ø60	6 x 5	ø38	8.4 (214)
0803	SS1	14.8 (376)	5.3 (134)	3.1 (79)	ø70	6 x 5	ø38	8.6 (219)
1002, 0308, 2502/05, 1006	SS1	15.2 (386)	5.4 (138)	1.9 (48)	ø80	8 x 7	ø50	9.8 (250)
1310, 0613	SS1	15.2 (386)	5.4 (138)	1.5 (39)	ø95	8 x 7	ø66	10.2 (259)
0814, 0417	SS1	15.2 (386)	5.4 (138)	1.5 (39)	ø95	12 x 10	ø66	10.2 (259)
0430	SS1	15.2 (386)	5.4 (137)	1.4 (35)	ø135	DN 10	ø117	10.4 (263)
0260	SS1	15.4 (390)	5.6 (142)	1.1 (28)	ø135	DN 15	ø117	10.7 (271)
1000	SB1	14.7 (373)	5.3 (134)	3.4 (87)	ø70	R1/4"	ø38	8.3 (211)
1601, 1202, 0803	SB1	14.7 (373)	5.3 (134)	3.1 (79)	ø85	R1/4"	ø38	8.6 (219)
1002, 0308, 2502/05, 1006	SB1	15.0 (381)	5.4 (138)	2.2 (56)	ø80	R1/4"	ø50	9.5 (242)
1310, 0613	SB1	15.0 (381)	5.4 (138)	1.9 (48)	ø95	R1/4"	ø66	9.8 (250)
0814, 0417	SB1	15.0 (381)	5.4 (138)	1.9 (48)	ø95	R1/4"	ø66	9.8 (250)
0430	SB1	15.0 (381)	5.4 (138)	.87 (22)	ø145	R1/4"	ø117	10.8 (275)
0260	SB1	15.1 (383)	5.5 (139)	1.1 (27)	ø145	R1/2"	ø117	11.0 (279)
1601, 1202, 0803	NS3	15.1 (383)	5.4 (136)	2.6 (67)	s. Abb.	6 x 4	ø38	9.6 (243)
1002	NS3	15.1 (383)	5.4 (136)	2.6 (67)	s.Abb.	6 x 4	ø50	9.6 (243)
1601, 1202, 0803	NS3	15.1 (383)	5.4 (136)	2.6 (67)	s. Abb.	6 x 4	ø38	9.6 (243)
1002	NS3	15.1 (383)	5.4 (136)	2.6 (67)	s.Abb.	6 x 4	ø50	9.6 (243)

Special Valves for EXtronic®



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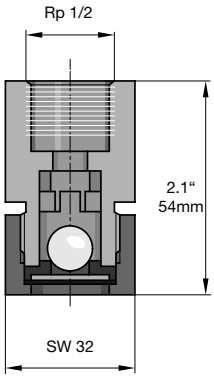

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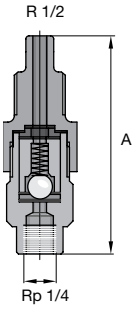

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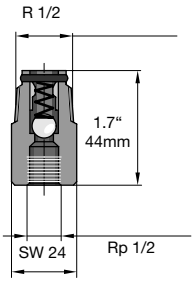

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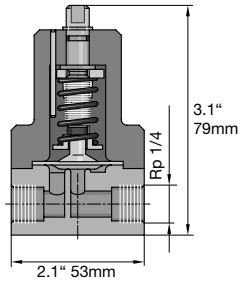

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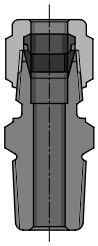


pk_1_028

Stainless steel 1.4404 “SB” foot valve

With filter and ball check valve, designed for use with flammable materials.

Materials: 1.4404/1.4401/PTFE/ceramic

	Order No.
Connector ISO 7 Rp 1/4 SB version for ProMinent EXtronic®	809301
Connector ISO 7 Rp 1/2 SB version for ProMinent EXtronic®	924561

Stainless steel 1.4404 “SB” injection valve

Spring loaded ball check valve designed for use with flammable materials.

Materials: 1.4404/1.4401/Hastelloy C/PTFE/ceramic

	Order No.
Connector ISO 7 Rp 1/4 - R 1/2, pre-pressure approx. 7.3 psi	809302
Connector ISO 7 Rp 1/2 - R 1/2, pre-pressure approx. 7.3 psi	924560

Adjustable “SB” back pressure valve

Materials: 1.4404; PTFE coated diaphragm. Connector both sides ISO 7 Rp 1/4

	Order No.
Operating range approx. 14.5 - 145 psi (1-10 bar), closed version designed for use with flammable materials.	924555

To generate a constant back pressure for accurate metering with a free outlet. Can also be used as an overflow valve.

PTFE dosing pipe

Carbon-filled, surface resistance $<10^7$

Material	Length m	Ext. diam. x int. diam.	Permissible operating press. psi (bar)*	Order No.
PTFE	Sold by the foot	6.0 x 4.0	174 (12)	1024831
PTFE	Sold by the foot	8.0 x 5.0	232 (16)	1024830
PTFE	Sold by the foot	12.0 x 9.0	130.5 (9)	1024832

* permissible operating pressure at 68°F (20 °C) in accordance with EN ISO 7751, $^1/_4$ of the bursting pressure, assuming chemical resistance and correct connection.

Additional ancillary equipment, i.e. foot valves, injection valves and back pressure valves in the usual material combinations, identical to gamma ancillary equipment and/or for connector DN 15 Vario ancillary equipment, see section 2.14.

Stainless steel straight threaded connectors

Swagelok system in stainless steel SS 316 (1.4401) for connection of pipework to liquid ends and valves with internal thread and for SB version.

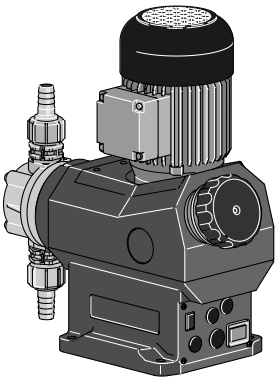
Normal thread o-rings compounds required.	Order No.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527

“motor-driven metering pumps” T.O.C. IV

CATALOG SECTION TABS

ProMinent® Vario C
Motor Diaphragm Metering Pumps

Overview: Vario C



pk_2_126

Ideal for basic chemical feed applications

(see page 132 for spare parts)

The ProMinent® Vario C motor-driven metering pump is available in the standard version fitted with a 115 V 60 Hz single-phase AC motor or alternatively with a 230/400 V 50/60Hz 3-phase AC motor. The capacity range is from 2.5-20.3 gph (9.6-76.8 l/h) with a maximum back pressure of 145-58 psi (10-4 bar). The pump capacity is adjusted by varying the stroke length (3 mm) in 1 % steps by means of a self-locking adjustment knob.

Under defined conditions and with correct installation, the reproducibility of the metering is better than ± 2 % over the stroke length range from 30 % to 100 % (notes in the operating instructions must be strictly observed).

The sturdy, corrosion-resistant plastic housing provides IP65 protection. A choice of 4 gear ratios, 2 liquid end sizes, 2 liquid end materials (PVDF; SS) allow the pump to be ideally matched to the basic metering duty.

On safety grounds, the electrical installation for all motor-driven metering pumps must incorporate suitable overload devices.

Capacity Data

Pump	Capacity at Maximum Back Pressure				Max. Stroke Rate	Max. Inlet Pressure	Max. Suction Lift		Suction/ Discharge Connector	Shipping Weight	
Pump Type VAM	psig	(bar)	U.S. GPH	(L/h)	Stroke/ min.	psi	(water) ft.	(m)	size	(approx.) lbs.	(kg)
10008 PVT	145	(10)	2.5	(9.6)	45	2.8	23	(7)	1/2” MNPT	13.2	(6.0)
10008 SST	145	(10)	2.5	(9.6)	45	2.8	23	(7)	3/8” FNPT	15.9	(7.2)
10016 PVT	145	(10)	5.1	(19.2)	92	2.8	23	(7)	1/2” MNPT	13.2	(6.0)
10016 SST	145	(10)	5.1	(19.2)	92	2.8	23	(7)	3/8” FNPT	15.9	(7.2)
07026 PVT	102	(7)	8.2	(31.2)	144	2.8	23	(7)	1/2” MNPT	13.2	(6.0)
07026 SST	102	(7)	8.2	(31.2)	144	2.8	23	(7)	3/8” FNPT	15.9	(7.2)
07042 PVT	102	(7)	13.3	(50.4)	230	2.8	23	(7)	1/2” MNPT	13.2	(6.0)
07042 SST	102	(7)	13.3	(50.4)	230	2.8	23	(7)	3/8” FNPT	15.9	(7.2)
07012 PVT	102	(7)	3.8	(14.3)	45	1.7	20	(6)	1/2” MNPT	13.2	(6.0)
07012 SST	102	(7)	3.8	(14.3)	45	1.7	20	(6)	3/8” FNPT	15.9	(7.2)
07024 PVT	102	(7)	7.6	(28.8)	92	1.7	20	(6)	1/2” MNPT	13.2	(6.0)
07024 SST	102	(7)	7.6	(28.8)	92	1.7	20	(6)	3/8” FNPT	15.9	(7.2)
04039 PVT	58	(4)	12.7	(48)	144	1.7	20	(6)	1/2” MNPT	13.2	(6.0)
04039 SST	58	(4)	12.7	(48)	144	1.7	20	(6)	3/8” FNPT	15.9	(7.2)
04063 PVT	58	(4)	20.3	(76.8)	230	1.7	20	(6)	1/2” MNPT	13.2	(6.0)
04063 SST	58	(4)	20.3	(76.8)	230	1.7	20	(6)	3/8” FNPT	15.9	(7.2)

Materials in Contact with Chemicals

	Liquid end	Suction/discharge connection	Seals	Valve balls	Valve seat	Standard connection
PVT	PVDF (polyvinylidene fluoride)	PVDF	PTFE	Ceramic	PTFE	See above table
SST	Stainless steel	Stainless steel	PTFE	Stainless steel	PTFE	See above table

ProMinent® Vario C
Motor Diaphragm Metering Pumps

Identcode Ordering System

VAMc — **Vario Diaphragm Metering Pumps, Version C**

Pump type:

10008	2.5 gph (9.6 l/h)	145 psi (10 bar)
10016	5.1 gph (19.2 l/h)	145 psi (10 bar)
07026	8.2 gph (31.2 l/h)	101.5 psi (7 bar)
07042	13.3 gph (50.4 l/h)	101.5 psi (7 bar)
07012	3.8 gph (14.4 l/h)	101.5 psi (7 bar)
07024	7.6 gph (28.8 l/h)	101.5 psi (7 bar)
04039	12.7 gph (48.0 l/h)	58 psi (4 bar)
04063	20.3 gph (76.8 l/h)	58 psi (4 bar)

Liquid end material:

PVT	PVDF
SST	stainless steel

Liquid end version:

0	no valve spring (standard) PVC
1	with 2 valve springs. Hastelloy C4

Hydraulic connection:

0	standard connection
1	union nut and PVC insert
2	union nut and PP insert
3	union nut and PVDF insert
4	union nut and stainless steel insert
7	union nut and PVDF hose barb
8	union nut and stainless steel hose barb

Version:

0	with ProMinent® logo (standard)
2	without ProMinent® logo
M	modified

Voltage Supply:

S	3 ph, 230 V / 400 V; 50/60 Hz
N	1 ph AC 115 V; AC 60 Hz

Stroke sensor:

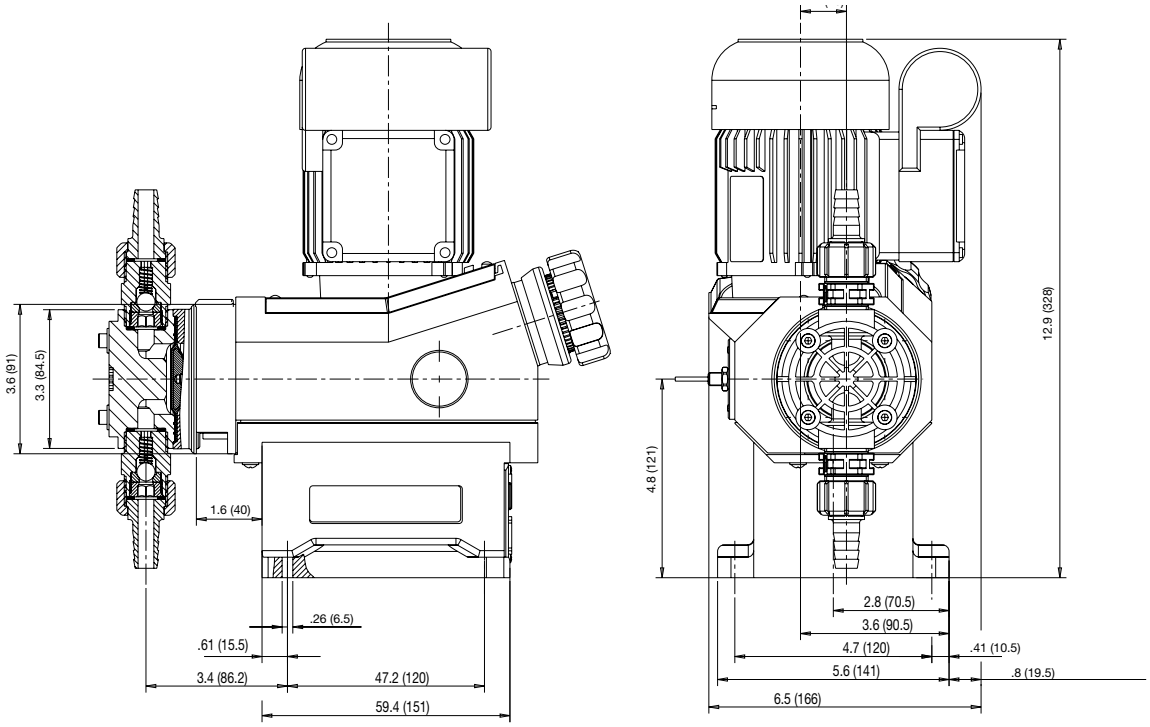
0	no stroke sensor
3	with stroke sensor (Namur)

Automatic stroke adjustment:

0	manual (standard)

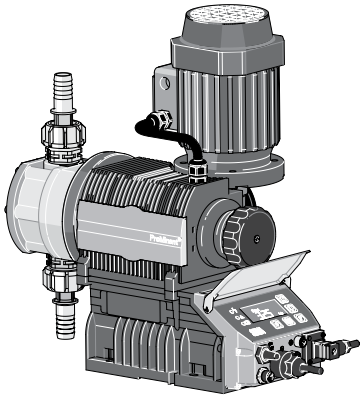
VAMc 04063 PVT 0 0 0 N 0 0

Dimensions in inches (mm).



ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Overview: Sigma/ 1



S1Ca

Ideal for Economical mid-range applications

(see page 133 for spare parts and page 138 for control cables)

The ProMinent® Sigma/ 1 is a mechanically actuated diaphragm metering pump. It has a capacity range of 5.3-38 gph (20-144 l/h) at a max. back pressure of 174-58 psi (12-4 bar). The pump capacity is adjusted by varying the stroke length (4 mm) in 1 % steps via a self locking adjusting knob.

The reproducible metering accuracy is better than ±2 % providing installation has been correctly carried out, and in the stroke length range of 30-100 %. (Instructions in the operating instructions manual must be followed.)

The stable, corrosion resistant metal and plastic housing is rated IP 65. To facilitate adaptation of the pumps to the widest possible range of processing requirements we offer a choice of three gearbox ratios, three liquid end sizes, two liquid end materials and either contact or analogue signal (e.g. 0/4-20 mA) control options in the form of the S1Ca Sigma controller.

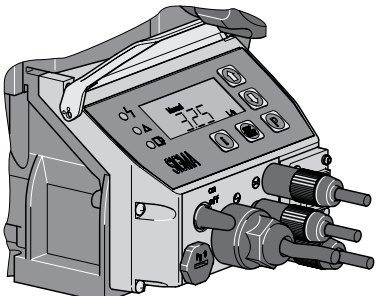
For safety reasons, all motor driven metering pumps must be equipped with adequate protection against electrical overload.

Sigma/ 1 Basic Type (S1Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S1Ba has a number of different drive options, including the single phase AC motor or a 3 ph. motor.

Different flanges are available so that customers can use their own motor to drive the pump.

Sigma/1 Control Type (S1Ca)



ProMinent® Sigma Controller
pk_2_104

The ProMinent® Sigma microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The controller has the same control panel as the ProMinent® gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

The individual pump functions are simply adjusted using the five programming keys. A backlit LCD indicates the current operating status, LEDs function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

PROFIBUS® Local or remote control is possible with PROFIBUS® and/or an integrated process timer.

(see page 138)

ProMinent® Sigma/ 1 Motor Diaphragm Metering Pumps

Standard Modes and Functions

Feed rate is determined by stroke length and stroke rate. Stroke length is manually adjustable from 1 to 100% in increments of 1% via the stroke length knob.

Stroke rate can be set to a maximum of 90, 170 or 200 strokes per minute (pump dependent). An illuminated LCD displays stroke length, stroke rate and an accumulative stroke counter, which can be cleared and reset.

Pump capacity output is displayed in either U.S. gph or l/h, set by the operator. Output is accumulated and totalized capacity is also displayed in either U.S. gallons or litres.

The "i" key is used to scroll information screens for stroke rate, stroke length, stroke counter, capacity and totalized capacity. Other information is available depending on control mode.

Control Modes

The control modes available with the Sigma/1 include manual, external contact with pulse control (multiplier/divider), batch, or analog control. The Profibus option includes all control modes, plus fieldbus connection.

In the "Manual" mode, stroke rate is controlled manually. The "Contact" external mode allows adjustments to be made externally (e.g. by means of a pulse-type water meter for proportional chemical feed). Pulse signals are fed into the contact input of the pump by an optional control cable. Each pulse from a water meter or pulse-type controller provides the pump an input to pump at the selected pulse ratio, up to the pump's maximum stroke rate. Over-stroking the pump is not possible.

Standard Functions

"Calibrate"

The pump can be directly calibrated in-line to actual flow. Calibration is maintained within the stroke frequency range of 90/170/200 spm (model dependent). A warning indicator flashes when adjustments to the stroke volume are made outside the calibrated range of +/- 10%.

"Auxiliary Frequency"

An auxiliary frequency can be programmed. This default stroking rate can be enabled via the optional control cable.

"Flow"

The Sigma/1 series metering pumps will monitor their own output, with an optional adjustable flow monitor. Every fluid discharge is sensed and fed back to the electronic control circuit of the pump. If insufficient fluid is discharged for a predetermined number of strokes (up to 125), the pump automatically stops and the red LED lights. The optional fault relay changes state to issue an alarm or activate a standby pump.
Call for availability.

"Float Switch"

An optional two-stage ProMinent float switch can be plugged into the pump to monitor chemical tank levels. An early warning is issued when the allowable minimum level is reached. The pump continues to operate while the display flashes, the yellow 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, the LCD displays "Minim" and the red LED lights. The optional fault relay remains activated.

"Pause"

The Sigma/1 series can be remotely started and stopped via a dry contact through the optional control cable.

"Stop"

The Sigma/1 can be stopped by pressing the STOP/START key without disconnecting from the power supply.

"Prime"

Priming is activated by pressing both arrow keys at the same time while the frequency display is showing.

Function and Error Indicators

Three LED lights on the pump faceplate signal operational status. The green light flashes during normal operation, and the yellow light warns of a situation that could lead to a fault (e.g. low chemical). If a fault occurs "error" will appear on the LCD screen and the red LED light appears.

ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Optional Modes and Functions

Optional Control Modes

"Analog" Mode

With this option, the stroking rate of the Sigma/1 is directly proportional to the analog signal. For a custom range setting, the curve feature of the analog input can be selected. With this, the pump response to the analog input can be easily programmed.

"Contact" Mode with Pulse Control

This feature is used to "tune" the pump 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 0.01-99.99 range, the step-up or step-down ratio is set.

For example:

Step-up Factor:
99.99 1 pulse = 99.99 pump strokes
10 1 pulse = 10 pump strokes

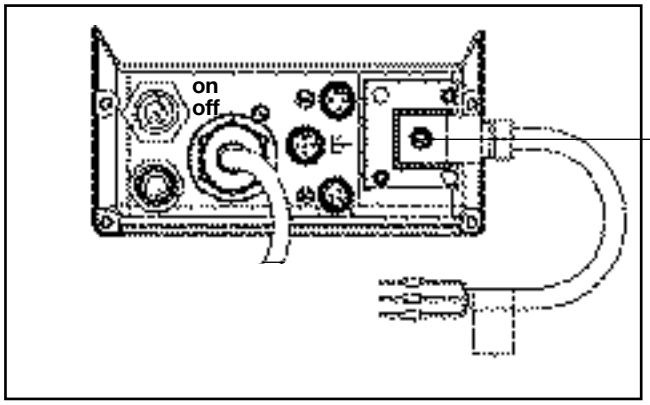
Step-down Factor:
0.25 4 pulses = 1 pump stroke
0.01 100 pulses = 1 pump stroke

"Batch" Mode

The Batch mode is a variation of the contact operating mode. A number of strokes can be predetermined up to 65,535 strokes (whole numbers) or the feed quantity can be predetermined. The batch is then initiated by either pressing the "P" key on the pump face or providing a contact to the external control cable.

Access Code

A programmable access code to prevent unauthorized changes to settings is available as an option.



An external panel enables optional relays to be installed on-site.

Relay outputs. . .

Fault annunciating relay

For low tank level (flow switch), loss of flow (flow monitor), loss of analog signal and diaphragm failure detector, system faults and fuse/ power supply failure.

Fault annunciating and Pacing relay

In addition to the fault annunciating 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.

4-20 mA Analog Output

A 4-20 mA analog output option is available for use with pumps that operate in the manual mode or by a remote 4-20 mA analog reference signal. The 4-20 mA analog output signal is linear to pump frequency multiplied by the percentage of stroke length. The output signal is isloated and can drive up to 300 Ohms impedance. Analog output can be used for status feedback to higher level control systems for closed loop control or for monitoring chemical usage. This option is available in combination with either the fault annunciating or pacing relay.

Timer Relay

The optional integrated 2-week timer offers 81 programmable events. It can be set to hourly, daily, work days, weekend, weekly or two-week periods with switch-on times from 1 second to two weeks. The timer can be programmed to change operation mode, frequency and the function of two relays. All the functions can be programmed independently of one another. Up to 13 delay times can be programmed into the timer function.

The range of applications exceeds that of a "standard timer". Typical application is disinfection in cooling towers, process water, etc. with the ability to automatically program shock dosages or increase the concentration at a certain interval.

Fieldbus connection

Monitor and control remotely via a SCADA/PLC system using the profibus-DP system.

Note: Relay options not available with profibus. Profibus is not field retrofittable.

ProMinent® Sigma/ 1 Motor Diaphragm Metering Pumps

Specifications

General:

Maximum stroke length:	0.16” (4.0 mm)
Power cord:	6 foot (2 m) 2 wire + ground (supplied on control versions)
Stroke frequency control:	S1Ba: Constant speed or optional DC/SCR drive or AC inverter S1Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.
Stroke counting:	Standard on S1Ca
Materials of construction *Housing:*	Glass-filled Luranyl™ (PPE)

Wetted materials of construction:

Liquid End:	PVDF	316 SS
Suct./Dis. Connectors:	PVDF	316 SS_
Seals:	PTFE/Viton®	PTFE/Viton®
Check Balls:	Ceramic	SS
Pressure Relief Valves:	PVDF/Viton® O-rings	SS/Viton® O-rings

Drive:	Cam and spring-follower (lost motion)
Lubrication:	Sealed grease lubricated bearings and gearing
Warranty:	Two years on drive, one year on liquid end.
Factory testing:	**Each pump is tested for rated flow at maximum pressure.**
Industry Standard:	CE approved, CSA available (standard in Canada)
Diaphragm materials:	PTFE faced EPDM with Nylon reinforcement and steel core
Liquid end options:	Polyvinylidene Fluoride (PVDF) or 316 SS, with PTFE faced Viton® seals
Check valves:	Single ball check, PVDF and SS versions. Optional springs available (Hastelloy C4)
Repeatability:	When used according to the operating instructions, better than ±2%

Max. fluid operating temperatures:

Material	Constant (Max. Backpressure)	Short Term (15 min. @ max.30 psi)
PVDF	149˚F (65˚C)	212˚F (100˚C)
316 SS	194˚F (90˚C)	248˚F (120˚C)

Diaphragm failure indication:	Optional, see accessories. Switch is N.C., opens to indicate failure. Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC,1.0 A resistive. Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.
Max. solids size in fluid:	0.3 mm
Stroke length adjustment:	Manual, in increments of 1%. Motorized stroke length adjustment available.

Sigma/1 Basic Version

Motor:	See available motors in identity code

ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Specifications

Sigma/1 Control Version

Control Function: At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.

Enclosure rating: NEMA 3 (IP 55)

Motor data: Totally enclosed, fan cooled (IP55); class F insulation; IEC frame; 1/8 HP (0.09 kW) 230 V, 3 phase (0.7 A)

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: max. 24 V, AC/DC, max. 100 mA
max. $50x10^6$ switch cycles @ 10 V, 10 mA

Contact closure: 100 ms (for pacing relay)

Analog output signal: max. impedance 300 W
Isolated 4-20 mA output signal

Profibus - DP fieldbus options:

Transfer: RS - 485
Wiring: 2-wired, twisted, shielded
Length: 3637 ft. (1200 m)/328 ft. (100 m)
Baudrate: 9600 bits/s; 12 Mbits/s
No. of participants: 32 with 127 repeaters
Topology: Line
Access procedure: Master/master with token ring*Relay cable (optional):* 6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A

Pulse contact/remote pause contact: With voltage-free contact, or semiconductor sink logic control (not source logic) 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).

ProMinent® Sigma/ 1 Motor Diaphragm Metering Pumps

Capacity Data

Sigma/1 Basic Version

Technical data:	60 Hz (1750 RPM) operation *Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		*Shipping Weight w/Motor	
Pump Version S1Ba HM	psig	(bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	(water) ft.	(m)	psig	(bar)	DN	in.	(approx.) lbs.	(kg)
12017 PVT	145	(10)	5.3	(20)	88	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
12017 SST	174	(12)	5.3	(20)	88	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
12035 PVT	145	(10)	11.1	(42)	172	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
12035 SST	174	(12)	11.1	(42)	172	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10050 PVT	145	(10)	15.8	(60)	240	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10050 SST	145	(10)	15.8	(60)	240	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10022 PVT	145	(10)	6.8	(26)	88	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10022 SST	145	(10)	6.8	(26)	88	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10044 PVT	145	(10)	14	(53)	172	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10044 SST	145	(10)	14	(53)	172	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
07065 PVT	102	(7)	20.6	(78)	240	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
07065 SST	102	(7)	20.6	(78)	240	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
07042 PVT	102	(7)	13.2	(50)	88	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
07042 SST	102	(7)	13.2	(50)	88	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)
04084 PVT	58	(4)	26.7	(101)	172	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
04084 SST	58	(4)	26.7	(101)	172	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)
04120 PVT	58	(4)	38	(144)	240	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
04120 SST	58	(4)	38	(144)	240	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)

* Flow rates and shipping weights are for 1/8 HP standard motors. Addition of 1/3 HP or 1/2 HP motors may increase output (consult factory for details)

Sigma/1 Control Version

Technical data:	60 Hz operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor	
Pump Version S1Ca HM	psig	(bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	(water) ft.	(m)	psig	(bar)	DN	in.	(approx.) lbs.	(kg)
12017 PVT	145	(10)	5.3	(20)	90	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
12017 SST	174	(12)	5.3	(20)	90	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
12035 PVT	145	(10)	11.1	(42)	170	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
12035 SST	174	(12)	11.1	(42)	170	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10050 PVT	145	(10)	13.2	(50)	200	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10050 SST	145	(10)	13.2	(50)	200	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10022 PVT	145	(10)	6.8	(26)	90	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10022 SST	145	(10)	6.8	(26)	90	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
10044 PVT	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
10044 SST	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
07065 PVT	102	(7)	17.2	(65)	200	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8	(9)
07065 SST	102	(7)	17.2	(65)	200	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5	(12)
07042 PVT	102	(7)	13.2	(50)	90	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
07042 SST	102	(7)	13.2	(50)	90	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)
04084 PVT	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
04084 SST	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)
04120 PVT	58	(4)	31.7	(120)	200	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21	(9.5)
04120 SST	58	(4)	31.7	(120)	200	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8	(13.5)

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

Materials In Contact With Chemicals

Liquid End	Suction/Discharge connector	Valve	Seals/ ball seat	Balls
PVT	PVDF (Polyvinylidenefluoride)	PVDF (Polyvinylidenefluoride)	PTFE/PTFE	Ceramic
SST	Stainless steel	Stainless steel	PTFE/PTFE	Stainless steel

ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Identcode Ordering System (S1Ba)

S1Ba **Sigma/1 Basic Version a**

H — Main Drive, Diaphragm

Pump version:

12017*	07042
12035*	04084
10050	04120
10022	
10044	
07065	

* For PVDF versions. Max. 145 psig
Note: Refer to technical data for capacities and stroke rates

Liquid end material:

PV	PVDF
SS	316 Stainless steel

Seal material:

T	PTFE

Diaphragm type:

0	Standard diaphragm
1	With double diaphragm and failure monitor (NC contact opens on fault)

Liquid end version:

0	Without valve springs
1	With 2 valve springs (Hastelloy C4, 1 psig)

Connectors:

7	PVDF clamping nut & insert
8	SS clamping nut & insert

Labeling:

0	Standard with logo

Voltage supply:

S	3 ph, 230 V/400 V, 50/60 Hz
M	1 ph, AC, 230 V, 50/60 Hz
N	1 ph, AC, 115 V, 60 Hz
K	90 VDC Permanent magnet
3	Explosion Proof**

Enclosure rating:

0	Standard

Stroke sensor:

0	Without stroke sensor (Standard)
2	With Pacing relay (Consult Factory)

Stroke length adjustment:

0	Manual (Standard)
4	W/ stroke positioning motor 4 - 20 mA, 230 V 50/60 Hz
6	W/ stroke positioning motor 4 - 20 mA, 115 V 50/60 Hz

**** EXPLOSION PROOF MOTOR (INCLUDING MOUNTING FLANGE):**

1) pn. 7500344
1/3 HP, single ph, AC, 115 V, 60 Hz, EPFC
(class 1 Group C & D or class 2 group F & G T3B)

2) pn. 7746261
1/2 HP, 3 ph, 1D, 208-230/ 460 VAC EPFC
(class 1 Group C & D or class 2 group F & G T3B)

S1Ba	H	10044	PV	T	0	0	7	0	2	0	0	0

ProMinent® Sigma/ 1 Motor Diaphragm Metering Pumps

Identcode Ordering System (S1Ca)

S1Ca **Sigma/1 Control Version a**

Main drive

H — Main drive/Diaphragm

Pump version:

12017*	10022	07042	*For PVDF versions, max. 145 psig
12035*	10044	04084	
10050	07065	04120	**Note**: Refer to technical data for capacities and stroke rates

Liquid end materials:

PVT — PVDF with PTFE gasket
SST — 316 Stainless steel with PTFE gasket

Diaphragm type:

0 — Standard diaphragm, PTFE
1 — With double diaphragm and failure monitor (NC contact opens on fault)
2 — With double diaphragm and failure monitor (alarm & continues to operate)

Liquid end version:

0 — Without valve springs
1 — With 2 valve springs (Hastelloy C4, 1.45 psig)

Connectors:

7 — PVDF clamping nut & insert
8 — SS clamping nut & insert

Labeling:

0 — Standard with logo

Voltage supply:

U — 1 ph, 115-230 V ± 10%, 50/60 Hz

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

A — European plug, 230 V
D — N. American plug, 115 V
U — N. American plug, 230 V

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
C — 4-20 mA output, drops out
D — 4-20 mA output, pulls in
E — 4-20 mA output, pacing relay

Control variants:

0 — Manual + External with pulse control (multiplier/divider)
1 — Manual + External with pulse control & analog control
4 — Option 0 + timer
5 — Option 1 + timer
P — Option 1 + Profibus (Relay must be 0)

Access code:

0 — No access code
1 — Access code

Flow monitor:

0 — Input for metering monitor signal (pulse)
1 — Input for maintained flow switch signal

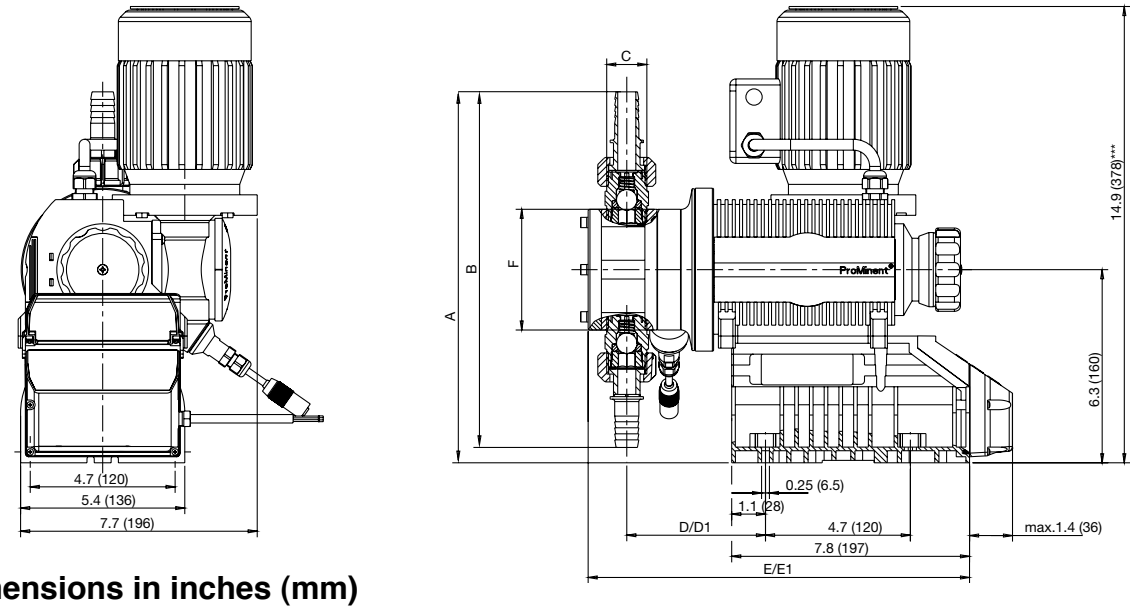
Stroke length adjustment:

C — Manual + Calibration

S1Ca	H	07042	PVT	0	0	7	0	U	D	0	0	0	0	C

ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S1Ba)



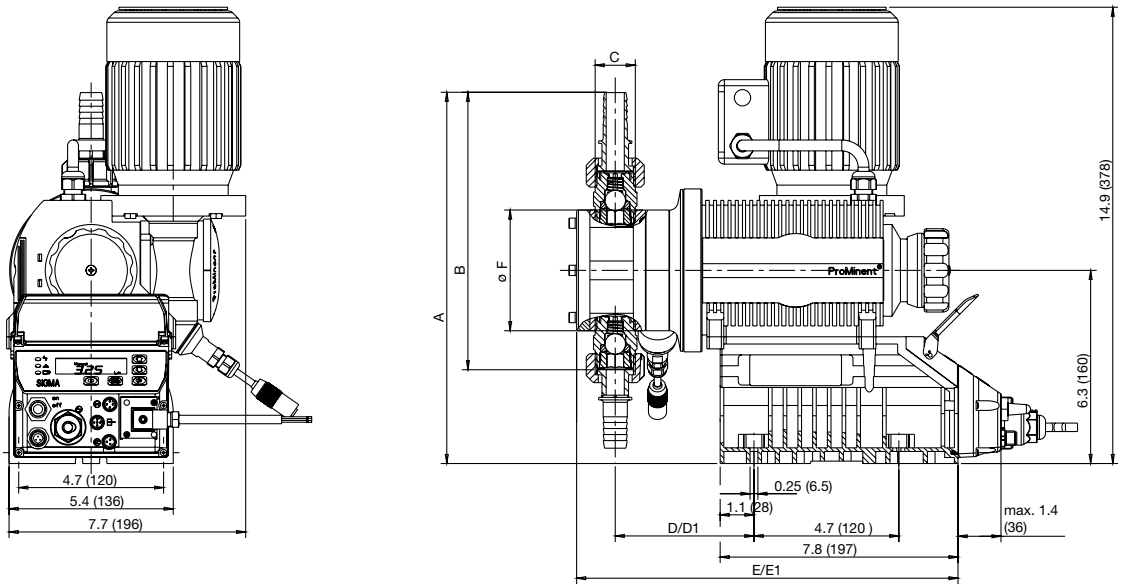
Dimensions in inches (mm)

Type Sigma/1	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
12017, 12035, 10050, 10022, 10044, 07065 PVT	11 (279)	9.38 (238)	1/2” MNPT	3.54 (90)	4.33 (110)	10.8 (275)	11.6 (295)	3.8 (96)
SST	9.75 (248)	7.13 (181)	3/8” FNPT	3.5 (89)	4.29 (109)	10.8 (275)	11.6 (295)	3.8 (96)
07042, 04084, 04120 PVT	11.38 (289)	10 (254)	3/4” MNPT	3.74 (95)	4.52 (115)	11.2 (285)	12 (305)	4.8 (122)
SST	10.25 (260)	8.13 (206)	1/2” FNPT	3.7 (94)	4.48 (114)	11.2 (285)	12 (305)	4 .8 (122)

* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.
*** Dimension may vary depending on motor installed.

ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S1Ca)



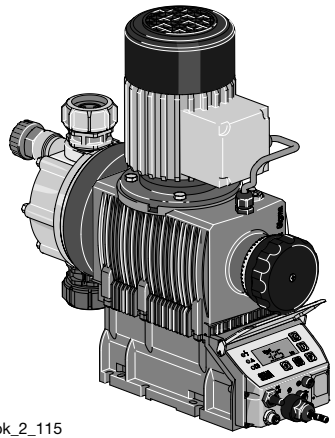
Dimensions in inches (mm)

Type Sigma/1	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
12017, 10035, 10050, 10022, 10044, 07065 PVT	11 (279)	9.38 (238)	1/2” MNPT	3.54 (90)	4.33 (110)	10.8 (275)	11.6 (295)	3.8 (96)
SST	9.75 (248)	7.13 (181)	3/8” FNPT	3.5 (89)	4.29 (109)	10.8 (275)	11.6 (295)	3.8 (96)
07042, 04084, 04120 PVT	11.38 (289)	10 (254)	3/4” MNPT	3.74 (95)	4.52 (115)	11.2 (285)	12 (305)	4.8 (122)
SST	10.25 (260)	8.13 (206)	1/2” FNPT	3.7 (94)	4.48 (114)	11.2 (285)	12 (305)	4 .8 (122)

* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.

ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Overview: Sigma/ 2



pk_2_115

Ideal for mid-range applications

(see page 133 for spare parts and page 138 for control cables)

The ProMinent® Sigma/ 2 is a mechanically actuated diaphragm metering pump. It has a capacity range of 15.9 - 111 gph (60-420 l/h) at a maximum backpressure of 232-58 psi (16-4 bar). The pump capacity is adjusted by varying the stroke length (5 mm) in 0.5 % steps via a self locking adjusting knob.

The reproducible metering accuracy is better than ±2 % providing installation has been correctly carried out, and in the stroke length range of 30-100 %. (instructions in the operating instructions manual must be followed.)

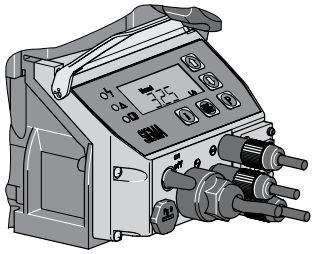
The stable, corrosion resistant metal and plastic housing is rated IP 65. To facilitate adaptation of the pumps to the widest possible range of processing requirements we offer a choice of three gearbox ratios, three liquid end sizes, two liquid end materials and either contact or analogue signal (e.g. 0/4-20 mA) control options in the form of the S2Ca Sigma controller.

For safety reasons, all motor driven metering pumps must be equipped with adequate protection against electrical overload.

Sigma/ 2 Basic Type (S2Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S2Ba offers a variety of different drive options in the single phase AC motors (56-C flange). Different flanges are available so that customers can use their own motor to drive the pump.

Sigma/ 2 Control Type (S2Ca)



ProMinent® Sigma Controller
pk_2_104

The ProMinent® Sigma microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The controller has the same control panel as the ProMinent® gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

The individual pump functions are simply adjusted using the five programming keys. A backlit LCD indicates the current operating status, LEDs function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

PROFIBUS® Central or decentral adjustment is possible with PROFIBUS® and/or an integrated process timer.

(see page 138)

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Standard Modes and Functions

Feed rate is determined by stroke length and stroke rate. Stroke length is manually adjustable from 1 to 100% in increments of 1% via the stroke length knob.

Stroke rate can be set to a maximum of 90, 170 or 200 strokes per minute (pump dependent). An illuminated LCD displays stroke length, stroke rate and an accumulative stroke counter, which can be cleared and reset.

Pump capacity output is displayed in either U.S. gph or l/h, set by the operator. Output is accumulated and totalized capacity is also displayed in either U.S. gallons or litres.

The "i" key is used to scroll information screens for stroke rate, stroke length, stroke counter, capacity and totalized capacity. Other information is available depending on control mode.

Control Modes

The control modes available with the Sigma/1 include manual, external contact with pulse control (multiplier/divider), batch, or analog control. The Profibus option includes all control modes, plus fieldbus connection.

In the "Manual" mode, stroke rate is controlled manually. The "Contact" external mode allows adjustments to be made externally (e.g. by means of a pulse-type water meter for proportional chemical feed). Pulse signals are fed into the contact input of the pump by an optional control cable. Each pulse from a water meter or pulse-type controller provides the pump an input to pump at the selected pulse ratio, up to the pump's maximum stroke rate. Over-stroking the pump is not possible.

Standard Functions

"Calibrate"

The pump can be directly calibrated in-line to actual flow. Calibration is maintained within the stroke frequency range of 90/170/200 spm (model dependent). A warning indicator flashes when adjustments to the stroke volume are made outside the calibrated range of +/- 10%.

"Auxiliary Frequency"

An auxiliary frequency can be programmed. This default stroking rate can be enabled via the optional control cable.

"Flow"

The Sigma/1 series metering pumps will monitor their own output, with an optional adjustable flow monitor. Every fluid discharge is sensed and fed back to the electronic control circuit of the pump. If insufficient fluid is discharged for a predetermined number of strokes (up to 125), the pump automatically stops and the red LED lights. The optional fault relay changes state to issue an alarm or activate a standby pump.
Call for availability.

"Float Switch"

An optional two-stage ProMinent float switch can be plugged into the pump to monitor chemical tank levels. An early warning is issued when the allowable minimum level is reached. The pump continues to operate while the display flashes, the yellow 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, the LCD displays "Minim" and the red LED lights. The optional fault relay remains activated.

"Pause"

The Sigma/1 series can be remotely started and stopped via a dry contact through the optional control cable.

"Stop"

The Sigma/1 can be stopped by pressing the STOP/START key without disconnecting from the power supply.

"Prime"

Priming is activated by pressing both arrow keys at the same time while the frequency display is showing.

Function and Error Indicators

Three LED lights on the pump faceplate signal operational status. The green light flashes during normal operation, and the yellow light warns of a situation that could lead to a fault (e.g. low chemical). If a fault occurs "error" will appear on the LCD screen and the red LED light appears.

Optional Modes and Functions

Optional Control Modes

"Analog" Mode

With this option, the stroking rate of the Sigma/1 is directly proportional to the analog signal. For a custom range setting, the curve feature of the analog input can be selected. With this, the pump response to the analog input can be easily programmed.

"Contact" Mode with Pulse Control

This feature is used to "tune" the pump 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 0.01-99.99 range, the step-up or step-down ratio is set.

For example:

Step-up Factor:
99.99 1 pulse = 99.99 pump strokes
10 1 pulse = 10 pump strokes

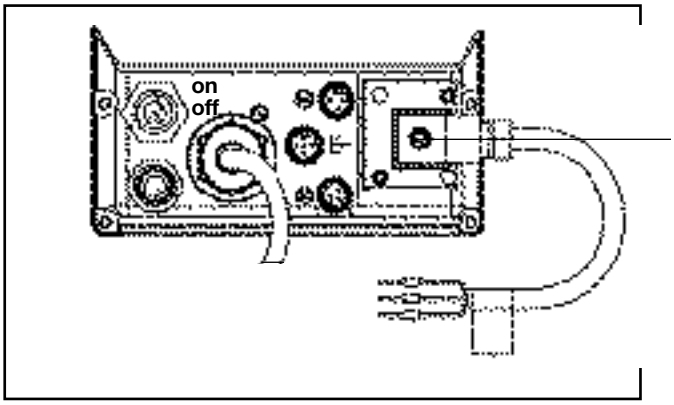
Step-down Factor:
0.25 4 pulses = 1 pump stroke
0.01 100 pulses = 1 pump stroke

"Batch" Mode

The Batch mode is a variation of the contact operating mode. A number of strokes can be predetermined up to 65,535 strokes (whole numbers) or the feed quantity can be predetermined. The batch is then initiated by either pressing the "P" key on the pump face or providing a contact to the external control cable.

Access Code

A programmable access code to prevent unauthorized changes to settings is available as an option.



An external panel enables optional relays to be installed on-site.

Relay outputs. . .

Fault annunciating relay

For low tank level (flow switch), loss of flow (flow monitor), loss of analog signal and diaphragm failure detector, system faults and fuse/ power supply failure.

Fault annunciating and Pacing relay

In addition to the fault annunciating 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.

4-20 mA Analog Output

A 4-20 mA analog output option is available for use with pumps that operate in the manual mode or by a remote 4-20 mA analog reference signal. The 4-20 mA analog output signal is linear to pump frequency multiplied by the percentage of stroke length. The output signal is isloated and can drive up to 300 Ohms impedance. Analog output can be used for status feedback to higher level control systems for closed loop control or for monitoring chemical usage. This option is available in combination with either the fault annunciating or pacing relay.

Timer Relay

The optional integrated 2-week timer offers 81 programmable events. It can be set to hourly, daily, work days, weekend, weekly or two-week periods with switch-on times from 1 second to two weeks. The timer can be programmed to change operation mode, frequency and the function of two relays. All the functions can be programmed independently of one another. Up to 13 delay times can be programmed into the timer function.

The range of applications exceeds that of a "standard timer". Typical application is disinfection in cooling towers, process water, etc. with the ability to automatically program shock dosages or increase the concentration at a certain interval.

Fieldbus connection

Monitor and control remotely via a SCADA/PLC system using the profibus-DP system.

Note: Relay options not available with profibus. Profibus is not field retrofittable.

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Specifications

General:

Maximum stroke length: 0.196" (5.0 mm) HM; 0.6" (15 mm) HK

Power cord: 6 foot (2 m) 2 wire + ground (supplied on control versions)

Stroke frequency control: S2Ba: Constant speed or optional DC/SCR drive or AC inverter
S2Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.

Stroke counting: Standard on S2Ca

Materials of construction
Inner casing: Cast aluminum
Housing: Glass-filled Luranyl™ (PPE)

Wetted materials of construction:

		PVDF	**316 SS**
Liquid End:			
Suct./Dis. Connectors:		PVDF	316 SS
Seals:		PTFE	PTFE
Check Balls:		Ceramic	SS

Drive: Cam and spring-follower (lost motion)

Lubrication: Oil lubricated

Recommended oil: ISO VG 460, such as Mobil Gear Oil 634; ProMinent Part no. 555325

Oil quantity: Approximately 0.6 quart (550 mL)

Recommended oil change interval: 5,000 hours

Warranty: Two years on drive, one year on liquid end.

Factory testing: **Each pump is tested for rated flow at maximum pressure.**

Industry Standard: CE approved, CSA available (standard in Canada)

Sigma/2 HM:

Diaphragm materials: PTFE faced EPDM with Nylon reinforcement and steel core

Liquid end options: Polyvinylidene Fluoride (PVDF) or 316 SS, with PTFE seals

Check valves: Single ball check, PVDF and SS versions.
Optional springs available (Hastelloy C4)

Repeatability: When used according to the operating instructions, better than ±2%

Max. fluid operating temperatures:

Material	Constant (Max. Backpressure)	Short Term (15 min. @ max.30 psi)
PVDF	149˚F (65˚C)	212˚F (100˚C)
316 SS	194˚F (90˚C)	248˚F (120˚C)

Diaphragm failure indication: Optional, see accessories. Switch is N.C., opens to indicate failure. Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC,1.0 A resistive. Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.

Separation of drive from liquid end: An air gap with secondary safety diaphragm separates the drive from the liquid end to prevent cross contamination of oil and process fluid (with or without optional diaphragm failure indication).

Max. solids size in fluid: 0.3 mm

Stroke length adjustment: Manual, in increments of 0.5%. Motorized stroke length adjustment available.

Sigma/2 HK:

Piston materials: Ceramic oxide; packing rings of PTFE, packing spring of 316 SS.

Liquid end options: 316 SS with PTFE seals

Check valves: Double ball, stainless steel; optional springs (Hastelloy C4).

Repeatability: When used according to the operating instructions, better than ±0.5%

Max. fluid operating temperatures:

Material	Constant	Short Term
316 SS	392˚F (200˚C)	428˚F (220˚C)

Stroke length adjustment: Manual, in increments of 0.2%. Motorized stroke length control optional.

ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Specifications

Sigma/2 Basic Version

Motor mounting flange:	Fits all NEMA 56C frame motors (motor not included with pump)
Gear ratios and stroke frequencies (with 1725 RPM motor):	20:1 = 87 SPM, 11:1 = 156 SPM, 7.25:1 = 232 SPM
Motor coupling:	Flexible coupling included with pump.
Required Motor HP:	1/3 HP (.25 kW)
Full load RPM:	1750 RPM (60 Hz)
Stroke sensor (optional):	Hall effect - requires 5 VDC

Sigma/2 Control Version

Control Function:	At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke fre quency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
Enclosure rating:	NEMA 3 (IP 55)
Motor data:	Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.18 kW (0.24 HP) 230 3 phase (1.9 A)
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: 24 V, 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 voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: $750x10^6$ Contact closure: 100 ms (for pacing relay)
Analog output signal:	max. impedance 300 Ω Isolated 4-20 mA output signal
Profibus - DP fieldbus options:	Transfer: RS - 485 Wiring: 2-wired, twisted, shielded Length: 3637 ft. (1200 m)/328 ft. (100 m) Baudrate: 9600 bits/s; 12 Mbits/s No. of participants: 32 with 127 repeaters Topology: Line Access procedure: Master/master with token ring
Relay cable (optional):	6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A
Pulse contact/remote pause contact:	With voltage-free contact, or semiconductor sink logic control (not source logic) 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 frequency:	25 pulses/sec
Contact impedance:	10 kOhm
Max. pulse memory:	65,535 pulses
Necessary contact duration:	20ms
Analog - current input burden:	Approximately 120 Ohm
Max. allowable input current:	50 mA
Power requirements:	single phase, 115-230 VAC

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Capacity Data

Sigma/2 Basic Version

Technical data:	60 Hz (1750 RPM) operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor	
Pump Version S2Ba HM	**psig**	**(bar)**	**U.S. GPH**	**(L/h)**	**Stroke/ min.**	**mL/ stroke**	**ft.**	**(m)**	**psig**	**(bar)**	**DN**	**in.**	**lbs.**	**(kg.)**
16050 PVT	145	(10)	15.9	(60)	87	11.4	23	(7)	44	(3)	15	1/2 MNPT	33	(15)
16050 SST	232	(12)	15.2	(57)	87	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16090 PVT	145	(10)	28.5	(108)	156	11.4	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16090 SST	232	(12)	27	(103)	156	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16130 PVT	145	(10)	41	(156)	232	10.9	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16130 SST	232	(12)	39.6	(150)	232	10.9	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
07120 PVT	100	(7)	38	(144)	87	27.4	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07120 SST	100	(7)	38	(144)	87	27.4	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
07220 PVT	100	(7)	69.7	(264)	156	27.7	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07220 SST	100	(7)	69.7	(264)	156	27.7	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
04350 PVT	58	(4)	111	(420)	232	29.4	16	(5)	15	(1)	25	1 MNPT	35	(16)
04350 SST	58	(4)	111	(420)	232	29.4	16	(5)	15	(1)	25	1 MNPT	53	(24)

Sigma/2 Control Version

Technical data:	60 Hz operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor	
Pump Version S2Ca HM	**psig**	**(bar)**	**U.S. GPH**	**(L/h)**	**Stroke/ min.**	**mL/ stroke**	**ft.**	**(m)**	**psig**	**(bar)**	**DN**	**in.**	**lbs.**	**(kg.)**
16050 PVT	145	(10)	15.9	(60)	90	11.4	23	(7)	44	(3)	15	1/2 MNPT	33	(15)
16050 SST	232	(12)	15.9	(60)	90	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16090 PVT	145	(10)	28.5	(108)	160	11.4	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16090 SST	232	(12)	28.5	(108)	160	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16130 PVT	145	(10)	34.3	(130)	200	10.9	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16130 SST	232	(12)	34.3	(130)	200	10.9	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
07120 PVT	100	(7)	38	(144)	90	27.4	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07120 SST	100	(7)	38	(144)	90	27.4	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
07220 PVT	100	(7)	69.7	(264)	160	27.7	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07220 SST	100	(7)	69.7	(264)	160	27.7	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
04350 PVT	58	(4)	92.5	(350)	200	29.4	16	(5)	15	(1)	25	1 MNPT	35	(16)
04350 SST	58	(4)	92.5	(350)	200	29.4	16	(5)	15	(1)	25	1 MNPT	53	(24)

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

Materials In Contact With Chemicals

Liquid End	Suction/Discharge connector	Valve	Seals/ ball seat	Balls
PVT	PVDF (Polyvinylidenefluoride)	PVDF (Polyvinylidenefluoride)	PTFE/PTFE	Ceramic/Glass*
SST	Stainless steel	Stainless steel	PTFE/PTFE	Stainless steel

*for 07120, 07220, 04350

ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Identcode Ordering System (S2Ba)

S2Ba **Sigma/2 Basic Version a**

HM — Main Drive, Diaphragm

Pump version:

16050*
16090*
16130*
07120
07220
04350

* For PVDF versions, max. 145 psig (10 bar)

Liquid end material:

PV — PVDF
SS — 316 Stainless steel

Seal material:

T — PTFE

Diaphragm type:

0 — Standard diaphragm
1 — With double diaphragm and failure detector (NC contact opens on fault)

Liquid end version:

0 — Without valve springs
1 — With 2 valve springs (Hastelloy C4, 1 psig)

Connectors:

7 — PVDF clamping nut & insert
8 — SS clamping nut & insert

Labeling:

0 — Standard with logo

Motor mount:

2 — Without motor, with NEMA 56C flange

Enclosure rating:

0 — Standard

Stroke sensor:

0 — Without stroke sensor (Standard)
2 — With Pacing relay (Consult Factory)

Stroke length adjustment:

0 — Manual (Standard)
4 — W/ stroke positioning motor 4 - 20 mA, 230 V 50/60 Hz
6 — W/ stroke positioning motor 4 - 20 mA, 115 V 50/60 Hz

S2Ba	HM	120130	PV	T	0	0	7	0	2	0	0	0

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Identcode Ordering System (S2Ca)

S2Ca **Sigma/2 Control Version a**

Main drive

HM Main drive/Diaphragm

Pump version:

16050*	07120
16090*	07220
16130* **	04350**

* For PVDF versions, max. 145 psig (10 bar)
** Max. 200 strokes per minute

Liquid end materials:

PVT PVDF with PTFE
SST 316 Stainless steel with PTFE

Diaphragm type:

0 Standard diaphragm, PTFE
1 With double diaphragm and failure detector (NC contact opens on fault)
2 With double diaphragm and failure detector (alarm & continues to operate)

Liquid end version:

0 Without valve springs
1 With 2 valve springs (Hastelloy C4, 1.45 psig)

Connectors:

7 PVDF clamping nut & insert
8 SS clamping nut & insert

Labeling:

0 Standard with logo

Voltage supply:

U 1 ph, 115-230 V ± 10%, 50/60 Hz

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

A European plug, 230 V
D N. American plug, 115 V
U N. American plug, 230 V

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
C Option 1 + 4-20 mA output
D Option 3 + 4-20 mA output
E Pacing relay + 4-20 mA output

Control variants:

0 Manual + External with pulse control (multiplier/divider)
1 Manual + External with pulse control & analog control
4 Option 0 + timer
5 Option 1 + timer
P Option 1 + Profibus (Relay must be 0)

Access code:

0 No access code
1 Access code

Flow monitor:

0 Input for metering monitor signal (pulse)
1 Input for maintained flow switch signal

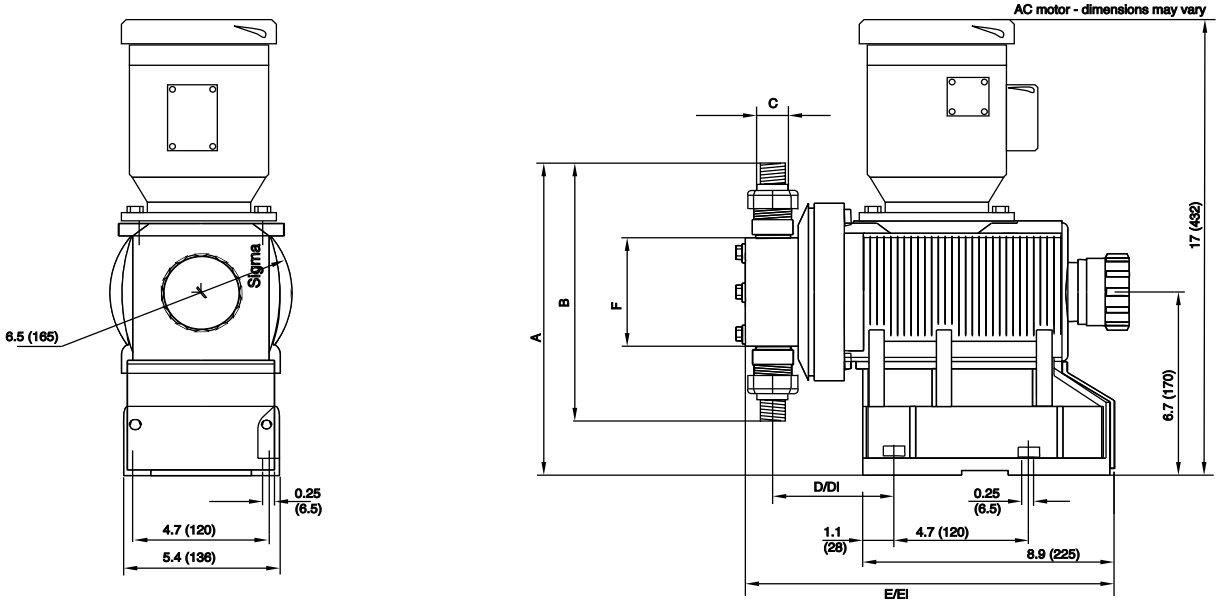
Stroke length adjustment:

C Manual + Calibration

S2Ca	H	07120	PVT	0	0	7	0	U	D	0	0	0	0	C

ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S2Ba)



Dimensions in inches (mm)

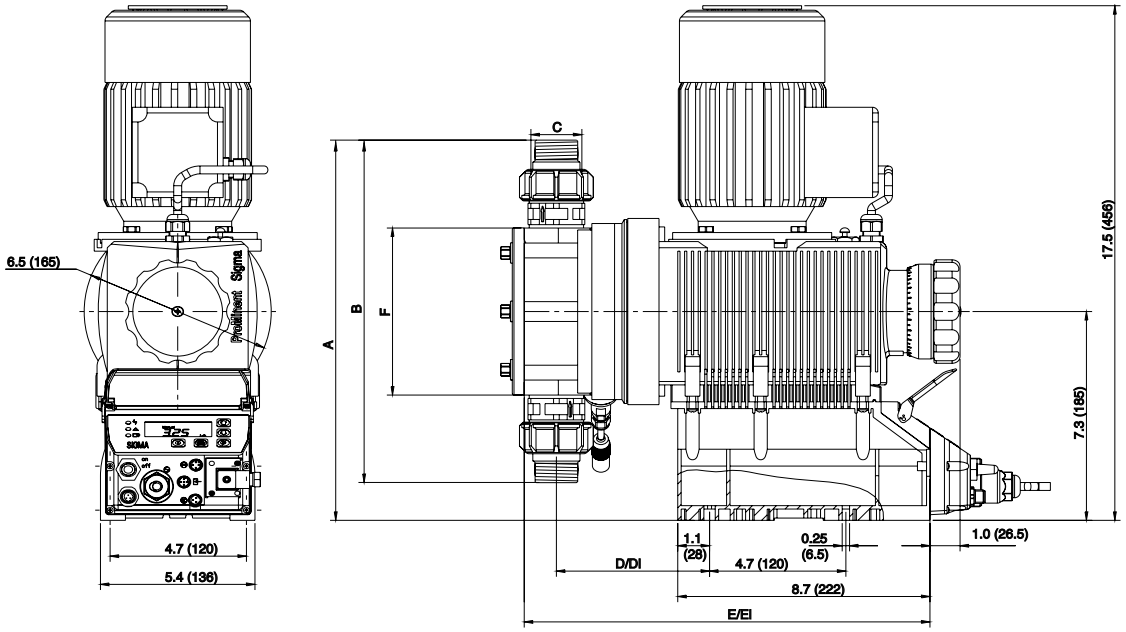
Type Sigma/2	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
16050, 16090, 16130								
PVT	10.1 (257)	6.95 (177)	DN 15	4.1 (104)	4.9 (124)	13.0 (329)	13.7 (349)	4.0 (101)
SST	10.9 (276)	8.2 (208)	DN 15	4.1 (104)	4.9 (124)	13.0 (329)	13.7 (349)	4.0 (101)
07120, 07220,								
PVT	13.3 (337)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
SST	13.3 (337)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
04350								
PVT	14.3 (362)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
SST	14.3 (362)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector.

ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S2Ca)



Dimensions in inches (mm)

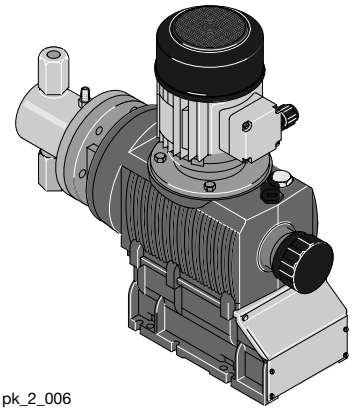
Type Sigma/2	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
16050, 16090, 16130 PVT	10.6 (272)	6.95 (177)	DN 15	4.1 (104)	4.9 (124)	12.8 (326)	13.6 (346)	4.0 (101)
SST	10.4 (288)	8.2 (208)	DN 15	4.1 (104)	4.9 (124)	12.8 (326)	13.6 (346)	4.0 (101)
07120, 07220, PVT	13.9 (352)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
SST	13.9 (352)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
04350 PVT	14.9 (377)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
SST	14.9 (377)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Overview: Sigma/2 HK



pk_2_006

Ideal for high pressure applications requiring significant turndown

The ProMinent® Sigma/ 2 motor driven plunger metering pump has a high strength metal-lined housing for those components subject to load, and an additional plastic housing to protect against corrosion. It has a capacity range of 0.6- 20.1 gph (2.3-76 l/h) at a max. backpressure of 174-4640 psi (12-320 bar). The pump capacity is adjusted by varying the stroke length 0.6 in (15 mm) in 0.2 % steps via a self locking rotary knob.
The reproducible metering accuracy is better than ±1 % providing installation has been correctly carried out, and in the stroke length range of 30 -100 %. (Follow instructions given in operating instructions manual.)

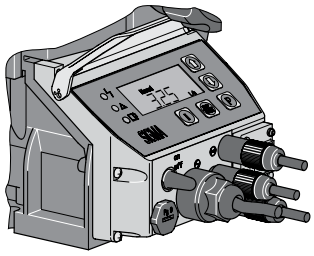
The rugged, corrosion resistant metal and plastic housing is combined with a choice of three gearbox ratios and four 316 stainless steel liquid end sizes. To facilitate adaptation of the pumps to the widest possible range of processing requirements the S2Ca Sigma controller offers either contact or analogue signal (e.g. 0/4-20 mA) control options.

For safety reasons, all motor driven metering pumps must be equipped with adequate protection against electrical overload.

Sigma/ 2 HK Basic Type (S2Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S2Ba offers a variety of different drive options in the single phase AC motors (56-C flange). Different flanges are available so that customers can use their own motor to drive the pump.

Sigma/ 2 HK Control Type (S2Ca)



pk_2_104

The ProMinent® Sigma/ 2 microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The control unit has the same control surface as the ProMinent® gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

With five programming keys the individual pump functions are easy to set. A backlit LCD gives information about the prevailing operating status. LEDs along with a fault-indicating or pacing relay act as operating and warning indicators to ensure monitoring of the pump function.

pk_2_103

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Specifications

General:

Maximum stroke length:	0.196” (5.0 mm) HM; 0.6” (15 mm) HK
Power cord:	6 foot (2 m) 2 wire + ground (supplied on control versions)
Stroke frequency control:	S2Ba: Constant speed or optional DC/SCR drive or AC inverter S2Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.
Stroke counting:	Standard on S2Ca
Materials of construction	
Inner casing:	Cast aluminum
Housing:	Glass-filled Luranyl™ (PPE)

Wetted materials of construction:

	PVDF	**316 SS**
Liquid End:		
Suct./Dis. Connectors:	PVDF	316 SS
Seals:	PTFE	PTFE
Check Balls:	Glass	SS

Drive:	Cam and spring-follower (lost motion)
Lubrication:	Oil lubricated
Recommended oil:	ISO VG 460, such as Mobil Gear Oil 634; ProMinent Part no. 555325
Oil quantity:	Approximately 0.6 quart (550 mL)
Recommended oil change interval:	5,000 hours
Warranty:	Two years on drive, one year on liquid end.
Factory testing:	**Each pump is tested for rated flow at maximum pressure.**
Industry Standard:	CE approved, CSA available (standard in Canada)

Sigma/2 HM:

Diaphragm materials:	PTFE faced EPDM with Nylon reinforcement and steel core
Liquid end options:	Polyvinylidene Fluoride (PVDF) or 316 SS with PTFE
Check valves:	Single ball check, PVDF and SS versions. Optional springs available (Hastelloy C4)
Repeatability:	When used according to the operating instructions, better than ±2%

Max. fluid operating temperatures:

Material	**Constant** (Max. Backpressure)	**Short Term** (15 min. @ max.30 psi)
PVDF	149˚F (65˚C)	212˚F (100˚C)
316 SS	194˚F (90˚C)	248˚F (120˚C)

Diaphragm failure indication:	Optional, see accessories. Switch is N.C., opens to indicate failure. Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC,1.0 A resistive. Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.
Separation of drive from liquid end:	An air gap with secondary safety diaphragm separates the drive from the liquid end to prevent cross contamination of oil and process fluid (with or without optional diaphragm failure indication).
Max. solids size in fluid:	0.3 mm
Stroke length adjustment:	Manual, in increments of 0.5%. Motorized stroke length adjustment available.

Sigma/2 HK:

Piston materials:	Ceramic oxide; packing rings of PTFE, packing spring of 316 SS.
Liquid end options:	316 SS with PTFE seals
Check valves:	Double ball, stainless steel; optional springs (Hastelloy C4).
Repeatability:	When used according to the operating instructions, better than ±0.5%

Max. fluid operating temperatures:

Material	**Constant**	**Short Term**
316 SS	392˚F (200˚C)	428˚F (220˚C)

Stroke length adjustment:	Manual, in increments of 0.2%. Motorized stroke length control optional.

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Specifications

Sigma/2 Basic Version

Motor mounting flange:	Fits all NEMA 56C frame motors (motor not included with pump)
Gear ratios and stroke frequencies (with 1725 RPM motor):	20:1 = 87 SPM, 11:1 = 156 SPM, 7.25:1 = 232 SPM
Motor coupling:	Flexible coupling included with pump.
Required Motor HP:	1/3 HP (.25 kW)
Full load RPM:	1750 RPM (60 Hz)
Stroke sensor (optional):	Hall effect - requires 5 VDC

Sigma/2 Control Version

Control Function:	At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
Enclosure rating:	NEMA 3 (IP 55)
Motor data:	Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.18 kW (0.24 HP) 230 3 phase (1.9 A)
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: 24 V, 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 voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: $750x10^6$ Contact closure: 100 ms (for pacing relay)
Analog output signal:	max. impedance 300 Ω Isolated 4-20 mA output signal
Profibus - DP fieldbus options:	Transfer: RS - 485 Wiring: 2-wired, twisted, shielded Length: 3637 ft. (1200 m)/328 ft. (100 m) Baudrate: 9600 bits/s; 12 Mbits/s No. of participants: 32 with 127 repeaters Topology: Line Access procedure: Master/master with token ring
Relay cable (optional):	6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A
Pulse contact/remote pause contact:	With voltage-free contact, or semiconductor sink logic control (not source logic) 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 frequency:	25 pulses/sec
Contact impedance:	10 kOhm
Max. pulse memory:	65,535 pulses
Necessary contact duration:	20ms
Analog - current input burden:	Approximately 120 Ohm
Max. allowable input current:	50 mA
Power requirements:	single phase, 115-230 VAC

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Capacity Data

Sigma/2 HK Basic Version

Technical data:	60 Hz (1750 RPM) operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector	Shipping Weight w/Motor	
Pump Version Sigma/2B HK	psig	(bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	ft.	(m)	psig	(bar)	in. FNPT (G)	lbs.	(kg.)
32002 SST	4640	(320)	0.6	(2.3)	84	0.46	16	(5)	2175	(150)	1/4	53	(24)
23004 SST	3335	(230)	1.2	(4.8)	153	0.52	16	(5)	2175	(150)	1/4	53	(24)
10006 SST	1450	(100)	2.0	(7.6)	233	0.55	16	(5)	2175	(150)	1/4	53	(24)
14006 SST	2030	(140)	1.8	(7.1)	84	1.42	13	(4)	870	(60)	1/4	53	(24)
10011 SST	1450	(100)	3.4	(13.1)	153	1.43	13	(4)	870	(60)	1/4	53	(24)
05016 SST	725	(50)	5.2	(20)	233	1.43	13	(4)	870	(60)	1/4	53	(24)
07012 SST	1015	(70)	3.9	(14.8)	84	2.90	13	(4)	435	(30)	1/4	53	(24)
04522 SST	652	(45)	7.0	(27.6)	153	2.91	13	(4)	435	(30)	1/4	53	(24)
02534 SST	363	(25)	10.7	(40.8)	233	2.92	13	(4)	435	(30)	1/4	53	(24)
04022 SST	580	(40)	7.0	(26.5)	84	5.26	13	(4)	218	(15)	3/8	55	(25)
02541 SST	363	(25)	13.0	(49.2)	153	5.37	13	(4)	218	(15)	3/8	55	(25)
01264 SST	174	(12)	20.1	(76)	233	5.45	13	(4)	218	(15)	3/8	55	(25)

Sigma/2 HK Control Version

Technical data:	60 Hz operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector	Shipping Weight w/Motor	
Pump Version Sigma/2C HK	psig	(bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	ft.	(m)	psig	(bar)	in. FNPT (G)	lbs.	(kg.)
32002 SST	4640	(320)	0.6	(2.3)	84	0.46	16	(5)	2175	(150)	1/4	53	(24)
23004 SST	3335	(230)	1.2	(4.8)	153	0.52	16	(5)	2175	(150)	1/4	53	(24)
10006 SST	1450	(100)	1.7	(6.5)	200	0.55	16	(5)	2175	(150)	1/4	53	(24)
14006 SST	2030	(140)	1.8	(7.1)	84	1.42	13	(4)	870	(60)	1/4	53	(24)
10011 SST	1450	(100)	3.4	(13.1)	153	1.43	13	(4)	870	(60)	1/4	53	(24)
05016 SST	725	(50)	4.5	(17.2)	200	1.43	13	(4)	870	(60)	1/4	53	(24)
07012 SST	1015	(70)	3.9	(14.8)	84	2.90	13	(4)	435	(30)	1/4	53	(24)
04522 SST	652	(45)	7.0	(27.6)	153	2.91	13	(4)	435	(30)	1/4	53	(24)
02534 SST	363	(25)	9.2	(35.0)	200	2.92	13	(4)	435	(30)	1/4	53	(24)
04022 SST	580	(40)	7.0	(26.5)	84	5.26	13	(4)	218	(15)	3/8	55	(25)
02541 SST	363	(25)	13.0	(49.2)	153	5.37	13	(4)	218	(15)	3/8	55	(25)
01264 SST	174	(12)	17.3	(65.4)	200	5.45	13	(4)	218	(15)	3/8	55	(25)

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

Materials In Contact With Chemicals

	Liquid End	Suction/ Discharge connector	Seals	Valve Balls	Ball Seat
SST	Stainless steel	Stainless steel	PTFE/PTFE	Ceramic	Stainless steel

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Identcode Ordering System (S2Ba HK)

S2Ba **Sigma Basic Version a**

HK — Main drive/Plunger

Pump version:

32002	04522
14006	02541
07012	10006
04022	05016
23004	02534
10011	01264

Liquid end material:
SS — 316 Stainless steel

Seal material:
T — PTFE seal

Plunger assembly:
4 — Plunger (Ceramic)

Liquid end version:
0 — Without valve springs (Standard)
1 — With 2 valve springs (Hastelloy C4, 1 psig)

Connectors:
0 — Standard (In accordance with technical data)

Labeling:
0 — Standard with logo

Motor mount:
2 — Without motor, with NEMA 56C flange

Enclosure rating:
0 — Standard

Stroke sensor:
0 — Without stroke sensor (Standard)
1 — With Pacing relay (consult factory)

Stroke length adjustment:
0 — Manual
5 — W/ stroke positioning motor 0 - 20 mA, 115 V, 50/60 Hz
6 — W/ stroke positioning motor 4 - 20 mA, 115 V, 50/60 Hz

SIBa	**HK**	**14006**	**SS**	**T**	**4**	**1**	**0**	**0**	**2**	**0**	**0**	**0**

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Identcode Ordering System (S2Ca HK)

S2Ca **Sigma Control Version a**

HK — Main drive/ Plunger

Pump version:

32002	04522
14006	02541
07012	10006
04022	05016
23004	02534
10011	01264

Liquid end material:
SS — 316 Stainless steel

Seal material:
T — PTFE seal

Plunger:
4 — Plunger (Ceramic)

Liquid end version:
0 — Without valve springs (Standard)
1 — With 2 valve springs (Hastelloy C4, 1 psig)

Connectors:
0 — Standard (In accordance with technical data)

Labeling:
0 — Standard with logo

Voltage supply:
U — 1 ph, 115-230 V ± 10%, 50/60 Hz

Cable and plug with 6 ft (2 m) power cord, single phase:
A — European plug, 230 V
D — N. American plug, 115 V
U — N. American plug, 230 V

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

Control variants:
0 — Manual + External with pulse control (multiplier/divider)
1 — Manual + External with pulse control & analog control
4 — Option 0 + timer
5 — Option 1 + timer
P — Option 1+ Profibus (Relay must be 0)

Access code:
0 — No access code
1 — Access code

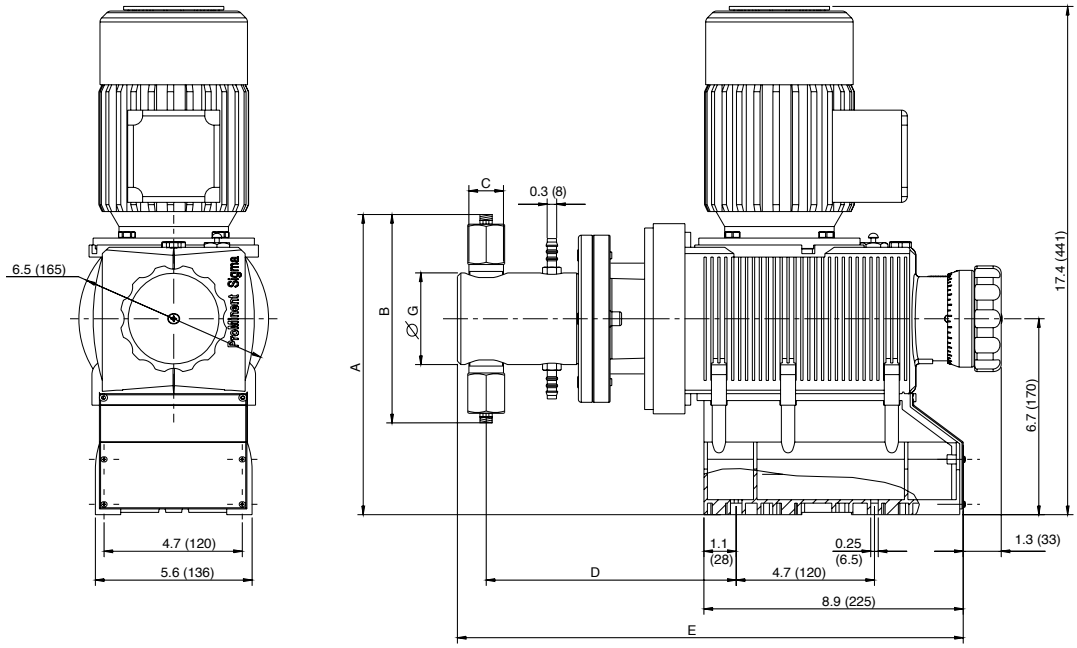
Flow monitor:
0 — Input for metering monitor signal (pulse)
1 — Input for maintained flow switch signal

Stroke length adjustment:
C — Manual + Calibration

S2Ca	HK	14006	SS	T	4	0	0	0	U	D	0	0	0	0	C

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Dimensional Drawing: (S2Ba HK)



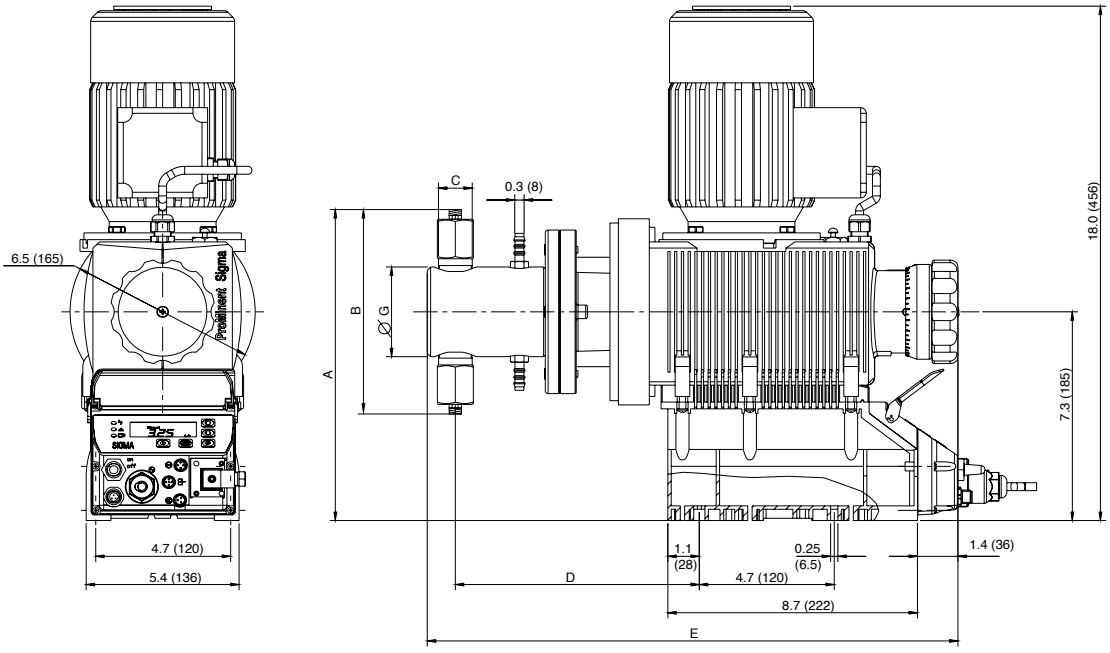
The S2Ba HK models offer other motors, and height dimensions may vary.

Dimensions in inches (mm)

Model	Connector	A	B	C	D	E	G
32002 23004 10006	1/4” DN 8	10.9 (277)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
14006 10011 05016	1/4” DN 8	10.9 (277)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
07012 04522 02534	1/4” DN 8	10.9 (277)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
04022 02541 01264	3/8” DN 10	11 (279)	8.8 (223)	R3/8”	8.5 (217)	17.3 (439)	3.1 (79.5)

ProMinent® Sigma/ 2 HK Plunger Metering Pumps

Dimensional Drawing: (S2Ca HK)

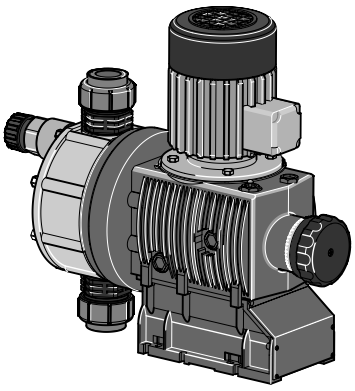


Dimensions in inches (mm)

Model	Connector	A	B	C	D	E	G
32002 23004 10006	1/4” DN 8	11.5 (292)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
14006 10011 05016	1/4” DN 8	11.5 (292)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
07012 04522 02534	1/4” DN 8	11.5 (292)	8.5 (216)	R1/4”	8.5 (217)	17.3 (439)	3.1 (79.5)
04022 02541 01264	3/8” DN 10	11.6 (294)	8.8 (223)	R3/8”	8.5 (217)	17.3 (439)	3.1 (79.5)

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Overview: Sigma/ 3



pk_2_071

Ideal for applications requiring automation, large turndown and/or feed verification

(see page 133 for spare parts and page 138 for control cables)

The ProMinent® Sigma/ 3 is a mechanically actuated diaphragm metering pump. The capacity range extends from 46-264 gph (174-1000 l/h) at a max backpressure of 174-58 psi (12-4 bar). The feed rate is adjustable by altering the stroke length (6 mm) in 0.5 % increments by means of a self-locking rotating knob.

Under defined conditions and when installed correctly, the reproducibility of the metering is better than ±2 % at a stroke length of between 30 % and 100 % (instructions in the operating instructions manual must be followed).

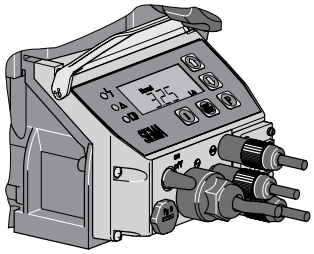
The stable, corrosion-resistant metal and plastic housing is combined with four gear ratios, two liquid end sizes and two liquid end materials. The optional control via switch or analogue signal (e.g. 0/4-20 mA) for the Sigma (S3Ca) controller type means that the pump is highly adaptable, even to fluctuating metering requirements.

In all motor-driven metering pumps without integrated overload protection, for safety reasons, suitable overload protection must be provided during installation.

Sigma/ 3 Basic Type (S3Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S2Ba offers a variety of different drive options in the single phase AC motors (56-C flange). Different flanges are available so that customers can use their own motor to drive the pump.

Sigma/ 3 Control Type (S3Ca)



pk_2_104

The ProMinent® Sigma/ 3 microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The control unit has the same control surface as the ProMinent® gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

With five programming keys the individual pump functions are easy to set. A backlit LCD gives information about the prevailing operating status. LEDs along with a fault-indicating or pacing relay act as operating and warning indicators to ensure monitoring of the pump function.

PROFI® PROCESS FIELD BUS BUS Central or decentral adjustmentis possible with PROFIBUS® and/or an integrated process timer.

(see page 138)

pk_2_003

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Specifications

General:

Maximum stroke length:	0.236" (6.0 mm)
Power cord:	6 foot (2 m) 2 wire + ground (supplied on control version)
Stroke frequency control:	S3Ba: Constant speed or optional DC/SCR drive or AC inverter S3Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.
Stroke counting:	Standard on S3Ca
Materials of construction	
Inner casing:	Cast aluminum
Housing:	Glass-filled Luranyl™ (PPE)

Wetted materials of construction:	Liquid End:	**PVDF**	**316 SS**
Suct./Dis. Connectors:	PVDF	316 SS	
	Seals:	PTFE	PTFE
	Check Balls: DN 25	Glass	SS
	Check Plates: DN 32	Hastelloy C	Hastelloy C

Drive:	Cam and spring-follower (lost motion)
Lubrication:	Oil lubricated
Recommended oil:	ISO VG 460, such as Mobil Gear Oil 634; ProMinent Part no. 555325
Oil quantity:	Approximately 0.95 quart (900 mL)
Recommended oil change interval:	5,000 hours
Warranty:	Two years on drive, one year on liquid end.
Factory testing:	**Each pump is tested for rated flow at maximum pressure.**
Industry Standard:	CE approved, CSA available (standard in Canada)
Diaphragm materials:	PTFE faced EPDM with Nylon reinforcement and steel core
Liquid end options:	Polyvinylidene Fluoride (PVDF) or 316 SS with PTFE
Check valves:	DN 25 valves - Single ball check, PVDF and SS versions. Optional springs available (Hastelloy C4) DN 32 valves - Plate valves, with Hastelloy C4 plates and springs in both PVDF and SS valves.
Repeatability:	When used according to the operating instructions, better than ±2%

Max. fluid operating temperatures:	Material	Constant (Max. Backpressure)	Short Term (15 min. @ max.30 psi)
	PVDF	149˚F (65˚C)	212˚F (100˚C)
	316 SS	194˚F (90˚C)	248˚F (120˚C)

Diaphragm failure indication:	Optional, see accessories. Switch is N.C., opens to indicate failure. Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC,1.0 A resistive. Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.
Separation of drive from liquid end:	An air gap with secondary safety diaphragm separates the drive from the liquid end to prevent cross contamination of oil and process fluid (with or without optional diaphragm failure indication).
Max. solids size in fluid:	0.3 mm
Stroke length adjustment:	Manual, in increments of 0.5%. Motorized stroke length adjustment available.

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Specifications

Basic Version

Motor mounting flange:	Fits all NEMA 56C frame motors (motor not included with pump)
Gear ratios and stroke frequencies (with 1725 RPM motor):	20:1 = 86 SPM, 14:1 = 124 SPM, 10.1: = 173 SPM
Motor coupling:	Flexible coupling included with pump.
Required Motor HP:	3/4 HP (.55 kW)
Full load RPM:	1750 RPM (60 Hz)
Stroke sensor (optional):	Hall effect - requires 5 VDC

Control Version

Control Function:	At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
Enclosure rating:	NEMA 3 (IP 55)
Motor data:	Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.37 kW (0.5 HP) 230 3 phase (1.9 A)
Thermal overload protection:	Thermal cutout switches off at 284˚F (140˚C).
Relay cable (optional):	6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A
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: 24 V, 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 voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: $750x10^6$ Contact closure: 100 ms (for pacing relay)
Analog output signal:	max. impedance 300 Ω Isolated 4-20 mA output signal
Profibus - DP fieldbus options:	Transfer: RS - 485 Wiring: 2-wired, twisted, shielded Length: 3637 ft. (1200 m)/328 ft. (100 m) Baudrate: 9600 bits/s; 12 Mbits/s No. of participants: 32 with 127 repeaters Topology: Line Access procedure: Master/master with token ring
Pulse contact/ Remote pause contact:	With voltage-free contact, or semiconductor sink logic control (not source logic) 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 frequency:	25 pulses/sec
Contact impedance:	10 kOhm
Max. pulse memory:	65,535 pulses
Necessary contact duration:	20ms
Analog - current input burden:	Approximately 120 Ohm
Max. allowable input current:	50 mA
Power requirements:	115 VAC or 230 VAC single phase

ProMinent® Sigma/ 3 Motor Diaphragm Metering Pumps

Capacity Data

Capacity at Maximum Backpressure					Max. Stroke Rate	Output per Stroke	Recomm. Motor HP	Max Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector		Approximate Shipping Weight w/ Motor	
Pump type S3Ba/S3Ca	psig	(bar)	U.S. GPH	(l/h)	Stroke/min. (S3B/S3C)	mL/ stroke	HP	ft.	(m)	psig	(bar)	in. MNPT	DN	lbs.	(kg)
120145 PVT	145	(10)	46	(174)	86/90	31.5	3/4	16	(5)	29	(2)	1	25	49	(22)
120145 SST	174	(12)	46	(174)	86/90	31.5	3/4	16	(5)	29	(2)	1	25	57	(26)
120190 PVT	145	(10)	60.2	(228)	124/120	31.5	3/4	16	(5)	29	(2)	1	25	49	(22)
120190 SST	174	(12)	60.2	(228)	124/120	31.5	3/4	16	(5)	29	(2)	1	25	57	(26)
120270 PVT	145	(10)	85.6	(324)	173/180	31.5	3/4	16	(5)	29	(2)	1	25	49	(22)
120270 SST	174	(12)	85.6	(324)	173/180	31.5	3/4	16	(5)	29	(2)	1	25	57	(26)
070410 PVT	100	(7)	130	(492)	86/90	95.1	3/4	13	(4)	14.5	(1)	1-1/2	32	53	(24)
070410 SST	100	(7)	130	(492)	86/90	95.1	3/4	13	(4)	14.5	(1)	1-1/2	32	64	(29)
070580 PVT	100	(7)	184	(696)	124/120	95.1	3/4	13	(4)	14.5	(1)	1-1/2	32	53	(24)
070580 SST	100	(7)	184	(696)	124/120	95.1	3/4	13	(4)	14.5	(1)	1-1/2	32	64	(29)
040830 PVT	58	(4)	264	(1000)	173/180	95.1	3/4	10	(3)	14.5	(1)	1-1/2	32	53	(24)
040830 SST	58	(4)	264	(1000)	173 /180	95.1	3/4	10	(3)	14.5	(1)	1-1/2	32	64	(29)

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

Materials In Contact With Chemical

Material	Suction/discharge connector Liquid end	DN 25 Seals	DN 25 Valve balls	DN 25 Valve seats	DN 32 Seals	DN 32 Valve Plate/ Spring	DN 32 Valve seats
PVT	PVDF (Polyvinylidenefluoride)	PTFE	Glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel	PTFE	Stainless steel	PTFE	PTFE	Stainless steel	PTFE

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Identcode Ordering System (S3Ba)

S3Ba **Sigma/3 Basic Version a**

H — Main Drive, Diaphragm

Pump version:

120145
120190
120270
070410
070580
040830

Liquid end material:

PV — PVDF
SS — 316 Stainless steel

Seal material:

T — PTFE

Diaphragm type:

0 — Standard diaphragm
1 — With double diaphragm and failure detector (NC contact opens on fault)

Liquid end version:

0 — Without valve springs
1 — With 2 valve springs (Hastelloy C4, 1 psig) (standard for 070410, 070580, 040830)

Connectors:

7 — PVDF clamping nut & insert
8 — SS clamping nut & insert

Labeling:

0 — Standard with logo

Motor mount:

2 — Without motor, with NEMA 56C flange

Enclosure rating:

0 — Standard

Stroke sensor:

0 — Without stroke sensor (Standard)
2 — With Pacing relay (Consult Factory)

Stroke length adjustment:

0 — Manual (Standard)
4 — W/ stroke positioning motor 4 - 20 mA, 230 V 50/60 Hz
6 — W/ stroke positioning motor 4 - 20 mA, 115 V 50/60 Hz

S3Ba	H	120145	PV	T	0	0	7	0	2	0	0	0

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Identcode Ordering System (S3Ca)

S3Ca **Sigma/3 Control Version a**

H — Main drive/Diaphragm

Pump version:

120145	070410
120190	070580
120270	040830

Liquid end material:

PVT	PVDF with PTFE
SST	316 Stainless steel with PTFE

Diaphragm type:

0	Standard diaphragm, PTFE
1	With double diaphragm and failure detector (NC contact opens on fault)
2	With double diaphragm and failure detector (alarm & continues to operate)

Liquid end version:

0	Without valve springs
1	With 2 valve springs (Hastelloy C4, 1.45 psig) (standard for 070410, 070580, 040830)

Connectors:

7	PVDF clamping nut & insert
8	SS clamping nut & insert

Labeling:

0	Standard with logo

Voltage supply:

W	1 ph, 115-230V ± 10%, 50/60 Hz

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

A	European plug, 230V
D	N. American plug, 115 V
U	N. American plug, 230 V

Relay:

0	Without relay (For Profibus only)
1	Fault annunciating relay, drops out (Standard)
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay
C	Option 1 + 4-20 mA output
D	Option 3 + 4-20 mA output
E	Pacing relay + 4-20 mA output

Control Variants:

0	Manual + External with pulse control (multiplier/divider)
1	Manual + External with pulse control & analog control
4	Option 0 + timer
5	Option 1 + timer
P	Option 1+ Profibus (Relay must be 0)

Access Code:

0	No Access Code
1	Access Code

Flow Monitor:

0	Input for metering monitor signal (pulse)
1	Input for maintained flow switch signal

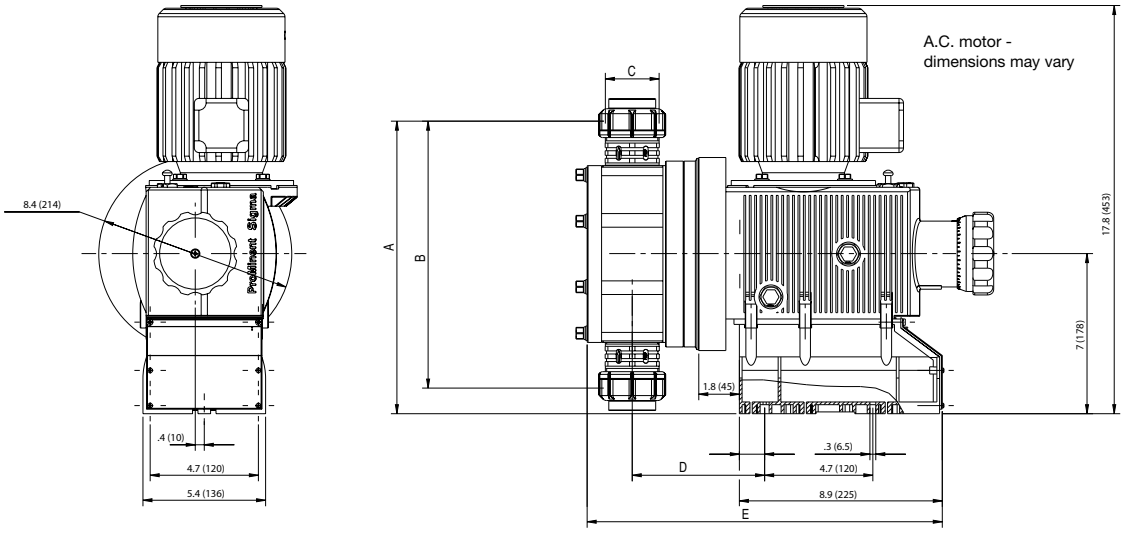
Stroke Length Adjustment:

C	Manual + Calibration

S3Ca H 040830 PVT 0 0 7 0 U D 0 0 0 0 C

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S3Ba)



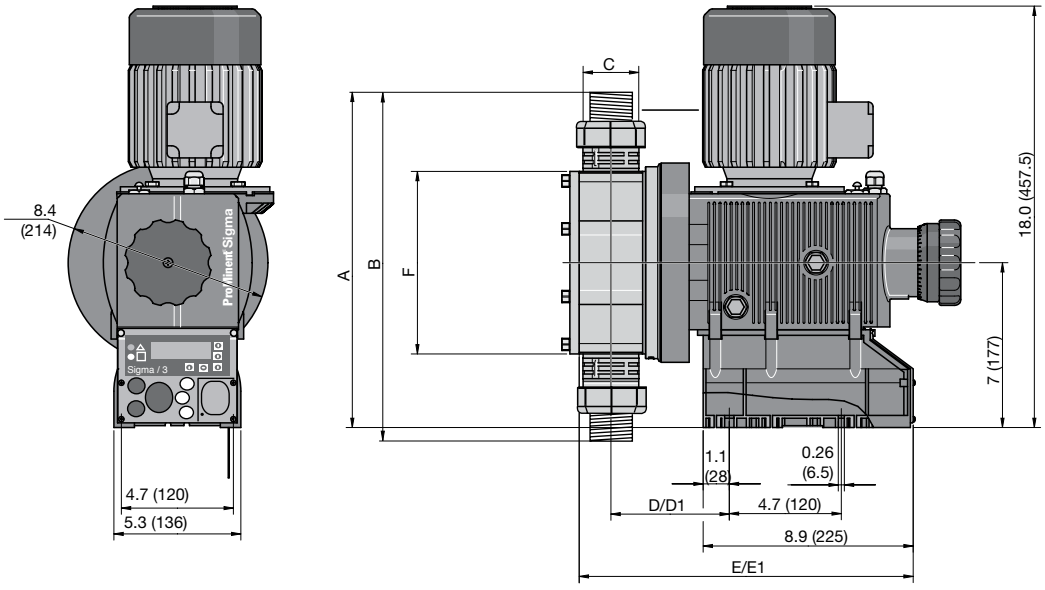
Dimensions in inches (mm)

Type Sigma/3	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
121045, 120190, 120270								
PVT	14.1 (358)	14.3 (364)	1" MNPT	4.7 (120)	5.5 (140)	13.6 (346)	14.4 (366)	6.1 (156)
SST	14.1 (358)	14.3 (364)	1" MNPT	4.8 (121)	5.6 (141)	13.7 (349)	14.5 (369)	6.1 (156)
070410, 070580, 040830								
PVT	15.9 (403)	17.8 (453)	1-1/2" MNPT	5.0 (127)	5.7 (147)	14.0 (358)	14.8 (378)	8.1 (206)
SST	15.3 (387)	16.9 (430)	1-1/2" MNPT	5.0 (127)	5.7 (147)	14.0 (358)	14.8 (378)	8.1 (206)

* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.

ProMinent® Sigma/ 3
Motor Diaphragm Metering Pumps

Dimensional Drawing: (S3Ca)



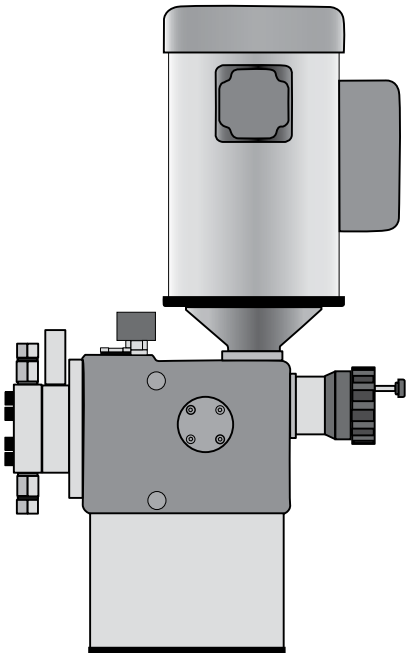
Dimensions in inches (mm)

Type Sigma/3	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	F
121045, 120190, 120270								
PVT	14.1 (358)	14.3 (364)	1" MNPT	4.7 (120)	5.5 (140)	13.6 (346)	14.4 (366)	6.1 (156)
SST	14.1 (358)	14.3 (364)	1" MNPT	4.8 (121)	5.6 (141)	13.7 (349)	14.5 (369)	6.1 (156)
070410, 070580, 040830								
PVT	15.9 (403)	17.8 (453)	1-1/2" MNPT	5.0 (127)	5.7 (147)	14.0 (358)	14.8 (378)	8.1 (206)
SST	15.3 (387)	16.9 (430)	1-1/2" MNPT	5.0 (127)	5.7 (147)	14.0 (358)	14.8 (378)	8.1 (206)

* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Overview: ProMus



High pressure chemical process metering

(see page 135 for spare parts)

The ProMus is a motor driven metering pump with a hydraulically actuated diaphragm. The drive case and the hydraulic unit are filled with a liquid that functions as a hydraulic coupling. A plunger connects the drive case with the hydraulic unit. The dosing diaphragm separates the hydraulic part of the pump from the dosing unit. The movement of the diaphragm depends on the amount of liquid displaced by the plunger.

ProMus Design Specifications

The ProMinent ProMus is a motor driven metering pump incorporating a hydraulically balanced Teflon diaphragm. The drive case is cast iron incorporating a worm gear set (5 Ratios available) driving a rotating eccentric. The locking stroke adjuster varies the flow from 100% to 0% in 1% increments. The pump is built in accordance to API 675 standards. The hydraulic system transfers the rotating eccentric motion to diaphragm movement by way of a reciprocating plunger (8 plunger diameters available). The plunger and diaphragm are hydraulically coupled (no mechanical connection). Coupling compliance is precisely controlled by a mechanically actuated replenishment valve, which senses diaphragm position to admit coupling fluid as required. The coupling fluid is automatically degassed to maintain accuracy and drive case is protected from overload by a simple acting relief valve. The hydraulic system is separated from the fluid end by a Teflon diaphragm completely isolating the pumped fluid from the surroundings. The liquid end is currently available in PVDF, Stainless Steel, Hastelloy C and Alloy 20.

ProMus Benefits

- Flow rates from 0.23 gph (0.87 L/h) to 101 gph (382 L/h) and Pressures up to 3500 psi (241 bar)
- Hydraulically actuated diaphragm ensuring a sealed pumping system for corrosive or toxic chemicals with superior leak protection
- Built in accordance to API 675 standards suitable for heavy industrial applications and specifications
- Robust cast iron drive construction ideal for applications such as boiler feeds, catalyst feed, dye injection and petrochemicals
- Flexible design for a wide range of applications including water treatment and high pressure chemical refining
- Fast and easy field maintenance with minimal downtime

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Specifications

Pump type:	Hydraulically actuated diaphragm type liquid end
Maximum stroke length:	20mm
Materials of construction:	
Housing:	Cast iron
Diaphragm:	Flat Teflon
Required Motor HP:	1/2 HP (if 12.5:1 gear is selected 3/4 hp might be used)
Full load RPM:	1725
Drive:	Uses a hydraulic piston and mechanically actuated Oil replenishment valve to transfer the reciprocating Motion to a flat Teflon diaphragm
Gear ratios:	5 gear ratios; 12.5:1, 15:1, 30:1, 40:1, 50:1*, 100:1* Note: minimum stroke rate is 29 spm
Motor mounting flange:	Fits all NEMA 56 C frame motors (Optional IEC 71 with B5 flange)
Motor coupling:	Direct coupled to worm gear shaft
Check valves:	PVDF/PTFE: size 17 double inlet & outlet; sizes 30/40 single inlet & outlet Metal: 1) single inlet & outlet 2) double inlet & outlet 3) single inlet & double outlet (Double ball needed for pressures over 500 psi)
Repeatability:	Steady state flow accuracy is +/- 1% over turndown Ratio of 10:1
Max fluid operating temp:	constant: 195 F (90 C) short term 250 F (120 C)
Max solids size :	0.3mm; if larger than this provisions must be made to remove them prior to suction inlet
Max viscosity:	200 mPas
Recommend oil:	Mobilube SCH 75w-90 ProMinent PN: 1005823
Oil quantity:	1.5 quart (1.42 l)
Oil change interval:	Every 5000 hours
Stroke length adjustment:	Manual adjustment. Automatic stroke length adjustment via 4 to 20 mA available as an option
Pressure relief:	Integrated pressure relief to protect pump. External pressure relief must be used to protect system
Warranty:	2 years on drive, 1 year on liquid end
Factory testing:	each pump is tested for capacity at rated pressure
Maximum inlet pressure:	14.5 psi (1 bar)

*50:1 and 100:1 are not available for 50 Hz operation

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Capacity Data

		At 60 Hz (1750 rpm)				Capacity at Max. Backpressure		Gear Ratio	Max. Stroke Rate	At 50 Hz (1458 rpm) Capacity at Max. Backpressure				Typical suct./dis. Connection	
		psig	Bar	psig	Bar	U.S.			Stroke/	U.S	Stroke/	Max.		FNPT/ BSP	MNPT/ BSP
Plunger (in.)		(PVDF)	(PVDF)	(metal)	(metal)	GPH	(l/h)		min.	GPH	(l/h)	min	Bar	(metal)	(PVDF)
Size 17	**3/8"**	230	16	3500	241	0.2	(0.87)	100	18	-	-	-	-	-	-
	3/8"	230	16	3500	241	0.61	(2.3)	50	35	-	-	-	-	-	-
	3/8"	230	16	3500	241	0.76	(2.8)	40	43	0.63	2.45	36	241	1/4	1/4
	3/8"	230	16	3500	241	1.02	(3.8)	30	58	0.85	3.29	48	241	1/4	1/4
	3/8"	230	16	3500	241	2.03	(7.6)	15	115	1.69	6.56	96	241	1/4	1/4
	3/8"	230	16	3500	241	2.44	(9.2)	12.5	138	2.03	7.88	115	241	1/4	1/4
	7/16"	230	16	3500	241	0.83	(3.1)	50	35	-	-	-	-	-	-
	7/16"	230	16	3500	241	1.04	(3.9)	40	43	0.87	3.36	36	241	1/4	1/4
	7/16"	230	16	3500	241	1.38	(5.2)	30	58	1.15	4.46	48	241	1/4	1/4
	7/16"	230	16	3500	241	2.77	(10.4)	15	115	2.31	8.94	96	241	1/4	1/4
	7/16"	230	16	3500	241	3.32	(12.5)	12.5	138	2.77	10.72	115	241	1/4	1/4
Size 30	5/8"	230	16	2080	143	1.8	(6.8)	50	35	-	-	-	-	-	-
	5/8"	230	16	2080	143	2.2	(8.5)	40	43	1.87	7.26	36	143	1/4	1/2
	5/8"	230	16	2080	143	3.0	(11.3)	30	58	2.50	9.68	48	143	1/4	1/2
	5/8"	230	16	2080	143	6.0	(22.7)	15	115	5.00	19.37	96	143	1/4	1/2
	5/8"	230	16	2080	143	7.2	(27.2)	12.5	138	6.00	23.24	115	143	1/4	1/2
	13/16"	230	16	1230	85	3.0	(11.5)	50	35	-	-	-	-	-	-
	13/16"	230	16	1230	85	3.8	(14.3)	40	43	3.17	12.27	36	85	3/8	1/2
	13/16"	230	16	1230	85	5.1	(19.1)	30	58	4.22	16.37	48	85	3/8	1/2
	13/16"	230	16	1230	85	10.1	(38.2)	15	115	8.45	32.73	96	85	3/8	1/2
	13/16"	230	16	1230	85	12.2	(46.1)	12.5	138	10.14	39.28	115	85	3/8	1/2
	1-1/8"	230	16	640	44	6.3	(24.0)	50	35	-	-	-	-	-	-
	1-1/8"	230	16	640	44	7.9	(30.0)	40	43	6.61	25.61	36	44	3/8	1/2
	1-1/8"	230	16	640	44	10.6	(40.1)	30	58	8.81	34.14	48	44	3/8	1/2
	1-1/8"	230	16	640	44	21.1	(79.8)	15	115	17.62	68.29	96	44	3/8	1/2
	1-1/8"	230	16	640	44	25.4	(96.1)	12.5	138	21.15	81.95	115	44	3/8	1/2
Size 40	1-3/4"	230	16	265	18	15.4	(58.2)	50	35	-	-	-	-	-	-
	1-3/4"	230	16	265	18	19.2	(72.6)	40	43	15.99	61.97	36	18	3/4	3/4
	1-3/4"	230	16	265	18	25.6	(96.9)	30	58	21.32	82.62	48	18	3/4	3/4
	1-3/4"	230	16	265	18	51.2	(193.8)	15	115	42.64	165.24	96	18	3/4	3/4
	1-3/4"	230	16	265	18	61.4	(232.4)	12.5	138	51.17	198.29	115	18	3/4	3/4
	2"	200	14	200	14	20.1	(76.0)	50	35	-	-	-	-	-	-
	2"	200	14	200	14	25.1	(95.0)	40	43	20.89	80.94	36	14	3/4	3/4
	2"	200	14	200	14	33.4	(126.4)	30	58	27.85	107.91	48	14	3/4	3/4
	2"	200	14	200	14	66.8	(252.8)	15	115	55.70	215.83	96	14	3/4	3/4
	2"	200	14	200	14	80.2	(303.5)	12.5	138	66.84	258.99	115	14	3/4	3/4
	2-1/4"	160	11	160	11	25.4	(96.1)	50	35	-	-	-	-	-	-
	2-1/4"	160	11	160	11	31.7	(119.9)	40	43	26.43	102.43	36	11	3/4	3/4
	2-1/4"	160	11	160	11	42.3	(160.1)	30	58	35.25	136.58	48	11	3/4	3/4
	2-1/4"	160	11	160	11	84.6	(327.8)	15	115	70.49	273.16	96	11	3/4	3/4
	2-1/4"	160	11	160	11	101.5	(384.2)	12.5	138	84.59	327.79	115	11	3/4	3/4

- not available for 50 Hz operation

Materials In Contact With Chemicals

Material	Liquid End	Suction/Discharge connector	Seals/ball seat	Valve Balls
SS	stainless steel	stainless steel	PTFE/SS	stainless steel
A2	alloy 20	alloy 20	PTFE/A2	alloy 20
HC	hastelloy C	hastelloy C	PTFE/HC	hastelloy C
PVT	PVDF	PVDF	PTFE/PVDF	ceramic

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Identcode Ordering System ProMus

ProMus1

Pump version:

17A	Size 17 liquid end with 3/8” Plunger
17B	Size 17 liquid end with 7/16” Plunger
30A	Size 30 liquid end with 5/8” Plunger
30B	Size 30 liquid end with 13/16” Plunger
30C	Size 30 liquid end with 1-1/8” Plunger
40A	Size 40 liquid end with 1-3/4” Plunger
40B	Size 40 liquid end with 2” Plunger
40C	Size 40 liquid end with 2-1/4” Plunger

Liquid end material:

SS1	316 Stainless steel Single ball check
SS2	316 Stainless steel Double ball check (*Needed for applications above 500 psi)
SS3	316 St. steel Single inlet, double outlet (Recommended for Flooded suction w/ discharge pressure above 500 psi)
HC1	Hastelloy C Single ball check
HC2	Hastelloy C Double ball check (Needed for applications above 500 psi)
HC3	Hastelloy C Single inlet, double outlet (Recommended for Flooded suction with discharge pressure above 500 psi)
A21	Alloy 20 single ball check
A22	Alloy 20 Double ball check (Needed for applications above 500 psi)
A23	Alloy 20 Single inlet, double outlet (Recommended for Flooded suction with discharge pressure above 500 psi)
PVT	PVDF/PTFE size 17 double inlet & outlet; sizes 30/40 single inlet & outlet

Connectors:

0	NPT
1	BSP taper
7	MNPT PVDF Standard (PVT LE only)

Gear ratio:

01	12.5:1 56C
02	15:1 56C
03	30:1 56C
04	40:1 56C
05	50:1 56C
06	12.5:1 IEC (IEC 71 with B5 flange)
07	15:1 IEC (IEC 71 with B5 flange)
08	30:1 IEC (IEC 71 with B5 flange)
09	40:1 IEC (IEC 71 with B5 flange)
11	100:1 (17A/ 3/8 plunger only) 56C

Motor:

X	No motor included
D	Standard motor (1/2 HP, 115V, single phase ,TEFC, NEMA 56C)

Base:

0	Standard Base

Stroke adjustment:

1	Manual stroke adjustment
7	Explosion proof stroke positioning motor

Internal relief valve:

A	3500 psi/size 17
B	2080 psi/size 17
C	1230 psi/size 17
D	640 psi/size 17
E	300 psi/size 17
F	2080 psi/size 30
G	1230 psi/size 30
H	640 psi/size 30
I	265 psi/sizes 30 & 40
J	200 psi/sizes 30 & 40
K	160 psi (30B,C & 40)

Hydraulic oil:

0	Standard

PROMUS	17A	SS2	0	01	D	0	1	A	0

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Data required to size ProMus Pump:

Complete this data sheet and fax it to ProMinent Pittsburgh at (412) 787-0704 or ProMinent Canada at (519) 836-5226 for a review of the system hydraulics and recommendations on pump and accessory specifications.

Desired capacity min./max.	GPH (l/h)_____
Available power supply	_____V, _____Hz, _____ phase
Working temperature min./max.	°F (°C) _____
Description of process fluid	_____
Concentration %	_____
Solids content %	_____
Absolute viscosity, cP	_____
Vapor pressure at working temperature	psig (bar) _____
Remarks (e.g. abrasive, developing	_____
gases and fumes, flammable, corrosive)	_____

Suction conditions:

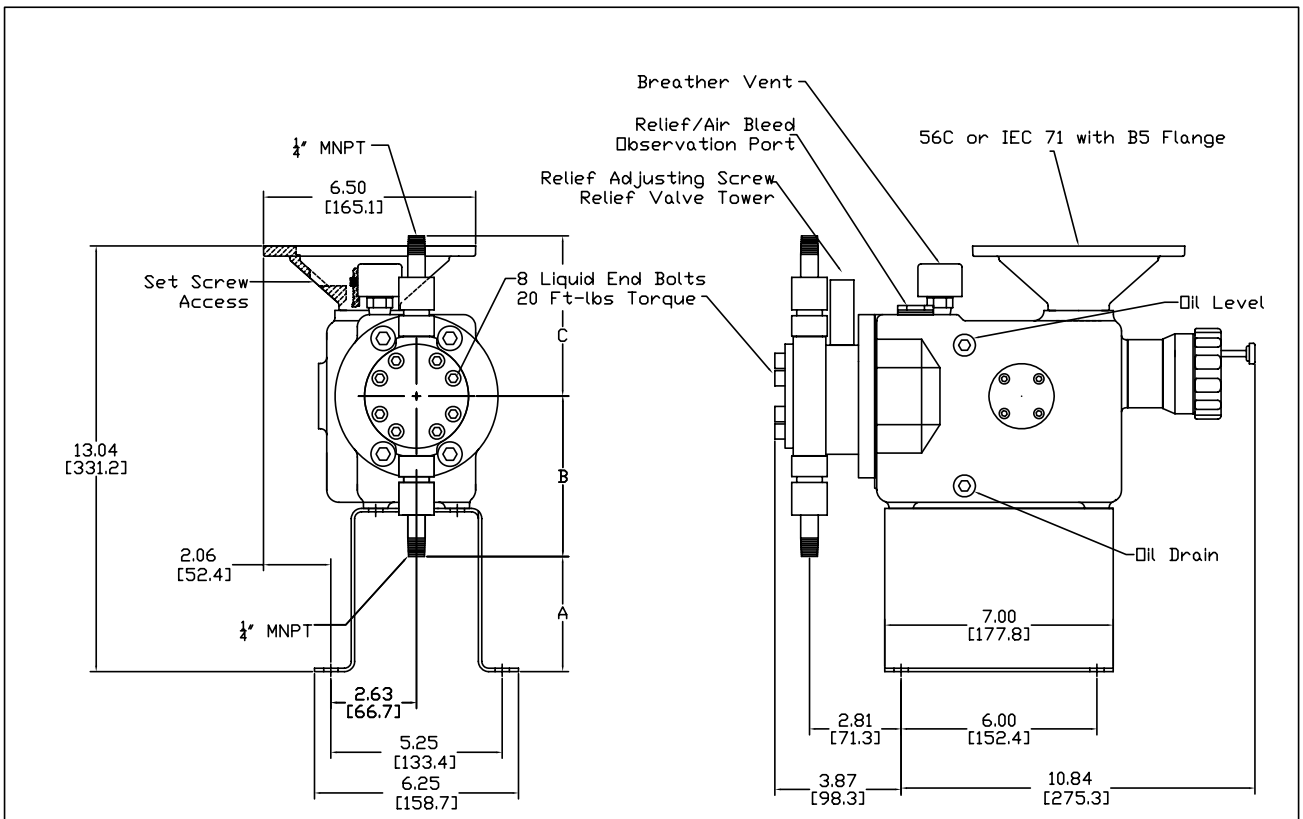
Suction lift min./max., or	ft. (m) _____
Positive suction head min./max., or	ft. (m)_____
Pressure in chemical tank	psig (bar) _____
Length of suction line	ft. (m) _____
Size (I.D.) of suction line	in. (mm)_____
Number of valves and fittings in suction line	_____

Discharge conditions:

Back-pressure min./max.	psig (bar) _____
Discharge head min./max.	ft. (m) _____
Negative discharge head min./max.	ft. (m) _____
Length of discharge line	ft. (m) _____
Size (I.D.) of discharge line	in. (mm)_____
Number of valves and fittings in discharge line	_____

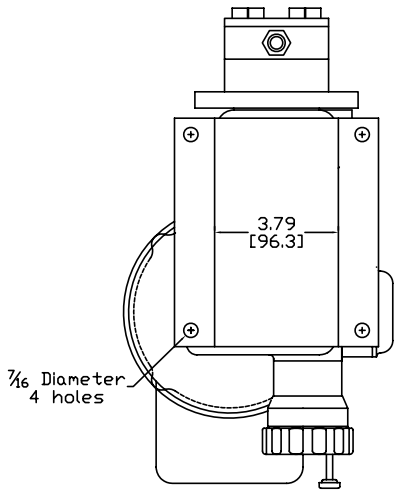
ProMinent® ProMus Hydraulic Diaphragm Metering Pumps

Dimensional Drawing: Size 17A/B (Metal)



Size 17

Plunger Diameters $\frac{3}{8}$" & $\frac{7}{16}$"



			Sixth Place in the Ident Code		
			A	B	C
ProMus	17A / 17B	PV	1	3.06 [89.6]	4.91 [124.8]	4.91 [124.8]

CUSTOMER

JOB No | PURCHASE ORDER No

TITLE: Outline Plastic 17 Less Motor

ENGINEERS SEAL

ProMinent® THE PROMINENT GROUP OF COMPANIES

PITTSBURGH, PA USA WWW.PROMINENT.US

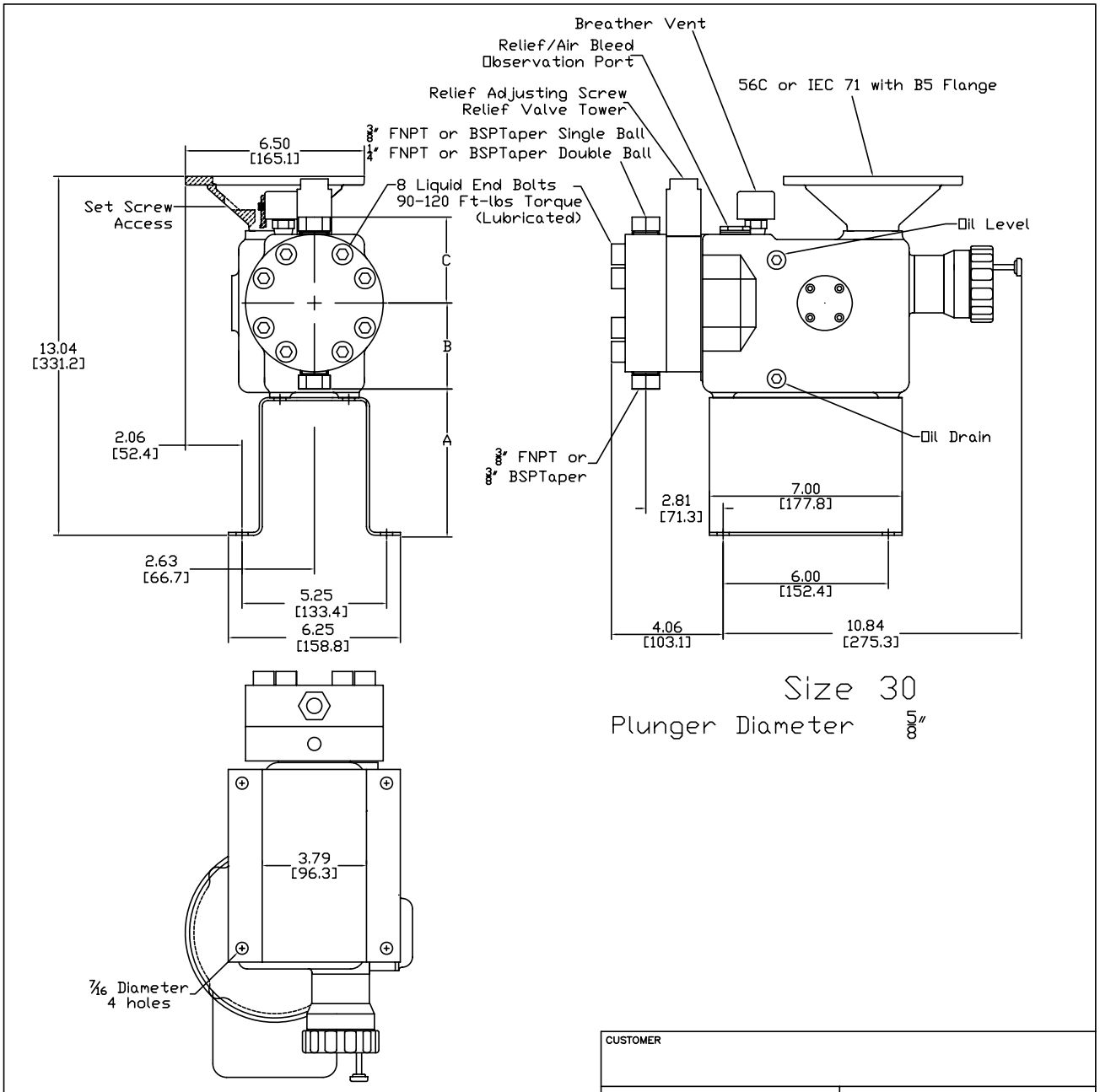
PROMINENT FLUID CONTROLS LTD.
490 SOUTHGATE DRIVE.
GUELPH, ONTARIO, CANADA
N1H 6J3
TEL. 519 836 5692 FAX. 519 836 5226

PROMINENT FLUID CONTROLS, INC.
RIDC PARK WEST
136 INDUSTRY DRIVE
PITTSBURGH, PA 15275 USA
TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	LLK	APPROVED	JD
DRAWN	LLK	SCALE	1:5
CHECKED	BF	DATE	04/15/06

SHEET SIZE	DWG No	REV	PAGE
A	850104-00-600-01	0	1/1

Dimensional Drawing: Size 30A (Metal)



Sixth Place in the Ident Code

ProMus 30A		A	B	C
SS, A2, HC	1	5.37 [136.5]	3.13 [79.4]	3.13 [79.4]
SS, A2, HC	2	4.11 [104.5]	4.32 [109.8]	3.92 [99.6]
SS, A2, HC	3	5.37 [136.5]	3.13 [79.4]	3.92 [99.6]

CUSTOMER

JOB No | PURCHASE ORDER No

TITLE: Outline Promus 30 5/8 Plunger Less Motor

ENGINEERS SEAL

ProMinent®
THE PROMINENT GROUP OF COMPANIES
PITTSBURGH, PA USA WWW.PROMINENT.US

PROMINENT FLUID CONTROLS LTD.
490 SOUTHGATE DRIVE.
GUELPH, ONTARIO, CANADA
N1H 6J3
TEL. 519 836 5692 FAX. 519 836 5226

PROMINENT FLUID CONTROLS, INC.
RIDC PARK WEST
136 INDUSTRY DRIVE
PITTSBURGH, PA 15275 USA
TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	LLK	APPROVED	JD
DRAWN	LLK	SCALE	1:5
CHECKED	BF	DATE	03/08/06

SHEET SIZE	DWG No	REV	PAGE
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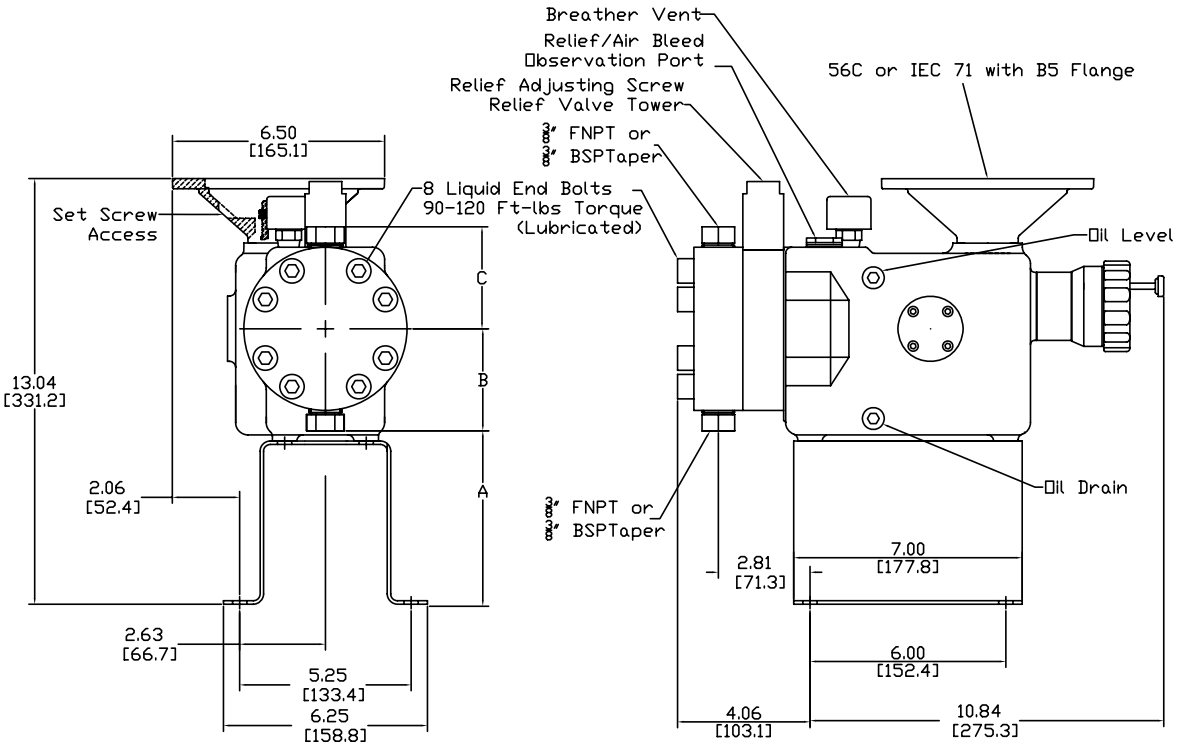
ProMinent® ProMus Hydraulic Diaphragm Metering Pumps

Dimensional Drawing: Size 30B/C (Metal)



ProMus			A	B	C
	30B	SS	5.37 [136.5]	3.13 [79.4]	3.13 [79.4]
	30C	A2	4.11 [104.5]	4.32 [109.8]	4.32 [109.8]
		HC	5.37 [136.5]	3.13 [79.4]	4.32 [109.8]

Sixth Place in the Ident Code

CUSTOMER

JOB No | PURCHASE ORDER No

TITLE: Outline Promus 30 13/16 & 1 1/8 Plunger Less Motor

ENGINEERS SEAL

ProMinent® THE PROMINENT GROUP OF COMPANIES

PITTSBURGH, PA USA WWW.PROMINENT.US

PROMINENT FLUID CONTROLS LTD.
490 SOUTHGATE DRIVE.
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PROMINENT FLUID CONTROLS, INC.
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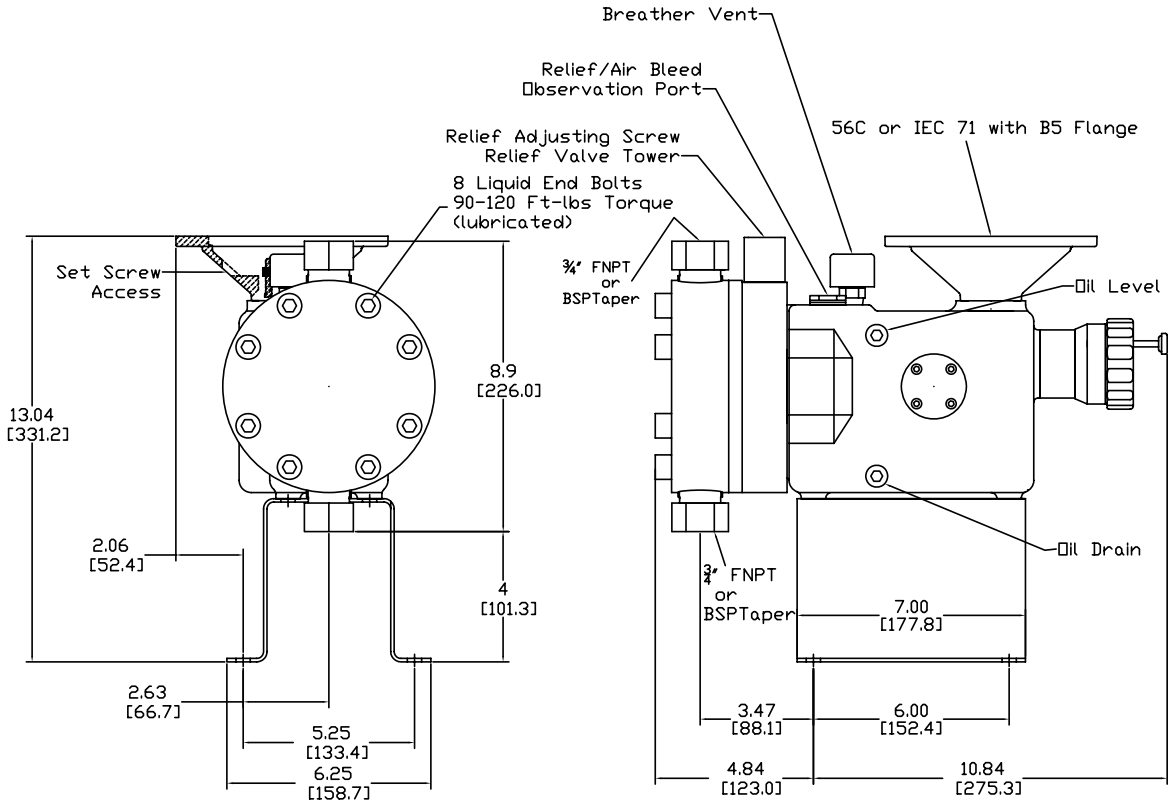
TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	LLK	APPROVED	JD
DRAWN	LLK	SCALE	1:5
CHECKED	BF	DATE	03/08/06

SHEET SIZE	DWG No	REV	PAGE
A	850102-00-600-01	0	1/1

ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

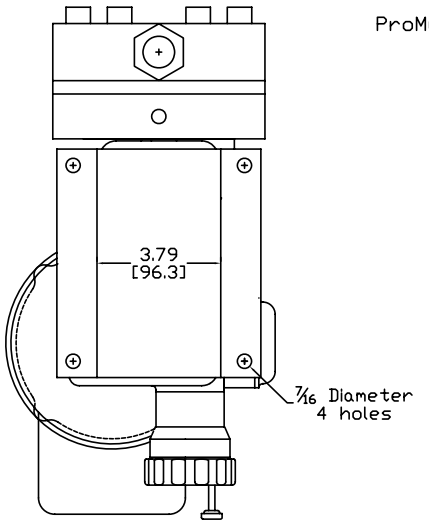
Dimensional Drawing: Size 40A/B/C (Metal)



Plunger Diameters $1\frac{3}{4}$", 2" & $2\frac{1}{4}$"

Sixth Place in the Ident Code

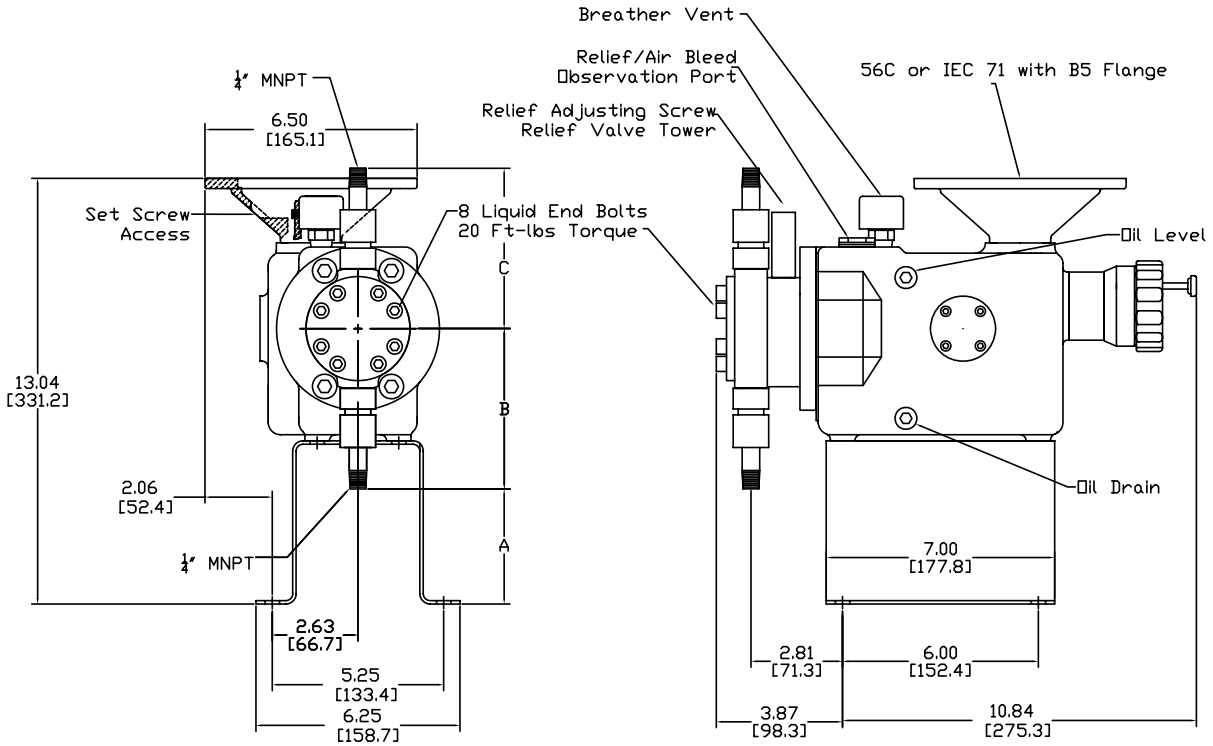
ProMus 40A SS
40B A2 1
40C HC



CUSTOMER			
JOB No		PURCHASE ORDER No	
TITLE	Outline ProMus 40 Less Motor		
ENGINEERS SEAL	ProMinent® THE PROMINENT GROUP OF COMPANIES		
	PITTSBURGH, PA USA	WWW.PROMINENT.US	
	PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226	PROMINENT FLUID CONTROLS, INC. RIDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704	
THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS, INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS, INCORPORATED.	DESIGNED LLK	APPROVED JD	
	DRAWN LLK	SCALE 1:5	
	CHECKED BF	DATE 03/08/06	
SHEET SIZE A	DWG No 850103-00-600-01	REV 0	PAGE 1/1

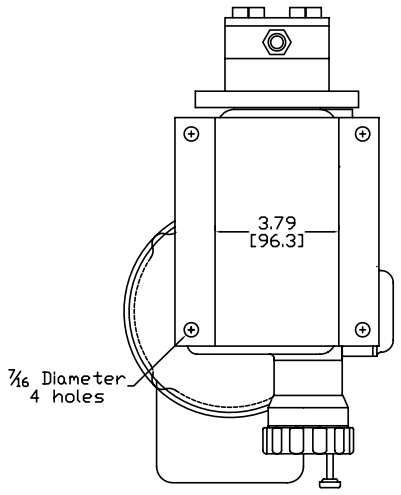
ProMinent® ProMus Hydraulic Diaphragm Metering Pumps

Dimensional Drawing: Size 17 (Plastic)



Size 17

Plunger Diameters $\frac{3}{8}$" & $\frac{7}{16}$"



			Sixth Place in the Ident Code A	B	C
ProMus	17A 17B	PV	1	3.06 [89.6]	4.91 [124.8]	4.91 [124.8]

CUSTOMER	
JOB No	PURCHASE ORDER No
TITLE	Outline Plastic 17 Less Motor
ENGINEERS SEAL	ProMinent® THE PROMINENT GROUP OF COMPANIES
	PITTSBURGH, PA USA — WWW.PROMINENT.US
	PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226
	PROMINENT FLUID CONTROLS, INC. RIDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704
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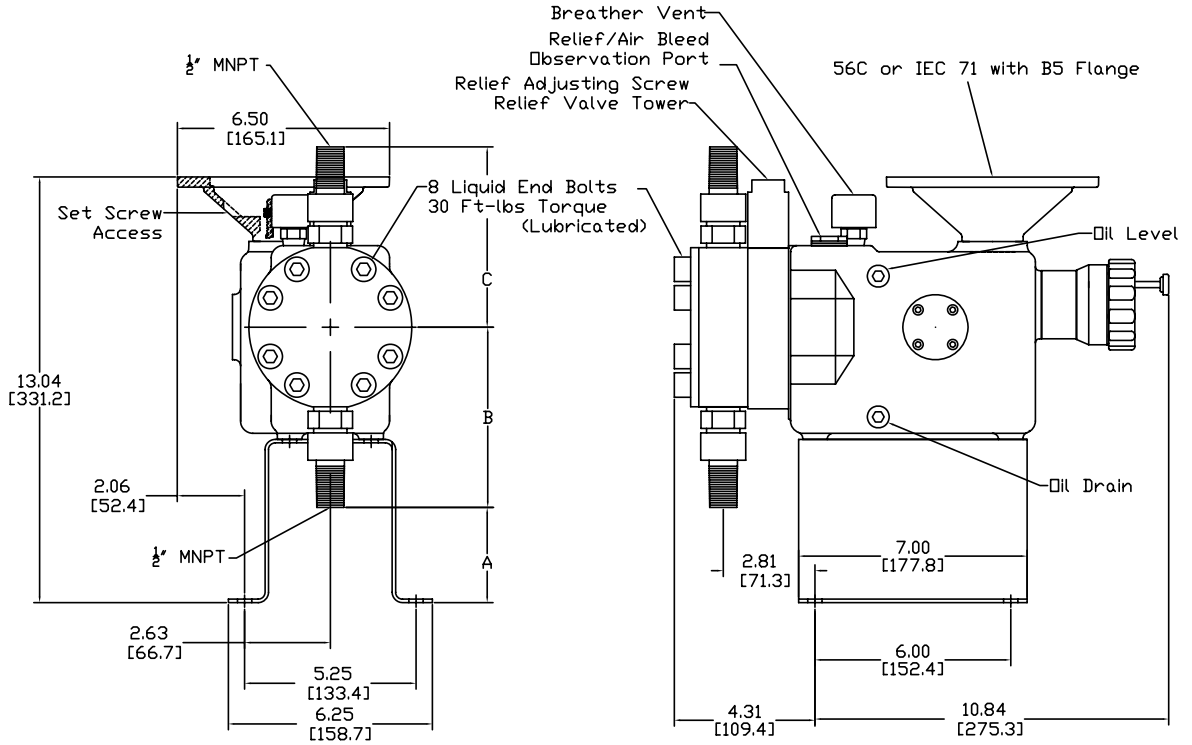
	DRAWN LLK — SCALE 1:5
	CHECKED BF — DATE 04/15/06
SHEET SIZE A	DWG No 850104-00-600-01 — REV 0 — PAGE 1/1

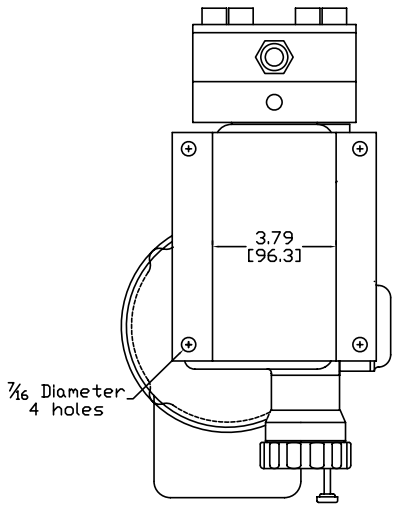
ProMinent® ProMus
Hydraulic Diaphragm Metering Pumps

Dimensional Drawing: Size 30 (Plastic)



Size 30

Plunger Diameters $\frac{5}{8}$" $\frac{13}{16}$" & $1\frac{1}{8}$"



ProMus			A	B	C
	30A 30B PV 30C	1	2.92 [74.1]	5.52 [140.2]	5.52 [140.2]

Sixth Place in the Ident Code

CUSTOMER			
JOB No		PURCHASE ORDER No	
TITLE: Outline Plastic 30 $\frac{5}{8}$, $\frac{13}{16}$ & $1\frac{1}{8}$ Plunger Less Motor			
ENGINEERS SEAL	ProMinent® THE PROMINENT GROUP OF COMPANIES		
	PITTSBURGH, PA USA		WWW.PROMINENT.US
	PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226		PROMINENT FLUID CONTROLS, INC. RIDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704
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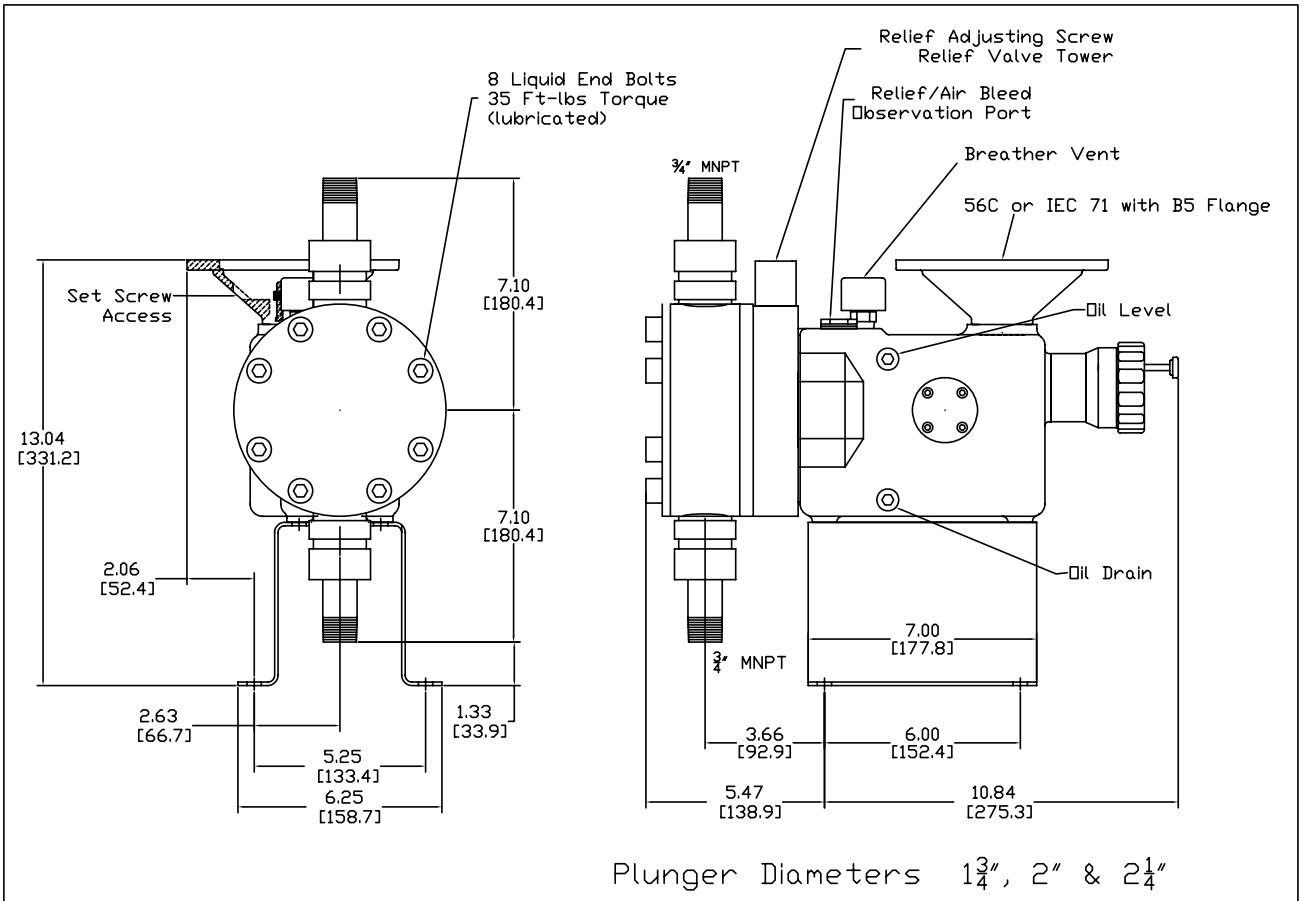
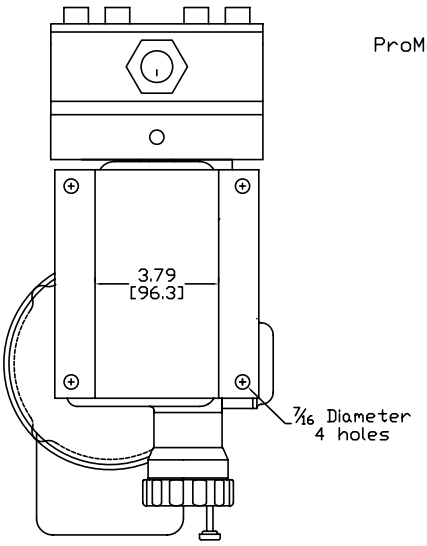
	DRAWN LLK		SCALE 1:5
	CHECKED BF		DATE 04/15/06
SHEET SIZE A	DWG No 850105-00-600-01	REV 0	PAGE 1/1

ProMinent® ProMus Hydraulic Diaphragm Metering Pumps

Dimensional Drawing: Size 40 (Plastic)



Plunger Diameters $1\frac{3}{4}$", 2" & $2\frac{1}{4}$"



Sixth Place in the Ident Code

ProMus 40A / 40B / 40C PV 1

CUSTOMER	
JOB No	PURCHASE ORDER No
TITLE	Outline Plastic 40 Less Motor
ENGINEERS SEAL	ProMinent® THE PROMINENT GROUP OF COMPANIES
	PITTSBURGH, PA USA — WWW.PROMINENT.US
	PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226
	PROMINENT FLUID CONTROLS, INC. RIDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704
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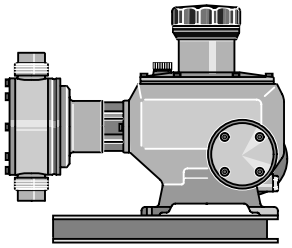
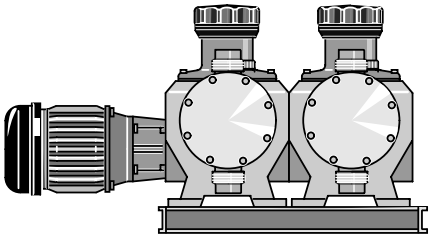
	DRAWN LLK — SCALE 1:5
	CHECKED BF — DATE 04/15/06
SHEET SIZE A	DWG No 850106-00-600-01 — REV 0 — PAGE 1/1

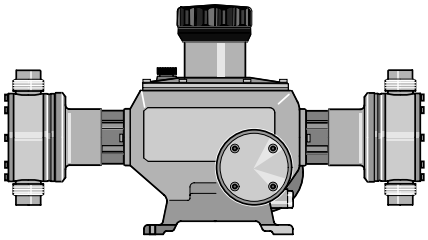
ProMinent® Makro TZ
Diaphragm Metering Pumps

Overview: Makro TZ





pk_2_013



pk_2_014

Ideal for high volume and high pressure applications

(see page 135 for spare parts)

The ProMinent® Makro TZMb is a mechanically or hydraulically actuated motor driven diaphragm metering pump.

The stroke length can be adjusted by means of the shift ring mechanism from 0-10 mm (TZMb), with 0.5 % accuracy. The 5-speed gearbox is encased in a cast, seawater resistant, acrylic resin lacquered housing. Liquid ends are available in different material combinations to suit differing applications. The suction lift varies according to the density and viscosity of the medium, the dimension of the pipework and the pump stroke rate. Reproducibility of metering is better than ±2 % in the stroke length range from 30 % -100 % subject to defined conditions and correct installation. (You must follow the instructions in the operating instruction manual).

ProMinent® Makro TZ TZMbA Add-On Pumps

The ProMinent® Makro TZ main diaphragm metering pump can be converted to a duplex or triplex pump with the ProMinent® Makro TZ add-on diaphragm pump (several add-on pumps can be operated at reduced back pressure). Multiplex pumps can also be retrofitted by the operator; all the necessary components and fittings are included with the TZMbA. Different stroke rates can be achieved with the add-on pump independently of the main pump as each TZMbA has its own reducing gear. The main power end can be fitted for this purpose with a more powerful drive motor. A base frame is required when using add-on power ends.

ProMinent® Makro TZ Double Head Version TZMbD/TZMbB

The double head version of the ProMinent® Makro TZ is similar to the simplex pump. It is, however, fitted with a second liquid end.

The liquid ends work in push-pull mode by means of a coupling element in the gearbox.

ProMinent® Makro TZ Diaphragm Metering Pumps

Identcode Ordering System (TZMb)

TZMb — **Motor-Driven Metering Pump TZMb Makro TZ 10 (mechanically driven add-on diaphragm pump)**

Drive type
- H Main drive
- A Add-on power end
- D Double main drive
- B Double add-on power end

Pump type:

120260	070430	040840
120340	070570	041100
120430	070720	041400
120510	070860	041670
120650	071070	

Liquid end material:
- PC PVC
- PP Polypropylene
- SS Stainless steel
- TT PTFE + 25% carbon

Seal material:
- T PTFE

Positive displacement element:
- 1 Standard composit diaphragm with rupture indicator

Liquid end version:
- 0 No valve springs
- 1 With valve springs

Hydraulic connection:
- 0 Standard connection
- 1 PVC union nut and insert
- 2 PP union nut and insert
- 3 PVDF union nut and insert
- 4 SS union nut and insert

Version:
- 0 with ProMinent® logo
- 2 No ProMinent® logo
- A 0 with ProMinent® logo, with frame, simplex
- B 0 with ProMinent® logo, with frame, duplex
- C 0 with ProMinent® logo, with frame, triplex
- M Modified

Electrical power supply:
- S 3 ph. 230/400 V 50/60 Hz (dual wound)
- P 3 ph. 230/400 V 60 Hz (Exe, Exde)
- R Variable speed motor4 pole230/400 V
- V Variable speed motor with integr.speed changer
- Z Speed control kit
- 4 No motor, with 56 C flange
- 7 No motor, with 120/80 flange
- 8 No motor, with 160/90 flange
- 9 No motor, with 200/90 flange

Enclosure rating:
- 0 IP 55 (Standard) ISO class F
- A ATEX power end

Stroke sensor:
- 0 No stroke sensor
- 1 With stroke sensor (Namur)

Stroke length adjustment:
- 0 0 Stroke length adjustment, man.
- 1 230 V stroke actuator
- 2 115 V stroke actuator
- 3 230 V 0-20 mA stroke controller
- 4 230 V 4-20 mA stroke controller
- 5 115 V 0-20 mA stroke controller
- 6 115 V 4-20 mA stroke controller

Applications:
- 0 Standard

TZMb	H	120260	PC	T	1	0	0	0	S	0	0	0	0

ProMinent® Makro TZ Diaphragm Metering Pumps

Capacity Data (TZMbH)

	with 1800 rpm motor at 60 Hz Pump Capacity at Max. backpressure					Max. Stroke Frequency	Suc-tion Lift	Connection Suction Discharge Side	Shipping Weight PP, PC, TT/SS
Pump type TZMbH	**gph**	**l/h**	**psi**	**bar**	**ml/ stroke**	**strokes/ min.**	**ft (m)**	**in (DN)**	**lb (kg)**
120260	82	312	174	12	60	86	13.1 (4)	1 (25)	101.4/119 (46/54)
120340	108	408	174	12	60	115	13.1 (4)	1 (25)	101.4/119 (46/54)
120430	136	516	174	12	60	144	13.1 (4)	1 (25)	101.4/119 (46/54)
120510	162	612	174	12	60	173	13.1 (4)	1 (25)	101.4/119 (46/54)
120650	–	–	174	12	60	–	13.1 (4)	1 (25)	101.4/119 (46/54)
070430	136	516	100	7	99	86	11.5 (3.5)	1 1/2 (32)	110.2/141 (50/64)
070570	180	684	100	7	99	115	11.5 (3.5)	1 1/2 (32)	110.2/141 (50/64)
070720	228	864	100	7	99	144	11.5 (3.5)	1 1/2 (32)	110.2/141 (50/64)
070860	272	1032	100	7	99	173	11.5 (3.5)	1 1/2 (32)	110.2/141 (50/64)
071070	–	–	100	7	99	–	11.5 (3.5)	1 1/2 (32)	110.2/141 (50/64)
040840	266	1008	58	4	194	86	9.8 (3)	2 (40)	123.5/176.4 (56/80)
041100	348	1320	58	4	194	115	9.8 (3)	2 (40)	123.5/176.4 (56/80)
041400	443	1680	58	4	194	144	9.8 (3)	2 (40)	123.5/176.4 (56/80)
041670	529	2004	58	4	194	173	9.8 (3)	2 (40)	123.5/176.4 (56/80)
042100	-	-	58	4	194	-	9.8 (3)	2 (40)	123.5/176.4 (56/80)

Stroke length 10 mm

The admissible priming pressure on the suction side is 50 % of the maximum back pressure.

Materials In Contact With Chemical In Version

			DN 25 Ball Valves		DN 32/DN 40 Plate Valves**			
	Pump Head	**Suction/ Discharge Connector**	**Seals**	**Valve Balls**	**Valve Seat**	**Seals**	**Valve Plate/ Valve Spring**	**Valve Seat**
PPT	Polypropylene	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel	Stainless steel	PTFE	Stainless steel	PTFE	PTFE	Stainless steel Hast. C + CTFE*	PTFE

Multi-layer safety diaphragm with PTFE coating.

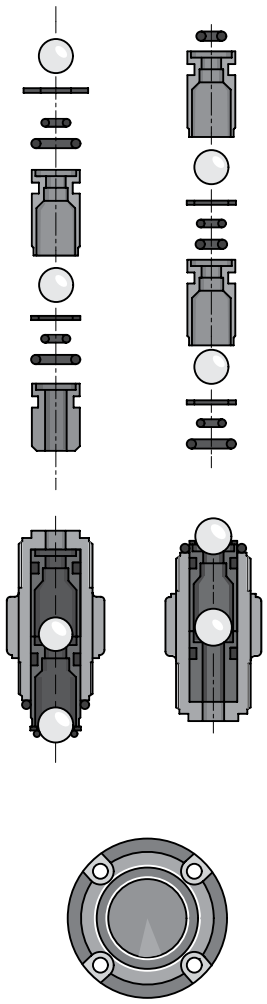
** The valve spring is coated with CTFE (similar to PTFE)
Custom designs available to order.

"pump spare parts & accessories" T.O.C. VI

CATALOG SECTION TABS

Solenoid Pump Spare Parts

beta, Concept^{PLUS} & gamma/ L



pk_1_008

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

PP, PC, PV, & NP Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
2 Valve Balls
1 Set O-rings

TT Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
2 Valve Balls
1 Set O-rings
2 Ball Seat Discs

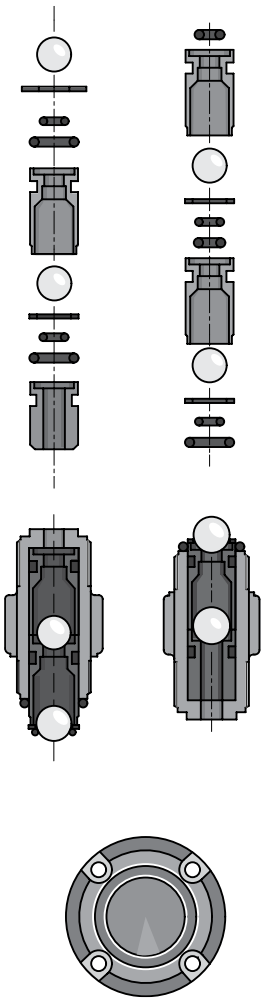
SS Liquid Ends

1 Diaphragm
4 Valve Balls
1 Set O-rings
4 Ball Seat Discs

Liquid End Version	Material Code	Complete Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Diaphragm
1000	PPE	1002057	1001644	792644	740350	1000244
	PPB	1002065	1001652	792646	740351	1000244
	PCE	1002365	1001713	792119	740349	1000244
	NPE	1002193	1001713	792119	740349	1000244
	PCB	1002358	1001721	792026	740348	1000244
	NPB	1002201	1001721	792026	740348	1000244
	TTT	1002345	1001737	809407	809406	1000244
	SST	1002557	1002549	809424	809423	1000244
	PVT	1023134	1023107	1023128	1023127	1000244
1601	PPE	1002058	1001645	792644	740350	1000245
	PPB	1002066	1001653	792646	740351	1000245
	PCE	1002366	1001714	792119	740349	1000245
	NPE	1002194	1001714	792119	740349	1000245
	PCB	1002359	1001722	792026	740348	1000245
	NPB	1002202	1001722	792026	740348	1000245
	TTT	1002346	1001738	809407	809406	1000245
	SST	1002558	1002550	809424	809423	1000245
	PVT	1023135	1023108	1023128	1023127	1000245
1602	PPE	1002059	1001646	792644	740350	1000246
	PPB	1002067	1001654	792646	740351	1000246
	PCE	1002367	1001715	792119	740349	1000246
	NPE	1002195	1001715	792119	740349	1000246
	PCB	1002360	1001723	792026	740348	1000246
	NPB	1002203	1001723	792026	740348	1000246
	TTT	1002347	1001739	809407	809406	1000246
	SST	1002559	1002551	809424	809423	1000246
	PVT	1023136	1023109	1023128	1023127	1000246
1005	PPE	1002060	1001647	792644	740350	1000247
	PPB	1002068	1001655	792646	740351	1000247
	PCE	1002368	1001716	792119	740349	1000247
	NPE	1002196	1001716	792119	740349	1000247
	PCB	1002361	1001724	792026	740348	1000247
	NPB	1002204	1001724	792026	740348	1000247
	PVT HV	1018072	1019066	1002267	1002267	1000247
	TTT	1002348	1001740	809407	809406	1000247
	SST	1002560	1002552	809424	809423	1000247
	PVT	1023137	1023110	1023126	1023125	1000247
0708	PPE	1002061	1001648	1001437	1001441	1000248
	PPB	1002069	1001656	1001436	1001440	1000248
	PCE	1002369	1001717	1001435	1001439	1000248
	NPE	1002197	1001717	1001435	1001439	1000248
	PCB	1002362	1001725	1001434	1001438	1000248
	NPB	1002205	1001725	1001434	1001438	1000248
	PVT HV	1018073	1019067	1002267	1002267	1000248
	TTT	1002349	1001741	809445	809444	1000248
	SST	1002561	1002553	809497	809496	1000248
	PVT	1023138	1023111	1023126	1023125	1000248
0413	PPE	1002062	1001649	1001437	1001441	1000249
	PPB	1002070	1001657	1001436	1001440	1000249
	PCE	1002370	1001718	1001435	1001439	1000249

Solenoid Pump Spare Parts

beta & gamma/ L

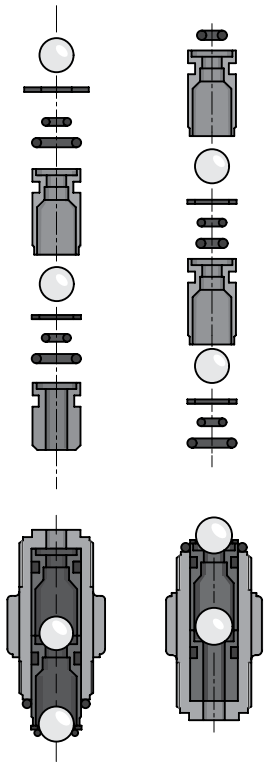


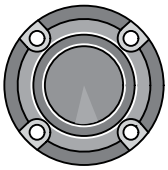
pk_1_008

Liquid End Version	Material Code	Complete Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Diaphragm
0413 (cont.)	NPE	1002198	1001718	1001435	1001439	1000249
	PCB	1002363	1001726	1001434	1001438	1000249
	NPB	1002206	1001726	1001434	1001438	1000249
	PVT HV	1018084	1019069	1002267	1002267	1000249
	TTT	1002350	1001742	809445	809444	1000249
	SST	1002562	1002554	809497	809496	1000249
	PVT	1023139	1023112	1023126	1023125	1000249
0220	PPE	1002063	1001650	1001437	1001441	1000250
	PPB	1002071	1001658	1001436	1001440	1000250
	PCE	1002371	1001719	1001435	1001439	1000250
	NPE	1002199	1001719	1001435	1001439	1000250
	PCB	1002364	1001727	1001434	1001438	1000250
	NPB	1002207	1001727	1001434	1001438	1000250
	PVT HV	1018085	1019070	1002267	1002267	1000250
	TTT	1002351	1001754	809445	809444	1000250
	SST	1002563	1002555	1002547	1002548	1000250
	PVT	1023140	1023113	1023126	1023125	1000250
1605	PPE	1002060	1001647	792644	740350	1000247
	PPB	1002068	1001655	792646	740351	1000247
	PCE	1002368	1001716	792119	740349	1000247
	NPE	1002196	1001716	792119	740349	1000247
	PCB	1002361	1001724	792026	740348	1000247
	NPB	1002204	1001724	792026	740348	1000247
	PVT HV	1018072	1019066	1002267	1002267	1000247
	TTT	1002348	1001740	809407	809406	1000247
	SST	1002560	1002552	809424	809423	1000247
	PVT	1023137	1023110	1023126	1023125	1000247
1008	PPE	1002061	1001648	1001437	1001441	1000248
	PPB	1002069	1001656	1001436	1001440	1000248
	PCE	1002369	1001717	1001435	1001439	1000248
	NPE	1002197	1001717	1001435	1001439	1000248
	PCB	1002362	1001725	1001434	1001438	1000248
	NPB	1002205	1001725	1001434	1001438	1000248
	PVT HV	1018073	1019067	1002267	1002267	1000248
	TTT	1002349	1001741	809445	809444	1000248
	SST	1002561	1002553	809497	809496	1000248
	PVT	1023138	1023111	1023126	1023125	1000248
0713	PPE	1002062	1001649	1001437	1001441	1000249
	PPB	1002070	1001657	1001436	1001440	1000249
	PCE	1002370	1001718	1001435	1001439	1000249
	NPE	1002198	1001718	1001435	1001439	1000249
	PCB	1002363	1001726	1001434	1001438	1000249
	NPB	1002206	1001726	1001434	1001438	1000249
	PVT HV	1018084	1019069	1002267	1002267	1000249
	TTT	1002350	1001742	809445	809444	1000249
	SST	1002562	1002554	809497	809496	1000249
	PVT	1023139	1023112	1023126	1023125	1000249
0420	PPE	1002063	1001650	1001437	1001441	1000250
	PPB	1002071	1001658	1001436	1001440	1000250
	PCE	1002371	1001719	1001435	1001439	1000250
	NPE	1002199	1001719	1001435	1001439	1000250
	PCB	1002364	1001727	1001434	1001438	1000250
	NPB	1002207	1001727	1001434	1001438	1000250
	PVT HV	1018085	1019070	1002267	1002267	1000250
	TTT	1002351	1001754	809445	809444	1000250
	SST	1002563	1002555	1002547	1002548	1000250
	PVT	1023140	1023113	1023126	1023125	1000250
0232	PPE	1002064	1001651	1001437	1001441	1000251
	PPB	1002072	1001659	1001436	1001440	1000251
	PCE	1002609	1001720	1001435	1001439	1000251
	NPE	1002200	1001720	1001435	1001439	1000251
	PCB	1002608	1001728	1001434	1001438	1000251
	NPB	1002208	1001728	1001434	1001438	1000251
	TTT	1002352	1001755	809445	809444	1000251
	SST	1002564	1002556	1002547	1002548	1000251
	PVT	1023141	1023124	1023126	1023125	1000251

Solenoid Pump Spare Parts

beta & gamma/ L





pk_1_008

For Auto-degassing pumps.

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

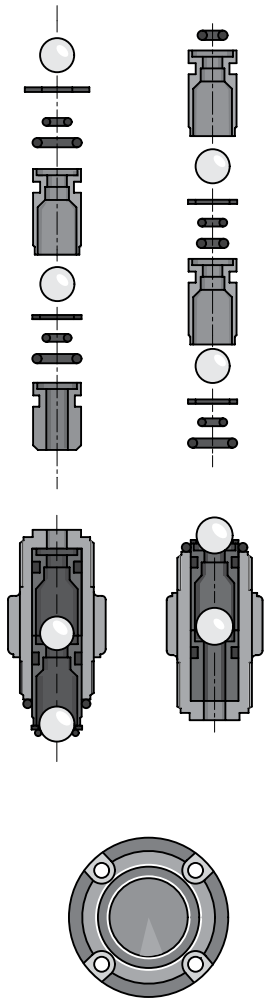
PP & NP
Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
2 Valve Balls
1 Set O-rings
1 Vent Valve, Complete

Liquid End Version	Material Code	Complete Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Vent	Diaphragm
GALa							
1601	PPE	1002393	1001756	792644	1001067	1001063	1000245
	PPB	1002392	1001762	792646	1001066	1001062	1000245
	NPE	1002248	1001660	792119	1001065	1001061	1000245
	NPB	1002242	1001666	792026	1001064	1001060	1000245
1602	PPE	1002395	1001757	792644	1001067	1001063	1000246
	PPB	1002394	1001763	792646	1001066	1001062	1000246
	NPE	1002249	1001661	792119	1001065	1001061	1000246
	NPB	1002243	1001667	792026	1001064	1001060	1000246
1005	PPE	1002399	1001758	792644	1001067	1001063	1000247
	PPB	1002398	1001764	792646	1001066	1001062	1000247
	NPE	1002250	1001662	792119	1001065	1001061	1000247
	NPB	1002244	1001668	792026	1001064	1001060	1000247
0708	PPE	1002397	1001759	1001437	1001071	1001063	1000248
	PPB	1002396	1001765	1001436	1001070	1001062	1000248
	NPE	1002251	1001663	1001435	1001069	1001061	1000248
	NPB	1002245	1001669	1001434	1001068	1001060	1000248
0413	PPE	1002401	1001760	1001437	1001071	1001063	1000249
	PPB	1002400	1001766	1001436	1001070	1001062	1000249
	NPE	1002252	1001664	1001435	1001069	1001061	1000249
	NPB	1002246	1001670	1001434	1001068	1001060	1000249
0220	PPE	1002403	1001761	1001437	1001071	1001063	1000250
	PPB	1002402	1001767	1001436	1001070	1001062	1000250
	NPE	1002253	1001665	1001435	1001069	1001061	1000250
	NPB	1002247	1001671	1001434	1001068	1001060	1000250
1605	PPE	1002399	1001758	792644	1001067	1001063	1000247
	PPB	1002398	1001764	792646	1001066	1001062	1000247
	NPE	1002250	1001662	792119	1001065	1001061	1000247
	NPB	1002244	1001668	792026	1001064	1001060	1000247
1008	PPE	1002397	1001759	1001437	1001071	1001063.5	1000248
	PPB	1002396	1001765	1001436	1001070	1001062.7	1000248
	NPE	1002251	1001663	1001435	1001069	1001061.9	1000248
	NPB	1002245	1001669	1001434	1001068	1001060.1	1000248
0713	PPE	1002401	1001760	1001437	1001071	1001063.5	1000249
	PPB	1002400	1001766	1001436	1001070	1001062.7	1000249
	NPE	1002252	1001664	1001435	1001069	1001061.9	1000249
	NPB	1002246	1001670	1001434	1001068	1001060.1	1000249
0420	PPE	1002403	1001761	1001437	1001071	1001063.5	1000250
	PPB	1002402	1001767	1001436	1001070	1001062.7	1000250
	NPE	1002253	1001665	1001435	1001069	1001061.9	1000250
	NPB	1002247	1001671	1001434	1001068	1001060.1	1000250

Solenoid Pump Spare Parts

D_4a



pk_1_008

Spare parts kits for ProMinent D_4a series metering pumps.

PP, NP Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
2 Valve Balls
1 Set of O-rings

TT Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
2 Valve Balls
2 Ball Seat Disks
1 Set of O-rings

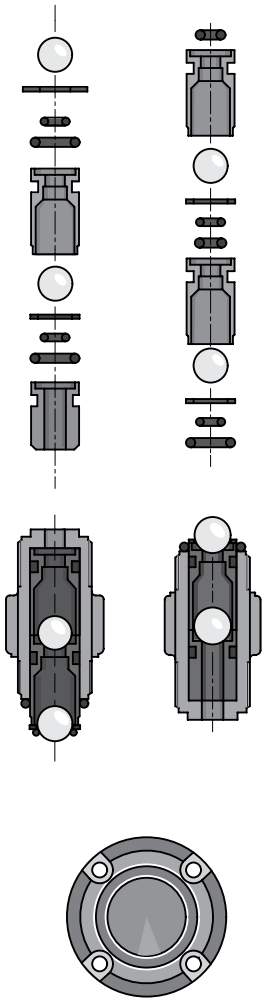
SS Liquid Ends

1 Diaphragm
4 Valve Balls
1 Discharge Valve Inserts
2 Suction Valve Inserts
1 Set of O-rings

Liquid End Version	Material Code	Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Diaphragm
1601	PP1	740413	740361	792644	740350	811453
	NP3	740410	740358	792026	740348	811453
	NS2	792239	792122	792119	792120	811453
	NS3	791849	792033	792026	792025	811453
	TT1	911338	912678	809407	809406	811453
	SS2	911344	912679	809424	809423	811453
1201	PP1	740417	740380	792644	740350	811454
	NP3	740414	740362	792026	740348	811454
	NS2	792241	792123	792119	792120	811454
	NS3	791850	792034	792026	792025	811454
	TT1	911365	912682	809407	809406	811454
	SS2	911371	912683	809424	809423	811454
0803	PP1	740421	740384	792644	740350	811455
	NP3	740418	740381	792026	740348	811455
	NS2	792243	792124	792119	792120	811455
	NS3	791851	792035	792026	792025	811455
	TT1	911392	912686	809407	809406	811455
	SS2	911398	912687	809424	809423	811455
1002	PP1	740425	740388	792644	740350	811456
	NP3	740422	740385	792026	740348	811456
	NS2	792245	792125	792119	792120	811456
	NS3	791852	792036	792026	792025	811456
	TT1	911420	912690	809445	809444	811456
	SS2	911426	912691	809497	809496	811456
	PP4	910344	910174	809457	809457	811456
0308	PP1	912227	912693	809439	809438	811457
	NP1	912226	912692	809413	809412	811457
	TT1	911448	912694	809445	809444	811457
	SS2	911454	912695	809497	809496	811457
0215	PP1	912232	912697	809439	809438	811458
	NP1	912231	912696	809413	809412	811458
	TT1	911476	912698	809445	809444	811458
	SS2	911482	912699	809497	809496	811458

Solenoid Pump Spare Parts

EXtronic



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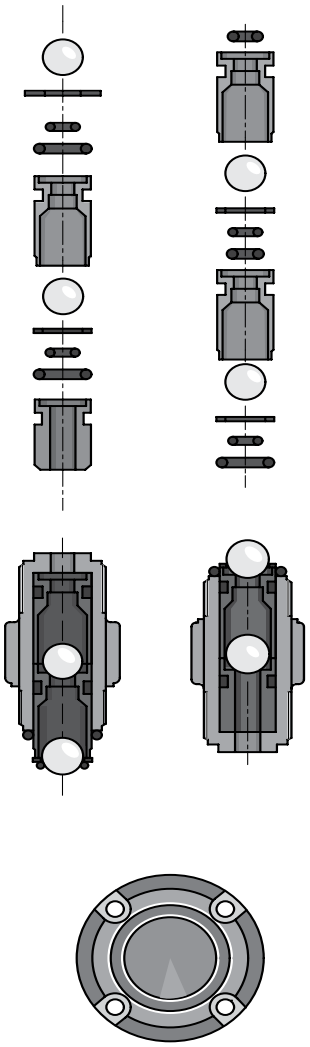
EXtronic Spare Parts Kits

Liquid end version	Material Code	Spare Parts Kit	Diaphram
1000	PP1	740357	811452
	NP3	740354	811452
	TT	912674	811452
	SS2	912675	811452
1601	PP1	740361	811453
	NP3	740358	811453
	NS3/PS3	792033	811453
	TT	912678	811453
	SS2	912679	811453
1201	PP1	740380	811454
	NP3	740362	811454
	NS3/PS3	792034	811454
	TT	912682	811454
	SS2	912683	811454
0803	PP1	740384	811455
	NP3	740381	811455
	NS3/PS3	792035	811455
	TT	912686	811455
	SS2	912687	811455
1002/2502	PP1	740388	811456
	NP3	740385	811456
	NS3/PS3	792036	811456
	TT	912690	811456
	SS2	912691	811456
	HV/PP4 (Type 1002)	910174	811456
0308/1006/2505	PP1	740497	811457
	NP1	740498	811457
	TT	912694	811457
	SS2	912695	811457
	HV/PP4 (Type 1006)	910940	811457
0613/1310	PP1	740504	811458
	NP1	740505	811458
	TT1	912698	811458
	SS2	912699	811458
	HV/PP4 (Type 1310)	910942	811458
0417/0814	PP1	740501	811459
	NP1	740502	811459
	TT	910978	811459
	SS2	910980	811459
	HV/PP4 (Type 0814)	910944	811459
0430/0230-DN 10	PP1	740507	811460
	NP1	740508	811460
	TT	910994	811460
	SS1	910996	811460
0260			811461

Solenoid Pump Spare Parts

delta®



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Spare parts kits for delta®, consisting of:

1 diaphragm
1 suction valve set
1 discharge valve set
2 ball valves
1 set of O-rings
1 connector set

Stainless steel version without suction and discharge valve sets

Spare parts kit for delta®

Liquid End Version	Material Code	Part No.
1612	PVT	1027081
	SST	1027086
1020	PVT	1027082
	SST	1027087
0730	PVT	1027083
	SST	1027088
0450	PVT	1027084
	SST	1027089
0280	PVT	1027085
	SST	1027090

Replacement diaphragms for delta® series

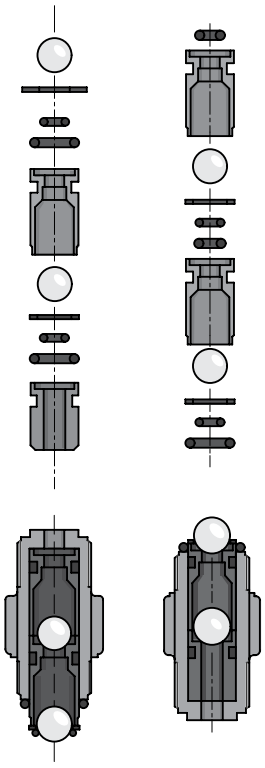
Liquid End Version	Material Code	Part No.
1612	all materials	1000248
1020	all materials	1000249
0730	all materials	1000250
0450	all materials	1000251
0280	all materials	1025075

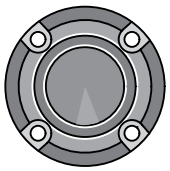
Auto-degassing Retrofit Kit for delta® series

Version	Part No.
115V	1030928

Motor Pump Spare Parts

alpha





pk_1_008

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

PP, PE & NP Liquid Ends

1 Diaphragm
1 Suction Valve
1 Discharge Valve
2 Connector Sets
1 Valve Ball
1 Set of O-rings

alpha/b

Liquid End Version	Material Code	Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Diaphragm
1001, 1002, 1003	PP1	791521	740388	792644	740350	811456
	PP3	791523	740387	792646	740351	811456
	NP3	1001629	740385	792026	740348	811456
0804, 0808, 0612, 0419	PP1	791522	740015	792644	740350	794175
	PP2	791524	740017	792646	740351	794175
	NP6	791526	740013	792026	740348	794175

alpha/a (old style)

Liquid End Version	Material Code	Liquid End	Spare Parts Kit	Spare Valves Only (connector sets not included) Suction	Discharge	Diaphragm
1001	PE1	7912322	912689	809439	809438	811456
	PE2	7912336	910769	809449	809448	811456
	NP3	7912321	912688	809413	809412	811456
1002, 1003	PP1	7912327	912689	809439	809438	811456
	PP2	7912337	910769	809449	809448	811456
	NP3	7912321	912688	809413	809412	811456
0804, 0808, 0612, 0419	PP1	7912338	7912693	809439	809438	791475
	PP2	7912339	7910771	809449	809448	791475
	NP6	7912340	7912692	809413	809412	791475

Motor Pump Spare Parts

Vario C

Spare parts kit for PVT version include:

1 pump diaphragm
1 suction valve set
1 discharge valve set
2 valve balls
1 set of seals (packing rings, ball seat housings)

Spare parts kit for SST version include:

1 pump diaphragm
2 valve balls
1 set of seals (packing rings, flat seals, ball seat)

Vario spare parts kit

(applicable for Identity Code:
Type VAMc 10008, 10016, 07026, 07042)

Liquid End Version	Material Code	Part No.
Liquid end FM 042 - DN 10	PVT	1003641
	SST	910751

(applicable for Identity Code:
Type VAMc 07012, 07024, 04039, 04063)

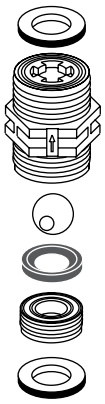
Liquid End Version	Material Code	Part No.
Liquid end FM 063 - DN 10	PVT	1003642
	SST	910756

Pump diaphragms

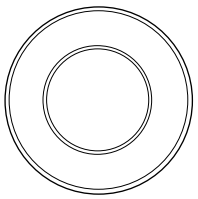
	Liquid End Version	Part No.
Vario with	**FM 042** Type VAMc 10008, 10016, 07026, 07042	811458
	FM 063 Type VAMc 07012, 07024, 04039, 04063	811459

Motor Pump Spare Parts

Sigma 1, 2, & 3



Valve Complete



Complete liquid ends include pump head, valves, mounting screws, diaphragm and backplate. Clamping nuts and inserts are not included with complete liquid ends, complete valves or spare parts kits. Spare parts kits include:

PVT Liquid ends
1 Diaphragm
1 Suction valve
1 Discharge valve
2 Valve balls
1 Set of o-rings

SST Liquid ends
1 Diaphragm
2 Valve balls
1 Set of o-rings, complete
(sleeve rings, ball seat rings)

Material Code	Liquid End Complete	Spare Parts Kit	Valve Complete	Diaphragm
12017, 12035, 10050 with Liquid end FM 50				
PVT	1010560	1010541	1002267	1010279
SST	1010561	1010555	809459	1010279
SST*		1010554		1010279
10022, 10044, 07065 with Liquid end FM 65				
PVT	1010562	1010542	1002267	1010282
SST	1010563	1010557	809459	1010282
SST*		1010556		1010282
07042, 04084, 04120 with Liquid end FM 120				
PVT	1010565	1010543	792517	1010285
SST	1010566	1010559	809404	1010285
SST*		1010558		1010285
12050 with Liquid end FM 130				
PVT	792755	740324	792517	792495
SST	792761	740328	809404	792495
SST*		740326		
12090, 12130 with Liquid end FM 130				
PVT	7792755	740324	792517	792495
SST	792761	740328	809404	792495
SST*		740326		
07120, 07220 with Liquid end FM 350				
PVT	792756	740325	740615	792496
SST	792762	740329	803708	792496
SST*		740327		
04350 with Liquid end FM 350				
PVT	7792756	740325	740615	792496
SST	792762	740329	803708	792496
SST*		740327		
120145, 120190, 120270, with Liquid end FM 330 - DN 25				
PVT	1005298	1005308	740615	1004604
SST	1005300	1005312	803708	1004604
SST*		1005310		1004604
070410, 070580, 040830, with Liquid end FM 1000 - DN 32				
PVT	1005297	1005309	1020031	1002835
SST	1005299	1005313	1002811	1002835
SST*		1005311		1002835

*SS complete without spare valves

Liquid End Version		Material Code	Complete Liquid End	Spare Parts Kit	Valve Complete Suction (Spare valves only)	Discharge	Packing set
Sigma HK							
08	(For pump versions 32002, 23004, & 10006)	S	1000584	1001572	803792	803793	1000565
12.5	(For pump versions 14006, 10011, & 05016)	S	910420	910470	803792	803793	485401
25	(For pump versions 07012, 04522, & 02534)	S	910421	910471	803792	803793	485402
50	(For pump versions 04022, 02541, & 01264)	S	910422	910472	803794	803795	485403

Motor Pump Spare Parts

Meta

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

Standard kit for PP, TT and PVC material versions:

1 Pump diaphragm
1 Suction valve, complete
1 Discharge valve, complete
2 Valve balls
1 Set of o-rings (complete w/O-rings & ball-seat discs)

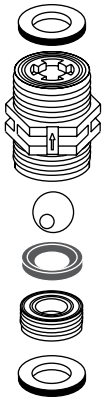
Standard kit for SS (316 stainless steel) version:

1 Pump diaphragm
2 Valve balls
1 Set of o-rings (complete w/sleeve rings & ball-seat discs)

Standard kit for MTKa version:

1 Pump diaphragm
4 Valve balls
4 Ball-seat discs
2 PTFE/graphite piston packing rings
2 Piston guides
14 Flat o-rings
2 O-rings

Note: Union nut and NPT inserts are not included in the spare parts kit.



MTMa Valve Complete

Liquid End Version		Material Code	Complete Liquid End	Spare Parts Kit	Valve Complete	Diaphragm
Meta MTMaH/MTMaA						
130	(For pump versions 12065, 12086, 12108 & 12130)	PCA	910402	910454	803703	811470
		PCE	7910402	7910454	7803703	811470
		PPE	910401	910451	803701	811470
		TTT	910403	910457	803705	811470
		SST	910404	910474	803707	811470
		SST	910404	910460*	803707	811470
260	(For pump versions 10130, 09173, 07216, 06260, 10173, 10216, 10260, 10200, 10263 & 10330)	PCA	910408	910455	803703	811471
		PCE	7910409	7910455	7803703	811471
		PPE	910407	910452	803701	811471
		TTT	910409	910458	803705	811471
		SST	910410	910475	803707	811471
		SST	910410	910461*	803707	811471
		†PPT 6 mm	7910407	1001570	792518	811471
		†PCT 6 mm	7910408	1001570	792518	811471
530	(For pump versions 05265, 04253, 03441, 03530, 05540, 05530, 04400, 04527, 03662, & 03790)	PCA	910414	910456	803704	811472
		PCE	7910415	7910456	7803705	811472
		PPE	910413	910453	803702	811472
		TTT	910415	910459	803706	811472
		SST	910416	910476	803708	811472
		SST	910416	910462*	803708	811472
		††PPT 6 mm	7910413	1001568	740615	811472
		††PCT 6 mm	7910414	1001568	740615	811472

*SS complete without spare valves
†For pump versions 10200, 10263, 10333
††For pump versions 04400, 04527, 03662

Liquid End Version		Material Code	Complete Liquid End	Spare Parts Kit	Valve Complete Suction (Spare valves only)	Valve Complete Discharge (Spare valves only)	Packing set
Meta MTKaH/MTKaA							
12.5	(For pump versions 10812, 21012, 21606, 24006, 16208, 22508, 12190 & 21610)	SS	910420	910470	803792	803793	485401
25	(For pump versions 10213, 11313, 07617, 10617, 06122, 10222, 05126 & 09926)	SS	910421	910471	803792	803793	485402
50	(For pump versions 05425, 06025, 04033, 05633, 03241, 05441, 02749 & 05249)	SS	910422	910472	803794	803795	485403

Motor Pump Spare Parts

ProMus

Description	Part No.
Rebuild Kit for Manual Stroke Adjuster	852751
Rebuild Kit for Nema 7 Electric Stroke Adjuster	852753
Rebuild Kit for Sz 17 Hydraulics 3/8 Plunger	853755
Rebuild Kit for Sz 17 Hydraulics 7/16 Plunger	853756
Rebuild Kit for Sz 30 Hydraulics 5/8 Plunger	854756
Rebuild Kit for Sz 30 Hydraulics 13/16 Plunger	854757
Rebuild Kit for Sz 30 Hydraulics 1 1/8 Plunger	854758
Rebuild Kit for Sz 40 Hydraulics 1 3/4 Plunger	855754
Rebuild Kit for Sz 40 Hydraulics 2 Plunger	855755
Rebuild Kit for Sz 40 Hydraulics 2 1/4 Plunger	855756
Liquid End Spare Parts Kits Size 17	
Spare Parts Kit for Size 17 with 316 SS single ball	853502
Spare Parts Kit for Size 17 with 316 SS double ball for suct. & disch.	853503
Spare Parts Kit for Size 17 with 316 SS double ball for disch.	853505
Spare Parts Kit for Size 17 with Alloy 20 single ball	853582
Spare Parts Kit for Size 17 with Alloy 20 double ball for suct. & disch.	853583
Spare Parts Kit for Size 17 with Alloy 20 double ball for disch.	853585
Spare Parts Kit for Size 17 with Hastelloy C single ball	853662
Spare Parts Kit for Size 17 with Hastelloy C double ball for suct. & disch.	853663
Spare Parts Kit for Size 17 with Hastelloy C double ball for disch.	853665
Spare Parts Kit for Size 17 with PVT double ball	853908
Liquid End Spare Parts Kits Size 30	
Spare Parts Kit for Size 30 with 316 SS single ball	854501
Spare Parts Kit for Size 30 with 316 SS double ball for suct. & disch.	854503
Spare Parts Kit for Size 30 with 316 SS double ball for disch., 30/17	854505
Spare Parts Kit for Size 30 with 316 SS double ball for disch., 30/30	854507
Spare Parts Kit for Size 30 with 316 SS double ball for suct. & disch., 30/17	854509
Spare Parts Kit for Size 30 with Alloy 20 single ball	854601
Spare Parts Kit for Size 30 with Alloy 20 double ball for suct. & disch., 30/30	854603
Spare Parts Kit for Size 30 with Alloy 20 double ball for disch., 30/17	854605
Spare Parts Kit for Size 30 with Alloy 20 double ball for disch., 30/30	854607
Spare Parts Kit for Size 30 with Alloy 20 double ball for suct. & disch., 30/17	854609
Spare Parts Kit for Size 30 with Hastelloy C single ball	854801
Spare Parts Kit for Size 30 with Hastelloy C double ball for suct. & disch., 30/30	854803
Spare Parts Kit for Size 30 with Hastelloy C double ball for disch., 30/17	854805
Spare Parts Kit for Size 30 with Hastelloy C double ball for disch., 30/30	854807
Spare Parts Kit for Size 30 with Hastelloy C double ball for suct. & disch., 30/17	854809
Spare Parts Kit for Size 30 with PVT single ball	854908
Liquid End Spare Parts Kits Size 40	
Spare Parts Kit for Size 40 with 316 SS single ball	855501
Spare Parts Kit for Size 40 with Alloy 20 single ball	855504
Spare Parts Kit for Size 40 with Hastelloy C single ball	855507
Spare Parts Kit for Size 40 with PVT single ball	855908

Motor Pump Spare Parts

Makro TZMa

Spare parts kits for ProMinent Makro series metering pumps include pump diaphragm, valve balls, valve components and all required o-rings.

Standard kit for PP, NP-Acrylic and PVC material versions:

1 Pump diaphragm
1 Suction valve, complete
1 Discharge valve, complete
2 Valve balls
1 Set of o-rings, complete

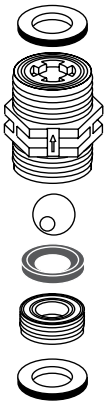
Standard kit for TT-PTFE material version:

1 Pump diaphragm
1 Suction valve, complete
1 Discharge valve, complete
2 Valve balls
2 Ball-seat discs or valve assembly
1 Set of o-rings, complete

Standard kit for SS (stainless steel) version:

1 Pump diaphragm
2 Valve balls
1 Set of o-rings, complete

Note: Union nut and NPT inserts are not included in the spare parts kit.



HM/AM Valve complete

Liquid end Type	Material Code	Complete Liquid end	Spare Parts Kit	Valve Complete	Diaphragm
FM-130	PP	910401	910451	803701	811470
DN 20	P	910402	910454	803703	811470
	T	910403	910457	803705	811470
	SS	910404	910474	803707	811470
			910460*		
FM-260	PP	910407	910452	803701	811471
DN 20	P	910408	910455	803703	811471
	T	910409	910458	803705	811471
	SS	910410	910475	803708	811471
			910461*		
FM-530	PP	910413	910453	803702	811472
DN 25	P	910414	910456	803704	811472
	T	910415	910459	803706	811472
	SS	910416	910476	803708	811472
			910462*		
FM-1500 & 2100	PP	1001245	1001573	741174	811473
	P	1001244	1001574	741173	811473
DN 40	T	1001246	1001575	1000580	811473
	SS	1001247	1001577	741175	811473
			1001576*		
FMH-70-20	PP		911903	741174	806938
	P		911901	741173	806938
	T		911905	1000580	806938
	SS		911907	741175	806938
			911908*		
FMH-90-20	PP		911904	741174	806938
	P		911902	741173	806938
	T		911906	1000580	806938
	SS		911909	741175	806938
			911910*		

*SS with 2 valves, complete

Motor Pump Spare Parts

Makro TZMb

Identity Code: 120260, 120340, 120430, 120510, 120650

Liquid End Version	Material Code	Part No.
FM 670 - DN 25	PCT/PPT/TTT	1025164
	S	1022896
	S (without valve cpl.)	1022895

Identity Code: 070430, 070570, 070720, 070860, 071070

Liquid End Version	Material Code	Part No.
FM 1100 - DN 32	PCT/PPT/TTT	1025167
	S	1022917
	S (without valve cpl.)	1022916

Identity Code: 040840, 041100, 041400, 041670, 042100

Liquid End Version	Material Code	Part No.
FM 2100 - DN 40	PCT/PPT/TTT	1025169
	S	1022930
	S (without valve cpl.)	1022929

Pump & Systems Accessories

Accessory Kits

Accessory kits for alpha, concept^{PLUS}, beta and gamma/L 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	Part No.
1/4 x 3/16	PCB/NPB/NP3	PE	PE	7809401
1/4 x 3/16	PPE/PP1	PE	PE	7809403
1/4 x 3/16	PPB	PE	PE	7809405
1/4 x 3/16	PCE/NPE	PE	PE	7809422
1/2 x 3/8	PCB/NPB/NP1/NP3/NP6	PVC	PE	7809402
1/2 x 3/8	PPE/PP1	PVC	PE	7809404
1/2 x 3/8	PPB/PP2/PP3	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.

Profibus adapters

5-pin, M12 x 1 to 9 pin., Sub D-plug, length approx. 11.8" (300 mm)

	Part No.
Y-adapter	
2 x M12 x 1 male/female, 9 pin, Sub-D plug	1005838
Adapter	
1 x M12 x 1 male, 9 pin, Sub-D plug	1005839

Control Cables

Required for external control of ProMinent metering pumps including:

- beta
- gamma/ L
- delta
- Sigma/ 1 control
- Sigma/ 2 control
- Sigma/ 3 control

Description	Part No.
Universal control cable, 5-wire, 6 ft. (2 m)	1001300
Universal control cable, 5-wire, 15 ft. (5 m)	1001301
Universal control cable, 5-wire, 30 ft. (10 m)	1001302

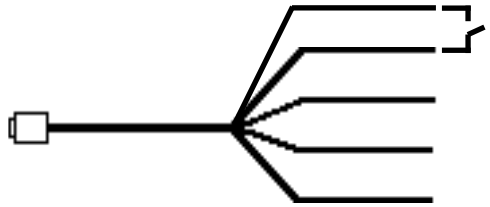
(SEE DETAILED WIRING DIAGRAMS NEXT PAGE)

Control Cable Diagrams

Remote On/Off

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 back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

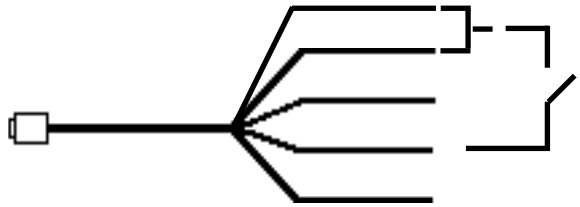
WHITE: Pulse (+)

BLUE: Analog (+)

Pulse Control

Pulse control will allow the pump to run in proportion to a pulsing potential 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 back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

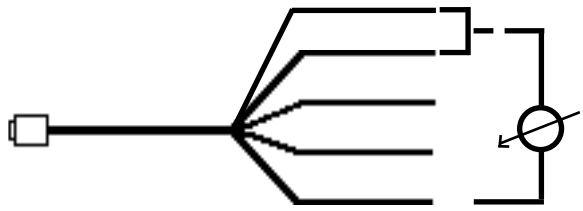
WHITE: Pulse (+)

BLUE: Analog (+)

Analog Control (not available with beta metering pumps)

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 back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

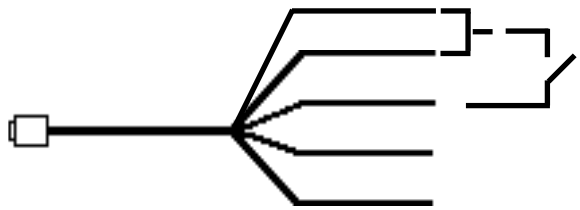
WHITE: Pulse (+)

BLUE: Analog (+)

Auxiliary Frequency

Auxiliary frequency will allow the pump to default to a predetermined stroking frequency regardless of which operating mode the pump is in. The pump defaults to this stroking frequency as long as a contact is closed between the black and grey wires of the universal control cable.

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

WHITE: Pulse (+)

BLUE: Analog (+)

Pump & Systems Accessories

Foot Valves

To be installed at the end of the suction line to improve priming and protect pump against coarse impurities. With ceramic* weight, strainer and ball check valve (must be mounted vertically for ball check function).

Fig. 1

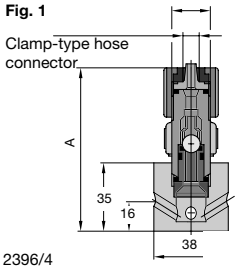


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Fig. 2

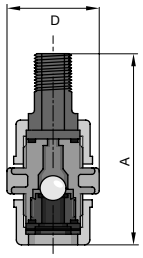

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Fig. 3

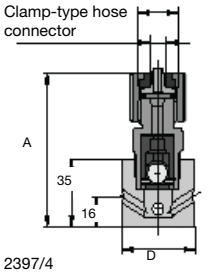

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Fig. 4

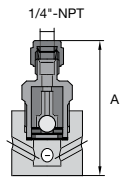

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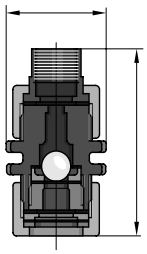
Fig. 5



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	Dimensions inches (mm)				
Polypropylene	**Dim "A"**		**Dim "D"**		**Part No.**
Valve body of PP, o-rings of EPDM (PP1, PPE)					
Connection 1/4" x 3/16" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	924558
Connection 1/2" x 3/8" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	924566
Connection 1/2" MNPT for 0423/0230 (Fig 2)	3-7/8	(98)	1-3/8	(35)	809465
Connection 3/8" PPE Foot Valve					7924552
Valve body of PP, o-rings of Viton® (PP2, PPB)					
Connection 1/4" x 3/16" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	7924558
Connection 1/2" x 3/8" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	7809470
Connection 1/2" MNPT for 0423/0230 (Fig 2)	3-7/8	(98)	1-3/8	(35)	7809465
Connection 3/8" PPB Foot Valve					7924553
Valve body of PP, o-rings of EPDM-high viscosity (PP4)					
Connection 1/2" MNPT (Fig 2)	4	(102)	1-5/8	(42)	7924516
Valve body of PP, o-rings of Viton®-high viscosity (PP5)					
Connection 1/2" MNPT (Fig 2)	4	(102)	1-5/8	(42)	7809471
PVC					
Valve body of PVC, o-rings of EPDM					
Connection 1/4" x 3/16" tubing (Fig 1)	3-1/8	(79)	1-3/8	(35)	7924547
Connection 1/2" x 3/8" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	7924549
Connection 1/2" MNPT (Fig 2)	3-7/8	(98)	1-3/8	(35)	7809464
Connection 3/8" NPE Foot Valve					7924550
Valve body of PVC, o-rings of Viton®					
Connection 1/4" x 3/16" tubing (Fig 1)	3-1/8	(79)	1-3/8	(35)	924557
Connection 1/2" x 3/8" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	924565
Connection 1/2" MNPT (Fig 2)	3-7/8	(98)	1-3/8	(35)	809464
Connection 3/8" NPB Foot Valve					7924551
PVT					
Valve body of PVT, seals of Teflon					
Connection 1/4" x 3/16" tubing (Fig 1)	3-1/8	(79)	1-3/8	(35)	1024705
Connection 1/2" x 3/8" tubing (Fig 1)	3-1/4	(83)	1-3/8	(35)	1024827
PTFE					
Valve body and seals of PTFE (TT1)					
Connection 1/4" x 3/16" tubing (Fig 3)	3-1/4	(83)	1-1/2	(38)	809455
Connection 1/2" x 3/8" tubing (Fig 3)	3-1/2	(89)	1-1/2	(38)	809473
Connection 1/2" MNPT (not illustrated)	3-7/8	(98)	1-1/2	(38)	809466
SS					
Valve body of stainless steel, seals of PTFE					
Connection 1/4"FNPT (SS2) (Fig 4)	2-5/8	(67)	1-1/2	(38)	924567
Connection 3/8" FNPT (SS1) (Fig 5)	2-5/8	(67)	1-1/2	(38)	809467

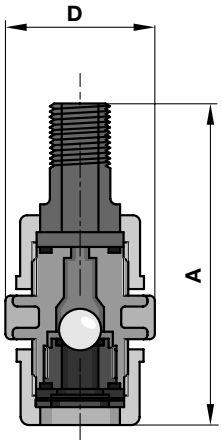
***Note:** For fluoride, (hydrofluosilicic acid) or when plastic is required to replace standard ceramic weight.

PVC foot valve weight 7404007

Viton® is a registered trademark of Dupont Dow Elastomers

Foot Valves

Fig. 1



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Polypropylene (Fig. 1) - Valve body of PP, o-rings of EPDM (PP1)

Connection	Dimensions inches (mm) Dim "A"		Dim "D"		Part No.
1/2" MNPT (DN 10) (delta, Sigma 1 and Sigma 2)	3-7/8	(98)	1-1/2	(38)	809465
3/4" MNPT (DN 15) (Sigma 1 and Sigma 2)	4	(102)	1-3/4	(44)	924516
3/4" MNPT (DN 20) (Sigma 2)	5	(127)	2-1/4	(57)	803721
1" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro)	5-1/4	(133)	2-1/2	(63)	803722
1-1/2" MNPT (DN 40) (Sigma 3 and Makro)	6-1/2	(165)	3-1/2	(89)	1004204

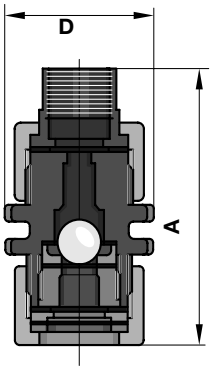
PVC (Fig. 1) - Valve body of PVC, o-rings of Viton® (NP1)

1/2" MNPT (DN 10) (delta, Sigma 1 and Sigma 2)	3-7/8	(98)	1-1/2	(38)	809464
3/4" MNPT (DN 15) (Sigma 1 and Sigma 2)	4	(102)	1-3/4	(44)	924515
3/4" MNPT (DN 20) (Sigma 2)	5	(127)	2-1/4	(57)	803723
1" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro)	5-1/4	(133)	2-1/2	(63)	803724
1-1/2" MNPT (DN 40) (Sigma 3 and Makro)	6-1/2	(165)	3-1/2	(89)	1004193

PVDF/PTFE (Fig. 1) Valve body and seals of PTFE (TT1)

1/2" MNPT (DN 10) (delta, Sigma 1 and Sigma 2) (PTFE/PTFE)	3-7/8	(98)	1-3/8	(35)	809466
1/2" MNPT (DN 10) (delta, Sigma 1 and Sigma 2) (PVDF/PVDF)	3-7/8	(98)	1-3/8	(35)	7803720
3/4" MNPT (DN 15) (Sigma 1 and Sigma 2) (PVDF/PVDF)	4-1/8	(105)	1-3/4	(44)	7803721
3/4" MNPT (DN 15) (Sigma 1 and Sigma 2) (PTFE/PTFE)	4-1/8	(105)	1-3/4	(44)	924517
3/4" MNPT (DN 20) (Sigma 2) (PTFE/PTFE)	4-3/4	(121)	2-1/4	(57)	803725
3/4" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro) (PVDF/PVDF)	4-3/4	(121)	2-1/4	(57)	7803722
1" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro) (PVDF/PVDF)	5-3/8	(137)	2-1/2	(63)	7803723
1" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro) (PTFE/PTFE)	5-3/8	(137)	2-1/2	(63)	803726
1-1/2" MNPT (DN 32) (PVDF/PVDF)					1006434
1-1/2" MNPT (DN 40) (Sigma 3 and Makro) (PTFE/PTFE)	6-1/2	(165)	3-1/2	(89)	1004205

Fig. 2



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SS - Valve body of stainless steel, seals of PTFE

3/8" FNPT (DN 10) (delta, Sigma 1 and Sigma 2)	2-3/4	(70)	1-1/2	(38)	809467
1/2" FNPT (DN 15) (Sigma 1 and Sigma 2)	3	(76)	1-3/4	(44)	924518
3/4" MNPT (DN 20) (Sigma 2)	4-1/2	(114)	2-1/8	(54)	803727
1" MNPT (DN 25) (Sigma 2, Sigma 3 and Makro)	5-1/8	(130)	2-1/2	(63)	803728
1-1/2" MNPT (DN 32)					1006435
1-1/2" MNPT (DN 40) (Sigma 3 and Makro)	6-1/4	(159)	3-1/8	(79)	1004206
1/4" FNPT	2-3/4	(70)	1-1/2	(38)	803730
3/8" FNPT	2-3/4	(70)	1-1/2	(38)	803731

* See Figure 1, ** See Figure 2

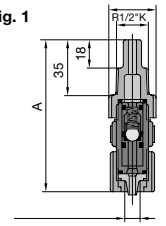
Pump & Systems Accessories

Injection Valves

To connect the pump discharge line to the point of injection for installation in any position, except PTFE version without spring to be installed in a vertical position discharging upward. All valves except PTFE include a 7 psig (0.5 bar) Hastelloy-C spring.

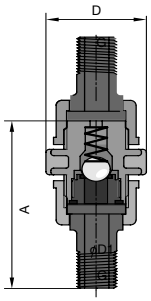
Caution: Injection valves and injection lances should not be used as isolating elements or for antisiphon protection!

Fig. 1



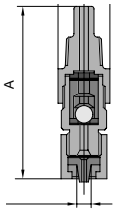
Clamp-type hose connector
2399/4

Fig. 2



1447/4

Fig. 3



Clamp-type hose connector
2400/4

Fig. 4

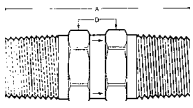
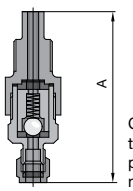


Fig. 5
1/4" NPT SS2



Clamp-type pipe connector
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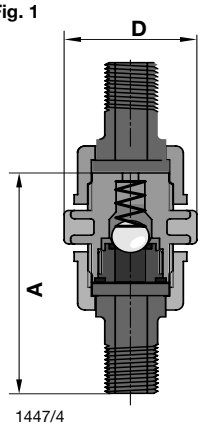
Polypropylene Valve body of PP, o-rings of EPDM (PP1, PPE)	Dim "A" inches (mm)	Part No.
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	924681
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	924596
Connection 1/2" MNPT for 0423/0230 (Fig 2)	5-1/4 (133)	809461
Connection 3/8" PPE Injection Valve		7924586
Valve body of PP, o-rings of Viton® (PP2, PPB)		
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	7924681
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	7809478
Connection 1/2" MNPT for 0423/0230 (Fig 2)	5-1/4 (133)	7809461
Connection 3/8" PPB Injection Valve		7924587
Valve body of PP, o-rings of EPDM-high viscosity (PP4)		
Connection 1/2" MNPT for PP4 (Fig 2)	5-3/8 (137)	7924521
Valve body of PP, o-rings of Viton®-high viscosity (PP5)		
Connection 1/2" MNPT for PP5 (Fig 2)	5-3/8 (137)	7809462
PVC		
Valve body of PVC, o-rings of EPDM		
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 1)	3-3/4 (95)	7924580
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	7924582
Connection 1/2" MNPT (Fig 2)	5-3/8 (137)	7809460
Connection 3/8" NPE Injection Valve		7924583
Valve body of PVC, o-rings of Viton®		
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 1)	3-3/4 (95)	924680
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	924595
Connection 1/2" MNPT (Fig 2)	5-3/8 (137)	809460
Connection 3/8" NPB Injection Valve		7924584
PTFE		
Body and o-rings of PTFE		
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 3)	4-1/8 (105)	809488
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 3)	4-1/4 (108)	809481
Connection 1/2" MNPT (not illustrated)		809462
SS		
Valve body of stainless steel, seals of PTFE (SS1 & SS2)		
Poppet check valve, connection 1/4" MNPT x 1/4" MNPT, spring-loaded, adjustable by internal hex nut from 3-50 psig (0.2-3.5 bar) (Fig 4)	1-5/8 (42)	7914587
Optional adapter for above valve 1/4" FNPT x 1/2" MNPT (Fig 5)		7914588
Ball check valve, connection 1/4" FNPT inlet to 1/2" MNPT discharge, 7 psig (0.5 bar) spring (Fig 5)	3-1/2 (89)	924597
Ball check valve, connection 3/8" FNPT inlet to 1/2" MNPT discharge, 7 psig (0.5 bar) spring (not illustrated) (SS1) (for 0423 & 0230 only)	3-1/2 (89)	809463
PVT		
Valve body of PVT, seals of Teflon		
Connection 1/4" x 3/16" tubing x 1/2" MNPT injection end (Fig 1)	3-3/4 (95)	1024708
Connection 1/2" x 3/8" tubing x 1/2" MNPT injection end (Fig 1)	3-7/8 (98)	1024714

Injection valves

To connect the pump discharge line to the point of injection for installation in any position, except PTFE version without spring to be installed in a vertical position discharging upward. All valves except PTFE and Sigma/Meta/Makro HK have 7 psig (0.5 bar) Hastelloy-C spring.

Caution: Injection valves and injection lances should not be used as isolating elements or for antisiphon protection!

Fig. 1



1447/4

Fig. 2

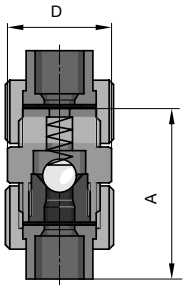


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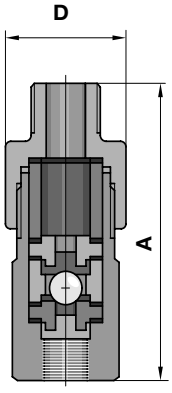
Fig. 3



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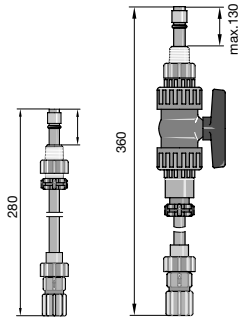
Threaded Connection		Dimensions inches (mm) Dim "A"		Dim "D"		Part No.
Polypropylene (Fig. 1) Valve body of PP, o-rings of EPDM (PP1)						
1/2" MNPT (DN 10)		5-1/4	(133)	1-1/2	(38)	809461
3/4" MNPT (DN 15)		5-3/8	(137)	1-3/4	(44)	924521
3/4" MNPT (DN 20)		6-3/4	(171)	2-1/4	(57)	803710
1" MNPT (DN 25)		7-1/8	(181)	2-3/8	(60)	803711
1-1/2" MNPT (DN 40)		8-1/4	(210)	3-1/2	(89)	804761
PVC (Fig. 1) - Valve body of PVC, o-rings of Viton® (NP)						
1/2" MNPT (DN 10)		5-3/8	(137)	1-1/2	(38)	809460
3/4" MNPT (DN 15		5-3/8	(137)	1-5/8	(42)	924520
3/4" MNPT (DN 20)		6-3/4	(171)	2-1/4	(57)	803712
1" MNPT (DN 25)		7-1/8	(181)	2-3/8	(60)	803713
1-1/2" MNPT (DN 40)		8-1/4	(210)	3-1/2	(89)	804760
PVDF/PTFE (Fig. 1) - Valve body and seals of PTFE (TT1)						
1/2" MNPT (DN 10)	(PTFE/PTFE)	4-7/8	(124)	1-3/8	(35)	809462
1/2" MNPT (DN 15)	(PVDF/PVDF)	4-7/8	(124)	1-3/8	(35)	7803724
3/4" MNPT (DN 15)	(PVDF/PVDF)	5-1/2	(140)	1-3/4	(44)	7803725
3/4" MNPT (DN 15)	(PTFE/PTFE)	5-1/2	(140)	1-3/4	(44)	924522
3/4" MNPT (DN 20)	(PTFE/PTFE)	6-7/8	(175)	2-1/4	(57)	803714
3/4" MNPT (DN 25)	(PVDF/PVDF)	6-7/8	(175)	2-1/4	(57)	7803726
1" MNPT (DN 25)	(PVDF/PVDF)	7-1/4	(184)	2-1/2	(63)	7803727
1" MNPT (DN 25)	(PTFE/PTFE)	7-1/4	(184)	2-1/2	(63)	803715
1-1/2" MNPT (DN 32)	(PVDF/PVDF)					1002783
1-1/2" MNPT (DN 40)	(PTFE/PTFE)	8-1/4	(210)	3-1/2	(89)	804762
SS - Valve body of stainless steel, seals of PTFE						
3/8" FNPT (DN 10)		3-1/8	(79)	1-3/8	(35)	809463
1/2" FNPT (DN 15)		3-1/2	(89)	1-3/4	(44)	924523
3/4" MNPT (DN 20)		6-1/2	(165)	2-1/8	(54)	803716
1" MNPT (DN 25)		7-1/4	(184)	2-1/2	(63)	803717
1-1/2" MNPT (DN 40)		8-1/4	(210)	3-1/8	(79)	804763
1-1/2" MNPT (DN 32)						1002801
High pressure valves for HK pumps (Fig. 3)						
1/4" MNPT by 1/2" MNPT (DN 8)		4	(83)	1-5/8	(42)	803732
3/8" MNPT by 1/2" MNPT (DN 10)		4	(83)	1-5/8	(42)	803733

Injection Lances

Length of insertion variable from 3/4" to 6-1/2" (20 mm...165 mm) for large diameter pipes. Consisting of spring-loaded ball check injection valve, adjustable insertion pipe and elastomeric sleeve over injection port for backflow prevention. Materials: Hastelloy C spring, Ceramic valve ball, EPDM and silicon o-rings. Max. working pressure 87 psig (6 bar). Requires 1/2" FNPT pipe tap.

Note: For units with isolating valve, the valve may not be closed until the insertion pipe has been pulled out through the valve. Call factory for 3/4" and 1" connection.



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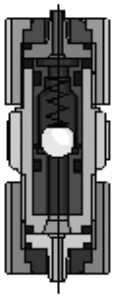
Polypropylene (EPDM o-rings)	Part No.
Connection 1/4" x 3/16" tubing to 1/2" MNPT	1021530
Connection 1/2" x 3/8" tubing to 1/2" MNPT	1021530
same, but with ball-type isolating valve	
Connection 1/4" x 3/16" tubing to 1/2" MNPT	1021531
Connection 1/2" x 3/8" tubing to 1/2" MNPT	1021531
PVC (Viton® o-rings)	
Connection 1/4" x 3/16" tubing to 1/2" MNPT	1021528
Connection 1/2" x 3/8" tubing to 1/2" MNPT	1021528
same, but with ball-type isolating valve	
Connection 1/4" x 3/16" tubing to 1/2" MNPT	1021529
Connection 1/2" x 3/8" tubing to 1/2" MNPT	1021529

Note: For brass 3/4" and 1" corporation stops, please call factory.

In-line check valve for tubing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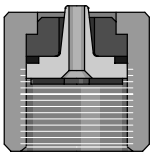
Polypropylene	Part No.
With connectors on both ends for installation in flexible tubing, valve body of PP, o-rings of EPDM, with valve ball, spring-loaded with Hastelloy C spring, 7 psig (0.5 bar).	
By using different Connector Sets, different sizes of tubing from 1/4" to 1/2" can be connected with each other.	
Connection for tubing 1/4" x 3/16"	809434
Connection for tubing 1/2" x 3/8"	809436
PVC	
With connectors on both ends for installation in flexible tubing, valve body of PVC, o-rings of Viton®, with valve ball, spring-loaded with Hastelloy C spring, 7 psig (0.5 bar).	
By using different Connector Sets, different sizes of tubing from 1/4" to 1/2" can be connected with each other.	
Connection for tubing 1/4" x 3/16"	809417
Connection for tubing 1/2" x 3/8"	809415

Pump & Systems Accessories

Connector Sets



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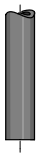
Description	Part No.
PP/VITON® for hose type 1/4" x 3/16"	790872
PP/VITON® for hose type 1/2" x 3/8"	740133
PP/VITON® for hose type 3/8" x 1/4"	7817168
PP/EPDM for hose type 1/4" x 3/16"	790885
PP/EPDM for hose type 1/2" x 3/8"	740132
PP/EPDM for hose type 1/4" x 1/2"	817163
PP/EPDM for hose type 3/8" x 1/4"	7817151
PVC/Viton® for hose type 1/4" x 3/16"	817050
PVC/Viton® for hose type 1/2" x 3/8"	817055
PVC/Viton® for hose type 1/4" x 1/2"	817068
PVC/Viton® for hose type 3/8" x 1/4"	7817051
PVC/EPDM for hose type 1/4" x 3/16"	790871
PVC/EPDM for hose type 1/2" x 3/8"	740160
PVC/EPDM for hose type 3/8" x 1/4"	7817049
PTFE for hose type 1/4" x 3/16"	817201
PTFE for hose type 1/2" x 3/8"	791199
PVT for hose type 1/4" x 3/16"	1023246
PVT for hose type 1/2" x 3/8"	1024584
PVT for hose type 3/8" x 1/4"	7781457

Tubing

Suction and discharge tubing



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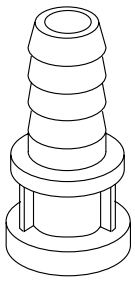
	Max. Operating . Pressure Rating (psig)	Part No.
PVC soft 1/4" x 3/16" (for suction side only)	7	7037004
PVC soft 1/2" x 3/8" (for suction side only)	7	7037009
PVC fabric reinforced 1/4" x 1/2"	232	037032
PE 1/4" x 3/16"	100	7037005
PE 1/2" x 3/8"	100	7037010
PE 3/8" x 1/4"		7037011
Teflon (FEP) 1/4" x 3/16"	100	7037426
Teflon (FEP) 1/2" x 3/8"	100	7037428

Hose Barbs

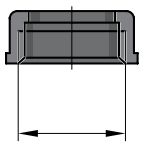


Material (all 1/2" DN 10)	Part No.
PP	800657
PVC	800554
PTFE	811572
316 SS	810536
Material (all 3/4" DN 15)	
PP	800655
PVC	811407
PTFE	811424
316 SS	810567

Pump & Systems Accessories

Union Nuts

Inserts



Union nut

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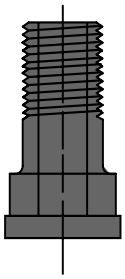

Threaded insert

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Pump	Union Nut Material	Threaded Insert Material	Union Nut Thread	Insert Thread	Union Nut Part No.	Threaded Insert Part No.
Vario	PP	PP	DN 10	1/2" MNPT	358613	7358630
High Viscosity	PP	PP	DN 10	1/2" MNPT	358613	7358402
Vario	PP	PP	DN 15	3/4" MNPT	358614	1017380
Meta/Makro	PP	PP	DN 20	3/4" MNPT	358615	1017381
Meta/Makro	PP	PP	DN 25	1" MNPT	358616	1017382
Meta/Makro	PP	PP	DN 40	1-1/2" MNPT	358618	7358611
Vario	PVC	PVC	DN 10	1/2" MNPT	356562	7358632
Vario	PVC	PVC	DN 15	3/4" MNPT	356563	1017380
Meta/Makro	PVC	PVC	DN 20	3/4" MNPT	356564	1017381
Meta/Makro	PVC	PVC	DN 25	1" MNPT	356565	1017382
Meta/Makro	PVC	PVC	DN 40	1-1/2" MNPT	356567	7358613
Vario	PVDF	PTFE	DN 10	1/2" MNPT	358813	7358634
Vario	PVDF	PTFE	DN 15	3/4" MNPT	358814	1017380
Meta/Makro	PVDF	PTFE	DN 20	3/4" MNPT	358815	1017381
Meta/Makro	PVDF	PTFE	DN 25	1" MNPT	358816	1017382
Meta/Makro	PVDF	PTFE	DN 40	1-1/2" MNPT	358818	7358615
Sigma	PVDF	PVDF	DN 10	1/2" MNPT	358813	7358634
Sigma	PVDF	PVDF	DN 15	3/4" MNPT	358814	1017380
Sigma	PVDF	PVDF	DN 20	3/4" MNPT	358815	1017381
Sigma	PVDF	PVDF	DN 25	3/4" MNPT	358816	7358645
Sigma	PVDF	PVDF	DN 25	1" MNPT	358816	1017382
Sigma/3	PVDF	PVDF	DN 32	1-1/2" MNPT	1003639	1017383
Vario/Sigma	SS	SS	DN 10	3/8" FNPT	805270	7805285
Vario/Sigma	SS	SS	DN 15	1/2" FNPT	805271	7805286
Meta/Makro	SS	SS	DN 20	3/4" MNPT	805272	7358609
Sigma	SS	SS	DN 25	3/4" MNPT	805273	7358646
Meta/Makro/Sigma	SS	SS	DN 25	1" MNPT	805273	7358610
Sigma/3	SS	SS	DN 32	1-1/2" MNPT	805274	7358648
Meta/Makro	SS	SS	DN 40	1-1/2" MNPT	805275	7358617

Seals

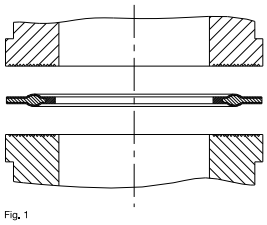


Fig. 1

Moulded composite seal	PTFE Part No.
DN10	1019364
DN15	1019365
DN20	1019366
DN25	1019367
DN32	1019353
DN40	1019368
DN50	1019369

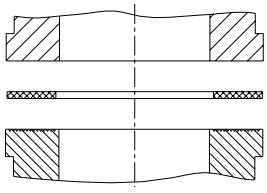
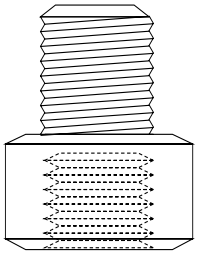


Fig. 2

Flat Seal	FPM Part No.	EPDM/P Part No.
DN10	1019315	1019314
DN15	1019317	1019316
DN25	1019319	1019318
DN32	1019321	1019320
DN40	1019323	1019322
DN50	1019325	1019324

Adapters

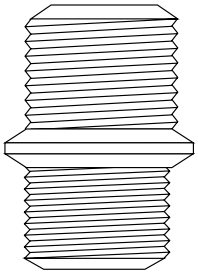


M20 x 1.5 Female by 1/2" MNPT

PVC	7744060
PVDF	7358652

M20 x 1.5 Female Socketweld

PVC	7740129
CPVC	7740881
PVDF	7745882

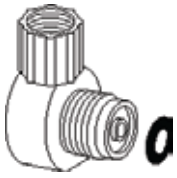


M20 x 1.5 Male by 1/2" MNPT

PVC	7358228
PVDF	7358660

M20 x 1.5 Male Socketweld

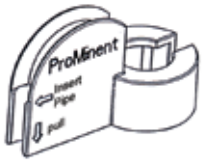
PVC	7740130
CPVC	7745158
PVDF	7745598



Right-angled PVC threaded connector

Connector for the beta and gamma/L auto-degassing liquid ends required when mounting multifunction valves; optionally used to direct discharge flow upwards. Angle union 90°.

Type PCB (PVC/Viton®)	1003318
Type PCE (PVC/EPDM)	1003472



Right-angled PVC threaded connector

Fits on top of the beta and gamma/L auto-degassing liquid ends, used to prevent a fold in the bypass line which is fed back to the tank. This is required when using soft tubing, however rigid tubing is standard.

for tubing size (mm)

1/4" x 3/16" (6mm)	1001844

Pump & Systems Accessories

Backpressure Valves

Pressure Relief Valves

Backpressure, antisiphon and pressure relief valves

In-line pressure relief valve (3 port)

Backpressure valve (2 port)

Backpressure valve on tee for pressure relief

Backpressure (2-port) valves may be used in-line to provide a constant discharge pressure for protection from siphoning, or they may be teed off of the discharge line for pressure relief, discharging back to the source tank or to the pump suction line to create a bypass.

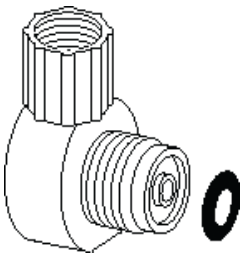
Pressure relief (3-port) valves are mounted in the discharge line, featuring a separate relief port which discharges back to the source tank or to the pump suction line to create a bypass.

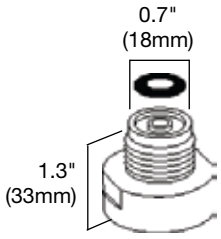
Backpressure valves provide several functions: they improve repeatability by providing a constant discharge pressure; they provide antisiphon protection for discharge into pressurized water lines or vacuums, or where suction head exceeds discharge head; and they minimize pulsation when used in conjunction with a pulsation dampener.

In-line backpressure/antisiphon and pressure relief valves

These adjustable backpressure (2-port) and pressure relief (3-port) valves have FNPT ports and require tubing adapters for use with flexible tubing.

Can be adjusted with screwdriver.





Adapter included with all back-pressure/pressure relief valves. Optional use in the event of diaphragm failure.

Technical data

Size:
1/4" and 1/2" NPT

Diaphragm Materials:
PTFE-faced EPDM

Liquid Handling Materials:
PP, PVC, PTFE, PVDF
316 Stainless Steel

Pressure Adjustment:
0-150 psig (0-10.3 bar)

Flow rates @ 45 psig (3.1 bar):
1/4" - 132 U.S. gph (500 L/h)
1/2" - 132 U.S. gph (500 L/h)

Flow rates @ 150 psig:
1/2" (PP, PVC) - 200 U.S. gph (757 L/h)
1/2" (PVDF, TT, SS) - 300 U.S. gph (1135 L/h)
3/4" - 300 U.S. gph (1135 L/h)
1" - 500 U.S. gph (1893 L/h)
1-1/2" - 900 U.S. gph (3407 L/h)
2" - 1200 U.S. gph (4542 L/h)

Max. Temperature:
PP - 195ºF (90ºC)
PVC - 140ºF (60ºC)
PTFE - 250ºF (121ºC)
PVDF - 250ºF (121ºC)
316 Stainless - 250ºF (121ºC)
Max. Pressure Rating 170 psig @ 120ºF

DIMENSIONS: 1/4" to 1/2" valves

D	A (in)	B (in)	C (in)
1/4”	4.90	2.6	1.2
*1/4”	*3.5	*2.375	*0.75
1/2”	4.9	2.6	1.2
*1/2”	*5.5	*3.5	*1.125
3/4”	5.4	3.5	1.1
1”	5.7	3.9	1.4
1-1/2"	8.5	4.6	2.2
2”	8.5	4.6	2.2v

***Note:** Dimensions apply to SS and PTFE valves only.

DIMENSIONS (for <u>replacement</u> valves only): 1/4" to 1/2" valves - SEE PG. 8

D	A (in)	B (in)	C (in)
1/4”	3.9	2.375	0.75
*1/4”	*3.5	*2.375	*0.75
1/2”	4.6	2.375	1.125
*1/2”	*5.5	*3.5	*1.125
3/4”	5.5	3.5	1.125
1”	5.8	3.5	1.25
1-1/2"	9.0	4.5	2.1
2”	9.0	5.0	2.1

***Note:** Dimensions apply to SS, PVDF and PTFE valves only.

Pump & Systems Accessories

Backpressure Valves

Pressure Relief Valves

1/4" FNPT valves

Material	Backpressure Valve (2-port)	Pressure Relief Valve (3-port)
PP	1009444	1009452
PVC	1009445	1009453
PVDF	1009446	1009454
316 SS	1009447	1009455

Tubing Adapters (1 required per valve port): 1/4" x 3/16" tubing x 1/4" MNPT	Part No.
PP/EPDM	7500060
PP/Viton®	7500058
PVC/EPDM	7500064
PVC/Viton®	7500062

1/2" FNPT valves

Material	Backpressure Valve (2-port)	Pressure Relief Valve (3-port)
PP	1006846	1006858
PVC	1006850	1006862
PVDF	1006854	1006866
316 SS	1008796	1008800

Tubing Adapters (1 required per valve port): 1/2" x 3/8" tubing x 1/2" MNPT	Part No.
PP/EPDM	7500061
PP/Viton®	7500059
PVC/EPDM	7500065
PVC/Viton®	7500063

3/4" FNPT valves

Material	Backpressure Valve (2-port)	Pressure Relief Valve (3-port)
PP	1006847	1006859
PVC	1006851	1006863
PVDF	1006855	1006867
316 SS	1008797	1008801

1" FNPT valves

PP	1006848	1006860
PVC	1006852	1006864
PVDF	1006856	1006868
316 SS	1008798	1008802

1-1/2" FNPT valves

PP	1006849	1006861
PVC	1006853	1006865
PVDF	1006857	1006869
316 SS	7302243	7302261

2" FNPT valves

PP	1009448	1009456
PVC	1009449	1009457
PVDF	1009450	1009458
316 SS	7302247	7302265

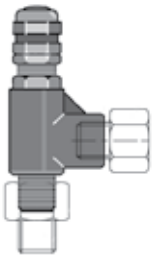
Spare Parts Sets — **Contains 1 of each:** *compression spring, diaphragm, spring plate, and pressure ad. disc.*

SPK 1/4" - 1/2"	1035446	1035446
SPK 3/4" - 1"	1035447	1035447
SPK 1-1/2" - 2"	1035448	1035448

Spare diaphragms

1/4" - 1/2" valve PTFE/EPDM	1006813	1006813
3/4" - 1" valve PTFE/EPDM	1006814	1006814
1-1/2" - 2" valve PTFE/EPDM	1006815	1006815

Pressure relief valves



1112/4

High pressure relief valve, adjustable, 1/4" and 1/2" NPT for Sigma/ Meta/Makro HK and ProMus pumps

Can also be used as a backpressure valve for < 30 gph (113 L/h).

These valves are without springs, which must be ordered separately.

			Part No.
Materials:	Stainless steel/Viton®		
Connection:	1/4" NPT male and female thread		7202505
Materials:	Stainless steel/EPDM		
Connection:	1/4" NPT male and female thread		7744507
Spring: psig (bar)		**Color:**	
50 - 350	(3.5 - 25)	blue	7202519
350 - 750	(25 - 50)	yellow	7202520
750 - 1500	(50 - 100)	violet	7202525
1500 - 2250	(100 - 155)	orange	7202524
2250 - 3000	(155 - 205)	brown	7202523
3000 - 4000	(205 - 275)	white	7202522
4000 - 5000	(275 - 340)	red	7202521
Materials:	Stainless steel/Viton®		
Connection:	1/2" NPT male and female thread		7744508
Materials:	Stainless steel/EPDM		
Connection:	1/2" NPT male and female thread		7744509
Spring: psig (bar)		**Color:**	
50 - 350	(3.5 - 25)	blue	7744510
350 - 750	(25 - 50)	yellow	7744511
750 - 1500	(50 - 100)	violet	7744512

Pump & Systems Accessories

Pulsation Dampeners

Pulsation dampeners operate on the principle that gas is compressible and fluid is not. The pulsation dampener consists of an air chamber containing compressed air, a fluid chamber connected to the pump's suction or discharge line, and a bladder or bellows which separates the air and fluid.

Some models are flow-through design, with two ports so they can be mounted directly on the pump suction or discharge line. Other models are single port design, to be teed off of the pump suction or discharge line. Flow-through models may also be used in a tee if one port is capped.

All models feature a Schrader (bicycle) valve and pressure gauge for charging the air chamber on-site.

PVDF/Nordel pulsation dampeners are recommended for sodium hydroxide (caustic) applications. Viton® pulsation dampeners are recommended for sodium hypochlorite applications.

Sizing Pulsation Dampeners

Multiply the pump's displacement per stroke (mL) times 26 to get minimum pulsation dampener volume (mL) to achieve 90% reduction in pulsation.

Safety Note: We recommend using pressure relief valves with the pulsation dampeners.

Fig. 1

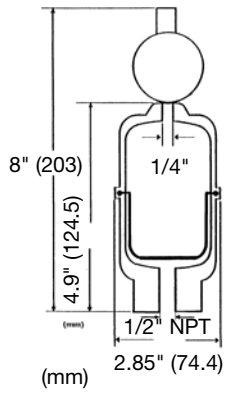
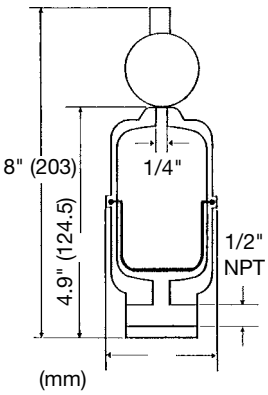


Fig. 2



General Specifications

Maximum pressure:	150 psig (polypro, PVDF and PTFE), 300 psig (SS)
Temperature range:	
Nordel bladder:	-60°F to 280°F (-51°C to 138°C)
Viton® bladder:	30°F to 350°F (-1°C to 177°C)
HYPALON® bladder:	-20°F to 275°F (-29°C to 135°C)
PTFE bellows:	40°F to 220°F (4°C to 104°C)
Polypro housing :	32°F to 175°F (0°C to 79°C)
PVC housing:	32°F to 140°F (0°C to 60°C)
PVDF housing:	10°F to 250°F (-12°C to 121°C)
PTFE housing:	-20°F to 125°F (-29°C to 52°C)
SS housing:	32°F to 200°F (0°C to 93°C)

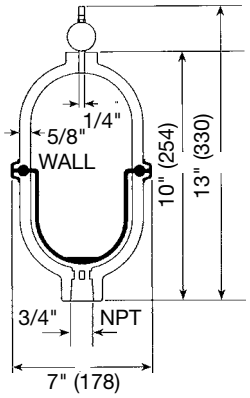
*Teflon bellows are smaller in volume

	Shipping Weight lbs (kg)	Model	Size	Part No.
131 mL (8 cu. in.) Models				
SS housing: 3/8" FNPT, 1 port (not illustrated)				
PTFE bellows	3 (1.4)	CTS1020 T	III	7253205
PVDF housing: 1/2" FNPT, 1 port (Fig. 1)				
PTFE bellows	1 (0.9)	CTK1005 T 5	III	7744101
164 mL (10 cu. in.) Models				
PVC housing: 1/2" FNPT,1 port (Fig. 1)				
Nordel bladder (EPDM)	1 (0.9)	CTP1015 ND 5	III	7744096
Viton® bladder	1 (0.9)	CTP1015 V 5	III	7744097
HYPALON® bladder	1 (0.9)	CTP1015 H 5	III	7744098
Polypro housing: 1/2" FNPT, 1 port (Fig. 1)				
Nordel bladder (EPDM)	1 (0.9)	CTP1005 ND 5	III	7744102
PVDF housing: 1/2" FNPT, 1 port (Fig. 1)				
Nordel bladder (EPDM)	1 (0.9)	CTK1005 ND 5	III	7744100
Viton® bladder	1 (0.9)	CTK1005 V 5	III	7744099
131 mL (8 cu. in.) Models				
PVDF housing: 1/2" FNPT, 2 port (Fig. 2)				
PTFE bellows	1 (0.9)	CTK1000 T	III	7253217
164 mL (10 cu. in.) Models				
PVC housing: 1/2" FNPT, 2 port (Fig. 2)				
Viton® bladder	1 (0.9)	CTP1010 V	III	7253216
HYPALON® bladder	1 (0.9)	CTP1010 H	III	7740945
Polypro housing: 1/2" FNPT, 2 port (Fig. 2)				
Nordel bladder (EPDM)	1 (0.9)	CTP1000 ND	III	7253201
PVDF housing: 1/2" FNPT, 2 port (Fig. 2)				
Nordel bladder (EPDM)	1 (0.9)	CTK1000 ND	III	7253203
Viton® bladder	1 (0.9)	CTK1000 V	III	7253204

Viton® and HYPALON® are registered trademarks of DuPont Dow Elastomers

Pulsation dampeners (cont.)

Fig. 3

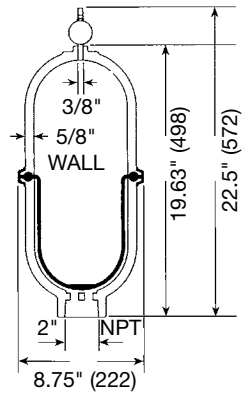


(mm)

	Shipping Weight lbs (kg)	Model	Size	Part No.
262 mL (16 cu. in.) Models				
PVC housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	7 (3.2)	CT1311 T	II	7744211
PVDF housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	7 (3.2)	CT1401 T	II	7253234
SS housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	11 (5.0)	CT3120 T	II	7253237
600 mL (36 cu. in.) Models (cont. from pg.15)				
PVC housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder	7 (3.2)	CT1311 ND	II	7253232
Viton® bladder	7 (3.2)	CT1311 V	II	7253233
HYPALON® bladder	7 (3.2)	CT1311 H	II	7740946
Polypro housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder	6 (2.7)	CT1301 ND	II	7253230
Viton® bladder	6 (2.7)	CT1301 V	II	7253231
PVDF housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder	7 (3.2)	CT1401 ND	II	7253236
Viton® bladder	7 (3.2)	CT1401 V	II	7253235
SS housing: 3/4" FNPT, 1 port (Fig. 3)				
Viton® bladder	11 (5.0)	CT3120 V	II	7253238
1147 mL (70 cu. in.) Models				
PVC housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	10 (4.5)	CT311 T	II	7253229
SS housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	14 (6.4)	CT3020 T	II	7253206
PVDF housing: 3/4" FNPT, 1 port (Fig. 3)				
PTFE bellows	8 (3.6)	CT401 T	II	7253219
1393 mL (85 cu. in.) Models				
PVC housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder	6 (2.7)	CT311 ND	II	7253221
Viton® bladder	6 (2.7)	CT311 V	II	7253220
HYPALON® bladder	6 (2.7)	CT311 H	II	7740947
Polypro housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder (EPDM)	6 (2.7)	CT301 ND	II	7253207
Viton® bladder	6 (2.7)	CT301 V	II	7253208
PVDF housing: 3/4" FNPT, 1 port (Fig. 3)				
Nordel bladder (EPDM)	7 (3.2)	CT401 ND	II	7253209
Viton® bladder	8 (3.6)	CT401 V	II	7253210
1998 mL (122 cu. in.) Models				
PVC housing: 2" FNPT, 1 port				
PTFE bellows	16 (7.3)	CT911 T	I	7253228
PVDF housing: 2" FNPT, 1 port				
PTFE bellows	15 (6.8)	CT1201 T	I	7253225
SS housing: 2" FNPT, 1 port				
PTFE bellows	30 (13.6)	CT2520 T	I	7253226
2867 mL (175 cu. in.) Models				
Polypro housing: 2" FNPT, 1 port				
Nordel bladder	13 (5.9)	CT901 ND	I	7253223
PVC housing: 2" FNPT, 1 port				
Viton® bladder	13 (5.9)	CT911 V	I	7253224
HYPALON® bladder	13 (5.9)	CT911 H	I	7740948

Pulsation dampeners (cont.)

Fig. 4



(mm)

	Shipping Weight lbs (kg)	Model	Size	Part No.
5822 mL (355 cu. in.) Models				
PVC housing: 2" FNPT, 1 port				
PTFE bellows	18 (8.2)	CT111 T	I	7253227
PVDF housing: 2" FNPT, 1 port				
PTFE bellows	21 (9.5)	CT201 T	I	7253215
SS housing: 2" FNPT, 1 port (Fig. 4)				
PTFE bellows	40 (18.1)	CT2400 T	I	7253211
6063 mL (370 cu. in.) Models				
PVC housing: 2" FNPT, 1 port (Fig. 4)				
Nordel bladder	16 (7.3)	CT111 ND	I	7253222
Viton® bladder	16 (7.3)	CT111 V	I	7253218
HYPALON® bladder	16 (7.3)	CT111 H	I	7740949
Polypro housing: 2" FNPT, 1 port (Fig. 4)				
Nordel bladder (EPDM)	15 (6.8)	CT101 ND	I	7253212
Viton® bladder	15 (6.8)	CT101 V	I	7253213
PVDF housing: 2" FNPT, 1 port (Fig. 4)				
Nordel bladder (EPDM)	18 (8.2)	CT201 ND	I	7253214

Note: Other sizes and materials available upon request.

High pressure pulsation dampeners for ProMus pumps only.

	Model	Size	Part No.
66 mL (4 cu. in.) Models			
Hastelloy C housing: 3/8" FNPT, 1 port (not illustrated)			
Santoprene® bladder	H1180 W	III	7744378
Viton® bladder	H1180 V	III	7744381
316 Stainless Steel housing: 3/8" FNPT, 1 port (not illustrated)			
Nordel bladder (EPDM)	H1120 ND	III	7744387
164 mL (10 cu. in.) Models			
Hastelloy C housing: 3/8" FNPT, 1 port (not illustrated)			
Santoprene® bladder	H1080 W	III	7744379
Viton® bladder	H1080 V	III	7744382
316 Stainless Steel housing: 3/8" FNPT, 1 port (not illustrated)			
Nordel bladder (EPDM)	H1020 ND	III	7744388
197 mL (12 cu. in.) Models			
316 Stainless Steel housing: 3/8" FNPT, 1 port (not illustrated)			
PTFE bellows	TG12SST	II	7744377
600 mL (36 cu. in.) Models			
Hastelloy C housing: 3/4" FNPT, 1 port (not illustrated)			
Hypalon bladder	H3180 H	II	7744380
Viton® bladder	H3180 V	II	7744383
316 Stainless Steel housing: 3/8" FNPT, 1 port (not illustrated)			
Nordel bladder (EPDM)	H3120 ND	II	7744389

Spare bladders/bellows

	Model	Size	Part No.
Nordel (EPDM) bladders	1000-28	III	7740208
	401-28	II	7740202
	201-28	I	7740205
Viton bladders	1000-31	III	7740209
	401-25	II	7740203
	201-25	I	7740206
Hypalon bladders	1000-30	III	7740959
	401-30	II	7740960
	201-30	I	7740961
PTFE bellows	301-10	II	7740204
	101-10	I	7740207

High pressure charging hose

Charging hose consists of an 8 foot (2.4 m) length of 5000 psi hose with a 1/4" NPT (M) fitting at one end, for connection to a nitrogen bottle regulator and a charging adapter with purge valve and gauge at the other end.

	Model	Part No.
1/4" air inlet and 1/8" fill valve	701-00	7744376

Inlet stabilizers

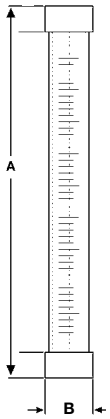
An inlet stabilizer will improve flow conditions to the inlet side of a pump and protect and extend the service life of all inlet system components. Inlet stabilizers must be mounted as close to the pump's inlet connection as possible, and no more than 10 pipe diameters away. All units include a 30-0-30 vacuum/pressure gauge, air venturi, and ball valve for charging bladder chamber. Units must be sized similar to pulsation dampeners, i.e. 26 x (mL/stroke) = minimum required inlet stabilizer volume. **Note:** Requires a compressed air supply be available for initial bladder charging and periodic readjustment as necessary.

	Model	Size	Part No.
1393 mL (85 cu. in.) Models (for 3/4" models)			
PVC housing:			
Viton® bladder	J3111V	II	7740859
HYPALON® bladder	J311H	II	7744305
Nordel bladder (EPDM)	J311ND	II	7744306
PVDF housing:			
Viton® bladder	J401V	II	7740860
6063 mL (370 cu. in.) Models (for 2" models)			
PVC housing:			
Viton® bladder	J111V	I	7744307
HYPALON® bladder	J111H	I	7744308
Nordel bladder (EPDM)	J111ND	I	7744309
PVDF housing:			
Viton® bladder	J201V	I	7744310

Materials shown are in contact with process fluid.
Other material and sizes are available. Please consult factory.

Calibration columns

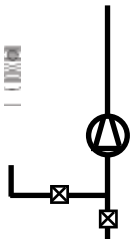
Clear PVC calibration columns



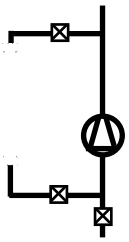
Cylinder size	Fitting size	Dimension (inches) A	B	Threaded base, removable top	Threaded both ends
100 mL	1/2" NPT	10.75	1.39	7500137	7500127
250 mL	1/2" NPT	11.51	1.89	7500138	7500128
500 mL	1/2" NPT	12.75	2.39	7500139	7500129
1000 mL	1/2" NPT	16.75	2.77	7500130	7500135
2000 mL	1" FNPT	20.67	3.52	7500140	7500131
4000 mL	1" FNPT	22.66	4.52	7500141	7500132
10,000 mL	2" FNPT	23.16	6.91	7500134	7500133
20,000 mL	2" FNPT	42.69	6.91	7500142	7500136

Typical Application of Calibration Columns

Column w/removable top
Note: Top must be removed during calibration

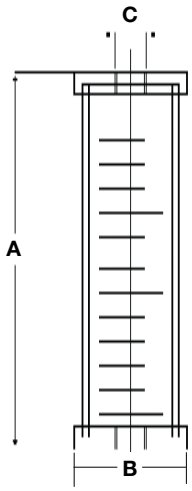


Column threaded both ends
Note: If plumbed as shown, a vent hole must be drilled into the top of the calibration column



Borosilicate Glass calibration columns with Viton® o-rings for Sulfuric Acid Applications

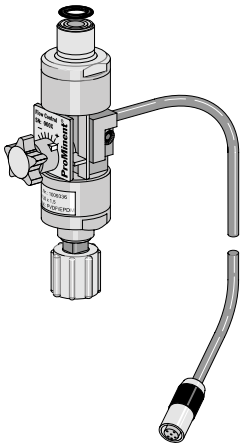
Glass cylinder with acrylic outer shield and 1/2" (316 SS) or 3/4" (PVDF, PVC) thick end flanges. All cylinders are bolted together using stainless steel rods with Viton O-rings for the glass seal and Buna N O-rings for the acrylic seal.

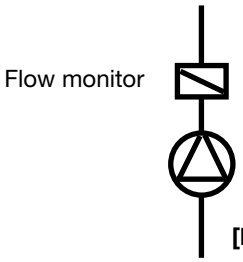


Cylinder size	Fitting size	Dimensions (inches) A	B	C	Part No.
100 mL	1/2" CPVC	10.0	3.0	1/2	7500151
100 mL	1/2" PVDF	10.0	3.0	1/2	7500152
100 mL	1/2" SS	9.5	3.0	1/2	7500153
250 mL	1/2" CPVC	12.5	3.5	1/2	7500154
250 mL	1/2" PVDF	12.5	3.5	1/2	7500155
250 mL	1/2" SS	12.0	3.5	1/2	7500156
500 mL	1/2" CPVC	14.5	4.0	1/2	7500157
500 mL	1/2" PVDF	14.5	4.0	1/2	7500158
500 mL	1/2" SS	14.0	4.0	1/2	7500159
1000 mL	1/2" CPVC	16.75	4.75	1/2	7500160
1000 mL	1/2" PVDF	16.75	4.75	1/2	7500161
1000 mL	1/2" SS	16.25	4.75	1/2	7500162
2000 mL	1" CPVC	18.75	5.5	1	7500163
2000 mL	1" PVDF	18.75	5.5	1	7500164
2000 mL	1" SS	18.25	5.5	1	7500165
4000 mL	1" CPVC	22.5	6.5	1	7500166
4000 mL	1" PVDF	22.5	6.5	1	7500167
4000 mL	1" SS	22.0	6.5	1	7500168

Adjustable metering monitor “Flow Control”

Supplied with connection cable for assembly directly to liquid end. Monitors individual strokes according to the float and orifice principle. The partial quantity of chemical flowing past the float is adjusted from the total stroke volume via the adjusting screw so that an alarm is actuated if the flow falls below 20%. The user can select the number of incomplete strokes permitted (between 1 and 125) in accordance with the actual process requirements.





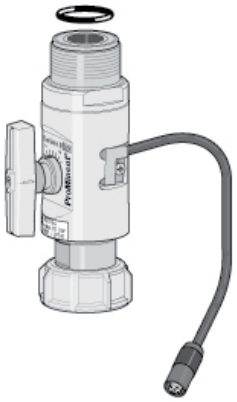
[For use with low-viscosity (water-like) fluids only].

Materials:

Flow meter: PVDF
Float: PTFE-coated
O-rings: Viton® B/EPDM

For gamma/L series in material versions PP, PVDF, NP and TT.

Flow Control	Material	Pump type	Part No.
Flow Control type I	PVDF, EPDM	1000, 1601, 1602	1009229
Flow Control type II	PVDF, EPDM	1005, 1605, 0708, 1008, 0413 0713, 0220, 0420, 0232	1009336
Flow Control type I	PVDF, Viton® B	1000, 1601, 1602	1009335
Flow Control type II	PVDF, Viton® B	1005, 1605, 0708, 1008, 0413 0713, 0220, 0420, 0232	1009338

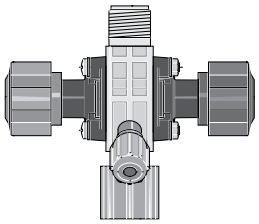


For Sigma HM with connection cable for assembly to liquid end.

Flow Control	Material	Pump type	Part No.
Flow Control type III (Sigma/ 1)	PVDF, EPDM	12017, 10022, 12035, 10044 10050, 07065	1021168
	PVDF, Viton® B	12017, 10022, 12035, 10044 10050, 07065	1021169
Flow Control type III (Sigma/ 1 & 2)	PVDF, EPDM	07042, 04084, 04120, 12050 12090, 12130	1021170
	PVDF, Viton® B	07042, 04084, 04120, 12050 12090, 12130	1021171
Flow Control type IV (Sigma/ 2 & 3)	PVDF, EPDM	07120, 04350, 120145, 120190 120270	1021164
	PVDF, Viton® B	07120, 04350, 120145, 120190 120270	1021165
Flow Control type V (Sigma/ 3)	PVDF, EPDM	07410,07580, 04830	1021166
	PVDF, Viton® B	07410,07580, 04830	1021167

Pump & Systems Accessories

Multifunction valve



3006/4

ProMinent's multifunction valve is operated by means of smooth-action rotary knobs which automatically return to their initial position when released. Made of PVDF, it can be used in feed systems for virtually all chemicals. The multifunction valve is mounted directly on the liquid end of the pump for backpressure, antisiphon, pressure relief, priming, and draining the discharge line. The inlet thread is female M20 x 1.5 and the discharge is male M20 x 1.5.

ProMinent's multifunction valve has the following functions:

- Backpressure valve, opening pressure approximately 22 psi (1.5 bar)
- Relief valve, opening pressure aproximately 87, 145 or 232 psi (6, 10 or 16 bar)
- Admission aid in existing backpressure, no need to de-pressurize pipes
- Pressure relief, e.g. prior to servicing

Warning: Backpressure valves are not intended as completely sealed units!

Materials in contact with chemicals:

Valve body	PVDF
Diaphragm	PTFE-coated
O-rings	Viton® or EPDM
DN 10 adapter	PVC

Technical data:

Type	Relief opening pressure	Application range by size	Part No.
Size I (M20 x 1.5)	232 psi (16 bar)	alpha all types	792011
Size I	145 psi (10 bar)	beta & gamma/L type 1000, 1601,	791715
Size I	87 psi (6 bar)	1602, 1605, 1005, 1008, 0708, 0413, 0220	1005745
Size II (M20 x 1.5)	145 psi (10 bar)	beta & gamma/L type 1605, 1008,	792203
Size II	87 psi (6 bar)	0713, 0420, 0232	740427
Size III (DN 10)	145 psi (10 bar)		792215

Note: Multifunction valves mounted to stainless steel liquid ends require below adapters.
**Cannot adjust pressure; fixed factory setting.*

Connector Set for SS version pumps

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

* Viton® is a registered trademark of DuPont Dow Elastomers

Bleed Relief valve

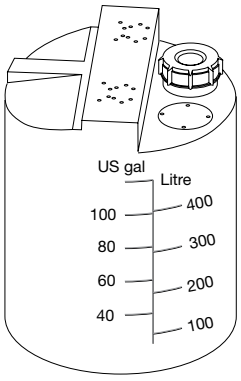
ProMinent's auto-degassing bleed relief valve is ideal for sodium hypochlorite and other applications condusive to off gassing. Upon detection of an airlock, the external solenoid valve will be opened automatically by the delta pump. The pump will stroke at maximum capacity for a preset period of time into the tank. Once the airlock siutuation is reolved, the external solenoid valve will close and the delta pump will automatically return to it's oringinal stroke rate.

ProMinent's multifunction valve has the following functions:

- Backpressure valve, opening pressure approximately 22 psi (1.5 bar)
- Relief valve, opening pressure aproximately 87, 145 or 232 psi (6, 10 or 16 bar)
- Admission aid in existing backpressure, no need to de-pressurize pipes
- Pressure relief, e.g. prior to servicing

Warning: Backpressure valves are not intended as completely sealed units!

Chemical tanks



15, 26, 66, 132 gallon capacity

Made of translucent UV-stabilized polyethylene, with gallon/litre scale, screw cap. Mounting platforms for ProMinent metering pumps and mixers. All tanks are specifically developed to maximize toughness. These tanks are impact, stress, and chemical resistant. Maximum allowable temperature 180°F (82°C).
Tank opening (screw cap) diameter for 15 - 132 gal.: 6.5".
Tank opening (screw cap) diameter for 220 and 300 gal.: 5-1/4".

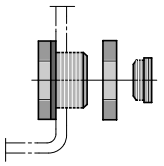
Capacity gallon	(litre)	O.D. in.	(mm)	Height in.	(mm)	Empty Weight lb.	(kg)	Part No.
15	(60)	18	(445)	22	(559)	11	(5.0)	791994
26	(100)	20	(500)	30	(760)	17	(7.7)	1001490
78	(296)	26	(661)	43	(1100)	37	(17)	1023175
132	(500)	32	(820)	47	(1190)	54	(24.5)	791997
220	(830)	42	(1067)	41	(1041)	55	(25.0)	7809688
300	(1100)	43	(1092)	59	(1499)	70	(31.7)	7809687

Note: pump mounting kit needed for all tanks (part no. 7500124)

Accessories

Lock and key for screw-on cap 200683

PVC tank drain fitting with plug

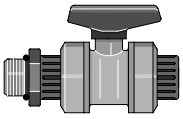

1077/4

1/2" FNPT as an additional con nection for chemical tanks. To be used as an open drain with plug or for addition of optional 1/2" ball valve fitting. Fits 1" opening.

	Part No.
PVC with Viton® seal	7809755
PVC with EPDM seal	7744374

3/4" FNPT as an additional connection for chemical tanks. To be used as an open drain with plug or for addition of optional 3/4" ball valve fitting. Fits 1-3/8" opening.

PVC with Viton® seal	7000300
PVC with EPDM seal	7744375


2424/4

PVC ball valve

1/2" PVC ball valve with 1/2" FNPT connections for all chemical tanks with 1/2" PVC tank drain fittings.

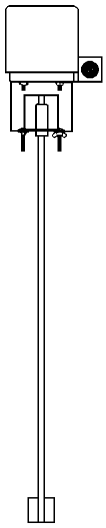
PVC with Viton® seal	7000309
PVC with EPDM seal	7000311

3/4" PVC ball valve with 3/4" FNPT connections for all chemical tanks with 3/4" PVC tank drain fittings.

PVC with Viton® seal	7741668
PVC with EPDM seal	7741485

U.S. Mixers

Fig. 1



Electric mixers

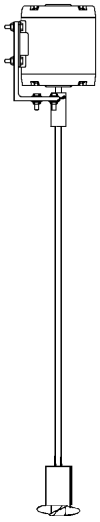
Note: with any tank-mounted mixer, the inertia of fluid rotating in a polyethylene tank may cause the tank to move when the fluid level is low. Provision should be made to anchor the tank or to automatically shut the mixer off when the fluid level is low.

For U.S. only. For Canada mixers, see below.
High speed mixer for water-like fluids in 15, 26 or 66 U.S. gallon tanks (Fig. 1):

Motor: 1/20 HP, 1550/1725 RPM, 115 VAC, 60 Hz, 1 ph., TEFC, with 8' Type SJ power cord, no on/off switch.
Shaft: 316 SS shaft/impeller (epoxy coated)
Mount: Four hole mounting flange with bolt holes, set at 5° angle for mounting directly on tank top.
Accessories: 1" diameter PVC metering pump suction pipe with bulkhead fitting for mounting to tank top.
Shipping weight: 9 lbs. (4 kg)

	Part No.
For 26 gallon tank (19" shaft)	7818588
For 66 gallon tank (34" shaft)	7818589
Shaft only (19" replacement)	7818590
Shaft only (34" replacement)	7818591

Fig. 2



High speed mixer for water-like fluids in 132 to 300 gallon tanks (Fig. 2):
Motor: 1/4 HP, 1725 RPM, 115/230 VAC, 60 Hz, TEFC. Power cord not included.
Shaft: 316 SS shaft/propeller. Shaft length: 36" (may be cut down for smaller tanks)
Mount: Bracket with bolt holes, for mounting directly on tank top.

Shipping weight: 27 lbs. (12 kg)	7818592
Shaft only (36" replacement)	7744506

Slow speed mixer for water-like fluids in 15, 26 0r 66 gallon tanks:
Motor: 1/3 HP, 60 RPM, 115 VAC, 50/60 Hz, 1 ph., TEFC. Power cord not included.
Shaft: 316 SS shaft w/ 1 set of impellers. Shaft length is 44" (may be cut).
Mount: Bracket w/ 4 bolt holes for mounting directly on tank top.

Shipping weight: 32 lbs.	7818594

Note: Motor not thermally protected.

Mixer mounting kit for 15 gallon tanks:

Polyethylene flange adapter for mounting mixers to metric flange. Includes all necessary hardware.	7744385

Mixer mounting kit for 26, 66, and 132 gallon tanks:

Polyethylene flange adapter for mounting mixers to metric flange. Includes all necessary hardware.	7744319

*(Other mixers available upon request)

Canada Mixers

High speed mixer for water-like fluids in 15, 26 or 66 gallon tanks:
Motor: 1/20 HP
Mount: includes mounting bracket

Shaft: 316 SS shaft and propeller	7356679

High speed mixer for water-like fluids in 132 to 300 gallon tanks:
Motor: 1/4 HP
Mount: includes PVC mounting flange

Shaft: 316 SS shaft and propeller	7818565

Note: Both mixers for Canada only.

Float switches, two stage Float switch, two-stage: for beta, gamma/ L and delta pumps
(includes ceramic weight - do not use ceramic weight for fluoride service)

2380/4

To monitor the fluid level in the chemical tank. Two-stage function, first stage is early warning annunciation, second stage will shut down pump after an additional drop in the fluid level of approximately 1.2" (30 mm).

With 3-pole round connector, suitable for direct connection to ProMinent gamma series.

Technical data:

Max. contact load 60 V, 0.3 A, 5 W/5 VA, temperature range -13°F to 167°F (-25°C to 75°C).

Materials:				**Part No.**
PP body, foamed PP float 7/8" (21 mm) dia., PE cable				
PP with 3-pole round connector	cable length	6 ft.	(2 m)	7142093
		15 ft.	(5 m)	7142095
PVC body, foamed PP float 7/8" (21 mm) dia., PE cable				
PVC with 3-pole round connector	cable length	6 ft.	(2 m)	7142043
		15 ft.	(5 m)	7142038
PVDF body, foamed PVDF float 1" (25 mm) dia., PE cable				
PVDF with 3-pole round connector	cable length	6 ft.	(2 m)	7792639
		15 ft.	(5 m)	7792640

Ceramic weight for float switch

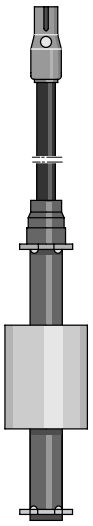
1.53" dia. x 1.26"with oval opening .51" x 1.06"
(39 mm x 32 mm) (13 mm x 27 mm) 404004

1086/4

With two-stage float switches with round connector, the weight is slid into position from below after the float has been removed.

Note: Not for use in fluoride application (e.g. hydrofluosilicic acid).

Float switches, single stageFloat switch, single-stage: for Concept^{PLUS} & D series pumps
(includes ceramic weight – do not use ceramic weight for fluoride service)



2820/4

For minimum level indication with simultaneous shutdown of the metering pump. With a flat connector for direct connection to the D series ProMinent metering pumps.

Technical data:

Max. contact load 60 V, 0.3 A, 5 W/5 VA, temperature range -13°F to 167°F (-25°C to 75°C).

Materials:				**Part No.**
PP body, foamed PP float 7/8" (21 mm) dia., PE cable				
PP with flat connector	cable length	6 ft.	(2 m)	790412
		15 ft.	(5 m)	790470
PVC body, foamed PP float 7/8" (21 mm) dia., PE cable				
PVC with flat connector	cable length	6 ft.	(2 m)	790414
		15 ft.	(5 m)	790468
PVDF body, PVDF float 1" (25 mm) dia., PE cable				
PVDF with flat connector	cable length	6 ft.	(2 m)	790416
		15 ft.	(5 m)	790472

Float switch weights

1086/4

Ceramic weight

1.53" dia. x 1.26" (39 mm x 32 mm)	with oval opening .51" x 1.06" (13 mm x 27 mm)	404003

With single stage float switch, the weight may be slid over the flat connector needed for D-pumps.

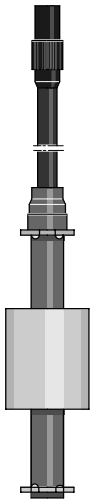
Note: Not for use in fluoride applications (e.g. hydrofluosilicic acid), use PVC weight.

PVC weight

For bottom of foot valve for flouride applications. 7404007

For fluoride, (hydrofluosilicic acid) or when plastic is required to replace standard ceramic weight.

Float switches, two stage for Sigma Control pumps



2380/4

Float switch, two-stage (includes ceramic weight - do not use ceramic weight for fluoride service)

To monitor the fluid level in the chemical tank. Two-stage function, first stage is early warning annunciation, second stage will shut down pump after an additional drop in the fluid level of approximately 1.2" (30 mm).

With 3-pole round connector, suitable for direct connection to ProMinent Vario series.

Technical data:

Max. contact load 60 V, 0.3 A, 5 W/5 VA, temperature range -13°F to 167°F (-25°C to 75°C).

Materials:				**Part No.**
PP body, foamed PP float 7/8" (21 mm) dia., PE cable				
PP with 3-pole round connector	cable length	6 ft.	(2 m)	7142093
		15 ft.	(5 m)	7142095
PVC body, foamed PP float 7/8" (21 mm) dia., PE cable				
PVC with 3-pole round connector	cable length	6 ft.	(2 m)	7142043
		15 ft.	(5 m)	7142038
PVDF body, foamed PVDF float 1" (25 mm) dia., PE cable				
PVDF with 3-pole round connector	cable length	6 ft.	(2 m)	7142006
		15 ft.	(5 m)	7142007

Float switches, single stage for Meta/Makro/Sigma basic pumps

2820/4

Float switch, single-stage (includes ceramic weight – do not use ceramic weight for fluoride service)

For minimum level indication in source tank. May be used to stop pump at motor starter or variable speed drive, or trigger alarm. May be used with relay combination.

Technical data:

Max. contact load 60 V, 0.3 A, 5 W/5 VA, temperature range -13°F to 167°F (-25°C to 75°C).

Materials:				
PP body, foamed PP float 7/8" (21 mm) dia., PE cable				
PP with 2 loose cable ends	cable length	15 ft.	(5 m)	790412
PVC body, foamed PP float 7/8" (21 mm) dia., PE cable				
PVC with flat connector	cable length	15 ft.	(5 m)	790468
PVDF body, PVDF float 1" (25 mm) dia., PE cable				
PVDF with flat connector	cable length	15 ft.	(5 m)	790472

Float switch weights

PVC weight

For bottom of foot valve for fluoride applications. 7404007

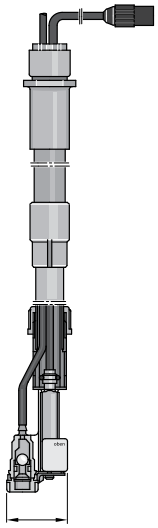
For fluoride, (hydrofluosilicic acid) or when plastic is required to replace standard ceramic weight.

Suction assemblies, two-stage: for beta, gamma/ L and delta pumps

Including foot valve, rigid supporting pipe, suction line and float switch with 6 ft. (2 m) cable. For use in drums or tanks with mixers, which could tangle flexible suction tubing or float switch cables.**two-stage:**with 3-pole *round connector*, for early warning and eventual pump shut-down, for gamma.

PP version: EPDM o-rings, PE suction line

PVC version: Viton® o-rings, PVC suction line



Adjustable PP suction assembly, with bulkhead fitting for 1" opening and 2-stage float switch

For ProMinent pumps with PP foot valve, PE suction hose, PP supporting pipe and union. PP two-stage float switch with 3-pole round connector **Adjustable length (foot valve to bulkhead)**

26" to 41" (660 mm to 1040 mm) for 26 - 220 gallon (140 - 830 L) tanks

Requires 1.0" hole in top of tank for bulkhead fitting**PP version**

	Part No.
Suction line	
1/4" x 3/16"	790368
1/2" x 3/8"	790370

2798/R

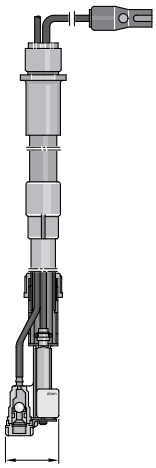
Suction assemblies, single-stage: for Concept^{PLUS} and D series pumps

Including foot valve, rigid supporting pipe, suction line and float switch with 6 ft. (2 m) cable. For use in drums or tanks with mixers, which could tangle flexible suction tubing or float switch cables.

Single-stage: with *flat connector* for D series pumps.

PP version: PP float switch, PE suction line

PVC version: PVC float switch, PE suction line



2798/F

Adjustable PP suction assembly, with bulkhead fitting for 1" opening and single-stage float switch for tanks

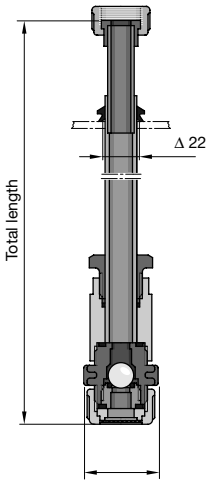
With PP foot valve, PE suction hose, PP supporting pipe and union.
PP single-stage float switch with flat connector **Length-adjustable**

Size II 26" to 41" (660 mm to 1040 mm) for 26 - 220 gal. (140 - 830 L) tank

Requires 1.0" hole in top of tank for bulkhead fitting

PP version	**Part No.**
Suction line	
1/4" x 3/16"	790356
1/2" x 3/8"	790358
PVC version	
1/4" x 3/16"	790350
1/2" x 3/8"	790352

Suction assemblies: for Sigma Basic, Meta and Makro pumps



Note: This fitting is a compression fitting, pipe can be cut to desired length.

2801/3

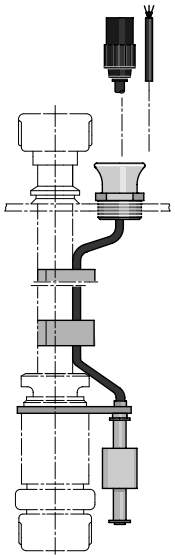
PP without float switch

Size of connection		Max. tank size gallons (litres)	Max. length inches (mm)	Part No.
PP-DN 10 - 1/2"	Sigma	220 (830)	up to 52"(1320)	790389
PP-DN 15 - 3/4"	Sigma	220 (830)	up to 52" (1320)	790394
PP-DN 20 - 3/4"	Meta/Makro	220 (830)	up to 52"(1320)	790395
PP-DN 25 - 1"	Meta/Makro/Sigma	220 (830)	up to 52"(1320)	790396
PP-DN 32 - 1-1/2"	Sigma	-	-	1005524

PVC without float switch

Size of connection		Max. tank size gallons (litres)	Max. length inches (mm)	
PVC-DN 10 - 1/2"	Sigma	220 (830)	up to 52"(1320)	790387
PVC-DN 15 - 3/4"	Sigma	220 (830)	up to 52"(1320)	790391
PVC-DN 20 - 3/4"	Meta/Makro	220 (830)	up to 52"(1320)	790392
PVC-DN 25 - 1"	Meta/Makro/Sigma	220 (830)	up to 52"(1320)	790393
PVC-DN 32 - 1-1/2"	Sigma	-	-	1005525

Float switch for rigid suction assemblies



2803/3

PP, two-stage with round connector for SICa pumps

The float switch set can be ordered together with the suction assemblies 1/2" and 3/4".

3-pole round connector	10 ft. (3 m) cable	790321

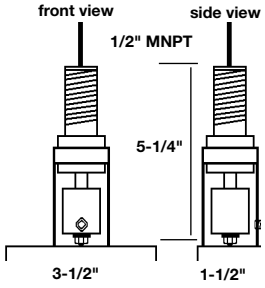
PVC, two-stage with round connector for SICa pumps

The float switch set can be ordered together with the suction assemblies 1/2" and 3/4".

3-pole round connector	10 ft. (3 m) cable	790318

Pump & Systems Accessories

Diaphragm-failure Detector



Diaphragm-failure detector

Part No.

To trip an alarm and/or switch the metering pump off in case of a. In a failure, fluid drains out a weep hole in the backplate, through a tube to the detector column. The float switch in the column trips with 10 mL. offfluid. Comprising of a float switch PVC/PE, clear PVC column, tube connectors and connecting tube. Switch closure, max. contact rating 60 VAC, 300 mA, 5 W.1/2" MNPT conduit connection. Shipped with loose ends on cable.

N/O	7803640
N/C	7803650

For processing the alarm signal from the level switch we recommend the relay combination Part No. 914769.5 with wall-mounted plastic housing and 2 change-over relays. Or, the signal could actuate the remote pause feature on the gamma/a & b pumps or could stop any gamma pump if plugged into the float switch port. Connections available upon request.

Signal horn

115 V, 60 Hz, 95 dB, NEMA 4X (e.g. in conjunction with fault annunciating relay or relay combination) 7705004

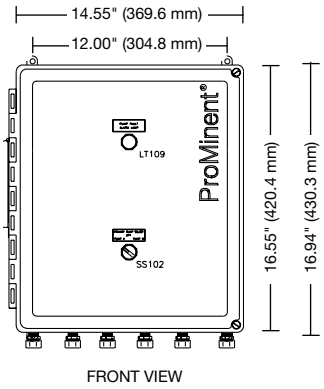
Amber signal strobe light

115 V, 60 Hz, NEMA 4X (e.g. for use in conjunction with fault annunciating relay or relay combination) 7914785

Universal Switchover Box

Two Pump Universal Switchover Box

Part No.



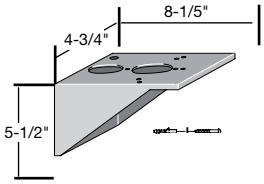
FRONT VIEW

Automatic backup protection for ProMinent® microprocessor based electronic metering pumps. Accepts Manual, 4-20 mA Analog, or External contact modes of operation, and can switch operation back and forth between two metering pumps based on an external dry contact opening and closure. Pumps must be equipped with an alarm relay output. The unit is equippped with a 120 VAC power cord and a weatherproof duplex receptacle for metering pumps power. Specify control mode of metering pumps when ordering (i.e. Remote 4-20 mA analog Pacing or Water Meter Contact Pacing).

7951130

Pump & Systems Accessories

Pumps and Stands



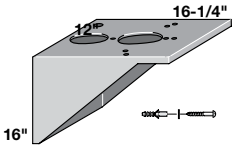
pk_1_092

Wall mounting bracket for solenoid pumps

Part No.

Made of fiberglass-reinforced PPE, with wall-plugs and screws, accepting a gamma, beta, Pneumados, alpha or the D series metering pump. Pumps can be mounted either parallel or perpendicular to the wall, except the mikro g/5 and gamma/5 pumps, which can only be mounted parallel to the wall.

PPE wall mounting bracket 810164

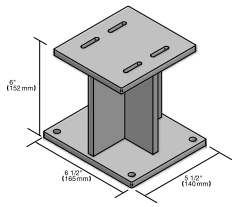


pk_1_092

Wall mounting bracket for Vario, Sigma and Meta

Wall-mounting bracket for Vario, Sigma and Meta

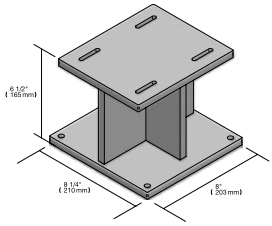
Polypro wall bracket mounts pumps so that diaphragm is parallel to the wall. 7803799



Floor mounting bracket for solenoid pumps

Polypropylene floor mounting bracket accepts pumps parallel to the floor.

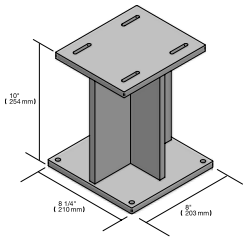
6" PP floor mounting bracket 1028758



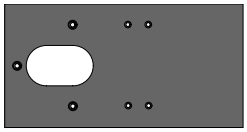
Floor mount bracket for Motor pumps

Polypropylene floor mounting bracket accepts pumps parallel to the floor.

6-1/2" PP floor mounting bracket 1028759



10" PP floor mounting bracket 1028760



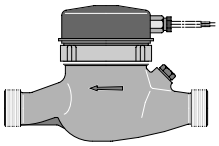
pk_1_121

Adapter plate

With fixtures, for vertical wall-mounting of beta or gamma pumps with auto-degassing liquid ends. Used with PPE wall console.

PP adapter plate 1003030

Pulse-type water meters for potable water



1137/4

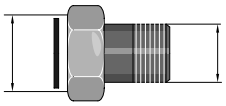
Contact water meter – US GPH Scale

max. operation temperature 104° F.

Pipe Coupl. Size	Min. Flow Rate in			Max. Flow Rate in			Press. Loss Max. Flow Rate		
in.	GPM	GPH	(L/h)	GPM	GPH	(L/h)	psig	(bar)	Part No.
3/4"	0.5	30	(113)	20	1200	(4542)	14.5	(1)	7500076
1"	0.6	36	(136)	50	3000	(11356)	14.5	(1)	7500077
1-1/2"	1.0	60	(227)	100	6000	(22712)	14.5	(1)	7500078
2"	2.0	120	(454)	130	7800	(29526)	14.5	(1)	7500079

Note: Price includes two screw fittings.

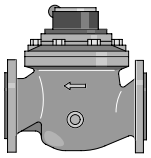
*Please specify pulse rate desired



1139/4

Screw fittings in brass with packing for water meters (price per unit)

3/4"	7359021
1"	7359022
1-1/2"	7359023
2"	7359024



1138/4

Contact water meter – US GPH, 3"...6" flanged

max. operation temperature 104°F.

Min. Flow Rate in			Max. Thru-Put		Pipe Flange Size	Install. Length	Standard Gallon/	Weight	
GPM	GPH	(L/h)	GPM	GPH	in.	in.	Pulse	lb. (kg)	Part No.
2.6	156	(590)	650	39000	3" ASA	9" (225 mm)	10	42 (19)	7304512
4	240	(908)	1100	66000	4" ASA	10" (251 mm)	10	51 (23)	7304513
11	660	(2498)	1875	112500	6" ASA	12" (298 mm)	25	89 (40)	7304514

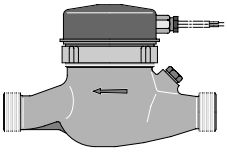
Pulse rates

		Cold
3/4"	P/G	1, 2, 4, 10, 20, 40
1"	P/G	1, 2, 4, 10, 20, 40
1-1/2"	P/G	1, 2, 4, 10, 20, 40
2"	P/G	1, 2, 4, 10, 20, 40
3"	G/P	100, 1,000
4"	G/P	100, 1,000
6"	G/P	1,000, 10,000

Note: P/G = pulses per gallon
G/P = gallons per pulse

Pulse-type water meters, 3/4"...2" NPT fittings – Liter Scale

Max. working temperature 40°C, max. contact load 100 mA, 24 V
Max. flow rate = Q_{max}, nominal flow rate = Q_n


1137/4

Qmax = Qn NG = Nominal size (m^3/h)	Connections in.	Overall length w/o unions mm	Standard K factor	Part No.
5	3/4"	190 mm (7.5")	1	304434
10	1"	260 mm (10.2")	1.5	304435
20	1-1/2"	300 mm (11.8")	2	304436
30	2"	270 mm (10.6")	4	304438

Note: Price includes two screw fittings.

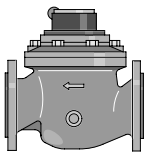
*Please specify pulse rate desired

Other pulse rates available (liters per pulse out)

.05	1	5	40	300
.1	1.5	10	50	400
.25	2	15	100	500
.3	2.5	20	150	1000
.4	3	25	200	1500
.5	4	30	250	2000

Pulse-type water meters, 3"...6" flanged

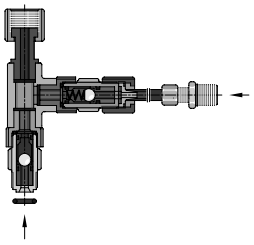
Max. working temperature 40°C, max. contact load 100 mA, 24 V
Max. flow rate = Q_{max}, nominal flow rate = Q_n


1138/4

Qmax/Qn (m^3/h)	Connections in.	Overall length mm	Pulse spacing	Part No.
110/55	3" ASA	225 mm (9")	Please call	304439
180/90	4" ASA	251 mm (10")		304442
350/175	6" ASA	298 mm (12")		304443

Flushing devices

Fig. 1

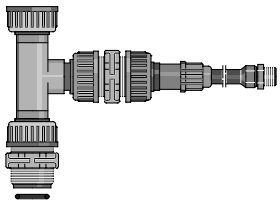


2152/3

To flush and clean liquid end, discharge line and injection valve, and to protect against deposits and crystallization. Manual or timer-controlled device. To be fitted to the suction connector of the metering pump (also suitable for retrofitting). The automatic version comprises flushing device, timer, solenoid valve and the required connectors.

Flushing device, manual, High Viscosity version	Part No.
For tubing connectors 1/4" x 3/16" and 1/2" x 3/8" (Fig. 1)	809909
For 1/2" MNPT connection for g/4 PP4/5, g/5 0423 and 0230 (Fig. 2)	7809917
For 1/2" MNPT connection for g/5 PP4/5 series	7809919

Fig. 2



2160/3

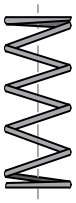
Flushing device, manual, PVC version	
For tubing connectors 1/4" x 3/16" and 1/2" x 3/8" (Fig. 1)	809925
For 1/2" MNPT connection for g/5 0423 and 0230 (Fig. 2)	7809926

Note: Call for info on automatic devices.

Valve Springs

Valve springs

Fig. 1



pk_1_103

Fig. 2

pk_1_104

You may spring-load the valve balls in the pump suction and/or discharge valves to improve the valve function and increase the repeatability. Particularly recommended when pumping viscous fluids of more than 50 cPs (mPa).

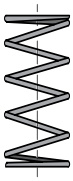
Discharge valve springs may be used instead of an external backpressure valve to improve repeatability when discharging to an open tank. Suction valve springs in excess of 1 psig (0.05 bar) make priming difficult; and in excess of 7 psig (0.5 bar) makes pumping impossible, except where suction pressure exceeds spring pressure.

Not recommended for antisiphon protection – use a diaphragm-type backpressure valve for antisiphon protection.There is no labor charge for installing the valve springs into the pump valves or injection valves.

	Pressure Rating Material of psig	(bar)	Construction	Part No.
Suction and Discharge Valves Model #'s:	1	(0.05)	316 SS	469406
BT/4 & G/L 1000, 1601, 1602, 1005, 1605 (Fig. 1)	14	(1.0)	316 SS	469401
Suction and Discharge Valves, and Injection Valves Model #'s:	1	(0.05)	Hastelloy C	469403
BT/4 & G/L 0708, 0413, 0220, 1008, 0713, 0420, 0232 (Fig. 2)	7	(0.5)	Hastelloy C	469404
	7	(0.5)	PVDF-coated Hastelloy C	818590
	14	(1.0)	Hastelloy C	469413
	14	(1.0)	PVDF-coated Hastelloy C	818536
	29	(2.0)	Hastelloy C	469410
Suction and Discharge Valves Model #'s:	1	(0.05)	Hastelloy C	469114
G/b 1002 PP4/PP5, 0423, 0230, plus	1	(0.05)	302 SS	7469401
Injection Valves: Models 0423, 0230	7	(0.5)	Hastelloy C	469115
	7	(0.5)	PVDF-coated Hastelloy C	818515
	14	(1.0)	Hastelloy C	469119
Suction and Discharge Valves:	1	(0.05)	Hastelloy C	469107
Model #'s: **G/b** 1006, 1310, 0813 PP4/PP5 only,	1	(0.05)	302 SS	7469404
plus Injection Valves: Models 1006,	7	(0.5)	Hastelloy C	469108
1310 and 0813 PP4/PP5	7	(0.5)	PVDF-coated Hastelloy C	818516
	14	(1.0)	Hastelloy C	469116
Discharge Valves Model #'s (w/ auto-degassing):	21	(1.5)	Hastelloy C	791052
BT/4 & G/L 1601,1602, 1005, and 1605				

Valve springs

Fig. 1

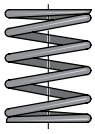


pk_1_103

You may spring-load the valve balls in the pump suction and/or discharge valves to improve the valve function and increase the repeatability. Particularly recommended when pumping viscous fluids of more than 50 cPs (mPa).

Discharge valve springs may be used instead of an external backpressure valve to improve repeatability when discharging to an open tank. Suction valve springs in excess of 1 psig (0.05 bar) make priming difficult; and in excess of 7 psig (0.5 bar) makes pumping impossible, except where suction pressure exceeds spring pressure.

Fig. 2



pk_1_104

Not recommended for antisiphon protection – use a diaphragm-type backpressure valve for antisiphon protection.

There is no labor charge for installing the valve springs into the pump valves or injection valves.

Pump Model	Spring Pressure Rating psig	(bar)	Material of Construction	Part No.
DN 10 valves: Vario models 12017, 12026, 12042, 10025, 09039, 07063 Sigma/1, Hydro	1	(0.05)	Hastelloy C	469114
	7	(0.5)	Hastelloy C	469115
	7	(0.5)	PVDF-coated Hastelloy C	818515
	14	(1.0)	Hastelloy C	469119
	1	(0.05)	302 SS	7469401
DN 15 Valves: Vario models 06047, 05075, 04120 Sigma/1 Sigma/2 models 12050, 12090, 12130 Hydro	1	(0.05)	Hastelloy C	469107
	7	(0.5)	Hastelloy C	469108
	7	(0.5)	PVDF-coated Hastelloy C	818516
	14	(1.0)	Hastelloy C	469116
	1	(0.05)	302 SS	7469404
DN 20 Valves: Meta/Makro models with 3/4" connectors	1	(0.05)	Hastelloy C	469451
	7	(0.5)	Hastelloy C	469409
	7	(0.5)	PVDF-coated Hastelloy C	818517
	14	(1.0)	Hastelloy C	469135
	1	(0.05)	302 SS	7469402
DN 25 Valves: Meta/Makro models with 1" connectors Sigma/2 models 07120, 07220, 04350	1	(0.05)	Hastelloy C	469452
	7	(0.5)	Hastelloy C	469414
	7	(0.5)	PVDF-coated Hastelloy C	818518
	14	(1.0)	Hastelloy C	469136
	1	(0.05)	302 SS	7469403
DN 40 Valves: Meta/Makro models with 1-1/2" connectors	7	(0.5)	Hastelloy C	469104
	7	(0.5)	PVDF-coated Hastelloy C	818519
	14	(1.0)	Hastelloy C	469137
Meta/Makro HK pumps with 1/4" connectors	1	(0.05)	316 SS	469461
Makro HK pumps with 3/8" connectors	1	(0.05)	316 SS	469462

Gaskets

Virgin White Teflon gaskets for PTFE/SS liquid ends.		Part No.
DN 10	Vario/Sigma	483957
DN 15	Sigma/Vario	483921
DN 20	Meta/Sigma	483922
DN 25	Meta/Sigma	483923
DN 32	Sigma	7744320
DN 40	Makro	483951

Note: The material make-up of the standard gaskets are teflon with a Viton® center. For applications using chemicals that react negatively with Viton®, the above gaskets are needed.

AC and DC Motors

AC motors

All AC motors are recognized by Underwriters Laboratories component approval program, and Canadian Standards Association.

All motors are 1725 RPM, C-faced, and 60 Hz. Manufacturer may vary.					**Part No.**
1/3 HP	TEFC	56-C	115/208-230V	1 phase	7951046
1/3 HP	TEFC	56-C	208-230/460V	3 phase	7951048
1/2 HP	TEFC	56-C	115/208-230V	1 phase	7951021
1/2 HP	TEFC	56-C	208-230/460V	3 phase	7951023
3/4 HP	TEFC	56-C	115/208-230V	1 phase	7951060
3/4 HP	TEFC	56-C	208-230/460V	3 phase	7951061
1 HP	TEFC	56-C	208-230/460V	3 phase	7951024
1-1/2 HP	TEFC	56-C w/base	115/208-230V	1 phase	7951025
1-1/2 HP	TEFC	56-C w/base	208-230/460V	3 phase	7951026
3 HP	TEFC	**184TC	230V	1 phase	7951141
3 HP	TEFC	**182TC	208-230/460V	3 phase	7951142

* Must use adapter (see below)

AC explosion-proof motors

Corrosion resistant epoxy finish. Positively locked drive end bearing.
UL and CSA approved for Class I, Group D or Class II, Group F and G.
UL approved cast conduit box-standard.

Manufacturer may vary.				**Part No.**
1/3 HP	56-C	115/208-230V	1 phase	7951014
1/3 HP	56-C	208-230/460V	3 phase	7951013
1/3 HP	56-C	115/208-230V	1 phase	*7500344
1/2 HP	56-C	208-230/460V	3 phase	**7746261
1/2 HP	56-C	115/208-230V	1 phase	7951006
1/2 HP	56-C	208-230/460V	3 phase	7951005
3/4 HP	56-C	115/208-230V	1 phase	7951004
3/4 HP	56-C	208-230/460V	3 phase	7951003
1 HP	56-C	208-230/460V	3 phase	7744983
1-1/2 HP	56-C w/base	208-230/460V	3 phase	7951002
3 HP	***182TC	208-230/460V	3 phase	7951001

* For use with Sigma/1 basic pumps only. Includes necessary mounting hardware.
** Sigma/1 basic Explosion-Proof motors for VFD applications. Includes necessary mounting hardware.
*** Must use adapter (see below)

Adapter * ** (Required when using motors with 184TC or 182TC face)

Mounting flange and motor shaft coupling (Makro pumps w/3 HP, AC motors)	7951144

DC motors

Permanent magnet 1750 rpm.					**Part No.**
1/3 HP	TENV	90 V	56-C	Sigma	7951078
1/2 HP	TENV	90 V	56-C	Meta	7951079
3/4 HP	TEFC	90 V	56-C	Sigma/3, Meta, Makro, Hydro	7951080
1-1/2 HP	TEFC	180 V	145-TC	Makro, Hydro	7951081
3 HP	TEFC	180 V	184-C	Makro	7951140

AC Inverter

Provides variable motor speed with three-phase AC motors by adjusting the frequency (Hz) output to the motor. Motor not included with inverter. See motor section for three-phase motors. Features NEMA 4/12 enclosure with keypad and display of percent load or output voltage. Selectable for local or remote operation via 4-20 mA signal. Minimum speed 3-30 Hz.

Specifications

For 1/4 to 1 HP motors with line voltage 208-230 VAC, 3 phase	7961001
3 phase AC output: 4.5 A	
Weight: 7 lbs (3.2 kg)	
Dimensions: (H x W x D) 12 x 5.5 x 4.7" (305 x 140 x 120 mm)	
For 1-1/2 to 2 HP motors with line voltage 208-230 VAC, 3 phase	7961002
3 phase AC output: 7.5 A	
Weight: 18 lbs (8.2 kg)	
Dimensions: (H x W x D) 13.3 x 11 x 6.25" (338 x 280 x 159 mm)	
For 1/4 to 1 HP motors with line voltage 380-460 VAC, 3 phase	7961003
3 phase AC output: 2.1 A	
Weight: 12 lbs (5.4 kg)	
Dimensions: (H x W x D) 11.1 x 8.8 x 6.25" (282 x 224 x 159 mm)	
For 1-1/2 to 2 HP motors with line voltage 380-460 VAC, 3 phase	7961004
3 phase AC output: 3.4 A	
Weight: 12 lbs (5.4 kg)	
Dimensions: (H x W x D) 11.1 x 8.8 x 6.25" (282 x 224 x 159 mm)	
For 3 HP motors with line voltage 208-230 VAC, 3 phase	7744984
For 3 HP motors with line voltage 380-460 VAC, 3 phase	7744985

Inverter Duty Rated Motors

1/3 HP	TEFC	230/460 VAC	56C	3 phase	7951146
1/2 HP	TEFC	230/460 VAC	56C	3 phase	7951145
3/4 HP	TEFC	230/460 VAC	56C	3 phase	7951147
1 HP	TENV	230/460 VAC	143TC	3 phase	7744373
1-1/2 HP	TENV	230/460 VAC	145TL	3 phase	7951149
3 HP	TENV	230/460 VAC	*184TC	3 phase	7951143

* Must use adapter (see below)

Adapter * (Required when using motors with 184TC or 182TC face)

Mounting flange and motor shaft coupling (Makro pumps w/3 HP, AC motors) 7951144

Dart DC SCR Drives with Motors

Dart DC SCR drives with motors

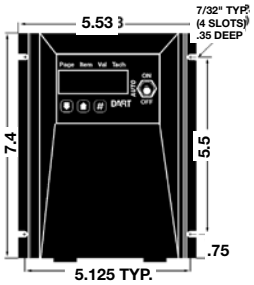
DC SCR variable speed motor and drive system, 1725 RPM max., AC line input voltage 120 (for 90 VDC motors) or 240 VAC (for 180 VDC motors), 1 phase, 50/60 Hz.

1/3 HP to 1/2 HP models with DC 56C frame TENV motors.
3/4 HP to 1-1/2 HP models with DC 56C/143TC frame TEFC motors.

Manual mode: Output voltage to motor is proportional to potentiometer setting between 20% and 100%. **In manual mode, setting 0 VDC output = 20% setting on potentiometer.**

Auto mode: Output voltage to motor is proportional to external 4-20 mA input (20 mA = 100%, 4 mA = 0%). Linearity is excellent between 100% and 10% (20 to 5.6 mA), and drops off below 10%. With manual/off/auto (external) switch. NEMA 4/12 enclosure.

		Part No.
1/3 HP SCR drive w/90 VDC motor	(requires 115/230 VAC input, 1 phase)	7951015
1/2 HP SCR drive w/90 VDC motor		7951010
3/4 HP SCR drive w/90 VDC motor		7951011
1-1/2 HP SCR drive w/180 VDC motor (requires 208-240 VAC input, 1 phase)		7951020



Dart DC SCR drives and motors with tach feedback

DC SCR variable speed motor, tachometer and drive system, 1725 RPM max., AC line input voltage 120 or 240 VAC, 1 phase, 50/60 Hz. DC output 90 or 180 volts.

1/3 HP to 1/2 HP models with DC 56C frame TENV motors; 3/4 HP to 1-1/2 HP models with DC 56C/143TC frame TEFC motors. Tachometer mounted between motor C-face and pump flange.
Includes long motor coupling to accommodate tach.

Manual mode: Digital RPM control by up/down keypad, LED readout in RPM or programmable engineering units (e.g. percent, strokes/min., flow rate, etc.). Actual RPM measured by tach corresponds to manual setpoint. Minimum speed 8 RPM.

External mode: Actual RPM measured by tach is proportional to analog 4-20 mA input (20 mA = 100%, 4 mA = 0%). Minimum speed 8 RPM.

1/3 HP SCR drive w/90 VDC motor and tach (requires 115 VAC input)	7951090
1/2 HP SCR drive w/90 VDC motor and tach (requires 115 VAC input)	7951094
3/4 HP SCR drive w/90 VDC motor and tach (requires 115 VAC input)	7951095
1-1/2 HP SCR drive w/180 VDC motor and tach (requires 230 VAC input)	7951096
1/2 HP SCR drive w/90 VDC motor and tach MD30P-panel mount	7951127
3/4 HP SCR drive motor and tach MD30P-panel mount	7951128

KB Penta SCR Drives with Motors

KB Penta SCR drives with motors

SCR variable speed motor and drive system, 1725 RPM max.,
AC line input voltage 120 (for 90 VDC motors) or 240 VAC (for 180 VDC motors),
1 phase, 50/60 Hz.

1/3 HP to 1/2 HP models with DC 56C frame TENV motors.
3/4 HP to 1-1/2 HP models with DC 56C/143TC frame TEFC motors.

Local mode: Output voltage to motor is proportional to potentiometer setting between 20% and 100%.

Remote mode: Output voltage to motor is proportional to external 4-20 mA input (20 mA = 100%, 4 mA = 0%). Linearity is excellent between 100% and 10% (20 to 5.6 mA), and drops off below 10%. With START/STOP and LOCAL/REMOTE switches. NEMA 4X enclosure.

	Part No.
1/3 HP SCR drive w/90 VDC motor (requires 115 VAC input)	7500086
1/2 HP SCR drive w/90 VDC motor (requires 115 VAC input)	7500087
3/4 HP SCR drive w/90 VDC motor (requires 115 VAC input)	7500088
1-1/2 HP SCR drive w/180 VDC motor (requires 230 VAC input)	7500089

Dart and KB-Penta DC SCR drive without motor

Variable speed drive for controlling the voltage output to DC motors. Motor not included with SCR. See motor section for selection.

KB Penta SCR Drive without Motor

2 HP Max, 90/180 VDC Out, 120/240 VAC In, SCR Drive, KB Penta KBPC-240D	7961005
(with 120 VAC Input, drive rating is 1 HP @ 90 VDC to motor)	

Dart 250 Series Variable Speed DC Control

2 HP Max, 90/180 VDC Out, 120/240 VAC In, SCR Drive, 253-200E-7-4X	7740941
(with 120 VAC Input, drive rating is 1 HP @ 90 VDC to motor)	

Dart MDII Series Programmable Drives (requires tachometer, below)

1 HP Max, 90 VDC Out, 120 VAC In, SCR Drive, MD30E-7	7951120
2 HP Max, 180 VDC Out, 240 VAC In, SCR Drive, MD30P-5-7	7951124
1 HP Max, 90 VDC Out, 120 VAC In, SCR Drive, MD30P Panel Mount	7951126
2 HP Max, 180 VDC Out, 240 VAC In, SCR Drive, MD30P-5 Panel Mount	7951129

C-Faced Tachometers for Programmable Dart SCR Drives above

NEMA 56C, 60 Pulses per revolution, Dart CF-H60	7951121
NEMA 143TC, 145TC, 182C, 184C, 60 Pulses per revolution, Dart CF-J60	7951122

AC Motors *(for Canadian customers only)

AC motors

All AC Motors are approved by CSA.
All motors are 1725 RPM, 60 Hz, manufacturers may vary.

Horsepower	Enclosure	Frame	AC Voltage	Phase	Part No.
1/3 HP	TEFC	56 C	115 / 208-230	1 phase	7901317
1/3 HP	TEFC	56 C	208-230 / 460	3 phase	7901329
1/3 HP	TEFC	56 C	575	3 phase	7901323
1/2 HP	TEFC	56 C	115 / 208-230	1 phase	7901318
1/2 HP	TEFC	56 C	208-230 / 460	3 phase	7901330
1/2 HP	TEFC	56 C	575	3 Phase	7901324
3/4 HP	TEFC	56 C	115 / 208-230	1 phase	7901319
3/4 HP	TEFC	56 C	208-230 / 460	3 phase	7901331
3/4 HP	TEFC	56 C	575	3 phase	7901325
1 HP	TEFC	56 C	115 / 208-230	1 phase	7901320
1 HP	TEFC	56 C	208-230 / 460	3 phase	7901332
1 HP	TEFC	56 C	575	3 phase	7901326
1-1/2 HP	TEFC	56 C	115 / 208-230	1 phase	7901321
1-1/2 HP	TEFC	56 C	208-230 / 460	3 phase	7901333
1-1/2 HP	TEFC	56 C	575	3 phase	7901327
3 HP*	TEFC	182 TC	208-230 / 460	3 phase	7901334
3 HP*	TEFC	184 C	575	3 phase	7901322
3 HP*	TEFC	182 TC	575	3 phase	7901328

* Must use adapter (see below)

AC explosion-proof motors

All motors come with an explosion proof conduit box and built in overload protection.
CSA approved for Class I Group C and D, or Class II Group F and G.
Manufacturer may vary.

Horsepower	Enclosure	Frame	AC Voltage	Phase	Part No.
1/3 HP	EXP	56 C	115 / 208-230	1 phase	7901335
1/3 HP	EXP	56 C	208-230 / 460	3 phase	7901339
1/3 HP	EXP	56 C	575	3 phase	7901340
1/2 HP	EXP	56 C	115 / 208-230	1 phase	7901336
1/2 HP	EXP	56 C	208-230 / 460	3 phase	7901341
1/2 HP	EXP	56 C	575	3 phase	7901342
3/4 HP	EXP	56 C	115 / 208-230	1 phase	7901337
3/4 HP	EXP	56 C	208-230 / 460	3 phase	7901343
3/4 HP	EXP	56 C	575	3 phase	7901344
1 HP	EXP	56 C	115 / 208-230	1 phase	7901338
1 HP	EXP	56 C	208-230 / 460	3 phase	7901345
1 HP	EXP	56 C	575	3 phase	7901346
1-1/2 HP	EXP	56 C	208-230 / 460	3 phase	7901347
1-1/2 HP	EXP	56 C	575	3 phase	7901348

***Flange Adapter** (Required for installing 3 HP motors or motors with 182/184 frames)

Mounting flange and motor shaft coupling (Makro pumps w/3 HP, AC motors) 7951144

AC Inverter *(for Canadian customers only)

Provides variable motor speed with three phase AC Motors by adjusting the frequency (Hz) output to the motor. The motor is not included with the inverter. Choose the motor from the AC Inverter Duty Rated Motors section following the listing of Inverters. Push button keypad and display for Hertz, RPM, % Frequency.

All Inverter AC output voltage is 3 phase.

Maximum Motor HP	AC Input	Phase	AC Output	Dim. (mm) H x W x D	Enclosure	Part No.
1/2 HP	120/240	1 ph	230 V 2.2 A	200 x 200 x 95	NEMA 4	7901357
1/2 HP	200/240	3 ph	230 V 2.2 A	200 x 155 x 110	NEMA 4	7901360
1 HP	120/240	1 ph	230 V 4 A	200 x 200 x 125	NEMA 4	7901363
1 HP	200/240	3 ph	230 V 4 A	200 x 155 x 110	NEMA 4	7901366
1 HP	400/480	3 ph	460 V 2 A	200 x 155 x 110	NEMA 4	7901369
1 HP	590	3 ph	575 V 1.6 A	200 x 155 x 110	NEMA 4	7901372
1-1/2 HP	120/240	1 ph	230 V 5.2 A	200 x 200 x 125	NEMA 4	7901375
1-1/2 HP	200/240	3 ph	230 V 5.2 A	200 x 200 x 125	NEMA 4	7901378
2 HP	200/240	3 ph	230 V 6.8 A	200 x 200 x 125	NEMA 4	7901381
2 HP	400/480	3 ph	460 V 3.4 A	200 x 200 x 125	NEMA 4	7901384
2 HP	590	3 ph	575 V 2.7 A	200 x 200 x 125	NEMA 4	7901387
3 HP	200/240	3 ph	230 V 9.6 A	200 x 200 x 150	NEMA 4	7901390
3 HP	400/480	3 ph	460 V 4.8 A	200 x 200 x 125	NEMA 4	7901393
3 HP	590	3 ph	575 V 3.9 A	200 x 200 x 125	NEMA 4	7901396

AC Inverter Duty Rated Motors *(for Canadian customers only)

HP	Enclosure	Frame	AC Voltage	Phase	Part No.
1/3 HP	TEFC	56 C	230/460	3 phase	7902404
1/3 HP	TEFC	56 C	575	3 phase	7902407
1/2 HP	TEFC	56 C	230/460	3 phase	7902405
1/2 HP	TEFC	56 C	575	3 phase	7902408
3/4 HP	TEFC	56 C	230/460	3 phase	7902406
3/4 HP	TEFC	56 C	575	3 phase	7902409
1 HP	TEFC	56 C	208-230 / 460	3 phase	7901332
1 HP	TEFC	56 C	575	3 phase	7901326
1-1/2 HP	TEFC	56 C	208-230 / 460	3 phase	7901333
1-1/2 HP	TEFC	56 C	575	3 phase	7901327
3 HP*	TEFC	182 TC	208-230 / 460	3 phase	7901334
3 HP*	TEFC	184 C	575	3 phase	7901322
3 HP*	TEFC	182 TC	575	3 phase	7901328

* Flange Adapter 7951144 Required for installing 3 HP motors or motors with 182/184 frames.

DC Motors *(for Canadian customers only)

DC motors

Permanent magnet 1750 RPM.

Horsepower	Enclosure	Frame	AC Voltage	Part no.
1/3 HP	TEFC	0 – 90 VDC	56 C	7902413
1/2 HP	TEFC	0 – 90 VDC	56 C	7902412
3/4 HP	TEFC	0 – 90 VDC	56 C	7356703
1-1/2 HP	TEFC	0 – 180 VDC	56 C	7902411

SCR Control for DC Motors *(for Canadian customers only)

The SCR control does not come with a motor. Select the required DC motor from the DC motor list.

The KB Penta DC Drive is used to control the DC voltage to DC motors. This controls the speed of the motor. The DC voltage is variable from 0 – 90 VDC or 0 – 180 VDC which represents 0 to approximately 1750 RPM motor speed. Features of this drive include: Manual –OFF – Auto selector switch; Speed pot for manual motor speed control; Auto motor speed control via an isolated 4 – 20 mA input. Single phase line input voltage is selectable as 120 VAC (for 0 – 1 HP motors 0 – 90 VDC) or 230 VAC (for 0 – 2 HP motors 0 – 180 VDC).

For motors 0 – 1 HP, 120 VAC in 0 – 90 VDC out
For motors 0 – 2 HP, 230 VAC in 0 – 180 VDC out

KB Penta DC Drive SCR Controller 7356704

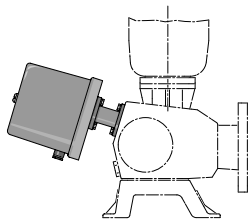
Economy KB Penta AC Drive *(for Canadian customers only)

This lower cost AC inverter can control motor speed on AC motors up to 1 HP. It has a selectable 115 VAC or 230 VAC input and generates a 230 VAC 3 phase 3.6 A output. Features include switch selectable manual / auto operation, Manual speed control via local potentiometer and Auto speed control via a 4 – 20 mA input. Motor is not included with the drive, select the motor from the AC Inverter Duty Rated Motor list.

Dimensions (mm) 241 x 140 x 148 (H x W x D)

Economy KB Penta AC Drive 7902410

Analog Stroke Positioning Systems



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Analog stroke-positioning system:

Note: Stroke postioning motors must be field wired to remove power when the pump drive motor is stopped. For automatic stroke-length control with positioning motor, controlled by a standard process signal.

Technical data:

With standard process signal input 4-20 mA, corresponding to 0-100% stroke length.
Power supply: 115V or 230 V, 60 Hz, 1 phase.
Manual/automatic mode selector switch.
Spring-return switch for manual stroke-length adjustment.
Mechanical stroke-length indicator.
Positioning time about 1 second per 1% stroke length

Stroke-positioning control system 4-20 mA

Type	115 V	230 V
Vario	807098	
Meta HM (4 mm)	803887	
Sigma/2 HM (5 mm)	1018894	1018893
Meta HM (6 mm)	1001826	
Meta HK	803506	803879
Sigma/2 HK	1018890	1018889
Sigma/3	1006504	1006505
Makro	1020798	
ProMus	852752	852752

Valve Balls

	Material	Dimensions in. (mm)	Part No.
For use with 4.8 mm valve	PTFE	1/4" (4.8)	7404205
	SS	1/4" (4.8)	7404233
	Ceramic	1/4" (4.8)	404201
For use with 9.5 mm valve only	PTFE	1/2" (9.5)	7404206
	SS	1/2" (9.5)	7404240
For use with 9.2 mm (standard) valve	Ceramic	1/2" (9.2)	404281

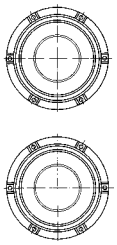
Special valve balls

For metering pumps and accessories if standard materials are unsuitable.

pk_1_102

	Part No.
11.1 mm dia. for DN 10 (Vario/ Sigma)	
PTFE (1/2" MNPT connection)	7404207
Ceramic (1/2" MNPT connection)	404277
SS (3/8" FNPT connection)	404243
16 mm dia. for DN 15 (Vario/ Sigma)	
PTFE (3/4" MNPT connection)	7404208
Ceramic (3/4" MNPT connection)	404275
SS (1/2" FNPT connection)	404244
20 mm dia. for valve dia. 3/4" DN 20 (Meta, Makro)	
PTFE	404256
Ceramic	404273
SS	404246
25 mm dia. for valve dia. 1" DN 25 (Sigma, Meta, Makro)	
PTFE	404257
Ceramic	404274
SS	404247
38.1 mm dia. for valve dia. 1-1/2" DN 40 (Makro)	
PTFE	404261
Ceramic	404278
SS	7404260

Motor Pump diaphragms



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ProMinent pump diaphragm made from a steel core with Viton® facing.
Particularly suited for media tending to crystalize, such as silicate.

Viton® for pump type:	Max. working pressure	Part No.
Sigma/1 12017, 12035, 10050	87 psi (6 bar)	1010281
Sigma/1 10022, 10044, 07065	87 psi (6 bar)	1010284
Sigma/1 07042, 04084, 04120	87 psi (6 bar)	1010287
Sigma/2 12050,12090, 12130	87 psi (6 bar)	1018953
Sigma/2 07120, 07220, 04350	87 psi (6 bar)	1018984
Sigma/3 120145, 120190, 120270, 120330	87 psi (6 bar)	1006564
Sigma/3 070410, 070580, 040830, 041030	87 psi (6 bar)	1006566
Meta/Makro 130	87 psi (6 bar)	7811470
Meta/Makro 260	87 psi (6 bar)	7811471

Viton® is a registered trademark of Dupont Dow Elastomers

ProMinent®

“pump engineering specifications” T.O.C. VII

CATALOG SECTION TABS

Solenoid Pump Specifications

beta

(THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – beta 4 and beta 5 (for flow rates less than 9 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.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 backplate with weep hole creating an air gap.An elastomer shaft wiper seal shall prevent contamination of the solenoid 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 PVDF, 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 of the self-degassing type, with integral automatic air relief valvefor self priming under maximum rated discharge line pressure.The liquid end shall be constructed of (PVC).The suction valve shall be of the double ball check design and discharge valve shall be double ball design, perpendicular to the suction valve.
- 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.
- The liquid end shall be constructed of PVDF with Teflon seals, with built coarse and

ON-OFF operation using the PAUSE function via a voltage-free contact relay through an optional control cable.

1.5 STATUS / LOW LEVEL INDICATION((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 via a LCD light.

B. Relay Output - An SPDT relay shall be installed on the pump for: ((SELECT ONE OR BOTH OF THE FOLLOWING))

- 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.
- If both of the above options are chosen, two SPST relay contacts shall be provided through a four-conductor cable.

1.6 ACCEPTABLE MANUFACTURER:

A. ProMinent Fluid Controls, model _____

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: Black, UV-protected polypropylene / 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 5-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. A diaphragm failure detector shall be provided to ((open/close)) a contact in the event of diaphragm failure.

G. An adjustable-pressure, diaphragm-type backpressure/antisiphon valve shall be provided with each metering pump.

H. An in-line, adjustable-pressure, diaphragm-type pressure relief valve shall be provided with each metering pump.

I. 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.

J. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.

K. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump.

L. Fifteen feet of tubing compatible with the fluid pumped shall be provided with each pump.

END OF SECTION

Solenoid Pump Specifications

gamma/ L

THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – gamma/ L (for flow rates up to 8.4 gph)

PART 1 - GENERAL

1.1 GENERAL

A. This specification covers the supply, installation, and testing of completely functional metering pump feed systems including all necessary accessories and appurtenances as shown on the drawings and described herein.A single chemical metering pump manufacturer shall be responsible for supplying all components of the metering pump feed system.

1.2 QUALITY ASSURANCE

A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc. All pumps shall be shop-tested for capacity and pressure prior to shipment with documented results provided.

1.3 WARRANTY

A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 – PRODUCTS

2.1 GENERAL

A. Manufacturers:
   1. ProMinent Fluid Controls, Inc.
   2. Pre-approved equal.

2.2 DESCRIPTION

A. The chemical metering pump(s) shall be 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 which is readable at an offset angle of 45 degrees.Keypad will allow for simple scrolling and display of programmed parameters.The housing shall be rated NEMA 4X.

B. 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 the frequency of the pump remains constant.

C. The liquid end shall be physically separated from the drive unit by a backplate with weep hole creating an air gap.An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails.The diaphragm shall be constructed of a steel core, vulcanized into nylon-reinforced EPDM, with PTFE-faced fluid contact surface.

2.3LIQUID END ((SELECT ONE))

- The liquid end shall be glass-filled polypropylene with ((EPDM/Viton) seals, (without/ with built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. Note-bleeder valve is not available with model type 0232)). The suction and discharge valves shall be of the double ball check design.
- The liquid end shall be PVC with ((EPDM/Viton)) seals, (without/with built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure.. Note-bleeder valve is not available with model type 0232)). The suction and discharge valves shall be of the double ball check design.
- The liquid end shall be Plexiglas (acrylic) with ((EPDM/Viton)) seals, (without/with built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. Note-bleeder valve is not available with model type 0232)). The suction and discharge valves shall be PVC, with double ball check design.
- The liquid end shall be of the self-degassing type, with integral automatic air relief valve for self-priming under maximum rated discharge line pressure.The liquid end shall be constructed of ((acrylic/polypropylene)).The suction valve shall be of the double ball check design and discharge valve shall be spring-loaded, horizontally acting single ball design.Note-this liquid end is not available for model types 1000 and 0232.
- The liquid end shall be constructed of carbon-filled PTFE with PTFE seals.The suction and discharge valves shall be of the double ball check design.
- The liquid end shall be constructed of 316 stainless steel with PTFE seals.The suction and discharge valves shall be of the double ball check design.
- The liquid end shall be constructed of PVDF with Teflon seals, ((without/with built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure.Note-bleeder valve is not available with model type 0232)).

2.4 PROGRAMMING AND CONTROL

A. Stroke length control shall be manually adjusted between 100% and 0% with a stroke adjustment knob on the pump face control.The LCD shall digitally display stroke length setting in 1% increments in the full range between 100% and 0%

B. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour.Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob.If stroke length is altered by more than 10%, a yellow warning light will light light and a flashing message “calib” will appear.

C. The pump shall be equipped with the programmable function of pressure levels to allow pump to operate at reduced pressures from the maximum rated pressure of the pump.

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or l/hr, dosing quan-

tity, mA current input being received by pump, and indication of external mode.

F. Stroke frequency control shall be manually adjusted by touch keypads, 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 rate.The pump shall be capable of remoteON-OFF operation using the pause function via a voltage free contact relay through an optional control cable.((OPTIONAL SELECTIONS))
PULSE MULTIPLIER/DIVIDER - The pump shall allow factoring to issue from 1 to 9,999 stokes per pulse input or to issue 1 stroke per 1 to 9,999 input pulses.
Or
ANALOG- The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmable at the pump.The pump shall allow the setting of a maximum stroke rate which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate.Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be allowed.
Or
PULSE MULTIPLIER/DIVIDER AND ANALOG – Both modes of frequency control, as described above, shall be configured into the metering pump.

2.5 FLOW ASSURANCE ((OPTIONAL, SELECT AS REQUIRED))

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

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 display upon loss of discharge flow.The pump shall be programmable, between 1 and 125 strokes per minute, to actuate the fault annunciation after flow is lost.

C. Relay Output – An SPDT relay shall be installed for ((SELECT ONE)) fault Indication. The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low chemical supply in tank/lack of chemical supply shut down, flow monitor, system faults, and fuse/power supply failure).Configure as ((NO/NC)) contact closure relay.
Or pacing relay.The metering pump shall have an integral relay to issue a contact closure with every pump stroke to pace a second ProMinent metering pump or both fault indication and pacing.The fault relay shall be configured as a ((NO/NC)) contact closure relay.The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

2.6 ACCESSORIES((ALL ARE OPTIONAL AND MAY BE INCLUDED AS SEPARATE ITEMSOR AS COMPONENTS OF A PUMP STAND))

A. The pump shall be mounted on a ((black, UV-protected polypropylene/304 stainless)) support stand suitable for wall, floor or top-of-tank mounting.A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system prior to shipment.The stand shall include the following accessories, pre-piped;

B. A foot valve and strainer, constructed of materials compatible with chemical to be used, shall be provided with each pump.

C. An injection valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.

D. A universal control cable with 5-pole round plastic connector and 5-wire cable with loose ends shall be provided with each pump.
E. A two stage float switch compatible with chemical to be used shall be provided with each pump to monitor tank level.
F. An adjustable discharge flow monitoring device, compatible with chemical to be used, shall be provided with each pump.The flow monitor shall be capable of signaling a fault condition to the pump.
G. A diaphragm failure detector shall be provided to ((open/close)) a contact for alarm in the event of a diaphragm failure.
H. An adjustable-pressure, diaphragm-type back pressure/anti-siphon valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.
I. An in-line, adjustable-pressure, diaphragm-type pressure relief valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.
J.A pump-mounted, multi-function, fixed-spring pressure diaphragm-type valve for backpressure/anti-siphon protection, pressure relief, priming, and discharge line drain, constructed of PVDF, shall be provided with each pump.
K. An air-charged, bladder-type pulsation dampener, constructed with materials compatible with chemical to be used, shall be provided with each pump.The pulsation dampener shall be sized to reduce pulsations by at least 90% at full pump capacity.
L. A clear PVC calibration column with FNPT fitting on top and bottom shall be provided with each pump.The column shall be sized to provide at least 2 minutes draw down at maximum pump capacity.
M. Fifteen feet of tubing compatible with chemical to be used shall be provided with each pump.

2.7 APPLICATION

A. Quantity:
B. Chemical Service:
C. Capacity (US gph):
D. Backpressure (psig):

END OF SECTION

Solenoid Pump Specifications

delta®

(THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – DELTA (for flow rates 3.1 to 21.1 gph)

PART 1 - GENERAL

1.1 GENERAL

A. This specification covers the supply, installation, and testing of completely functional metering pump feed systems including all necessary accessories and appurtenances as shown on the drawings and described herein. A simple chemical metering pump manufacturer shall be responsible for suppyling all components of the metering pump feed system.

1.2 QUALITY ASSURANCE

A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc.

B. All pumps shall be shop-tested for capacity and pressure prior to shipment with documented results provided.

1.3 WARRANTY

A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 - PRODUCTS

1.2 GENERAL

A. Manufacturers:
   1. ProMinent Fluid Controls, Inc.
   2. Pre-approved equal.

2.2 DESCRIPTION

A. The chemical metering pump(s) shall be microprocessor-controlled, simplex, solenoid-driven, reciprocating, mechanically-actuated diaphragm type. All pumping functions shall be set by membrane-switch keypad and status shall be displayedon an illuminated LCD, which is readable. Keypad will allow for simple scrolling and display of programmed parameters. The housing shall be rated NEMA 4X.

B. 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 the frequency of the pump remains constant.

C. The liquid end shall be physically separated from the drive unit by a backplate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails. The diaphragm shall be constructed of a steel core, vulcanized into nylon-reinforced EPDM, with PTFEfaced fluid contact surface.

D. The pump shall utilize optoDrive® technology or equal whereby the time sequence of the dosing flow can be exactly matched to the requirements of the application. The user can set a slow pressure stroke for almost continuous dosing, or a quick stroke as needed to prevent incomplete filling of the liquid end due to viscosity of

the media being pumped. In cases of outgassing dosing media, the settable suction stroke shall assist in preventing cavitation. Fluctuation in backpressure shall be automatically compensated by the drive.

E. The pump shall have optoGuard® technology integrated into the drive to detect blocked metering points or broken metering lines, and to detect airlocks within the delivery unit. This will function to prevent uncontrolled metering. These problems are to be shown on the pump delay.

2.3 LIQUID END ((SELECT ONE))

- The liquid end shall be constructed of 316 stainless steel with PTFE seals. The suction and discharge valves shall be of the double ball check design for discharge pressure greater than 100 psi.
- The liquid end shall be constructed of PVDF with Teflon seals, ((without/with built-in 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 valves shall be of the double ball check design for discharge pressures greater than 100 psi.

2.4 PROGRAMMING AND CONTROL

A. Stroke length control shall be manually adjusted between 0% and 100% with a stroke adjustment knob on the pump face control, The LCD shall digitally display stroke length setting in 1% increments in the full range between 0% and 100%

B. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning will light and a flashing message “calib” will appear.

C. The pump shall be equipped with the programmable function of pressure levels to allow pump to operate at reduced pressures from the maximum rated pressure of the pump (not available for models 0450 and 0280).

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unathorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or l/hr, dosing quantity, mA current input being received by pump, and indication of external mode.

F. Stroke frequency control shall be manually adjusted by touch keypads, 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 rate. The 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 SELECTIONS))

CONTACT-The pump shall allow fine-tune factoring to issue from 1 to 9,999 strokes per pulse input or to issue 1 stroke per 1 to 9,999 input pulses. The dosing can be activated by an impulse via external control through a contact or a semiconductor switching element.

Or

Batch-The dosing can be activated by pressuring the P key or by an external impulse through a contact or a semiconductor switching element. A dosing quantity

(batch) or a number of strokes (max 65535) can be preselected via the control unit.
Or
ANALOG-The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmable at the pump. The pump shall allow the setting of a maximum stroke rate which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be allowed.
Or
PULSE AND ANALOG – Both modes of frequency control, as described above, shall be configured into the metering pump.

2.5 FLOW ASSURANCE ((OPTIONAL, SELECT AS REQUIRED))

A. Low Level Control – A 2-stage float switch shall be supplied to stop pump prior to losing prime and annunciate low level on the pump LCD display.
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 display upon loss of discharge flow. The pump shall be programmable, between 1 and 125 strokes per minute, to actuate the fault annunciation after flow is lost.
C. Relay Output – An SPDT relay shall be installed for ((SELECT ONE))
fault indication. The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low chemical supply in tank/lack of chemical supply shut down, flow monitor, system faults, and fuse/power supply failure). Configure as ((NO/NC)) contact closure relay.
or pacing relay. The metering pump shall have an integral relay to issue a contact closure with every pump stroke to pace a second ProMinent metering pump or both fault indication and pacing. The fault relay shall be configured as a ((NO/NC)) contact closure relay. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.
D. Diaphragm Failure – A diaphragm failure detector will alert the possibility of a ruptured or distressed diaphragm.

2.6 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 ((black, UV-protected polypropylene/304 stainless)) support stand suitable for wall, floor or top-of-tank mounting. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system prior to shipment. The stand shall include the following accessories, pre-piped:
B. A foot valve and strainer, constructed of materials compatible with chemical to be used, shall be provided with each pump.
C. An injection valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.
D. A universal control cable with 5-pole round plastic connector and 5-wire cable with loose ends shall be provided with each pump.
E. A two stage float switch compatible with chemical to be used shall be provided with

each pump to monitor tank level.

F. An adjustable discharge flow monitoring device, compatible with chemical to be used, shall be provided with each pump. The flow monitor shall be capable of signaling a fault condition to the pump.

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

H. An adjustable-pressure, diaphragm-type back pressure/anti-siphon valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.

I. An in-line, adjustable-pressure, diaphragm-type pressure relief valve, constructed of materials compatible with chemical to be used, shall be provided with each pump.

J. A pump-mounted, multi-function, fixed-spring pressure diaphragm-type valve for backpressure/anti-siphon protection, pressure relief, priming, and discharge line drain, constructed of PVDF, shall be provided with each pump.

K. An air-charged, bladder-type pulsation dampener, constructed with materials compatible with chemical to be used, shall be provided with each pump. The pulsation dampener shall be sized to reduce pulsations by at least 90% at full pump capacity.

L. A clear PVC calibration column with FNPT fitting on top and bottom shall be provided with each pump. The column shall be sized to provide at least 2 minutes draw down at maximum pump capacity.

M. Fifteen feet of tubing compatible with chemical to be used shall be provided with each pump.

2.7 APPLICATION

A. Quantity:

B. Chemical Service:

C. Capacity (US gph):

D. Backpressure (psig):

END OF SECTION

Motor Pump Specifications

Sigma/1 HM (basic and control versions)

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – SIGMA/1 HM (for flow rates from 5 to 38 gph)

PART 1 – GENERAL

1.1 GENERAL

A. This specification covers the supply, installation, and testing of completely functional metering pump systems including all accessories and appurtenances as shown on the drawings and described herein. A single chemical metering pump manufacturer shall be responsible for supplying all components of the metering feed system.

1.2 QUALITY ASSURANCE

A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc. All pumps shall be shop-tested for capacity and pressure prior to shipment, with documented results provided.

1.3 WARRANTY

A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 – PRODUCTS

2.1 GENERAL

A. Manufacturers:

1. ProMinent Fluid Controls, Inc.
2. Pre-approved equal.

2.2 DESCRIPTION

A. The chemical metering pump shall be a simplex, motor-driven, reciprocating, mechanically-actuated diaphragm type. The pump shall include integral motor, permanently lubricated gear reducer, cam-and-spring drive mounted and sealed in a non-corrosive plastic outer, with heat sinks for cooling.

B. The power supply shall be ___VAC, ___Hz, ___Phase.

C. The liquid end shall be physically separated from the drive unit by a back plate with weep hole creating air gap separation. An elastomer shaft wiper seal shall prevent contamination of the gear box by confining chemical within the back plate if the primary diaphragm fails. The primary diaphragm shall have a steel core, vulcanized into a nylon-reinforced EPDM backing, with PTFE-faced fluid contact surface.

D. ((OPTIONAL)) The liquid end shall also feature a secondary diaphragm separated

from the primary diaphragm by a spacer plate with diaphragm-isolated pressure switch to close a contact for alarm annunciation and to prevent chemical spill or intrusion into pump drive upon failure of the primary diaphragm.

2.3 LIQUID END

A. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize diaphragm wear, liquid end dead volume, and to promote flow of solids in suspension.

((SELECT ONE))

- The liquid end shall be virgin PVDF. The suction and discharge valve shall be PVDF with PTFE faced Viton gasket seals and ceramic valve balls.

Or

- The liquid end shall be 316 stainless steel. The suction and discharge valves shall be 316 stainless steel with PTFE-faced Viton gasket seals and stainless steel valve balls.

2.4 CONTROL ((BASIC VERSION PUMP))

A. Stroke length control of the basic version pump

((SELECT ONE))

- shall be adjustable manually by means of a stroke length knob, in increments of 1.0%, from 0% to 100% of stroke length.

Or

- shall be adjustable by means of a stroke positioning motor from 0% to 100% of stroke length. The stroke positioning motor shall feature visual stroke length indication and manual/ external selector switch for local control via toggle switch or external control in proportion to a 4-20 mA signal.

B. Stroke frequency control of the basic version pump

((SELECT ONE))

- shall be fixed at the pump's maximum stroke rate.Pump shall include a 1/8 HP, TEFC, four-pole AC motor.

Or

- shall be controlled by DC SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and speed potentiometer. The DC voltage output to the motor shall be proportional to the potentiometer setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 1/8 HP, TENV, permanent magnet 90V DC motor.

Or

- shall be controlled by an AC inverter system for stroke frequency control. The inverter shall include a wall mountable NEMA 4/12 enclosure with keypad and display of % load or output voltage. Selectable for local or remote operation via 4-20 mA signal. Pump shall include a 1/8 HP, inverter duty, 3-phase, 208-230 VAC motor. Minimum speed 3-30 Hz.

2.4 PROGRAMMING AND CONTROL ((CONTROL VERSION PUMP))

A. The metering pump shall be microprocessor-controlled. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD, which is readable at an offset of 45 degrees. Keypad will allow for simple scrolling of programmed parameters.

B. Stroke length control shall be adjustable manually by means of a stroke length, in increments of 1.0%, from 0 to 100% of stroke length. The LCD shall digitally display stroke length in 1% increments in the full range between 100% and 0%.

C. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning light will light and a flashing message “calib” will appear.

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or L/hr, dosing quantity, mA input being received by pump, and indication of external mode.

F. An AC inverter shall be integral to the microprocessor control and function of the pump. While 115VAC or 230VAC, 1 phase may be used to power the pump, the inverter shall drive a 1/8 HP, 230VAC, 3 phase motor. Stroke frequency shall be accomplished through microprocessor control with proportional start/stop of the motor, from 0% to 33% of stroke rate. Stroke rate shall be accomplished through variable speed of the motor from 34% to 100% of stroke rate. Stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the LCD. The pump shall be capable of receiving a pulse input via optional external control cable such that one pulse gives one pump stroke rate. The pump shall be capable of remote ON-OFF operation using the pause function via a voltage free contact relay through an optional control cable. In addition, the pump shall be configured with;

((OPTIONAL SELECTIONS))

- pulse multiplier/divider functionality. The 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.

Or

- analog input functionality. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- pulse multiplier/divider and analog input functionality. The 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. The pump shall also accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- programmable timer functionality. The pump shall be configured with an integral, programmable 2-week, 81 event timer to change operational state of the pump. Timers external to the metering pump are not acceptable.

Or

- pulse multiplier/divider, analog input, and programmable timer functionality (as described above).

G. The pump shall be equipped with the programmable function of auxiliary frequency control, allowing for quick priming of the pump or for slug feed of process during initial start up after shutdown. Stroke frequency shall be programmable to the maximum for the pump, and the auxiliary frequency function shall be capable of interfacing with a contact closure relay for control purposes.

2.5 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 LED.

B. 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both fault indication and pacing relay. ((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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay. The pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

Or

- both 4-20mA output and fault indication. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The metering pump shall also 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both 4-20mA output and pacing relay. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

2.6 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: black, UV-protected polypropylene//304 stainless steel//FRP grating)) support stand suitable for wall, floor or top-of-tank mounting. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system under conditions of maximum rated pump pressure, prior to shipment. The stand shall include the following accessories, pre-piped;

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 5-pole round plastic connector and 5-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 mounted on a valved bypass 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 backpressure/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. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.

K. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump//skid.

2.7 APPLICATION

A. Quantity:

B. Chemical Service:

C. Capacity (U.S. gph):

D. Backpressure (psig):

END OF SECTION

Motor Pump Specifications

Sigma/2 HM (basic and control versions)

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – SIGMA/2 HM (for flow rates from 16 to 111 gph)

PART 1 – GENERAL

1.1 GENERAL

A. This specification covers the supply, installation, and testing of completely functional metering pump systems including all accessories and appurtenances as shown on the drawings and described herein. A single chemical metering pump manufacturer shall be responsible for supplying all components of the metering feed system.

1.2 QUALITY ASSURANCE

A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc. All pumps shall be shop-tested for capacity and pressure prior to shipment, with documented results provided.

1.3 WARRANTY

A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 – PRODUCTS

2.1 GENERAL

A. Manufacturers:

1. ProMinent Fluid Controls, Inc.
2. Pre-approved equal.

2.2 DESCRIPTION

A. The chemical metering pump shall be a simplex, motor-driven, reciprocating, mechanically-actuated diaphragm type. The pump shall include integral motor, oil-lubricated gear reducer, and cam-and-spring drive mounted in an aluminum housing. Such housing to be sealed into an outer plastic housing for corrosion protection with heat sinks for cooling.

B. The power supply shall be ___VAC, ___Hz, ___Phase.

C. The liquid end shall be physically separated from the drive unit by a back plate with weep hole creating air gap separation. An elastomer shaft wiper seal shall prevent contamination of the gear box by confining chemical within the back plate if the primary diaphragm fails. The primary diaphragm shall have a steel core, vulcanized into a nylon-reinforced EPDM backing, with PTFE-faced fluid contact surface.

D. ((OPTIONAL)) The liquid end shall also feature a secondary diaphragm separated from the primary diaphragm by a spacer plate with diaphragm-isolated pressure switch to close a contact for alarm annunciation and to prevent chemical spill or intrusion into pump drive upon failure of the primary diaphragm.

2.3 LIQUID END

A. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize diaphragm wear, liquid end dead volume, and to promote flow of solids in suspension.

((SELECT ONE))

- The liquid end shall be virgin PVDF. The suction and discharge valve shall be PVDF with PTFE faced Viton gasket seals and ceramic valve balls.

Or

- The liquid end shall be 316 stainless steel. The suction and discharge valves shall be 316 stainless steel with PTFE-faced Viton gasket seals and stainless steel valve balls.

2.4 CONTROL ((BASIC VERSION PUMP))

A. Stroke length control of the basic version pump

((SELECT ONE))

- shall be adjustable manually by means of a stroke length knob, in increments of 1.0%, from 0% to 100% of stroke length.

Or

- shall be adjustable by means of a stroke positioning motor from 0% to 100% of stroke length. The stroke positioning motor shall feature visual stroke length indication and manual/ external selector switch for local control via toggle switch or external control in proportion to a 4-20 mA signal.

B. Stroke frequency control of the basic version pump

((SELECT ONE))

- shall be fixed at the pump's maximum stroke rate. Pump shall include a 1/3 HP, TEFC, four-pole AC motor.

Or

- shall be controlled by DC SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and speed potentiometer. The DC voltage output to the motor shall be proportional to the potentiometer setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 1/3 HP, TENV, permanent magnet 90V DC motor.

Or

- shall be controlled by an SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and membrane keypad and digital display spannable to show RPM, percent output or flow rate. The actual motor speed, as measured by motor-mounted tachometer, shall be proportional to the rate setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 1/3 HP, TENV, permanent magnet 90V DC motor and Tach.

Or

- shall be controlled by an AC inverter system for stroke frequency control. The inverter shall include a wall mountable NEMA 4/12 enclosure with keypad and display of % load or output voltage. Selectable for local or remote operation via 4-20 mA signal. Pump shall include a 1/3 HP, inverter duty, 3-phase, 208-230 VAC motor. Minimum speed 3-30 Hz.

2.4 PROGRAMMING AND CONTROL ((CONTROL VERSION PUMP))

A. The metering pump shall be microprocessor-controlled.All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD, which is readable at an offset of 45 degrees.Keypad will allow for simple scrolling of programmed parameters.

B. Stroke length control shall be adjustable manually by means of a stroke length, in increments of 1.0%, from 0 to 100% of stroke length.The LCD shall digitally display stroke length in 1% increments in the full range between 100% and 0%.

C. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning light will light and a flashing message “calib” will appear.

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or L/hr, dosing quantity, mA input being received by pump, and indication of external mode.

F. An AC inverter shall be integral to the microprocessor control and function of the pump. While 115VAC or 230VAC, 1 phase may be used to power the pump, the inverter shall drive a 1/4 HP, 230VAC, 3 phase motor. Stroke frequency shall be accomplished through microprocessor control with proportional start/stop of the motor, from 0% to 33% of stroke rate. Stroke rate shall be accomplished through variable speed of the motor from 34% to 100% of stroke rate. Stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the LCD. The pump shall be capable of receiving a pulse input via optional external control cable such that one pulse gives one pump stroke rate. The pump shall be capable of remote ON-OFF operation using the pause function via a voltage free contact relay through an optional control cable. In addition, the pump shall be configured with;

((OPTIONAL SELECTIONS))

- pulse multiplier/divider functionality. The 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.

Or

- analog input functionality. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- pulse multiplier/divider and analog input functionality. The 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. The pump shall also accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- programmable timer functionality. The pump shall be configured with an integral, programmable 2-week, 81 event timer to change operational state of the pump. Timers external to the pump are not acceptable.

Or

- pulse multiplier/divider, analog input, and programmable timer functionality (as described above).

G. The pump shall be equipped with the programmable function of auxiliary frequency control, allowing for quick priming of the pump or for slug feed of process during initial start up after shutdown. Stroke frequency shall be programmable to the maximum for the pump, and the auxiliary frequency function shall be capable of interfacing with a contact closure relay for control purposes.

2.5 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 LED.

B. 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both fault indication and pacing relay. ((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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.The pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

Or

- both 4-20mA output and fault indication. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The metering pump shall also 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both 4-20mA output and pacing relay. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The metering pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

2.6 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: black, UV-protected polypropylene//304 stainless steel//FRP grating)) support stand suitable for wall, floor or top-of-tank mounting. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system under conditions of maximum rated pump pressure, prior to shipment.The stand shall include the following accessories, pre-piped.

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 5-pole round plastic connector and 5-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 mounted on a valved bypass 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 backpressure/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. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.

K. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump//skid.

2.7 APPLICATION

A. Quantity:
B. Chemical Service:
C. Capacity (U.S. gph):
D. Backpressure (psig):

END OF SECTION

Motor Pump Specifications

Sigma/2 HK (basic and control versions)

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC.

- SIGMA HK ((for flow rates from 0.12 gpd to 20 gph (basic) or to 17.2 gph (control))

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 simplex, motor-driven, reciprocating, packed plunger type. The pump shall include integral motor, oil-lubricated gear reducer and cam-and-spring drive mounted in an aluminum housing, such housing to be sealed into an outer plastic housing for corrosion protection with heat sink fins for cooling.
B. The chemical metering pump manufacturer shall provide a two year warranty on the pump drive and one year warranty on the pump liquid end, including packed plunger and O-rings.
C. The pump shall be fully tested to meet rated flow and pressure by the manufacturer.
D. The power supply shall be ____ VAC, ____ Hz, _____phase.

1.3 LIQUID END

- The liquid end shall be 316 stainless steel. The suction and discharge valve shall be 316 stainless steel with PTFE-faced Viton® gasket seals and stainless steel valve balls.

1.4 CONTROL

A. Stroke length control ((SELECT ONE))
- shall be adjustable manually by means of a stroke length knob, in increments of 1%, from 0% to 100% of stroke length.
- shall be adjustable by means of a stroke positioning motor from 0% to 100% of stroke length. The stroke positioning motor shall feature visual stroke length indication and adjust in proportion to a 4-20 mA signal.

B. Stroke frequency control ((SELECT ONE))

- shall be fixed at the pump's maximum stroke rate.Pump shall include a 1/3 HP, TEFC,four-pole AC motor.

- shall be switchable between manual or external control via 4-20 mA signal.In manual mode, stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the pump's LCD.In external mode, the pump shall be capable of receiving a 4-20 mA input via optional external control cable. 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. 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.

- shall be switchable between manual or external control via pulse signal. In manual mode, stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the pump's LCD. In external mode, the pump shall be capable of receiving a pulse train input via optional external control cable. The metering pump shall allow factoring to issue from 1 to 99.99 strokes per pulse input or to issue 1 stroke per 1 to 100 input pulses. 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.

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 LED.
B. 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, Inc. 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 universal control cable with 4 pole round plastic connector and 4-wire cable with loose ends shall be provided with each pump.

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

D. An adjustable discharge flow monitoring device mounted on a valved bypass shall be provided. The flow monitor shall be capable of signaling a fault condition to the metering pump.

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

END OF SECTION

Motor Pump Specifications

Sigma/3 HM (basic and control versions)

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. – SIGMA/3 HM (for flow rates from 46 to 264 gph)

PART 1 – GENERAL

1.1 GENERAL

A. This specification covers the supply, installation, and testing of completely functional metering pump systems including all accessories and appurtenances as shown on the drawings and described herein. A single chemical metering pump manufacturer shall be responsible for supplying all components of the metering feed system.

1.2 QUALITY ASSURANCE

A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc. All pumps shall be shop-tested for capacity and pressure prior to shipment, with documented results provided.

1.3 WARRANTY

A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 – PRODUCTS

2.1 GENERAL

A. Manufacturers:

1. ProMinent Fluid Controls, Inc.
2. Pre-approved equal.

2.2 DESCRIPTION

A. The chemical metering pump shall be a simplex, motor-driven, reciprocating, mechanically-actuated diaphragm type. The pump shall include integral motor, oil-lubricated gear reducer, and cam-and-spring drive mounted in an aluminum housing such housing to be sealed into an outer plastic housing for corrosion protection with heat sinks for cooling.

B. The power supply shall be ___VAC, ___Hz, ___Phase.

C. The liquid end shall be physically separated from the drive unit by a back plate with weephole creating air gap separation. An elastomer shaft wiper seal shall prevent contamination of the gear box by confining chemical within the back plate if the primary diaphragm fails. The primary diaphragm shall have a steel core, vulcanized into a nylon-reinforced EPDM backing, with PTFE-faced fluid contact surface.

D. ((OPTIONAL)) The liquid end shall also feature a secondary diaphragm separated from the primary diaphragm by a spacer plate with diaphragm-isolated pressure switch to close a contact for alarm annunciation and to prevent chemical spill or intrusion into pump drive upon failure of the primary diaphragm.

2.3 LIQUID END

A. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize diaphragm wear, liquid end dead volume, and to promote flow of solids in suspension.

((SELECT ONE))

- The liquid end shall be virgin PVDF. The suction and discharge valve shall be PVDF with PTFE faced Viton gasket seals and ceramic valve balls.

Or

- The liquid end shall be 316 stainless steel. The suction and discharge valves shall be 316 stainless steel with PTFE-faced Viton gasket seals and stainless steel valve balls.

2.4 CONTROL ((BASIC VERSION PUMP))

A. Stroke length control of the basic version pump

((SELECT ONE))

- shall be adjustable manually by means of a stroke length knob, in increments of 1.0%, from 0% to 100% of stroke length.

Or

- shall be adjustable by means of a stroke positioning motor from 0% to 100% of stroke length. The stroke positioning motor shall feature visual stroke length indication and manual/ external selector switch for local control via toggle switch or external control in proportion to a 4-20 mA signal.

B. Stroke frequency control of the basic version pump

((SELECT ONE))

- shall be fixed at the pump's maximum stroke rate. Pump shall include a 3/4 HP, TEFC, four-pole AC motor.

Or

- shall be controlled by DC SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and speed potentiometer. The DC voltage output to the motor shall be proportional to the potentiometer setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 3/4 HP, TENV, permanent magnet 90V DC motor.

Or

- shall be controlled by an SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and membrane keypad and digital display spannable to show RPM, percent output or flow rate. The actual motor speed, as measured by motor-mounted tachometer, shall be proportional to the rate setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 3/4 HP, TENV, permanent magnet 90V DC motor and Tach.

Or

- shall be controlled by an AC inverter system for stroke frequency control. The inverter shall include a wall mountable NEMA 4/12 enclosure with keypad and display of % load or output voltage. Selectable for local or remote operation via 4-20 mA signal. Pump shall include a 3/4 HP, inverter duty, 3-phase, 208-230 VAC motor. Minimum speed 3-30 Hz.

2.4 PROGRAMMING AND CONTROL ((CONTROL VERSION PUMP))

A. The metering pump shall be microprocessor-controlled. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD, which is readable at an offset of 45 degrees. Keypad will allow for simple scrolling of programmed parameters.

B. Stroke length control shall be adjustable manually by means of a stroke length, in increments of 1.0%, from 0 to 100% of stroke length. The LCD shall digitally display stroke length in 1% increments in the full range between 100% and 0%.

C. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning light will light and a flashing message “calib” will appear.

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or L/hr, dosing quantity, mA input being received by pump, and indication of external mode.

F. An AC inverter shall be integral to the microprocessor control and function of the pump. While 115VAC or 230VAC, 1 phase may be used to power the pump, the inverter shall drive a 1/2 HP, 230VAC, 3 phase motor. Stroke frequency shall be accomplished through microprocessor control with proportional start/stop of the motor, from 0% to 33% of stroke rate. Stroke rate shall be accomplished through variable speed of the motor from 34% to 100% of stroke rate. Stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the LCD. The pump shall be capable of receiving a pulse input via optional external control cable such that one pulse gives one pump stroke rate. The pump shall be capable of remote ON-OFF operation using the pause function via a voltage free contact relay through an optional control cable. In addition, the pump shall be configured with; ((OPTIONAL SELECTIONS))

- pulse multiplier/divider functionality. The 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.

Or

- analog input functionality. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- pulse multiplier/divider and analog input functionality. The 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. The pump shall also accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or

- programmable timer functionality. The pump shall be configured with an integral and programmable 2-week, 81 event timer to change the operational state of the pump. Timers external to the pump are not acceptable.

Or

- pulse multiplier/divider, analog input, and programmable timer functionality (as described above).

G. The pump shall be equipped with the programmable function of auxiliary frequency control, allowing for quick priming of the pump or for slug feed of process during initial start up after shutdown. Stroke frequency shall be programmable to the maximum for the pump, and the auxiliary frequency function shall be capable of interfacing with a contact closure for control purposes.

2.5 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 LED.

B. 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both fault indication and pacing relay. ((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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay. The pacing relay shall issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

Or

- both 4-20mA output and fault indication. ((OPTIONAL)) The analog output function shall be both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The metering pump shall also 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, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both 4-20mA output and pacing relay. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The pacing relay shall issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

2.6 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: black, UV-protected polypropylene// 304 stainless steel//FRP grating)) support stand suitable for wall, floor or top-of-tank mounting. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system under conditions of maximum rated pump pressure, prior to shipment. The stand shall include the following accessories, pre-piped.

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 5-pole round plastic connector and 5-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 mounted on a valved bypass 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 backpressure/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. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.

K. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump//skid.

2.7 APPLICATION

A. Quantity:
B. Chemical Service:
C. Capacity (U.S. gph):
D. Backpressure (psig)

END OF SECTION

Motor Pump Specifications

Makro TZMb

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC. - MAKRO HM/AM

SECTION - CHEMICAL METERING PUMP

PART 1 - GENERAL

1.01 DESCRIPTION

A. The chemical metering pump(s) shall be a motor-driven, mechanically actuated reciprocating diaphragm type positive displacement pump. The metering pump shall have a cast aluminum housing and shall be driven by a standard electric motor.

1.02 QUALITY ASSURANCE

A. The chemical metering pump manufacturer shall provide a two year warranty on the pump chassis components and one year warranty on the pump liquid end components, including diaphragm and O-rings.

B. The chemical metering pump shall be fully tested to meet rated flow and pressure, by the manufacturer prior to shipment.

C. All metering pump options and accessories shall be provided by the metering pump manufacturer to ensure system compatibility.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Chemical Metering Pump:

1. The Main Chassis of the pump, housing the drive train, shall be enclosed in a cast aluminum housing coated with corrosion resistant acrylic resin. The pump shall be driven by a standard electric motor whose drive rotation is reduced by a worm gear and converted into a recipricating motion by means of an excentric sleeve and transmitted by a conecting rod to the thrust rod creating a back and forth motion on the diaphram, hydraulically actuated diaphragm pumps will not be accepted . The stroke length is adjusted limiting the amount of the exentric (stroke amplitude modulation) via a knob on the pump control face. The pump shall be of a modular design to accommodate add-on pumps powered by a single electric motor.
2. The Motor shall be shall be a NEMA 56C frame and ____ HP ____ nominal AC voltage, 60 Hz TEFC 1750 RPM, _____ phase AC motor. ((Optional DC motor with SCR controller))
3. The Liquid End shall be physically separated from the main chassis with an air gap back plate, complete with drip port. The suction and discharge valves shall be of the single ball check design with the ball checks mounted internally in the valves. The diaphragm shall consist of a steel core vulcanized into an EPDM elastomer reinforced with nylon fabric and Teflon coated on the media contact surface.

((SELECT ONE))

_ The liquid end shall be constructed of polypropylene. The suction and discharge valve shall be constructed of polypropylene with ((EPDM or Viton)) seals and ceramic valve balls.

_ The liquid end shall be constructed of PVC. The suction and discharge valve shall be constructed of PVC with Viton seals and ceramic valve balls.

_ The liquid end shall be constructed of carbon-loaded PTFE. The suction and discharge valve shall be constructed of carbon-loaded PTFE with PTFE seals and ceramic valve balls.

_ The liquid end shall be constructed of 316 stainless steel. The suction and discharge valve shall be constructed of 316 stainless steel with PTFE seals and ceramic valve balls.

B. Metering Pump Control:

1. Stroke Length Control shall be manually adjusted between 100% and 0% with a stroke adjusting knob on the pump. ((OPTIONAL Stroke Length Control shall be automatically positioned with an electric motor with 2 limit switches for maximum and minimum positions.))
2. Stroke Frequency Control:

a. Basic version - the pumping stoke frequency is not adjustable. On-off via the use of standard motor starter switch controls pump operation, when on, the pump meters continuously.

b. Analog - ((OPTIONAL)) the metering pump shall have a SCR/DC drive system for stroke frequency control. The stroke frequency shall be proportional to the direct input of a remotely generated analog signal. The SCR/DC motor system shall be ____ hp motor, TEFC 1725 RPM, max, operating with 120/240 nominal single phase AC voltage, accepting 4-20 mA input signal.

3. Flow Assurance:

a. Low Level Control - the metering pump shall automatically stop pumping prior to loosing prime through the use of an OPTIONAL single-stage Float Switch.

b. Diaphragm-failure Detector - ((OPTIONAL with some models)) a detector shall be provide to signal the metering pump in the event of diaphragm failure.

C. Capacity Specifications:

1. All components of the liquid end must be compatible with_____ Solution.
2. The pump shall produce ____ gph, at ___ psi at maximum capacity.

D. Acceptable Manufacturer:

1. PROMINENT FLUID CONTROLS, INC.,
Makro model _____
2. or approved equal.

2.02 ACCESSORIES

A. ((OPTIONAL)) A foot valve and strainer shall be provided with each pump.

B. ((OPTIONAL)) A spring loaded injection valve shall be provided with each pump.

C. Backpressure and/or Pressure Relief Valve - ((OPTIONAL)) a backpressure valve (and/or pressure relief valve shall be provided with each metering pump.

D. Pulsation Dampener - ((OPTIONAL)) A flow pulsation dampener shall be provided-with each metering pump.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The metering pump installation shall be in accordance with manufacturers recommendations.

END OF SECTION

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“analytical instrumentation” T.O.C. VIII

CATALOG SECTION TABS

ProMinent® D1C and D2C Analyzers

Overview: D1C and D2C

An Introduction to Process Measurement and Control

Process control in water treatment involves measurement of a variable related to water quality, combined with automation of chemical feed equipment or other physical/chemical processes to keep the measured value as close as possible to the desired setpoint or between high and low control limits.

ProMinent's approach combines the functions of an analyzer and a controller into one instrument, dedicated to a specific water quality parameter to simplify calibration and operation.

Each ProMinent DULCOTEST® sensor measures a specific water quality parameter and sends an electronic signal back to a DULCOMETER® controller. The operator calibrates that sensor to a known standard. It then displays any changes that are measured in that parameter within the sensor's range.

Measured Value Outputs

Up to two outputs are available. DULCOMETER® controllers offer the ability to continuously record measured values to document water quality or to send to another control device. Analog 4-20 mA or 0-20 mA measured value outputs are proportional to the measuring range of the sensor or spannable to provide greater detail within a smaller range, for connection to a chart recorder, datalogger or distributed control system [D1C/D2C controllers and DULCOMETER® transmitters (monitor only)]

Control Outputs

Different control outputs are available to control virtually any type of actuating device.

Setpoint relays change state (open or close contact) when the measured value drops below or exceeds the setpoint to start a process control device or alarm, and shut it off when the setpoint is reached (D1C or D2C).

Analog control outputs (4-20 or 0-20 mA) can drive a variable speed analog control device, such as a DC SCR drive or AC inverter, according to the control action used (D1C or D2C).

Pulse outputs are brief contact closures to pace pulse-input metering pumps corresponding to the control action used (D1C).

Modulating relay outputs cause a relay to open and close according to the control action used. These are used with solenoid valves or constant-speed motor-driven metering pumps. Minimum on-times may be set to prevent overheating of motors (D1C or D2C).

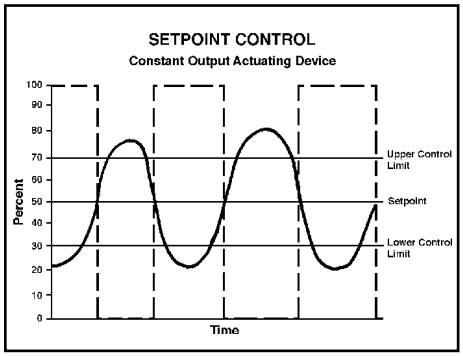
3P relays provide two relay outputs to control a bi-directional actuator (such as a stroke length controller on a metering pump) with provision for feedback potentiometer from the actuator to display the position according to the control action used (D1C or D2C).

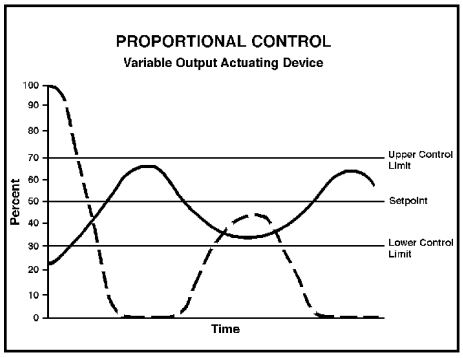
CONTROL ACTION RESPONSE IN ONCE-THROUGH SYSTEMS

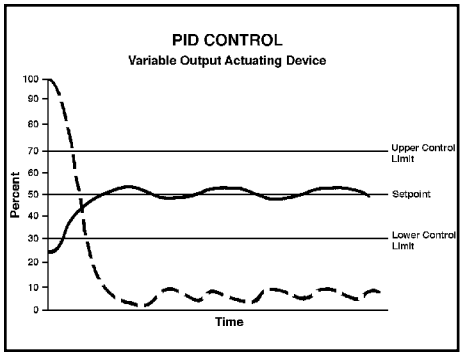
Note: Actuating device output increases measured value in example (e.g. chlorine feed)

—— Measured value (as percent of measurement range)

– – Actuating device output (as percent)







Control Actions

A variety of control actions are available to suit the application and budget. Any variable control output listed above may be used with any of the control actions listed below.

Setpoint Control

Setpoint control uses a setpoint relay to start a constant output pump or open a solenoid valve when the measured value drops below (or exceeds) the setpoint. Once the measured value reaches setpoint again, the pump stops or the valve closes. This always results in overshooting the setpoint because of the lag time between the point of chemical addition and the point of measurement. This can waste chemicals and cause excessive variation on either side of the setpoint. It is suited only for closed systems or batch applications where tight control is not required (D1C or D2C).

ProMinent® D1C and D2C Analyzers

Overview: D1C and D2C

Proportional Control

Proportional control gives an output that is directly proportional to the measured value's deviation from the setpoint. The farther from setpoint, the greater the output of the actuating device, and the closer to setpoint, the lesser the output. Proportional control is suitable for closed systems or batch applications where more precise control is required. The proportional bandwidth may be spanned to set the distance from setpoint at which the actuating device is operating at maximum output. A small bandwidth results in maximum output at a measured value close to setpoint, and may cause overshooting. A large bandwidth may result in long time periods required until the setpoint is reached (D1C or D2C).

PID Control

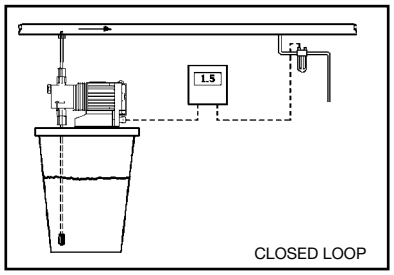
PID control combines proportional, integral and derivative control actions, or any combination thereof.

Integral control considers the time interval of deviation and increases output when the deviation exceeds a programmed time interval. Derivative control considers the rate of change of deviation and increases the output when the rate of deviation exceeds a programmed rate. PID control ensures the least deviation from setpoint possible (D1C, D2C).

Control Techniques

The control technique used depends on the location of the sensor in relation to the actuating device, the presence of other inputs which may effect the measured value, or the requirement for secondary actuating devices to handle large swings. Some common control techniques are described below.

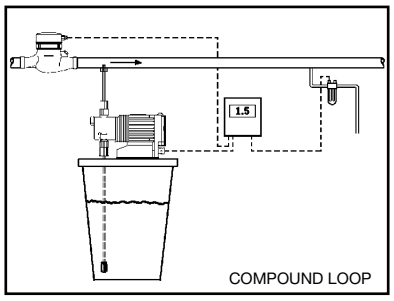
Closed loop control is where the sensor is located downstream of the actuating device and measures changes caused by the device. The controller varies the device's output to maintain the desired setpoint. This is usually used in recirculating or batch applications,



CLOSED LOOP

or once-through systems with constant flow rate. The sensor must be located far enough downstream to ensure that any physical/chemical changes are complete, whether measuring pH, oxidant residuals or other variables (D1C or D2C).

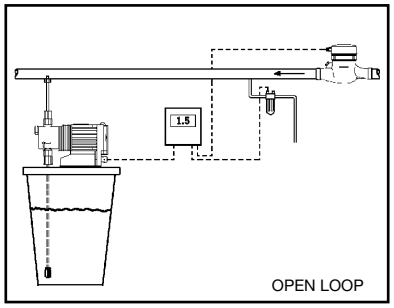
Compound loop control combines the closed loop signal from the



COMPOUND LOOP

sensor with a second (disturbance) input, normally water flow rate, and changes the actuating device's output in response to both variables. This is typically used in once-through applications with varying flow rates (D1C).

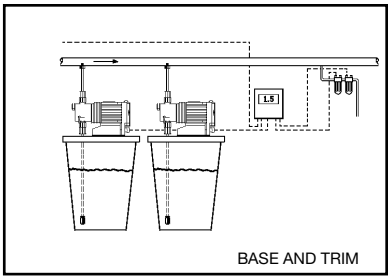
With open loop control, the sensor is upstream of the actuating device



OPEN LOOP

and a control signal changes the actuating device's output. Usually, this is only used when the resulting measured value would be outside of the sensor's measuring range (D1C or D2C).

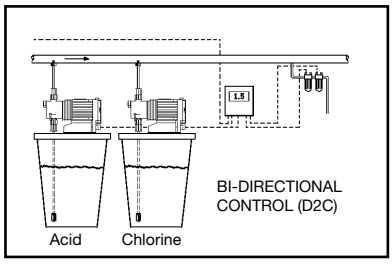
Base and trim control uses two actuating devices to bring large fluctuations into control very quickly, yet provide tight control under normal operation. A variable output actuating device is normally used with proportional or PID control for the trim or fine tuning. A constant



BASE AND TRIM

output device would be started by a setpoint relay for the base load to make fast changes in the event of large fluctuations that the trim device cannot handle (D1C or D2C).

Bi-directional control of two opposing actuating devices, such as pumps for acid and base in a pH control application, is possible with one controller (D1C or D2C). To prevent repeated corrections caused by overshooting on both sides, a deadband may be programmed (between two setpoints) in which both actuating devices are stopped (D1C or D2C).



PROPORTIONAL CONTROL ONLY (BATCH LINE)

ProMinent® D1C and D2C Analyzers

Specifications

Temperature data (Panel Mount)

Permissible ambient temperature

Basic version: Control panel installation: 32° to 122°F (0° to 50°C)
Installation in wall-mounted housing: 23° to 113°F (-5° to 45°C)

Extended version (with status feedback or with correction value via mA or with disturbance variable via mA: Control panel installation: 32° to 113°F (0° to 45°C)
Installation in wall-mounted housing: 23° to 104°F (-5° to 40°C)

Permissible storage temperature: Control panel installation: 14° to 158°F (-10° to 70°C)

Material data/chemical resistance:

Part	Material
Housing and frame	PPO GF 10
Rear panel	PPE GF 20
Membrane keypad	Polyester film PET
Seal, outside	Cellular rubber CR
Seal, inside	Silicon-based sealing compound
Retaining clip and screws	Galvanized steel

Temperature data (Wall Mount)

Permissible ambient temperature

Basic version: 23° to 122°F (-5° to 50°C)
Installation in wall-mounted housing: 23° to 113°F (-5° to 45°C)

Extended version (with status feedback or with correction value via mA or with disturbance variable via mA: 23° to 104°F (-5° to 40°C)

Permissible storage temperature: 14° to 158°F (-10° to 70°C)

Material data/chemical resistance:

Part	Material
Housing	Luranyl PPE GF 10
Membrane keypad	Polyester film PET
Housing seal	Cellular rubber CR
Outer seal	Cellular rubber CR
Retaining bracket	Galvanized steel
M5 screws	A2

Standards: Supply voltage in accordance with DIN IEC 38
Electrical safety in accordance with EN 61010-1
Electromagnetic emitted interference in accordance with EN 55011 Gr.1/C1.A
CSA special inspection

Electrical data:	**Panel Mount**	**Wall Mount**
Rated voltage:	115/230 VAC, 50/60 Hz	115/230 VAC, 50/60 Hz
Max. power input:	140 mA at 115 V 70 mA at 230 V	120 mA at 115 V 60 mA at 230 V
Internal fuse protection:	Fine-wire fuse 5 x 20 mm 250 V slow-blow 100-115 V = 315 mA 200-230 V = 160 mA	Fine-wire fuse 5 x 20 mm 250 V slow-blow 100-115 V = 315 mA 200-230 V = 160 mA

Rated voltage: 100/200 VAC, 50/60 Hz
Max. power input: 150 mA at 100 V
75 mA at 200 V

Internal fuse protection: Fine-wire fuse 5 x 20 mm
250V slow-blow
100-115 V = 315 mA
200-230 V = 160 mA

Electrical data for both wall mount and panel mount D1C's

Rated voltage: 24 VDC or 24 VAC, 50/60 Hz (low voltage operation only)
Internal fuse protection: Fine-wire fuse 5 x 20 mm
250 V slow-blow, 100-115 V = 315 mA, 200-230 V = 160 mA

ProMinent® D1C and D2C Analyzers

Specifications

Sensor input via SN6 socket:

Input impedance > 10^{12} W
Input impedance with reference electrode with respect to:
Device ground: <1 kW
Input range: ±1 V
Accuracy: ±0.5% of input range
Resolution: 0.0625% of input range
Connection facility for one potential equalization electrode (solution ground). As an alternative, two connection terminals can be connected with a wire jumper.

Sensor input via terminals:

Input impedance: >5 x 10^{11} W
Input impedance with reference electrode with respect to:
Device ground: <1 kW
Input range: ±1 V
Accuracy: ±0.5% of input range
Resolution: 0.0625% of input range
Connection facility for one potential equalization electrode (solution ground). As an alternative, two connection terminals can be connected with a wire jumper.

Standard signal input for measured variable:

Input range: 0/4...20 mA (programmable)
Input impedance: 50 W (Panel Mount); -50 W (Wall Mount)
Accuracy: 0.5% of input range
Resolution: 0.014/0.012 mA
Supply voltage and current for external electronics: 20 V ±0.5 V, 20 mA

Standard signal input for correction measured value or disturbance variable mA:

Galvanically isolated from remaining inputs and outputs
Insulation voltage: 500 V
Input range: 0/4...20 mA (programmable)
Input resistance: 50 W
Accuracy: 0.5% of input range
Resolution: 0.014/0.012 mA
Supply voltage and current for external electronics: 23 V ±1 V, 20 mA **(Panel)**
19 V ±1.5 V, 20 mA **(Wall)**

Pt100 input:

Input range: 32° to 212°F (0° to 100°C)
Accuracy: ±0.5°C
Resolution: 0.1°C

Digital inputs:

Common reference potential with respect to each other and with the RS 232 interface, but galvanically isolated from remaining inputs and outputs
Insulation voltage: 500 V (Wall Mount only)
Disturbance variable: Up to 10 Hz or up to 500 Hz (as per identity code/ programmable)

Status signaling input:

Galvanically isolated from remaining inputs and outputs
Insulation voltage: 500 V
Potentiometer to be connected: 800 W ...10 kW
Accuracy (without potentiometer error): 1% of input range
Resolution: 0.5% of input range

Current output:

Galvanically isolated from remaining inputs and outputs
Insulation voltage: 500 V (Wall Mount only)
Output range: 0/4...20 mA (programmable)
Maximum load: 600 W
Accuracy: 0.5% of output range with respect to displayed value

Frequency outputs (Reed relay)

Type of contact: n/o contact, interference suppressed with varistors
Load capacity: 100 V peak, 0.5 A switching current (Panel Mount)
25 V peak, 0.5 A switching current (Wall Mount)

for pump control:

Contact service life: >50 x 10^6 switching operations at contact load 10 V, 10 mA
Max. frequency: 8.33 Hz (500 strokes/min)
Closing time: 100 ms

Power relay output for alarm signaling:

Type of contact: Changeover contact, interference supressed with varistors
Load capacity: 250 VAC, 3 A, 700 VA
Contact service life: >50 x 10^6 switching operations (Panel Mount)
>20 x 10^6 switching operations (Wall Mount)

ProMinent® D1C and D2C Analyzers

Specifications

Power relay output for	Type of contact:	n/o contact, interference supressed with varistors
for control variable output	Load capacity:	250 VAC, 3 A, 700 VA
or limit value signaling:	Contact service life:	>20 x 10^6 switching operations

Electrotechnical Safety/Radio Interference Protection:

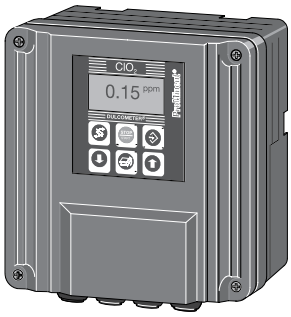
EC low voltage directive (73/23/EEC) subsequently 93/44/EEC
EC EMC directive (89/336/EEC) subsequently 92/31/EEC
Supply voltage in accordance with DIN IEC 38
Electrical safety in accordance with EN 61010-1
Electromagnetic emitted interference in accordance with EN 55011 Gr. 1/Cl B
Noise immunity in accordance with IEC 801-2, -3, -4 or DIN VDE 0843, Part 2,
Part 3, Part 4 or *EN 50082-2*

EN 60335-1:	Safety of electrical devices for domestic use
EN 50081-1:	EMC, emitted interference, residential
EN 50082-2:	EMC, noise immunity, industrial
EN 60555-2:	EMC, reactions in power supply networks, harmonics
EN 60555-3:	EMC, reactions in power supply networks, voltage fluctuations

ProMinent® D1C and D2C Analyzers

Technical Data

Measurement range:	Cl_2	0.00 - 0.500/2.00/5.00/10.0/ 20/50/100 ppm
	ClO_2	0.00 - 0.500/2.00/10.0/20.0 ppm
	Br	0.02 - 2.00/0.1 - 10.0 ppm
	O_3	0.00 - 2.00 ppm/l
	Dissolved oxygen	0.1 - 10/0.1 - 20 ppm
	Chlorite	0.02 - 0.50/0.1 - 2 ppm
Resolution:	0.001/0.01 ppm/l/0.1 %	
Accuracy:	0.5 % from measurement range	
Measurement input:	Standard signal terminal 0/4-20 mA	
Correction variable:	pH (Cl_2 version only) Temperature via Pt 100 (ClO_2 version only)	
Correction range temp.:	50 - 113 °F (10 - 45°C) (ClO_2 version only)	
Correction range pH:	7.0 - 8.5 pH (ClO_2 version only)	
Disturbance signals:	Additive/multiplicative	
Control characteristic:	P/PID control	
Control:	Bidirectional control	
Signal current output:	2 x electrically isolated 0/4-20 mA max. load 600 Ω (2nd output, 400 Ω) Adjustable range and direction (measured, correction and control variable)	
Control outputs:	2 reed contacts (pulse rate, for pump control) 2 relays (pulse length, 3P or limit value) 2 x 0/4-20 mA	
Alarm relay:	250 V~3 A, 700 VA changeover contact	
Power supply:	24 V~ =/100 V~/115 V~/200 V~/230 V~ ±10 %	
Ambient temperature:	Control panel version: 32 - 122°F (0-50°C) [32 - 113°F (0-45°C) with fully expanded units]	
	Wall mounted: 23 - 122°F (-5 - 50°C) [23 - 104°F (-5 - 40°C) with fully expanded units]	



Wall Mount

Mounting

- **Wall mount**: Nonmetallic enclosure with protective gland-style strain relief cable sockets

  Dimensions: 7.87”H x 7.87”W x 3.00”D (200 mm x 200 mm x 76 mm)

  Cable glands: Five Pg11, Five Pg7

  Weight: Approx. 2.6 lbs. (1.2 kg) Shipping Weight: 4.4 lbs. (2.0 kg)

  Mounting: Detachable wall mount bracket

  Protection class: NEMA 4X (IP 65)

- **Panel mount:**

  Dimensions: 3.78”H x 3.78”W x 5.50”D (96 mm x 96mm x 140 mm)

  Weight: Approximately 1.87 lbs. (850 g); 2.6 lbs. (1200 g) shipping weight

  Protection class: NEMA 3 (IP 54) when mounted in panel

ProMinent® D1C and D2C Analyzers

Typical Applications

pH - Control acid and/or base feed via metering pumps or valves to adjust pH

ORP - Control hypochlorite metering pump to maintain oxidant residual; or control sulfonator or bisulfite metering pump for dechlorination

Free Chlorine - Control chlorination or hypochlorite metering pump to maintain residual

Total Chlorine - Control chlorination or hypochlorite metering pump to maintain residual; or control sulfonator or bisulfite metering pump for dechlorination

Bromine - Control tablet brominator via solenoid valve; or bromine solution metering pump to maintain residual

Conductivity - Control conductivity through valve on blowdown/makeup for rinse bath, boiler or cooling tower

Dissolved Ozone - Control ozone generator output to maintain residual

Dissolved Oxygen - Control aeration units to limit energy usage or for nitrification/dentrification

Chlorite - Control chlorite as a by-product of the chlorine dioxide process

Fluoride - Monitor fluoride concentration in potable water

Chlorine Dioxide - Control chlorine dioxide generator output to maintain residual

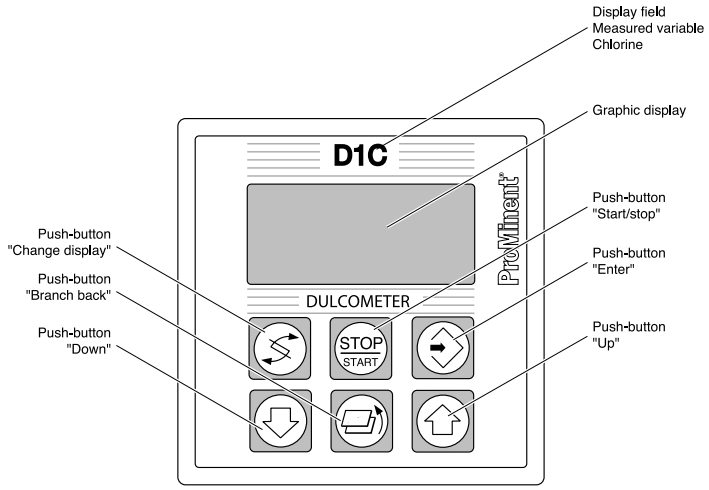
Temperature - Control heater or heat exchanger to maintain bath temperature or process cooling

Analog Signal Inputs - Control virtually any measureable and adjustable process where the measuring device has an analog output and the adjusting device may be controlled by one of the D1C's available control outputs

Peracetic Acid - Monitor or control concentration to ensure disinfection

Hydrogen Peroxide - Control peroxide metering pump for oxidation or advanced oxidation (AOX) systems

User Interface



	CHANGE DISPLAY menu button To change over within a menu level and to change from one variable to another within a menu point.
STOP START	START/STOP menu button Start/stop of control and metering function.
	ENTER menu button To accept, confirm or save a displayed value or status. For alarm acknowledgement.

	UP menu button To increase a displayed numerical value and to change variables (flashing display)
	BRANCH BACK menu button To exit operating menu (back to start of relevant setting).
	DOWN menu button To decrease a displayed numerical value and to change variables (flashing display).

ProMinent® D1C and D2C Analyzers

Identcode Overview (D1C/ D2C)

NOTE: OPTIONS ARE NOT IDENTICAL FOR THE D1C / D2C CONTROLLERS. REFER TO THE IDENTITY CODE.

SERIES:

D1C = Single variable controller

D2C = Dual variable controller

SERIES VERSION:

A = Standard

MOUNTING:

W = Wall mount enclosed in NEMA 4X non-metallic housing. Includes detachable mounting plate in back to allow easy removal from wall. Features five Pg11 and five Pg7 glands for wiring power cord, relays, SN6 connectors, etc.

D = Panel mount (no enclosure). Fits 3.78" x 3.78" (9.6 cm x 9.6 cm) opening, 5.51" (14 cm) depth. The unit must be mounted in an enclosure suitable for the environment. The controllers's membrane switch face and gasketed frame provide NEMA 3 (IP 54) protection; mounting hardware included. For optional wall mount enclosure for the panel mount controller, see PN 790235.

OPERATING VOLTAGE:

0 = 230 VAC, 50/60 Hz, 1 phase
1 = 115 VAC, 50/60 Hz, 1 phase
4 = 24 V AC/DC

Note: Power cord not included with unit. For 115 V US power cord, see PN 741203.

D1C MEASURED VARIABLES:

P = pH: For wall mount, use connection 2 (SN6) for push-and-twist connectors with pH sensors. For panel mount, use terminal connection 5 for same sensors. For distances between 30 and 300 feet from sensor to controller, add impedance converter, PN 305350. For distances > 300 feet from sensor to controller or with stray currents, use connection 1 with signal converter pH-V1 (PN 809126) giving 4-20 mA output.

R = Oxidation Reduction Potential: For wall mount, use connection 2 (SN6) for push-and-twist connectors with ORP sensors. For panel mount, use terminal connection 5 for same sensors. For distances between 30 and 300 feet from sensor to D1C, add impedance converter, PN 305350. For distances > 300 feet from sensor to D1C or with stray currents, use connection 1 with signal converter RH-V1 (PN 809127) giving 4-20 mA output.

C = Chlorine; use connection 1. For free chlorine (hypochlorous acid) measurement, use CLE-3-mA sensors. See "correcting value" for optional pH correction on free chlorine. For total chlorine, use CTE-mA sensors.

B = Bromine; use connection 1 and bromine BRE 1-mA-10 ppm sensor.

L = Conductivity; use connection 1 for conductivity cells with transducer giving 4-20 mA output. Use connection 3 for standard conductivity cells.

Z = Ozone; use connection 1 and OZE 3-mA-2 ppm sensor.

X = Dissolved Oxygen; Use connection 1 and DO1-mA-20 ppm sensor.

D = Chlorine Dioxide; use connection 1 and CDE 2-mA - 0.5 ppm, 2 ppm or 10 ppm sensors, or the CDP with PT 100.

T = Temperature; use connection 4, terminal, with PT100 sensor. For distances > 30 feet from sensor to D1C, use connection 1 with signal converter PT-100-V1 (PN 809128) giving 4-20 mA output.

S = Standard signal 0/4-20 mA. Use connection 1 with any measuring device that outputs a 0-20 or 4-20 mA signal corresponding to the measured value. Display is as a percent of input current.

A = Peracetic Acid; use connection 1 with PAA transducer (PN 741128).

H = Hydrogen Peroxide; use connection 1 with Perox transducer (PN 741129).

D2C MEASURED VARIABLES:

PC= pH/chlorine: See above descriptions for each variable.

PR= pH/Oxidation Reduction Potential: See above descriptions for each variable. (Requires Signal Converter PN 809127)

PP = pH/pH: See above descriptions for each variable. (Requires Signal Converter PN 809126) Variable 1 can be controlled, Variable 2 is for monitoring.

CC= Free Chlorine/Total chlorine: See above descriptions for each variable.

PD=pH/chlorine dioxide: See above descriptions for each variable. (Requires Signal Converter PN 809126) Variable 1 can be controlled, Variable 2 is for monitoring.

CONNECTION FOR SENSOR INPUT (FOR VARIABLE 1 CONNECTION ON D2C CONTROLLERS):

1 = Standard signal 0/4-20 mA

2 = SN6 plug connector for pH (P) or ORP (R). Usually, this is only used with the wall mount since SN6 plugs cannot pass through cable glands on a panel mount enclosure.

3 = Terminal for standard conductivity cell (L)

4 = Terminal for PT 100 temperature sensor (T)

5 = Terminal for mV input on standard pH (P) or ORP (R) sensors

CORRECTING VALUE:

0 = None

1 = pH for free chlorine (total chlorine does not require pH correction); corrects CLE sensor's hypochlorous acid (HOCl) measurement by chlorine dissociation curve to display free chlorine (HOCl + OCl^-).The correcting pH input must be a 4-20 mA signal, requiring signal converter PH-V1 (PN 809126).

2 = Temperature for P or L via terminal for PT-100 sensor. Required for accurate pH measurement when operating at extreme pH values and high temperatures. Required for accurate conductivity measurement at varied temperatures. (Temperature monitoring only for other variables)

3 = Temperature for P or L via 0/4-20 mA signal; used with signal converter PT-100-V1 (PN 809128) and PT-100 sensor. Feed Forward control is not possible with this option. (Temperature monitoring only for other variables)

4 = Manual temperature entry for P or L (no sensor); used where temperature is constant.

ProMinent® D1C and D2C Analyzers

Identcode Overview (D1C/ D2C)

FEED FORWARD CONTROL - The D1C's control output is based on measured value; however, with feed forward control, a signal from a flow meter proportions the control output considering both the measured value and process flow rate. This eliminates the need for both variable speed drives and stroke positoners on compound loop control metering pumps. Several types of signals may be accepted proportional to process flow:

0 = None

1 = 0/4-20 mA signal (such as from a magmeter or open channel flow meter) Note: cannot be used for chlorine measurement with pH compensation (D1C)

2 = 0-500 Hz signal (such as from a paddlewheel sensor)

3 = 0-10 Hz (0-600 pulses/min.) signal (such as from a pulse-type water meter)

PAUSE CONTACT - The pause contact allows the controller to continue monitoring measured value, but stops control outputs when the NC contact is opened. This may be used to stop metering when a main water pump is stopped, or when water flow in the sample line to the sensor is blocked as signaled by the DGMa rotameter:

0 = None (D1C); Pause contact (D2C)

1 = Pause contact (D1C)

ANALOG OUTPUTS (0/4-20 mA) - Analog outputs can be programmed as a control output or a measured value output for recording. Up to 2 analog outputs are possible except for Hydrogen Peroxide and Peracetic Acid controllers.

0 = None

1 = Measured value; normally used for chart recorder, datalogger or DCS.

2 = Control action; normally used to control a variable speed drive or actuator.

3 = Measured correcting value; normally used for recording or as input to a second D1C.

4 = Two current outputs (Not for measured variables A and H)

RELAY OUTPUTS:

G= Alarm + 2 limit relays: limits may be on either side of setpoint, or both limits may alarm on one side, such as low limit and low, low limit. May be used to start a constant rate feeder for simple setpoint control, or a baseline feeder to handle large swings with trim pump on the control output.

M = Alarm + 2 control relays: used to start and stop constant speed pumps or to open and close solenoid valves for opposing functions. Modulating output corresponds to the control action selected (proportional or PID). The minimum "on-time" period may be adjusted from 1 to 9,999 seconds.

R = Alarm + 2 positioner relays with positioner feedback from 1 kOhm feedback potentiometer. Positioner status displayed on LCD. Used for ProMinent 3P stroke positioning motors or valve positioners. Output corresponds to the control action selected (propor tional or PID).

PUMP PACING - gives pulse outputs for controlling 1 or 2 metering pumps:

0 = None

2 = Outputs for one or two pulse-control metering pumps (spannable from 0-500 pulses per minute); for opposing functions. Pulse (dry contact) output corresponds to the control action selected (proportional or PID).

CONTROL ACTION:

0 = None; for use as monitor or setpoint relay controller only.

1 = Proportional control; used for batch processes, where output signal is proportional to the measured variable such that the farther from setpoint the greater the output; the closer to setpoint the lesser the output.

2 = PID control; used for once-through or difficult to control processes, providing proportional, integral and derivative control actions, or a combination thereof.

INTERFACE:

0 = None (Future versions will have RS interface available)

LANGUAGE - Note that it is possible to change among other languages in the field, as indicated in parentheses:

†E = English (D, F, N)
†D = German (E, F, N)
†F = French (D, E, N)
H = German (F, I, S)
S = Spanish (D, I, F)
I = Italian (D, F, S)

Call for other available languages.

†Languages available for measured variables A and H

NOTE: Power cord not included.

Power cord, 6 ft. (2 m) 115 VAC
741203

Power cord, 6 ft. (2 m) 230 VAC
7724015

ProMinent® D1C and D2C Analyzers

Identcode Ordering System (D1C)

D1C **DULCOMETER one-variable**

Series version:
A Standard

Type of mounting:
W Wall mounting
D Panel mounting

Operating voltage:
0 230 V, 50/60 Hz
1 115 V, 50/60 Hz
2 200 V, 50/60 Hz (control panel version only)
3 100 V, 50/60 Hz (control panel version only)
4 24 V AC/DC

Note: Power cord not included with unit. For 115 V US & Canada power cord, see PN. 741203

Measured variables:
P pH 0-14 (mV)
R Redox/ORP -1000...+1000 (mV)
C Chlorine (0-0.5/2/5/10/20/50/100 ppm) (mA)
B Bromine (0-10 ppm) (mA)
L Conductivity (Separate)
Z Ozone (0-2 ppm) (mA)
X Dissolved oxygen (0.1-10/20 ppm) (mA)
D Chlorine dioxide (mA)
T Temperature (32-212 F, 0-100 C) (Seperate)
S Standard process signal (0/4-20 mA)
A Peracetic acid (mA)
H Hydrogen peroxide (mA)
K Conductivity for cooling tower control
I Chlorite (0-0.5/2 ppm) (mA)

Measured variable connection:
1 Standard signal 0/4-20 mA (old style PAA and H202 sensors)
2 SN6 plug (From pH or ORP sensor cable)
3 Terminal for standard conductivity cell (L)
4 Terminal for PT 100 temperature sensor (T)
5 Terminal for mV signal (From pH or ORP sensor cable)
6 Terminal inductive conductivity sensors
7 Standard signal 0/4-20 mA (for PAA and H202 25mm sensors)

Correcting value: (** Not available for measured variables A & H)
0 None**
1 pH for free chlorine via 4-20 mA signal
2 Temperature correction terminal for P or L (Temperature monitoring only for other variables)
3 Temperature correction terminal for 4-20 mA signal for P or L (Temperature monitoring only for other variables)
4 Manual temperature setting for P or L

Feed forward control:
0 None
1 0/4-20 mA standard signal
2 0-500 Hz signal
3 0-10 Hz signal
4 0/4-20 mA standard signal, parameter set switching
5 Parameter set switching

Pause contact:
0 None
1 Pause contact

Analog signal output (0/4-20 mA): (** Not available for measured variables A & H)
0 None
1 Measured value (For recording)
2 Control action
3 Measured correcting value
4 Two current outputs **

Relay outputs:
G Alarm + 2 limit relays
M Alarm + 2 control relays
R Alarm + positioner relays w/ position feedback potentiometer
S Alarm + servomotor (desalination vavle only)

Pump pacing:
0 None
2 Two pulse control outputs

Control action:
0 None
1 Proportional control
2 PID control

Interface:
0 None

Language: (Other Languages available)
E English

D1C A W 1 P 2 2 1 1 1 G 2 2 0 E

ProMinent® D1C and D2C Analyzers

Identcode Ordering System (D2C)

D2C **DULCOMETER two channel controller**

Series version:
A Standard

Type of mounting:
W Wall mounting (IP 65)
D Panel mounting (IP 54)

Operating voltage:
0 230 VAC, 50/60 Hz, 1 ph.
1 115 VAC, 50/60 Hz, 1 ph.
4 24 V AC/DC

Note: Power cord not included with unit. For 115 V US & Canada power cord, see PN. 741203

Measured variables (measured variable 1/ measured variable 2):
PC pH/chlorine (pH 0-14; 0-0.5/2/5/10/20/50/100 ppm)
PR pH/redox (pH 0-14; 0-1000 mV)
PP pH/pH (0-14 pH)
CC Free chlorine/Total chlorine (0-0.5/2/5/10/20/50/100 ppm)
PD pH/chlorine dioxide (0-0.5/2/10/20 ppm)

Measured variable 1 connector (m.v. 2 always via 4-20 mA):
1 Standard signal 0/4-20 mA
2 SN6 plug (From pH or ORP sensor cable)
5 Terminal for mV signal (From pH or ORP sensor cable)

Correcting variable (temperature compensation for pH):
0 None**
2 Temperature for P via terminal (Pt 100) for pH only
4 Manual temperature setting for P or L

Disturbance signal:
0 None

Signal output:
0 None
4 2 Programmable 0/4-20 mA standard signal outputs

Relay outputs:
G Alarm + 2 limit values relay
M Alarm + 2 solenoid valve relay (pulse length control)

Control characteristic:
1 Proportional control
2 PID control

Protocol output:
0 None

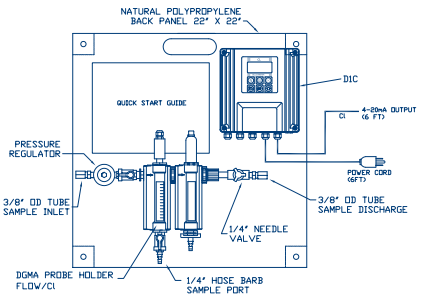
Language:
D German
E English

Note:
The pH/pH version contains only a 2-way controller.
Measured variable 2 can be used for moniitoring tasks.

D2C A W 0 PC 1 0 0 4 G 1 0 E

ProMinent® D1C and D2C Analyzers

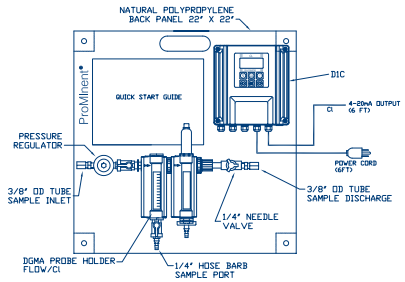
D1C Chlorine QuickPick Packages



Total Chlorine Analyzer

D1C part no. (D1CAW1C10114G220E)
Total chlorine analyzer mounted on a backplate for easy installation. The package is pre-wired and plumbed with 3/8" tubing connectors for sample inlet and outlet connections.

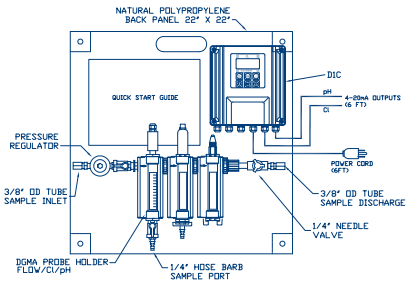
	Part No.
Total Chlorine Analyzer	7745160
Please indicate sensor when ordering package	
Total Chlorine Sensor (10 ppm)	740684
Total Chlorine Sensor (5 ppm)	1003203
Total Chlorine Sensor (2 ppm)	740685



Total Chlorine Monitor

D1C part no. (D1CAW1C10001G000E)
Total chlorine monitor mounted on a backplate for easy installation. The package is pre-wired and plumbed with 3/8" tubing connectors for sample inlet and outlet connections.

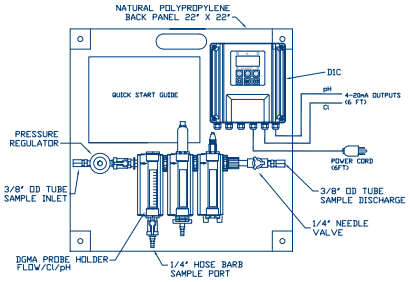
	Part No.
Total Chlorine Monitor	7745161
Please indicate sensor when ordering package	
Total Chlorine Sensor (10 ppm)	740684
Total Chlorine Sensor (5 ppm)	1003203
Total Chlorine Sensor (2 ppm)	740685



Free Chlorine Analyzer

D1C part no. (D1CAW1C11214G220E)
Free chlorine analyzer mounted on a backplate for easy installation. The package is pre-wired and plumbed with 3/8" tubing connectors for sample inlet and outlet connections.

	Part No.
Free Chlorine Analyzer	7745162
Please indicate sensor when ordering package	
Free Chlorine Sensor (50 ppm)	1020531
Free Chlorine Sensor (20 ppm)	1002964
Free Chlorine Sensor (10 ppm)	792919



Free Chlorine Monitor

D1C part no. (D1CAW1C11004G000E)
Free chlorine monitor mounted on a backplate for easy installation. The package is pre-wired and plumbed with 3/8" tubing connectors for sample inlet and outlet connections.

	Part No.
Free Chlorine Monitor	7745163
Please indicate sensor when ordering package	
Free Chlorine Sensor (50 ppm)	1020531
Free Chlorine Sensor (20 ppm)	1002964
Free Chlorine Sensor (10 ppm)	792919

ProMinent® D1C and D2C Analyzers

Fluoride Monitoring System

The D1C fluoride monitoring system incorporates the first buffer or reagent-free, ion specific sensor with a DULCOMETER® D1C fluoride monitor. The monitor features upper and lower limit relays with alarm, and analog output for recording.

Note: The fluoride D1C is for monitoring only.

Measuring Principle & Application

The D1C fluoride monitoring system is based on the principles of potentiometric measuring using a reagent-free, ion specific sensor & reference electrode. The fluoride sensor features a continuous electrode activation function, ensuring long-term stability of the measurement without the need for frequent recalibration or conditioning chemicals. The fluoride sensor automatically compensates temperature, but a temperature sensor is also used to compensate for fluctuation during application.

The fluoride sensor is recommended for use in water treatment only (patent pending). We recommend installation at atmospheric pressure.

Measuring Ranges & Operating Conditions of Fluoride Sensor

Measurement Range:	0.05 to 10 ppm fluoride
pH Operating Range:	5.5 to 8.5
Temperature Range:	34 to 95°F (1 to 35°C)
Max. Operating Pressure:	101.5 psi (7 bar) **Note:** the maximum admissible operating pressure for the monitoring system is 14.5 psi (1 bar) determined by the in-line sensor housing.
Sensor Response Rate T_{90}:	approx. 30 seconds
Reproducible Measuring Accuracy:	0.1 ppm
Measurement Water Flow Rate:	16 gph (60 L/h)

Fluoride Monitoring System

Part No. 7744836

- D1C Fluoride Monitor (1)
- Fluoride sensor (2): FLE 010 SE with PG 13.5 male threaded connector & SN6 plug
- Reference electrode (3): REFP-SE with PG 13.5 male connector & SN6 plug
- Temperature sensor (4): PT 100 SE with PG 13.5 connector & SN6 plug
- 4-20 mA Measurement transducer (5): FV1 for connection to fluoride monitor & reference electrode
- DLG IV In-line sensor housing (6): with PG 13.5 threaded connector
- Sample outlet (7)
- Magnetic stirrer and magnet (8)
- PVC piping with ball stop/adjusting valve, rotameter with limit contact (9), sampling tap (10)
- Sample inlet (11)
- 115V Power cord, connectors from monitor to sensors
- PP Backpanel (12)

Options

Stand Base	7744837
NEMA 4X enclosed	7744711
Heater	7744722
Sun shield	7744723

ProMinent® D1C and D2C Analyzers

Fluoride Monitoring System Accessories

Replacement Sensors

FLEP 010 Fluoride Sensor with PG 13.5 male threaded connector and SN6 plug	1028279
REFP-SE Reference Electrode with PG 13.5 male connector and SN6 plug	1018458
PT 100 SE Temperature Sensor with PG 13.5 male connector and SN6 plug	305063
FPV1 4-20 mA Measurement Transducer for connection to fluoride monitor and reference electrode	1028280

Fluoride Photometer

The D2TA or D2TB Photometer (see DULCOMETER section, pp. 34-35) can be used to calibrate the fluoride monitor.

Measurement Range:	**DT2A**	0.05 to 2 mg/L fluoride
	DT2B	0.05 to 2 mg/L fluoride 0.05 to 6 mg/L free or total chlorine 0.01 to 11 mg/L chlorine dioxide

D2TA kit with carry case	1010383
D2TB kit with carry case	1010394

ProMinent® D1C and D2C Analyzers

Overview: Hydrogen Peroxide and Peracetic Acid

Measuring principle

The Perox measuring systems are based on amperometric/potentiostatic measuring principles incorporating several special features compared to conventional measuring technologies. The platinum [hydrogen peroxide (H_2O_2) measurement] or gold (peracetic acid measurement) working electrode with a small surface area is covered by a microporous membrane cap to achieve a degree of selectivity and independence from flow influences. The entire stainless steel shaft of the Perox sensor serves as the counter-electrode. This represents the complete sensor section for H_2O_2 measurement; a reference pH electrode is also required for peracetic acid measurement.

A special, continuous electrode activation facility which represents the actual know-how, ensures long-term stability of the measurement without the need for frequent recalibration.

Since all amperometric measure-ment methods are relatively dependent of temperature, we recommend additional temperature compensation with the Pt 100 sensor if temperature fluctuations occur during applications. With the Pt 100, H_2O_2 measurement is a 2-electrode system while peracetic acid measurement is based on a 3-electrode system.

Applications

The environmentally-friendly substance hydrogen peroxide is used to an increasing extent in process control applications as an oxidizing or reduction agent. Examples of applications where continuous Perox H_2O_2 measure-ment control is used either alone or in advanced oxidation systems (with ozone, UV or Fenton's reagent) are:

- Odor control scrubbers
- Ground water purification
- Drinking water oxidation
- Utility water/cooling water disinfection
- Dechlorination, e.g. in chemical processes
- Landfill leachate treatment
- Biotechnology
- Vat dying/textile industry
- Swimming pool water disinfection

Peracetic acid as a disinfectant is used in the following industries:

- Food and beverage
- Cosmetics
- Pharmaceuticals
- Medicine

Continuous measurement and control is necessary wherever more demanding requirements are made with regard to disinfection and quality assurance.

Increasing the peracetic acid concentration in CIP processes as well as concentration control in bottle cleaning machines are typical applications of Perox peracetic acid measurement.

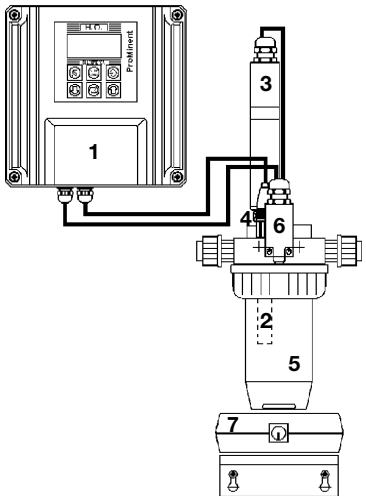
Operating conditions

Measuring ranges and applications	H2O2	Peracetic acid
Measuring range (selectable) mg/l	1 - 20 / 10 - 200 / 100 - 2000	10 - 200 / 100 - 2000
pH range	pH 2.5 - 10	pH 1 - 8
Temperature range	32 - 104°F (0 - 40°C)	41 - 95°F (5 - 35°C)
Permissible changes in temperature	less than 0.9°F (0.5°C) per minute	
Sensor response rate T_{90} approx.	20 seconds	2 minutes
Reproducible measuring accuracy	better than 2% referred to end value of measuring range	
Min. conductivity of measurement solution at:		
measuring range 20 mg/L	50 µS/cm	-
measuring range 200 mg/L	200 µS/cm	500 µS/cm
up to 1000 mg/L	500 µS/cm	2000 µS/cm
up to 2000 mg/L	1000 µS/cm	4000 µS/cm
Measurement water flow rate	recommended 16 gph (60 L/h)	
Max. operating pressure	29 psig (2 bar)	

Depending on the application, other parameters or water constituents may be of significance. For instance, higher concentrations of surface-active substances, such as fats or tensides, or suspended solids can have a detrimental effect on the measurement.

ProMinent® D1C and D2C Analyzers

Hydrogen Peroxide Analyzers



Recommended Hydrogen Peroxide System (descriptions follow)

		Part No.
1	D1C H_2O_2 Controller (1)	
1	Hydrogen Peroxide Sensor: H 2.10 P, complete with membrane cap (2)	792976
1	Perox signal converter: Perox-micro-H 1.20-mA (3)	741129
1	Connection between Perox signal converter and limit sensor Three-wire cable, priced per foot (specify length)	791948
1	Temperature Sensor: Pt 100 SE (4)	305063
1	Connection between the temperature sensor and the controller: (Based on distance between the controller and temperature sensor)	
	Up to 30 ft SN6 open end cable 6 ft. (2 m) long	305030
	15 ft. (5 m) long	305039
	30 ft. (10 m) long	305040
	Over 30 ft. Signal converter 4-20 mA Pt 100 V1	809128
	Two-wire cable - priced per foot (specify length)	7740215
1	DLG-PER In-line sensor housing (5) (includes limit sensor with 2 n/o contacts) (6)	1000165
1	Connection between the limit switch on the DLG-PER and the controller: Two-wire cable - priced per foot (specify length)	7740215
1	Magnetic stirrer 115 VAC (7)	7790915
1	Stirrer Magnet	7790916
1	Compact stand (PE, UV protected, black)	7740000
1	Power Cord, 6 ft.	741203

Accessories:

Replacement membrane cap: M 2.0 P for H_2O_2 sensor	792978
Polishing paste for sensor, 3 oz. (90 g) tube	559810

Note: We can also provide measuring and control instruments mounted and wired, e.g. on PVC board or in a control cabinet. See PCM Systems in Feed & Control Packages section.

Sensors: Hydrogen Peroxide Measurement

The H_2O_2 sensor shaft is made of stainless steel (counter and reference electrode) with a platinum working electrode. Installation length 4.7" (120 mm), 0.5" (12 mm) Ø, PG 13.5 internal thread and SN6 plug connection.

H 2.10 P, complete with membrane cap	792976

Temperature sensor Pt 100 for temperature compensation of H_2O_2 measurement; necessary when temperature fluctuations can occur in the measurement medium.

Pt 100 SE	305063

A coaxial measuring line with an SN6 connector is required for direct connection of a temperature sensor:

SN6 open end	6 ft. (2 m) long	305030
SN6 open end	15 ft. (5 m) long	305039
SN6 open end	30 ft. (10 m) long	305040

When distances between the measuring unit and sensor exceed 30 ft. (10 m), it is recommended to use a temperature signal converter which transmits the temperature signal via a 2-wire connection at 4-20 mA. Temperature compensation input should be taken into consideration when selecting the D1C-Perox controller from the identity code.

Signal converter 4-20 mA Pt 100 V1	809128

Two-wire cable for connection between point-of-use signal converter 4-20 mA and controller - priced per foot (specify length). 7740215

Perox Signal Converter

The signal converter controls and activates the hydrogen peroxide sensor and evaluates the sensor signal. It is screw-mounted directly on the head of the sensor.

The signal converter has a length of approx. 8.1" (205 mm) and a 1.25" (32 mm) Ø.

Signal converter for H_2O_2 measurement

A changeover switch for the three measuring ranges 1 - 20, 10 - 200 and 100 - 2000 mg/L H_2O_2 is located on the inside.

	Part No.
Perox-micro-H 1.20-mA	741129

In-line Sensor Housing

The DLG-PER in-line sensor housing must be used for hydrogen peroxide measurement where all (max. 3) individual sensors are installed in a measuring cup. A limit sensor must also be used which switches off the power supply for the signal converter when the measuring cup is removed. The DLG-PER in-line sensor housing features a body made of rigid PVC with a transparent polyamide cup and measurement water connection with 1/2" MNPT fittings.

DLG-PER In-line sensor housing (includes limit sensor with 2 n/o contacts)	1000165
Two-wire cable for connection between the limit switch on the DLG-PER and the controller - priced per foot (specify length)	7740215

For calibration of the DLG-PER in-line sensor housing, we recommend a magnetic stirrer to facilitate flow independent calibration.

Magnetic stirrer 115 VAC	7790915
Stirrer magnet	7790916
Mounting bracket for magnetic stirrer PVC (includes screws with wall anchor)	1000166

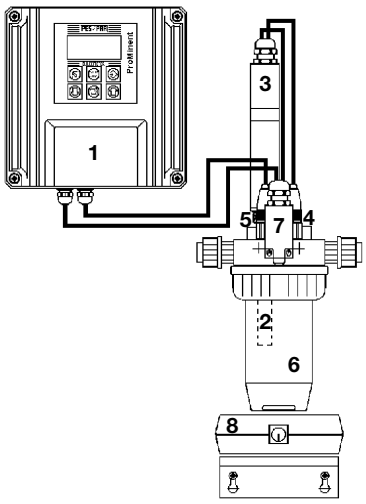
Accessories/Spare Parts

Replacement membrane cap:

M 2.0 P for H_2O_2	792978
Polishing paste for Perox sensor, 3 oz. (90 g) tube	559810

ProMinent® D1C and D2C Analyzers

Peracetic Acid Analyzers



Recommended Peracetic Acid System (descriptions follow)

			Part No.
1	D1C PAA Controller (1)		
1	Peracetic Acid Sensor: P2.10 B, complete with membrane cap (2)		809150
1	Perox signal converter: Perox-micro-P 1.30-mA (3)		741128
1	Connection between Perox signal converter and limit sensor		
	Three-wire cable, priced per foot (specify length)		791948
1	pH Sensor: REFP - SE (4)		1000505
1	Temperature Sensor: Pt 100 SE (5)		305063
1	Connection between the temperature sensor and the controller: (Based on distance between the controller and temperature sensor)		
	Up to 30 ft	SN6 open end cable 6 ft. (2 m) long	305030
		15 ft. (5 m) long	305039
		30 ft. (10 m) long	305040
	Over 30 ft.	Signal converter 4-20 mA Pt 100 V1	809128
		Two-wire cable - priced per foot (specify length)	7740215
1	DLG-PER In-line sensor housing (6)		1000165
	(includes limit sensor with 2 n/o contacts) (7)		
1	Connection between the limit switch on the DLG-PER and the controller:		
	Two-wire cable - priced per foot (specify length)		7740215
1	Magnetic stirrer 115 VAC (8)		7790915
1	Stirrer Magnet		7790916
1	Compact stand (PE, UV protected, black)		7740000
1	Power Cord, 6 ft.		741203

Accessories:

Replacement membrane cap: M 2.0 B for peracetic acid sensor	809154
Polishing paste for sensor, 3 oz. (90 g) tube	559810

Note: We can also provide measuring and control instruments mounted and wired, e.g. on PVC board or in a control cabinet. See PCM Systems in Feed & Control Packages section.

Sensors: Peracetic Acid Measurement

The peracetic acid sensor shaft is made of stainless steel (counter electrode) with a gold working electrode. Installation length 4.7" (120 mm), 0.5" (12 mm) Ø.

P 2.10 B, complete with membrane cap	809150

A pH sensor is also required as a reference electrode for peracetic acid measurement

REFP - SE	1000505

Temperature sensor Pt 100 for temperature compensation of peracetic acid measurement; necessary when temperature fluctuations can occur in the measurement medium.

Pt 100 SE	305063

A coaxial measuring line with an SN6 connector is required for direct connection of a temperature sensor:

SN6 open end	6 ft. (2 m) long	305030
SN6 open end	15 ft. (5 m) long	305039
SN6 open end	30 ft. (10 m) long	305040

When distances between the measuring unit and sensor exceed 30 ft. (10 m), it is recommended to use a temperature signal converter which transmits the temperature signal via a 2-wire connection at 4-20 mA. Temperature compensation input should be taken into consideration when selecting the D1C-Perox controller from the identity code.

Perox Signal Converter

The signal converter controls and activates the pracetic acid sensor and evaluates the sensor signal. It is screw-mounted directly on the head of the sensor.

The signal converter has a length of approx. 8.1" (205 mm) and a 1.25" (32 mm) Ø.

Signal converter for peracetic acid measurement

A changeover switch for the two measuring ranges 10 - 200 and
100 - 2000 mg/L peracetic acid is located on the inside; the standard scope of delivery includes a measuring line with SN6 plug connector to facilitate connection to the reference electrode.

	Part No.
Perox-micro-P 1.30-mA	741128

In-line Sensor Housing

The DLG-PER in-line sensor housing must be used for peracetic acid measurement where all (max. 3) individual sensors are installed in a measuring cup. A limit sensor must also be used which switches off the power supply for the signal converter when the measuring cup is removed. The DLG-PER in-line sensor housing features a body made of rigid PVC with a transparent polyamide cup and measurement water connection with 1/2" MNPT fittings.

DLG-PER In-line sensor housing (includes limit sensor with 2 n/o contacts)	1000165
Two-wire cable for connection between the limit switch on the DLG-PER and the controller - priced per foot (specify length)	7740215

For calibration of the DLG-PER in-line sensor housing, we recommend a magnetic stirrer to facilitate flow independent calibration.

Magnetic stirrer 115 VAC	7790915
Stirrer magnet	7790916
Mounting bracket for magnetic stirrer PVC (includes screws with wall anchor)	1000166

Accessories/Spare Parts

Replacement membrane cap:	
M 2.0 B for peracetic acid	809154
Polishing paste for Perox sensor, 3 oz. (90 g) tube	559810

ProMinent® DMT Transmitters

Overview: DMT

DULCOMETER® DMT type transmitters are compact 2-wire transmitters for measured variables pH, redox, chlorine, conductive conductivity, temperature.

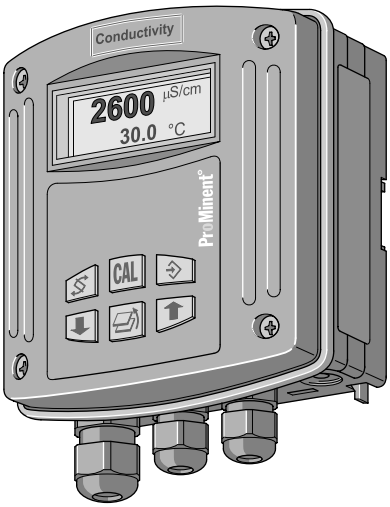
Easily combined with programmable memory controllers.

Summary of advantages:

- Reliable measurement due, e.g., to symmetrical input for pH and redox signals
- High level of operating safety, e.g. probe monitoring (pH), electrical isolation
- Simple flexible installation
- Full text user guidance
- Automatic buffer recognition (pH)
- Autoranging (conductivity)
- Compact design
- Switch between pH, redox and temperature

Applications: **process control, food and beverage industry, chemical and pharmaceutical industries, water treatment, waste water treatment, power stations**

Technical Data



pk_5_001

Measurement range:	pH -1.00 - 15.00 -1200…+1200 mV redox voltage 0.01…50.0 ppm/l chlorine -20 - +150 °C 1 µS/cm - 200 mS/cm (autoranging)
Cell constant:	0.006…12.0/cm for conductivity
Resolution:	pH 0.01 1 mV 0.1 % from measurement range for chlorine 0.1 °C Conductivity 1/1000 of display value (min. 0.001 µS/cm)
Reproducibility:	0.5 % from measurement range
Measurement input:	mV terminal (pH, redox); imput resistance >5 x 10^{11} Ω Chlorine terminal (DMT chlorine probes) Pt 100/1000 terminal Conductivity terminal (2 or 4 wire connector)
Correction variable:	Temperature via Pt 100/1000 (pH, chlorine, conductivity)
Correction range:	chlorine: 5 - 45 °C, pH: 0 - 100 °C, Cond: 0 - 100 °C
Current output:	4 - 20 mA, fault current 23 mA
Supply voltage:	16 - 40 V DC
Feed voltage:	2-wire transmitter, 16 - 40 V DC, nominal 24 V PROFIBUS® DP version, 16 - 30 V DC, nominal 24 V communication interface:
Communication interface:	PROFIBUS® DP (wall-mounted version only)
Ambient temperature:	-5 - +55 °C
Climatic conditions:	up to 95 % relative humidity (non-condensing)
Enclosure rating:	IP 65 (wall/pipe mounted) IP 54 (control panel installation)
Display:	graphical display
Housing:	PPE
Dimensions:	125 x 135 x 75 mm (WxHxD)
Weight:	approx. 450 g

A complete measuring station comprises the following:

- Measuring transducer DMTa (see Identcode)
- In-line probe housing: DGMa..., DLG III ..., immersible in-line probe housing (see section 6.5)
- Chlorine sensor (see section 6.3.1, dependent on Identcode)
- Assembly set for chlorine sensor (see section 6.5)
- pH sensor (see section 6.2.1, dependent on Identcode)
- Redox sensor (see section 6.2.4, dependent on Identcode)
- Temperature sensor Pt 100 /Pt 1000 (see section 6.2.3, dependent on Identcode)
- Conductivity sensor (see section 6.4.1)
- Sensor cable (see section 6.5)
- PROFIBUS®-DP connection accessories (see section 1.9.15)

PROFI® PROCESS FIELD BUS BUS

ProMinent® DMT Transmitters

Identcode Ordering System

DMT DULCOMETER® Transmitters

A **Version**

Type of Mounting:
- W Wall mounted (also pillar mounted)
- S Control panel installation[1)]

Version:
- 0 With ProMinent® logo

Electrical connection:
- 9 Ring main 4-20 mA (two wire technology), operating voltage16 - 40 V DC, nominal 24 V DC (only if communication point = none)
- 5 PROFIBUS® DP, operating voltage 16 - 30 V DC, nominal 24 V DC (only if communication interface = PROFIBUS® DP)

Communication interface:
- 0 None
- 4 PROFIBUS® DP (assembly type W only)

Measured variable 1:
- P pH
- R Redox
- T Temperature
- C Chlorine
- L Conductivity

Measured variable 2 (Correcting value):
- 1 Temperature Pt 1000/Pt 100
- 0 None (in the case of measured variable T)

Enclosure rating:
- 0 Standard

Language:
- D German
- E English
- F French
- S Spanish
- I Italian

Presetting A, probe:
- 0 Standard ProMinent® buffer solution pH 4-7-10
- D Ref. buffer DIN 19266 pH 4-7-9
- V Variable buffer recognition

Presetting B, probe:
- 0 Autom. temperature measurement (standard)
- 1 Manual temperature measurement
- 2 Autom./manual temperature measurement
- 9 No temperature measurement

Presetting C, output:
- 0 Prop. measured variable (standard)
- 1 Manual adjustable current value
- 2 Proportional or manual
- 3 Proportional or manual hold
- 4 4 mA constant current

The last four digits in the Identcode indicate the software presettings, e.g. cell constants for conductivity, temperature compensation etc.

0 = Standard setting.

The measuring transducer can be supplied with presettings already installed. Changes to the presettings can easily be carried out in the operating menu.

DMT A W 0 9 0 P 1 0 D 0 0 0 0

Note:

1) The panel-mounting variant does not have the back housing section.

2) AC Adapter (wall pack) PN/ 7500039

ProMinent® DDC Analyzers

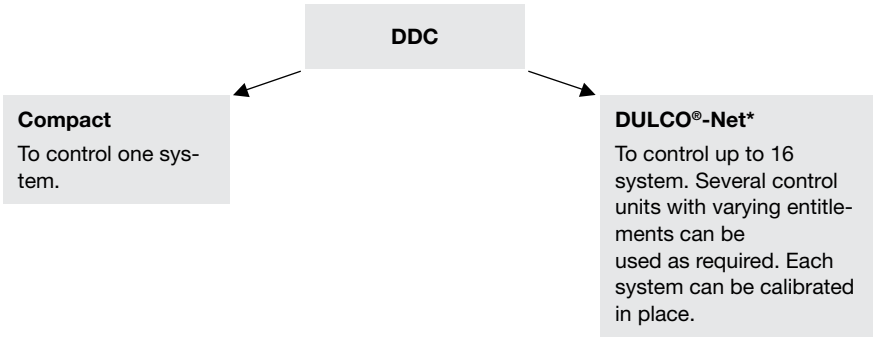
Overview: DDC

pk_5_045

The DULCOMETER® Disinfection Controller (DDC) contains the following features:

- 1/4 VGA colour display: simplest operation
- Controls 1 to 16 locations
- Integrated screen recorder plus datalogger: saves space and money
- CANopen BUS system: Simple to wire and expand
- LAN interface: Simple to connect to a PC or PC network
- Intelligent control with metering fault checks: monitors numerous variables and safely prevents incorrect dosing
- Intelligent sensors: with CANopen-Bus ... digital system stores sensor data and is always within the optimum measurement range thanks to AUTO Ranging
- Intelligent metering pumps: with CANopen Bus ... digital system provides information about operating parameters such as chemical level and feed rate
- Feed quantity display: determines the amount of chemicals used
- Calibration/maintenance timer: can be set as a reminder for calibration or maintenance
- OPC server: provides simple connection to SCADA systems
- Visualising: simple with Embedded Webserver
- Alarm: via SMS(System management server) or eMail
- SD Memory Card: easy to transfer measurement data to PC

The system can be supplied depending on requirements as a compact version **DULCOMETER® DISINFECTION CONTROLLER (DDC) compact** or as a external modular system **DULCOMETER® DISINFECTION CONTROLLER (DDC) DULCO®-Net**.



ProMinent® DDC Analyzers

Overview: DDC

The DULCOMETER® DISINFECTION CONTROLLER (DDC) compact system is designed for the control of one system and is characterized, in addition to the features outlined above, by the following options:

M module (measurement module):

- Measurement and display of the pH value
- Measurement and display of the Redox potential
- Measurement and display of the sample water temperature
- Sample water monitoring
- Measurement of free chlorine
- Measurement of combined chlorine (optional, calculated from difference of total chlorine and free chlorine)

Chlorine sensors:

- Measurement and control of the free chlorine content
- Total chlorine measurement and calculation of the combined chlorine content

A module (actuator module):

- 3 frequency outputs for actuation of pumps for pH correction and disinfectant metering with 3 switch outputs for pump errors or tank contents level monitoring
- 4 of 4 - 20 mA analog outputs, user-programmable and scalable for pH, Redox, free chlorine or total chlorine or combined chlorine or temperature

P module (power supply module):

- Pulse length output for pH correction solenoid valve or peristaltic pump
- Pulse length output for disinfectant solenoid valve or peristaltic pump
- Pulse length output for flocculant peristaltic pump or relay output for purging combined chlorine
- Alarm relay

Module R (Cl_2 actuator module)

- Control of a chlorine dosing system and a remote potentiometer position feedback signal (0 - 1kΩ)
  (only as external module)

ProMinent® DDC Analyzers

Technical Data

Measurement range:	pH	-1 - 15
	Redox:	-1200 - +1200 mV
	Chlorine free	0.01 - 10 ppm/l
	Chlorine total	0.01 - 10 ppm/l
	Combined chlorine	0.01 - 2 ppm
Temperature:	Pt 100 or Pt 1000, 28 to 302 ºF (-20 to +150 °C)	
Resolution:	0.01 pH / 1 mV / 0.01 ppm/l / 0.1 °C	
Reproducibility:	0.5 % of the measurement range (at 25 °C)	
Measurement inputs:	pH and Redox via terminal mV Chlorine via CANopen Bus	
Control type:	P/PI/PID-control	
Control:	Acid or alkali, chlorine	
Digital inputs:	Voltage free inputs (sample water, pause, 3 pump faults	
Signal current outputs:	4 x 0/4-20 mA (electrically isolated for each measured variable) Max. burden 600 Ω , range adjustable	
Control outputs:	Reed contacts, acid, alkali and chlorine (pulse rate for actuation of metering pumps) 2 relays (pulse length) make/break switches for actuation of solenoid valves or peristaltic pumps 250 V~, 3 A	
Alarm relay:	250 V ~3 A, 700 VA make/break switches	
Interfaces:	LAN, RS 232 as configuration interfaces, SD-expansion slot (for SD cards)	
Power supply:	85 - 265 V~, 50/60 Hz	
Ambient temperature.:	23 to 118ºF (-5 to 45 °C)	
Storage temp.:	14 to 158ºF (-10 to 70 °C)	
Enclosure rating:	IP 65	
Climate:	Admissible relative humidity: 95% non condensing DIN IEC 60068-2-30	
Dimensions:	342 x 227 x 78 mm (WxHxD)	

Guaranteed CANopen specifications, all devices:

All devices meet the standardised CAN specification for hardware 2.0 (ISO99-1, ISO99-2). This includes the CAN protocol (ISO 11898-1) and details about the physical application layer in accordance with ISO 11898-2 (high speed CAN to 1Mbit/sec.) and ISO 11898-3 (Low speed CAN to 125kBit/sec).

The device complies with the CAN-Open specification CIA-DS401, the basis of the European standard EN50325-4. It complies with the controller device profile CiA-404.

ProMinent® DDC Analyzers

Identcode Ordering System

DXCa DULCOMETER® Disinfection Controller, DXC Series

Mounting type:
- **W** Wall mounted (IP 65)
- S Control cabinet (IP 54)

Design:
- **0** With controls

Communication interfaces:
- **0** None
- 5 Embedded Web Server, LAN

Data logging:
- **0** None
- 1 Screen recorder with data storage incl. SD card

Module 1:
- **M** Measurement module pH, Redox, temperature

Module 2:
- 0 Not in use
- **A** Actuator module 3 pumps and 4 analog outputs

Module 3:
- **P** Power supply, 1 alarm relay, 3 solenoid valve relays
- N Power supply module without relay

Applications:
- **0** Standard
- S Swimming pool

Preset language:
- **EN** English

Approvals:
- 01 CE-mark

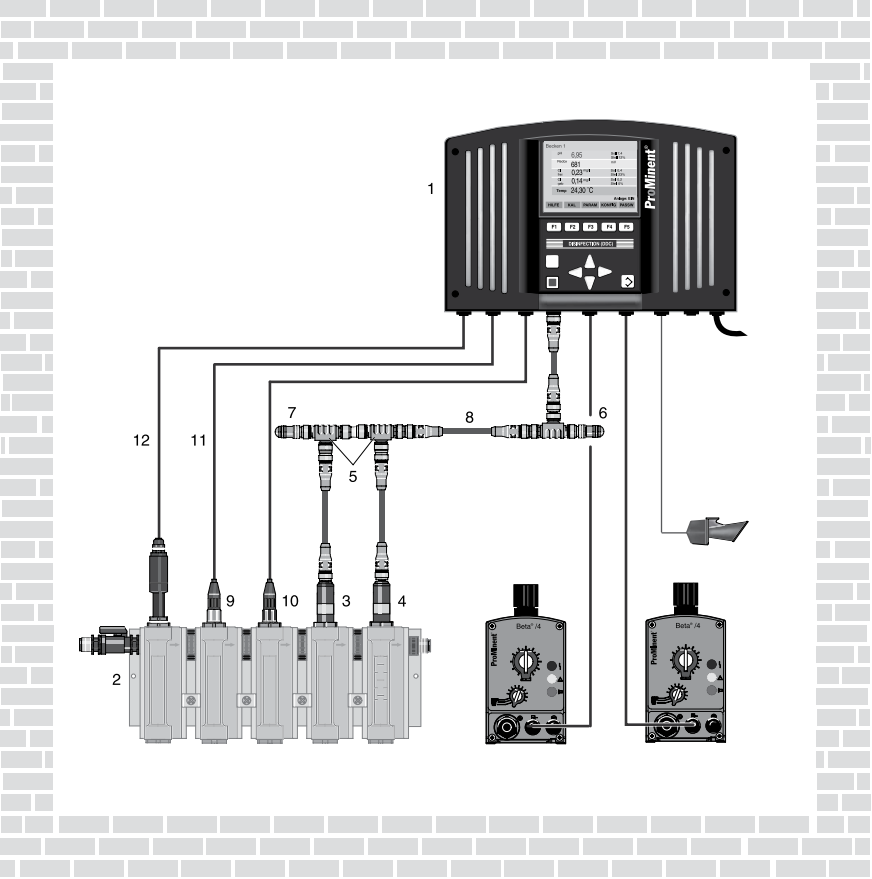
The Identcode describes the entire **DULCOMETER® (DDC) compact** unit.

The peripheral components itemised in the part list above are not included

DXCa W 0 0 0 M A P 0 EN 01

ProMinent® DDC Analyzers

Configuration



pk_5_020

The measurement and control system shown above for a single system comprises the following components (without metering equipment):

Item	Quantity	Name	Part No.
1	1	DULCOMETER® (DDC) central unit with actuator and measurement modules DXCa W 0 0 0 M A P 0 EN 01	
2	1	DULCOTEST® in-line probe housing DGMa 3 2 2 T 0 0 0	
3	1	Chlorine sensor CTE 1-CAN-10 ppm	1023427
4	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
5	3	T-distributors M12 5 pole CAN	1022155
6	1	Load resistor M12-coupler	1022154
7	1	Load resistor M12-plug	1022592
8	5	Connecting cable - CAN M12 5 pole. 1.5 ft (0.5 m)	1022137
9	1	pH electrode	As per application
10	1	Redox electrode	As per application
11	2	Coaxial cable, 6 ft. (2 m) - SN6 - pre-assembled*	1024106
12	6 ft. (2 m)	2 wire cable	7740215

* other lengths available

DULCO®-Net

The DULCOMETER® (DDC) DULCO®-Net control system uses the CANopen – BUS as the medium for transmission of the data between the measurement and actuator units and the sensors and the central unit.

In its maximum expanded form the system can control up to 16 systems, i.e. 16 measurement units and 16 dosing units and corresponding sensors can be operated from a single central unit.

For this purpose a central unit is combined with the number of measurement and dosing units required for the application.

A M12 T-distributor is required for connection to any CANopen device (sensors module, actuator module, metering pumps and chlorine sensors). This connects the device to the main bus via a stub cable.

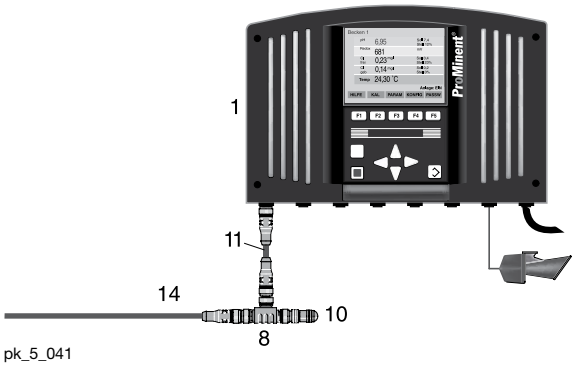
The sum of the lengths of all stub cables in a CANopen system cannot exceed 45 ft. (15 m.)

DULCOMETER® (DDC) DULCO®-Net and compact can both be easily expanded later.

What components make up a DULCOMETER® (DDC) DULCO®-Net system?

A DULCOMETER® (DDC) DULCO®-Net system comprises:

- One central unit **and** an individual combination of the following components:
- Measurement unit
- Dosing unit without main power module
- Dosing unit with main power module (optional)
- Chlorine gas dosing unit



pk_5_041

Central unit

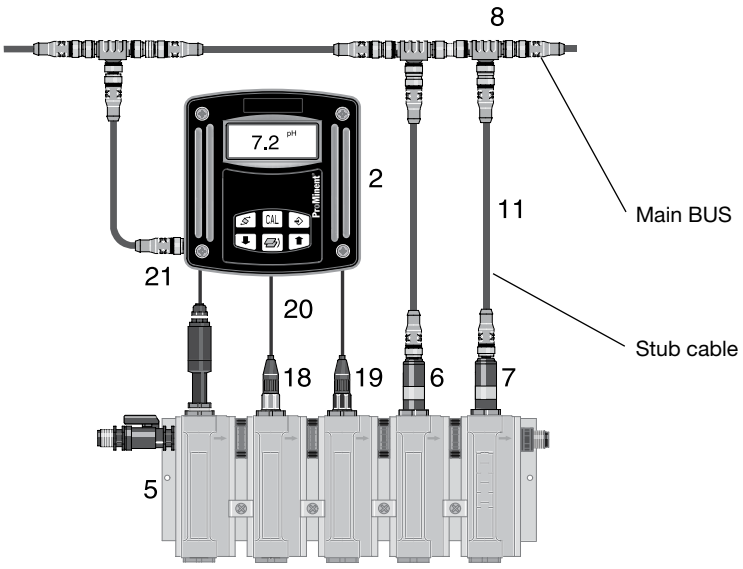
The central unit can be installed anywhere, e.g. in a control room or in the office. It serves as an input/output module (for viewing and configuring individual modules) and has the following functions: screen recorder, interface, Embedded Web Server and power supply. The central unit may optionally incorporate a sensor and an actuator module. The central unit is connected with the other units via the main Bus. CAN connection cables are used for this purpose. The main Bus of the first unit must be connected with a M 12 load resistor coupling and the final unit with a M 12 load resistor plug.

A unit always consists of a module, a T-connector and a CAN stub connection cable, 1.5 ft. (0.5 m) long.

The central unit in the above example comprises the following components:

Item	Quantity	Name	Part No.
1	1	DULCOMETER® (DDC) Central unit DXCa W 0 5 1 M A P 0 EN	
8	1	T-distributor M12 5 pole. CAN	1022155
11	1	Connecting cable - CAN M12 5 pole. 0.5 m	1022137
14	1	Connecting cable - CAN M12 5 pole 5 m	1022141
10	1	M 12 load resistor coupling	1022154

The measurement module



pk_5_042

The measurement module allows the display of the measured value and the calibration of the sensors for the respective loop. The following parameters can be measured: pH value, Redox potential, total and free available chlorine, and the sample water temperature.

The measurement module has digital inputs for pause or monitoring of the sample water. The illuminated graphic display and a keypad allow presetting of all parameters including total and free available chlorine, measured variables.

The measurement module is connected with the other units via the main Bus. CAN connection cables are used for this purpose. The main bus segment of the last unit must be connected by a M 12 load resistor plug.

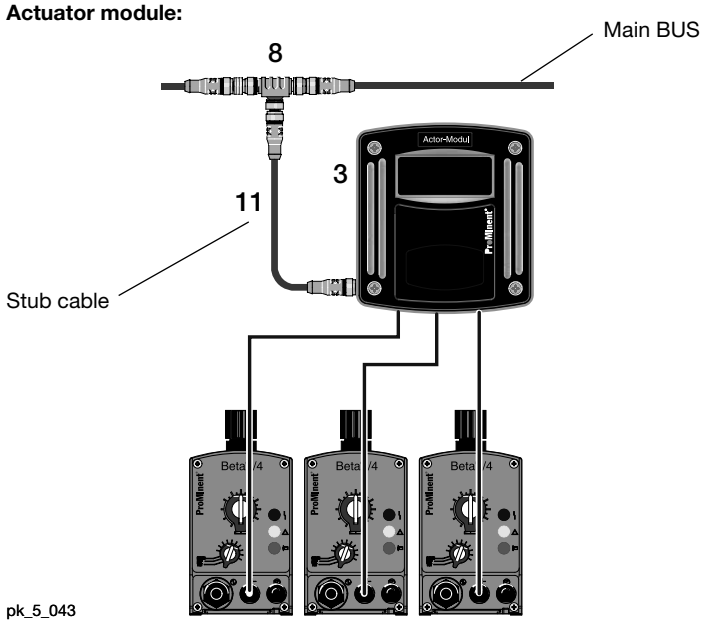
The measurement module in the above example comprises the following components:

Item	Quantity	Name	Part No.
2	1	Measurement module DXMa M W 0 0 EN 01	
5	1	In-line probe housing DGMa 3 2 2 T 0 0 0	
6	1	Chlorine sensor CTE 1 -CAN-10 ppm	1023427
7	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
8	3	T-distributors M12 5 pole CAN	1022155
11	4	Connecting cable - CAN M12 5 pole	
		1.5 ft. (0.5 m)	1022137
18	1	pH electrode	As per application
19	1	Redox electrode	As per application
20	2	Coaxial cable, 2 m - SN6 - pre-assembled*	1024106
21	6 ft. (2 m)	2 wire cable	7740215

* other lengths available

Actuator Module

Actuator module:



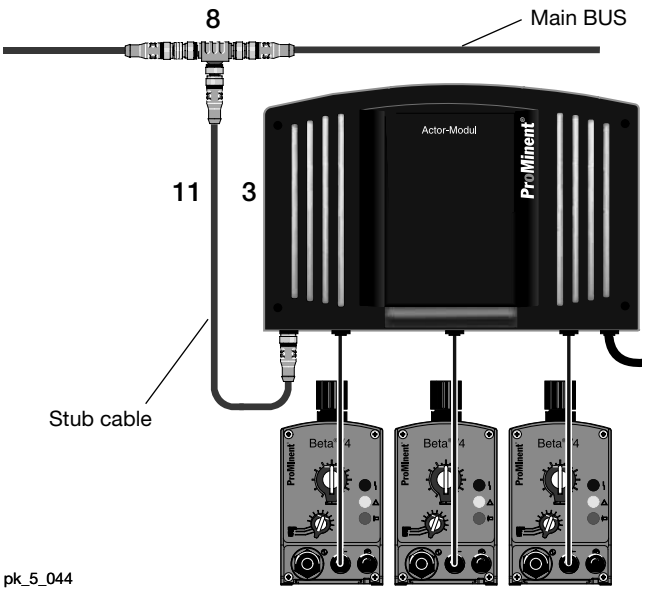
The actuator module allows control of up to 3 dosing pumps via pulse frequency control. Possible dosing combinations are: acid, alkaline solution and disinfectant, or acid and disinfectant.

It comprises 3 digital inputs for evaluation of the fault indication relays of the dosing pumps, 4 freely-configurable 0/4 - 20 mA standard signal outputs for documentation of data. The dosing unit is connected with the other units via the main bus. CAN connection cables are used for this purpose. The main Bus segment of the last unit must be connected by a M 12 load resistor plug.

The actuator module in the above example consists of the following components (without metering equipment):

Item	Quantity	Name	Part No.
3	1	Actuator module DXMa A W 2 0 0 0 01	
8	1	T-distributor M12 5 pole CAN	1022155
11	1	Connecting cable - CAN M12 5 pole	
		1.5 ft. (0.5 m)	1022137

Actuator module with power supply:



The actuator module with power supply allows control of up to 3 solenoid-operated dosing pumps via pulse frequency control, or motor-driven dosing pumps via pulse length control.

Possible dosing combinations are: acid, alkaline solution and disinfectant, or acid and disinfectant.

It consists of 3 digital inputs for evaluation of the fault indication relays of the dosing pumps, or level switch on motor pumps, 4 freely-configurable 0/4 - 20 mA standard signal outputs for documentation of data.

This unit is connected with the other units via the main bus. CAN connection cables are used for this purpose. The main bus of the last unit must be connected by a M 12 load resistor plug.

An additional power module is required after every third circuit.

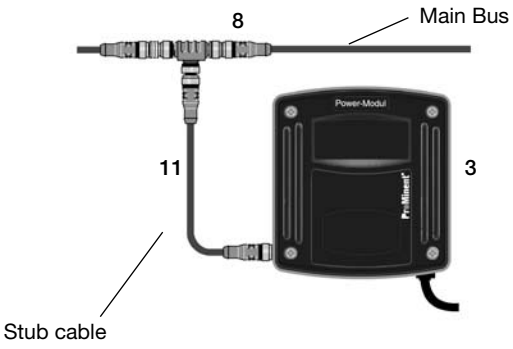
Module must be powered for operation.

The actuator module with power supply in the above example consists of the following components (without metering equipment):

Item	Quantity	Name	Part No.
3	1	Actuator module DXCa A W 2 0 0 0 A P 0 0 0 01	
8	1	T-distributor M12 5 pole CAN	1022155
11	1	Connecting cable - CAN M12 5 pole	
		1.5 ft. (0.5 m)	1022137

Power Module

Power module:



pk_5_043_C_power

If the combination of actuator module with power supply is not required, the power module is used.

This power module is used to supply power to the bus.

It must be powered for operation.

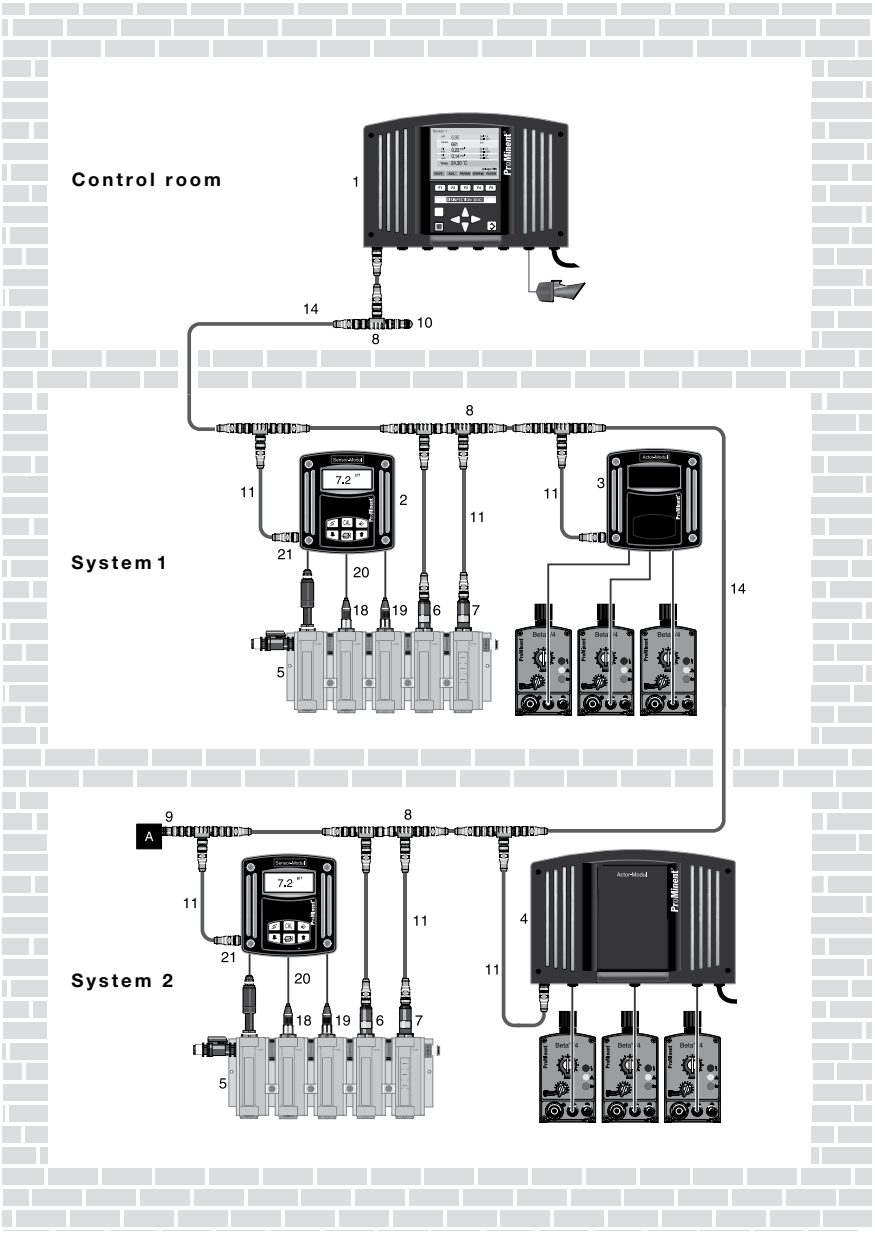
The power module in the above example comprises the following components:

Item	Quantity	Name	Part No.
3	1	Power-module DXMa N W 2 0 00 01	
8	1	T-distributor M12 5 Pol. CAN	1022155
11	1	Connecting cable - CAN M12 5 Pol. 1.5 ft. (0.5 m)	1022137

ProMinent® DDC Analyzers

Complete System

Example of configuration for two control systems:



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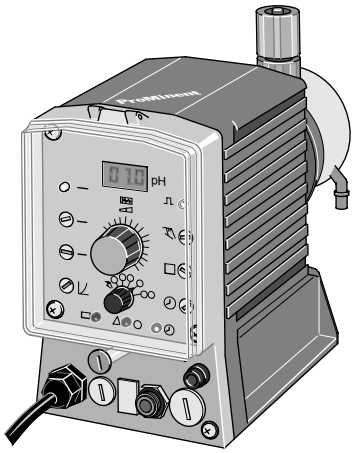
ProMinent® D_4a Analyzer & Pump

Overview: D_4a



pk_5_018

- Process controller with integrated metering pump
- pH and Redox measured variables
- Simple to operate using adjusting potentiometer
- Chemical resistant plastic housing (IP 65)
- Compact design

Applications: **laboratory**
pilot systems
electroplating
cooling water
neutralization
swimming pool
potable water

Capacity Data

D4a Pump Version	Maximum Pressure psig	(bar)	Capacity at max. Backpressure US GPH	(L/h)	mL/ stroke	mL/min	Capacity at 1/2 max. Backpressure US GPH	(L/h)	mL/ stroke	mL/min	Connections O.D. x I.D. (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 Pump Version	Capacity at Maximum Backpressure psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	mL/ min	Max. Stroking Rate spm	Connections O.D. x I.D. (inches)	Suction Lift 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)

Materials in Contact With Chemicals

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

ProMinent® D_4a Metering Pumps

Identity Code Ordering System

D_4a D Pump Type 4, Version a

Measured variable:

PH	pH measurement range 0-14
RH	ORP measurement range 0-999 mV

Pump type:

1601	232 psi; 0.26 gph
1201	174 psi; 0.42 gph
0803	101 psi; 0.84 gph
1002	145 psi; 0.58 gph
0308	43.5 psi; 2.01 gph
0215	22 psi, 3.25 gph

Liquid end material:

NP	Acrylic with Viton® O-ring
NS	Auto-degassing Acrylic with Viton® O-ring
PP	Polypropylene with EPDM O-ring
TT	PTFE + 25 % carbon with PTFE seal
SS	316 Stainless steel with PTFE seal

Operating Voltage:

A	230 V, 50/60 Hz Euro plug
D	115 V, 50/60 Hz USA plug

Sensor connection:

2	SN6 pH/RH
8	SN6 with reference electrode connector pH/RH

Correcting value:

0	None
1	Temperature (SN6) for pH only

Control direction:

1	Raise measured value
2	Lower measured value
3	Control direction switchable (for pH only)

Signal current output:

0	None
1	0/4-20 mA ≙ pH 1-12; 0-1000 mV; 0-2 mg/l
2	0/4-20 mA =^ 0-20 mg/l

Relay:

0	None
A	Liquid level relay output (n/c)
B	Stroke pacing relay output (n/c)
C	Pump stop relay output (n/c)
D	Set point indicating relay output (n/c)
E	Control period exceeded (n/c)
F	Fuse and power supply failure indicating relay (n/o)

D_4a PH 1601 NP A 2 0 1 0 0

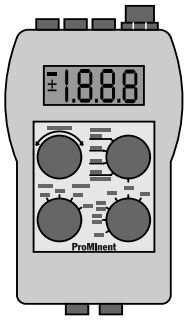
ProMinent® Measurement Simulator

Overview: Simulator

- Simulation of pH and mV signals
- Simulation of Pt 100/Pt 1000 (25 °C and 80 °C)
- Simulation and measurement of mA signals

Applications:
testing DULCOMETER® devices, service and laboratory

Technical Data



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Measurement range U_+:	5…30 V DC (measures the supply voltage for external passive 4…20 mA transmitters)
Simulation:	pH 2.00…12.00 ±2000 mV 0…20 mA Pt 100, Pt 1000 (25 °C and 80 °C)
Simulation output:	SN6 banana socket
Battery:	9 V battery pack
Operating life:	Approx. 150 hours
Weight:	Approx. 265 g (with battery)
Enclosure rating:	IP 20
Ambient temperature:	0…40 °C
Accessories:	9 V battery, signal lead kit

	Part No.
	1004042

ProMinent® Portable DT Photometer

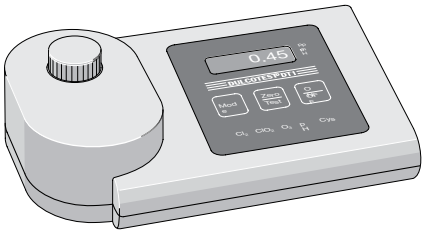
Overview: Photometer

Photometer DT1, DT2, DT3 and DT4

- Portable compact Photometer
- Simple to operate with support text
- Reliable, simple measurement of chlorine, chlorine dioxide, fluoride, chlorite, H_2O_2, bromine, ozone, pH and cyanic acid
- Self-diagnostic

Applications:
swimming pool, drinking water, process water

Technical Data



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Measurement range of DT1:	0.05…6.0 mg/l free chlorine (DPD 1) + total chlorine (DPD3) 0.1…13.0 mg/l bromine (DPD 1) 0.05…11 mg/l chlorine dioxide (DPD 1) 0.03…4.0 mg/l ozone (DPD 4) pH 6.5…8.4 (phenol red) 1…80 mg/l cyanuric acid
Measurement range of DT2B:	0.05…2.0 mg/l fluoride 0.05…6.0 mg/l free chlorine and total chlorine 0.05…11.0 mg/l chlorine dioxide
Measurement ranges, DT3:	1 - 50 / 40 - 500 mg/l hydrogen peroxide
Measurement ranges, DT4:	0.03 - 2.5 mg/l chlorite, 0.05 - 11 mg/l chlorine dioxide, 0.05 - 6 mg/l chlorine
Measuring tolerance:	Dependant upon measured value and measuring method
Battery:	9 V battery (approx. 600 x 4-minute measurement cycles)
Ambient temperature:	41 - 104° F (5 - 40 °C)
Relative humidity:	30 - 90 % (non-condensing)
Housing material:	ABS
Keypad:	Polycarbonate
Dimensions:	7.5 x 4.3 x 2.2 in (190 x 110 x 55 mm (LxWxH))
Weight:	approx. 1 lb. (0.4 kg)

	Part No.
Type **DT1 photometer**, complete with carrying case	1003473
Type **DT2B photometer**, complete with carrying case	1010394
Type **DT3 photometer**, complete with carrying case	1023143
Type **DT4 photometer**, complete with carrying case	1022736

Photometers supplied with accessories, container vessels and reagents.

Consumable items:	**Part No.**
DPD 1 buffer, 15 ml	1002857
DPD 1 reagent, 15 ml	1002858
DPD 3 solution, 15 ml	1002859
Phenol red tablets R 175 (100 in each)	305532
Cyanuric acid tablets R 263 (100 in each)	305531
SPADNS reagent, 250 ml for fluoride detection	1010381
Calibration standard fluoride 1 mg/l for calibration of photometer (fluoride detection)	1010382
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566
3 spare cells for fluoride detection (DT2A and B)	1010396
DPD reagents set, 15 ml each: 3 x DPD 1 buffer, 1 x DPD 1 reagent, 2 x DPD 3 solution	1007567
Chlorine dioxide tablets Nr. 1 R 127	501317
Chlorine dioxide tablets Nr. 2 R 128	501318

Spare parts

Chlorite meter:

Foamer for expulsion of chlorine dioxide (DT4)	1022754
3 No. spare cuvettes for chlorite determination	1007566

H_2O_2 meter:

Reagent for H_2O_2 (DT3), 15 ml	1023636
Spare cuvettes, 5 No., for H_2O_2 (DT3)	1024072

ProMinent® Cooling Tower & Boiler Controllers

MicroFLEX Controllers

Features

- Controls Cooling Towers or Boilers
- Timed or Continuous Sample
- Boiler Blowdown
- Chemical Relay Timer
- Conductivity Input
- Water Meter Input
- CE Approved
- Web Browser Interface
- Supports "Bleed Then Feed"
- Dry Contact Alarm Relay
- Single 4-20mA Output
- Built-In Diagnostics
- "Configure and View" from remote locations
- Single point calibration
- Feed chemical based on water volume
- NEMA 4X Enclosure
- Detect leaks in the system
- Supports Percentage Time Bleed & Feed

SlimFLEX Controllers

Features

- Conductivity and Temperature Inputs
- Two Digital Inputs
- Four Relay Outputs
- 5-Key Universal Keypad
- 2 Line, 16 character LCD
- Built-In Diagnostics
- Built-In Web Server
- LAN Accessible
- pH Control
- ORP Control
- Dry Contact Alarm Relay
- Flow Switch
- Single 4-20mA Output
- NEMA 4X Enclosure
- 120VAC, 60Hz
- Built-In Diagnostics
- CE Approved

MultiFLEX Controllers

Features

- Control up to 4 Towers at once
- Control up to 8 Boilers at once
- Web Browser Accessible
- LAN Accessible
- Up to 14 Analog Inputs
- Twelve Digital Inputs
- Ten Relay Outputs
- Works with Trackster 3 Software
- 5-Key Universal Keypad
- 4 Line, 20 Character Backlit Display
- Easily Upgradeable with Plug-in Modules
- Fully Programmable
- Ethernet with user definable static IP address
- NEMA 4X Enclosure
- 120 or 240VAC 50/60Hz, Switch Selectable
- CE Approved
- Detect leaks in the system
- Supports "Percentage Time Bleed & Feed"

AEGIS Controllers

Features

- Inhibitor Feed Using PPM Setpoints
- Volumetric Timer Controls
- Relay Mirroring
- Optional Ethernet Communications
- MODBUS
- Industrial and Commercial Series
- Plug and Play Upgrades
- Works with Trackster 3 Software
- Aquatrac Thermal Flow Switch
- Easily Upgradeable with Plug-in Modules
- Program Chemical Feed
- CE Approved
- NEMA 4X Enclosure
- Variable Frequency Pump Controls
- Data Logging
- Drum Level Alarms
- ProMinent Pump integration

"analytical sensors" T.O.C. IX

CATALOG SECTION TABS

ProMinent® DULCOTEST® Sensors

Overview: Sensors

There are four methods of measurement for reliable water treatment:

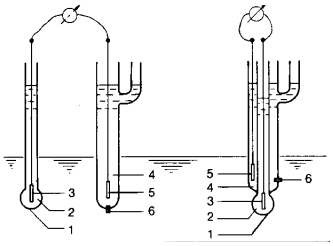
- **Potentiometric method: For pH and redox potential (ORP) measurement**
- **Amperometric method: For the measurement of chlorine, chlorine dioxide and ozone residual**
- **Conductometric method: For the measurement of electrolytic conductivity**
- **Potentiostatic method: For the measurement of hydrogen peroxide, peracetic acid and dissolved oxygen**

Potentiometry–Measurement of the potential of an electrode against an electrolyte solution.

The measuring element always consists of a **measuring electrode** that reacts specifically to changes in electrical charges, and a **reference electrode** which generates a potential that is as constant as possible and independent of the measuring electrode changes. ProMinent provides both in a combination electrode.

An example for this kind of measuring element is the pH sensor.

1 Glass electrode
2 pH buffer solution
3 Inner electrode, measuring system
4 Electrolyte filling
5 Inner electrode, reference system
6 Diaphragm



Separate measuring and reference

Combination electrode

Fig. 1

pH - that's the negative logarithm of the hydrogen ion activity

Since hydrogen ions in aqueous solutions range in concentrations from less than 10^{-14} g/L to more than 10 g/L (= mol/L) and the exponential notation is rather unwieldy, the pH scale is defined as

$$pH = -\log a_{H}+$$

When the concentration is not too high, activity and concentration can be considered as equivalent. Thus, a hydrogen ion concentration of 10^{-14} mol/L means a pH of 14, one of 10^{0} = 1 mol/L a pH of 0.

The pH value of 7 is called the neutral point. This means that the effective concentrations of H^+ ions and OH^- ions produced by the dissociation of water ($H_2O \Rightarrow H^+ + OH^-$) are equal.

If the hydrogen ions predominate because an acid (e.g. HCl) has been added, the pH value is lower than 7. If caustic has been added (e.g. NaOH), the solution becomes alkaline and the pH value is higher than 7.

pH is a logarithmic scale, such that each change of the pH by 1 corresponds to a change in concentration by the factor 10.

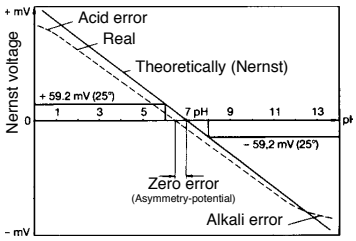


Fig. 2
Zero error and slope of a pH combination sensor

Fig. 2 shows the theoretical voltage curve of a pH glass electrode. In reality, the voltage curves of glass electrodes depart more or less from the theoretical values.

Electrode systems usually show a zero error (asymmetry potential) which, however, as a rule is less than ±0.5 pH. The slope (mV/pH) too can deviate from the theoretical value [59.2 mV/pH at 77°F (25°C)] which is true particularly for glass electrodes that have been used for some time.

An acid error which manifests itself at very low pH values; while an alkali error (or sodium error) will occur at high pH values.

pH transmitters must be calibrated so as to compensate zero and slope errors of the electrode used...

Zero calibration is made by means of a standardizing solution having a pH of 7. Slope calibration is made by means of a buffer solution, normally pH 4 or pH 10.

With pH measurements, except at pH 7, varying temperatures of the sample liquid might necessitate a correction for temperature variations. **The following questions need to be answered:**

1. At which pH will the measurement take place?
2. How great are the temperature changes?
3. How accurate a measurement is required?

The following is an example for the influence of temperature without correction:

At pH 10 an increase of the temperature by 18°F (10°C) results in an error of about +0.1 pH. The error increases with increasing distance from pH 7.

Measurement of the redox potential is a potentiometric measurement too!

The term "redox" stands for the simultaneously occuring reduction and oxidation processes in aqueous solutions. In an oxidation process electrons are transferred from the substance to be oxidized to the oxidant. Simultaneously, in oxidizing the substance, the oxidant is reduced. Oxidants are electron acceptors and reducing agents electron donors.

The redox potential is measured by means of noble metal electrodes, usually platinum electrodes. In a solution containing an oxidant (e.g. chlorine) the redox voltage will be positive, in a solution containing a reducing agent (e.g. sodium sulfite) it will be negative.

The magnitude of the redox potential is an indicator of the oxidizing or reducing properties of a solution. In water treatment the redox potential is a yardstick for the disinfecting properties of, for example, chlorine or ozone.

Thus, in water treatment the redox potential can be considered as an indicator of the disinfection potential.

It should be noted that there is a relationship between redox potential and pH so that redox measurements can be compared with each other only when the measurements were made at the same pH.

Typical applications of redox measurements:

1. Cyanide control by oxidation at high pH values, redox potential measurement by means of gold electrodes.
2. Chromate control by reduction at low pH values, redox potential measurement by means of platinum electrodes.
3. In disinfecting processes, measurement of chlorine residual or ozone concentration by means of platinum electrodes.

Amperometry– a method of measuring concentrations of certain dissolved substances in aqueous solutions.

In this method electric currents in the order of nA (10^{-9} A) or μA (10^{-6} A) are measured. The sensors used in this method are bare or membrane-covered 2-electrode cells.

Our DULCOTEST® chlorine, ozone and chlorine dioxide sensors are designed as membrane-covered 2-electrode cells of the highest quality.

By separating the electrodes from the sample liquid by means of a special microporous membrane, clearly defined measuring conditions are achieved and interferences eliminated.

The ProMinent DULCOTEST® sensor uses a platinum or gold cathode and a silver/silver chloride anode. In an appropriate electrolyte the latter assumes a well defined potential that may be used as a reference potential.

Unlike bare-electrode cells, which are extremely prone to interferences, membrane-covered cells do not require a constant flow rate of the sample liquid as long as there is a minimum flow rate of about 8 GPH (30 L/h). This does away with expensive equipment to keep the flow rate constant.

The influence of pH on the measurement of chlorine

It is important to know in what form chlorine exists in an aqueous solution. Only at a very low pH chlorine is present as a dissolved gas (Cl_2), while above pH 3 it exists in form of hypochlorous acid (HOCl) which at still higher pH dissociates into hypochlorite ion (OCl^-) (Fig. 3).

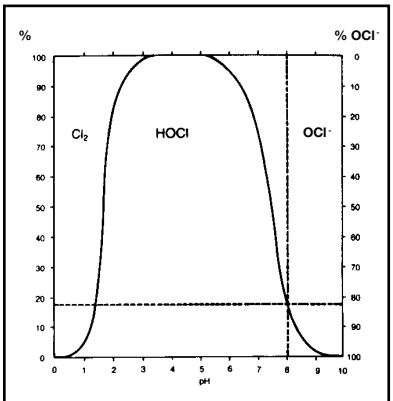


Fig. 3
Relationship between elemental chlorine, hypochlorous acid and hypochlorite ion, and pH

Compared to hypochlorous acid, the bactericidal action of hypochlorite ion is lower by the factor 100. Therefore, it makes little sense to measure hypochlorite. However, both hypochlorous acid and hypochlorite are interpreted as "free chlorine" and returned as such when determined by the DPD 1 method which is most commonly used for standardizing the chlorine analyzer.

The following example will make this clear:

At pH 8 only about 20% of the chlorine exist in form of highly effective HOCl, while about 80% are present as ineffective OCl^- (Fig. 3). If the chlorine analyzer is to read the same value as is obtained by a comparative determination by the DPD 1 method, the slope must be adjusted accordingly. ProMinent's D1C controller offers optional pH correction for free chlorine according to the dissociation curve (Fig. 3). The WS series with CLE sensor measures only the hypochlorous acid component of free chlorine.

The influence of temperature on the chlorine reading must be considered. That is why the reading of the DULCOTEST® chlorine sensor is automatically corrected for variations in temperature.

While the amperometric method of ascertaining chlorine does not pose any problems when inorganic chlorine is used (chlorine gas Cl_2, sodium hypochlorite NaOCl or calcium hypochlorite $Ca(OCl)_2$), provided the pH is constant, some complications might be introduced when chlorinated organic compounds as sources of chlorine are used, but under certain conditions such problems can be eliminated.

When chlorinated organic compounds are added to the water they do not only react to form hypochlorous acid, which is registered by the chlorine sensor, but they also form combined chlorine which is bound to ammonia or isocyanuric acid, and as such is less effective and not registered by the CLE chlorine sensor.

However, the DPD 4 method measures total chlorine, which is measurable using the amperometric method with the CTE sensor.

The determination of chlorine is interfered with in the presence of bromine, iodine, ozone or chlorine dioxide, but not in the presence of dissolved oxygen. Surface-active substances (fats, tensides) block the membrane and prohibit the use of the chlorine sensor.

For determining chlorine dioxide or ozone residual, a sensor similar to the chlorine sensor is used. The reading is independent of the pH. The influence of temperature is negligible. Dissolved oxygen and chlorite do not interfere.

The benefits of the DULCOTEST® sensors at a glance

Easy handling.
- No dechlorinating filter for sample liquid required.
- Quick installation and calibration.
- No buffers or reagents.

Reliable reading
- The DULCOTEST® method of ascertaining chlorine is not affected by dissolved solids and therefore may be used for sea water.
- The reading is not affected by the flow rate of the sample liquid above a minimum of 0.5 L/min.

Low maintenance
- Maintenance work is limited to changing membrane cap and electrolyte filling approx. once every 6 or 12 months.
- Low long-term operating costs.
- No continual changing of buffer solutions or reagants.

Conductometry– measurement of the electrolytic conductivity

Unlike the conductivity of metals which is brought about by the migration of electrons, electrolytic conductivity is caused by the migration of ions, that is, of positively or negatively charged atoms or groups of atoms existing in aqueous solutions owing to dissociation. Conductivity measuring cells are distinguished by the following criteria:

The cell constant

A system in which the conductivity of an electrolyte would be measured in a pipe of a length L = 1 cm and a cross sectional area of A = 1 cm^2 has a cell constant k = 1 cm^{-1}. If the length were L = 10 cm (or the area were A= 0.1 cm^2) the cell constant would be k = 10 cm^{-1}. If the area were increased to A = 10 cm^2 (or the length decreased to L = 0.1 cm) then the cell constant would be k = 0.1 cm^{-1}. A measuring cell having a small cell constant is used for determining low conductivities and one having a large cell constant for determining high conductivities. The reason behind it is obviously to increase the sensitivity for low conductivities (e.g. k = 0.1 cm^{-1}) and to decrease it for high conductivities (e.g. k = 10 cm^{-1}).

Conductivity varies with temperature

As a rule different dissolved substances possess different temperature coefficients α (alpha) so that the temperature behavior is very complex and varies as the concentration and the temperature change.

Since the objective of conductivity measurement usually is to determine the concentration of a substance, readings must be corrected for temperature changes if accurate measurement is required, especially when conductivity is to be corrected to the internationally used reference temperature of 77° F (25°C). The temperature is sensed by an NTC resistor or a Pt 100 (platinum resistance thermometer), the Pt 100 being superior as far as linearity, and hence accuracy.

Potentiostatic Measurement– combining potentiometry and amperometry

The measurement of hydrogen peroxide, peracetic acid and dissolved oxygen use the potentiostatic measurement principle. This combines a three-electrode technique (working electrode, counter electrode and reference electrode) with a two-electrode amperometric measurement (working and counter electrodes), plus temperature compensation. The complexity of the system requires a special microprocessor capable of recognizing the unique signatures of low concentrations for accurate measurement and control without cross-sensitivity to other oxidants.

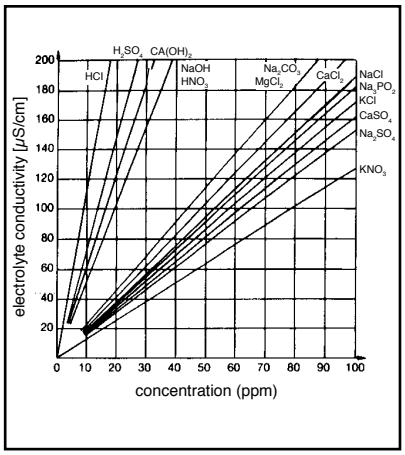


Figure 4. Electrolytic conductivity – concentration relationship for dilute acids, bases and salt solutions.

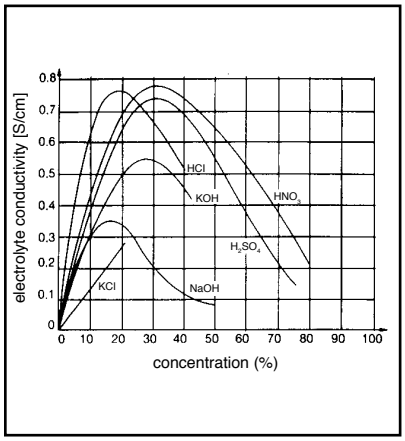


Figure 5. Specific conductivity – concentration relationship for dilute acids, bases and salt solutions (% w/w).

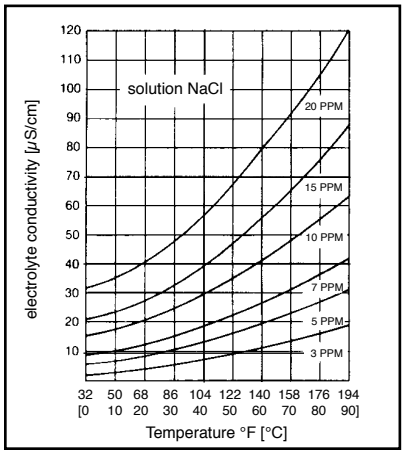


Figure 6. Conductivity of aqueous solutions of table salt vs. temperature at different concentrations.

ProMinent® DULCOTEST® Sensors

pH Identcode description

Aid to selection of pH-electrodes see page 6

Identcode Description (Type description)

PHEX T 112 SE 3D

pH-combination probe

X: with solid electrolyte and circular gap diaphragm

K: with strong plastic shaft

N: refillable KCl electrode

E: insertion electrode

R: with PTFE ring diaphragm

P: pressure tight up to 87 psi (6 bar)

D: 2 ceramic diaphragms (double junction)

S: swimming pool electrode

F: hydrofluoric acid solution-resistant

unspecified: standard gel electrode

with integrated temperature sensor

pH measurement range: 1-12

V: Vario Pin socket

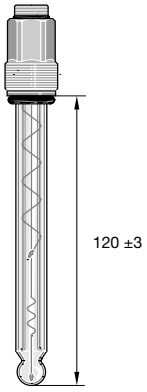
S: Plug connector for SN6 coax plug

L: KCl refillable laboratory electrode

E: mounting thread PG 13.5

3D: 3 ceramic diaphragms

pH Combination Sensors With SN6



pk_6_016

PHE 112 SE

pH range: 1-12
Temperature: 32-140 °F (0-60 °C)
Max. pressure: 7.25 psi (0.5 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm), thread PG 13.5
Typical applications: Swimming pool, atmospheric pressure installation, potable water, lightly contaminated waste water.

	Part No.
PHE 112 SE	305054
PHE 112 SE as above, but length 8.9“ (225 ±3 mm)	150092

PHES 112 SE

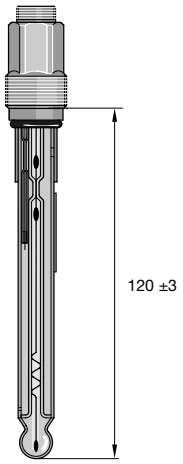
As PHE 112 SE but max. pressure 43.5 psi (3 bar)

Typical uses: Swimming pools during pressurisation, drinking water, slightly contaminated industrial and wastewater

	Part No.
PHES 112 SE	150702

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With SN6

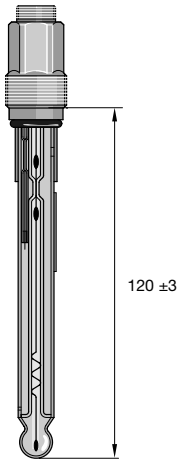


pk_6_019

PHEP 112 SE

pH range: 1-12
Temperature: 32-176 ºF (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm), thread PG 13.5
Mounting hole: min Ø 0.6“ (14.5 mm)
Typical uses: Swimming pools under pressure for higher temperatures and pressures, potable and industrial water, lightly soiled wastewater and the electroplating and chemical industries

	Part No.
PHEP 112 SE	150041



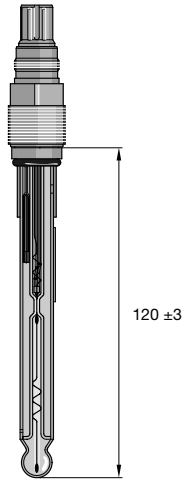
pk_6_019

PHEP-H 314 SE

pH range: 3-14 (Note: use below pH 3 shortens the service life)
Temperature: 32-212 ºF (0-100 °C)
Max. pressure: 87 psi (6 bar) at 77 ºF (25 °C)
43.5 psi (3 bar) at 212 ºF (100 °C)
Min. conductivity: 150 µS/cm
Diaphragm: ceramic
Insertion length: 4.72“ (120 ±3 mm), screw-in thread PG 13.5
Shank diameter: 0.47“ (12 mm) min. diam.
Typical applications: monitoring or control of chemical processes with neutral to highly-alkaline media and temperatures up to 100 °C

	Part No.	
PHEP-H 314 SE	1024882	**Note:**

the electrode will be available from the first quarter of 2005



pk_6_068

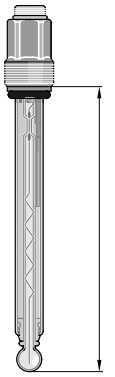
PHEPT 112 VE

Technical data and conditions for use as type PHEP 112 SE, however, with integrated Pt 100 enclosed in glass shaft and Vario Pin plug with gold plated contacts.

	Part No.
PHEPT 112 VE	1004571

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With SN6

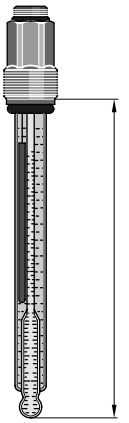


pk_6_018

PHER 112 SE

pH range: 1-12
Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >50 µS/cm
Electrolyte with solid KCl supply (salt rings in the reference electrolyte)
Diaphragm: PTFE ring diaphragm
Installation Length: 4.72“ (120 ±3 mm)
Typical applications: Municipal and industrial wastewater, process water, water in the chemical and paper manufacturing industries. General, for water with suspended solid content.

	Part No.
PHER 112 SE	1001586



pk_6_017

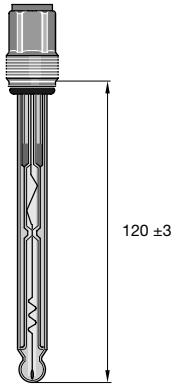
PHEX 112 SE

pH range: 1-12
Temperature: 32-212 °F (0-100 °C)
Max. pressure: 232 psi (16 bar) at 77 °F (25 °C); 87 psi (6 bar) at 212 °F (100 °C)
Min. conductivity: >500 µS/cm
Diaphragm: Circular gap diaphragm (solid electrolyte)
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Waste water, industrial water, process chemistry, emulsions, suspensions, fluids containing protein and sulphide (not for chlorine/fluoride or when subject to temperature fluctuations). General, for water with a high suspended solid content.
Not suitable for use in clear water

	Part No.
PHEX 112 SE	305096
PHEX 112 SE as above but length 8.9“ (225 ±3 mm)	150061

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With SN6

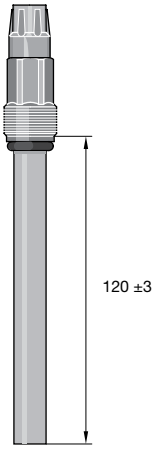


pk_6_022

PHED 112 SE

pH range: 1-12
Temperature: 32-176 ºF (0-80 °C)
Max. pressure: 116 psi (8 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Double junction
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Potable, industrial water, lightly contaminated waste water, cooling tower water

	Part No.
PHED 112 SE	741036



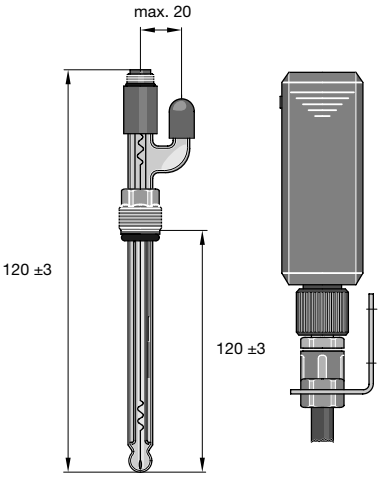
pk_6_007

PHEF 012 SE

HF

pH range: 1-12
Temperature: 32-122 ºF (0-50 °C)
Max.pressure: 100 psi/7 bar
Min.conductivity: >150 µS/cm
Diaphragm: HDPE ring diaphragm, flat (Double Junction)
Glass membrane: flat membrane glass, largely resistant to hydrofluoric acid solutions
Electrode shaft: epoxy
Typical applications: achieves a significantly longer service life in hydrofluoric acidic fluids as compared to standard pH electrodes, e.g. in wastewaters from the chip industry or electroplating applications.
The electrode is protected against dirt by the flat glass membrane and the circumferential flat PE diaphragm.

	Part No.
PHEF 012 SE	1010511



pk_6_021

PHEN 112 SE

pH range: 1-12
Temperature: 32-176 ºF (0-80 °C)
Max. pressure: Atmospheric pressure
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
KCl electrolyte, refillable
Installation Length: 4.72“ (120 ±3 mm)
Typical applications: Waste water
Supplied without PE storage container and tubing

		Part No.
PHEN 112 SE		305090
Accessories:		
PE storage container with connectors and tubing		305058
We recommend installation approx. 1.5 - 3 ft. (0.5-1 m) above sample fluid level		
KCl solution 3 molar	250 ml	791440
KCl solution 3 molar	1000 ml	791441

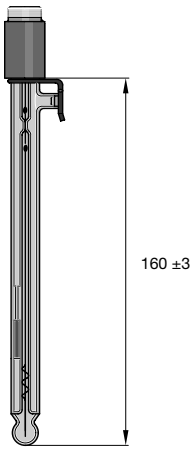
PHEN 112 SE 3D

As PHEN 112 SE but
Min. conductivity: >50 µS/cm
Diaphragm: 3 ceramic diaphragms
Typical applications: As PHEN but for lower conductivity

	Part No.	
PHEN 112 SE 3D	150078	**PHEN 012 SL**

pH range: 0-12
Temperature: 32-176 °F (0-80 °C)
Max. pressure: Atmospheric pressure operation
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
KCl electrolyte, refillable
No internal mounting thread
Typical applications: Manual measurement in laboratory

	Part No.	
PHEN 112 SL	305078	**PHEN 012**

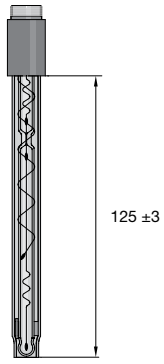


pk_6_020

SL 3D

As above but
Min. conductivity: >50 µS/cm
Diaphragm: 3 ceramic diaphragms
Typical applications: Laboratory, lower conductivity

	Part No.
PHEN 112 SL 3D	791508



pk_6_023

PHEK 112 SE

pH range 1-12
Temperature: 32-140 °F (0-60 °C)
Max. pressure: Atmospheric pressure operation
Min. conductivity: >150 µS/cm
Diaphragm: Glass fiber
No internal mounting thread, plastic shaft
Typical applications: Hand-held measurement in swimming pool, potable water

	Part No.
PHEK 112 SE	305051

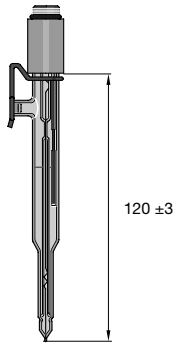
PHEK-L 112 SE

pH range 1-12
Temperature: 32-140 °F (0-60 °C)
Max. pressure: 44 psi
Min. conductivity: 150 µS/cm
Diaphragm: Ceramic
Shaft material: Polycarbonate
Installation dimensions: length:120mm, diameter: 12mm
Installation position: vertically to horizontal (0-90°)
Typical applications: swimming pool at elevated sample pressures, drinking water, slightly contaminated industrial water and wastewater, aquariums.

	Part No.
PHEK-L 112 SE	1034918

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With SN6



pk_6_025

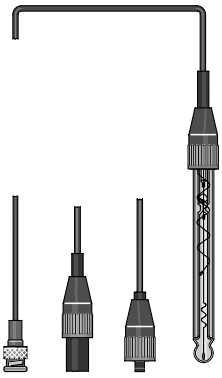
PHEE 112 S

pH range: 1-12
Temperature: 32-140 ºF (0-60 °C)
Max. pressure: Atmospheric pressure operation
Diaphragm: 3 ceramic diaphragms
No internal mounting thread
Typical applications: pH measurement in foodstuffs, e.g. meat, cheese
non sterilisable

	Part No.
PHEE 112 S	791094
Accessories	
Cleaning fluid Pepsin/hydrochloric acid 250 ml	791443

pH Combination Sensors with Fixed Cable

The fixed cable electrodes with threaded male adapter, type - FE are fitted with a rotating threaded sleeve. This facilitates installation in inline probe housings because you rotate only the threaded sleeve and not the whole electrode when installing.



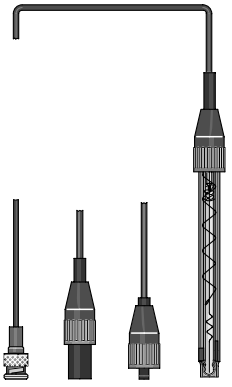
pk_6_024

Type PHE 112 F

pH combination probes, gel-filled, with fixed coax cable and device plug, no internal thread.

Type	Cable length	Device plug	Part No.
PHE 112 F 301 S	3.3 ft. (1 m)	SN6	304976
PHE 112 F 501 D	3.3 ft. (1 m)	DIN	304978
PHE 112 F 301 B	3.3 ft. (1 m)	BNC	304980
PHE 112 F 303 B	9.8 ft. (3 m)	BNC	304981

Further types on request.



pk_6_027

Type PHEK 112 F

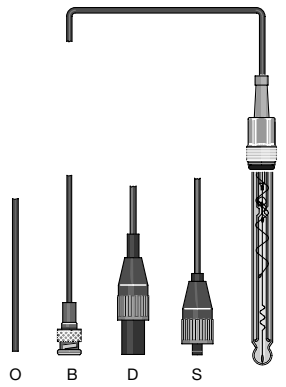
pH combination probe with plastic shaft, glass stem, fixed coax cable and connector, no internal thread.

Type	Cable length	Device plug	Part No.
PHEK 112 F 301 S	3.3 ft. (1 m)	SN6	304994
PHEK 112 F 501 D	3.3 ft. (1 m)	DIN	304995
PHEK 112 F 301 B	3.3 ft. (1 m)	BNC	304996

Further types on request.

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With Fixed Cable

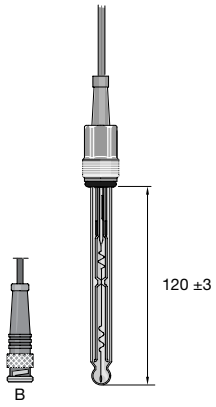


pk_6_028

Type PHE 112 FE

Type	Cable length	Device plug	Part No.
PHE 112 FE 303 S	9.8 ft. (3 m)	SN6	304984
PHE 112 FE 310 S	32.8 ft. (10 m)	SN6	304985
PHE 112 FE 503 D	9.8 ft. (3 m)	DIN	304986
PHE 112 FE 303 B	9.8 ft. (3 m)	BNC	304988
PHE 112 FE 310 O	32.8 ft. (10 m)	without	304990

Further types on request.



pk_6_030

pk_6_029

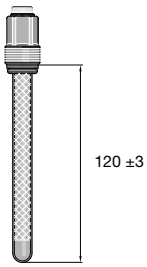
Type PHED 112 FE

Type	Cable length	Connector	Part No.
PHED 112 FE 303 B	9.8 ft. (3 m)	BNC	741038

Further types on request.

ProMinent® DULCOTEST® Sensors

Temperature Sensors



pk_6_026

Temperature range: 0…100 °C
Max. pressure: 10 bar
Typical applications: Temperature measurement and pH temperature correction

	Part No.
Pt 100 SE	305063
Pt 1000 SE	1002856

ORP Identcode Description

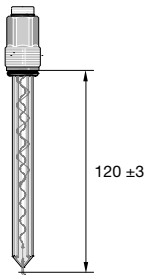
Aid to selection of Redox electrodes see page 6

Identity Code Description (Type description)

RHEX Pt SE

- ORP-combination probe
  - **X**: with solid electrolyte and circular gap diaphragm
  - **K**: with strong plastic shaft
  - **P**: pressure tight to 87 psi (6 bar)
  - **R**: with PTFE ring diaphragm
  - **N**: refillable KCl electrode
  - **S**: swimming pool electrode
  - unspecified: standard gel-filled electrode
- **Pt:** Platinum electrode (pin)
  - **Au:** Gold electrode (pin)
- **E**: internal mounting thread PG 13.5
  - **S**: connector for SN6 coax plug

ORP Combination Sensors With SN6



pk_6_031

RHE-Pt-SE

Temperature: 32-140 °F (0-60 °C)
Max. pressure: 7.3 psi (0.5 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Swimming pool, atmospheric pressure installation, potable water, lightly contaminated water

	Part No.
RHE-Pt-SE	305001

RHES-Pt-SE

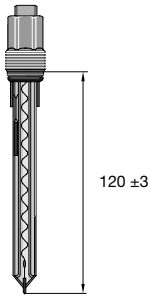
As RHE-Pt-SE but max. pressure 43.5 psi (3 bar)

Typical use: swimming pools during pressurisation, drinking water, slightly fouled industrial and wastewater

	Part No.
RHES-Pt-SE	150703

ProMinent® DULCOTEST® Sensors

ORP Combination Sensors With SN6



pk_6_035

RHEP-Pt-SE

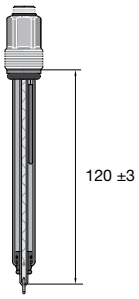
Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm)
Mounting hole: min. Ø 0.57“ (14.5 mm)
For installation in DGM (delivered before 1997) the assembly kit (Part No. 791219 has to be ordered additionally.
Typical applications: Swimming pools under pressure, potable and industrial water, lightly soiled wastewater, the electroplating and chemical industries, for higher temperatures and pressures.
Not suitable for media containing ozone

	Part No.
RHEP-Pt-SE	150094

RHEP-Au-SE

Technical data as type RHEP-Pt-SE, but with gold pin electrode.
Typical application: cyanide detoxification, ozone monitoring.
Not suitable for media containing chlorine

	Part No.
RHEP-Au-SE	1003875

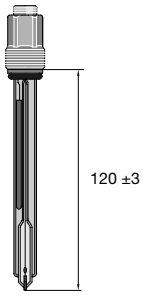


pk_6_034

RHER-Pt-SE

Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >50 µS/cm
Electrolyte with KCl supplement (salt rings in the reference electrolyte)
Diaphragm: PTFE ring diaphragm
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Municipal and industrial waste water, drinking and industrial water, chemical industry, paper manufacture, food industry. General, for water with distinct suspended solid content.

	Part No.
RHER-Pt-SE	1002534



pk_6_033

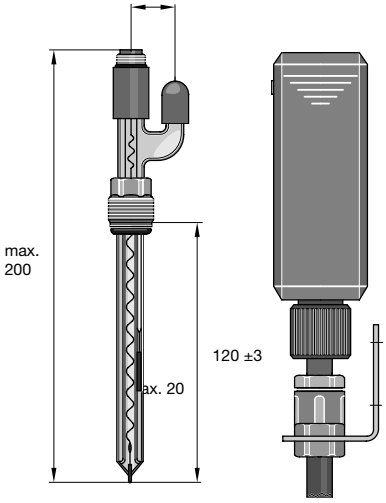
RHEX-Pt-SE

Temperature: 32-212 °F (0-100 °C)
Max. pressure: 232 psi (16 bar) at77 °F (25 °C); 87 psi (6 bar) at 212 °F (100 °C)
Min. conductivity: >500 µS/cm
Diaphragm: circular gap (solid electrolyte)
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Waste water, industrial water, process chemistry, emulsions, suspensions, fluids containing protein and sulphide (not chlorine/fluoride or when subject to temperature fluctuations). General, for water with high suspended solid content.
Not suitable for clear media

	Part No.
RHEX-Pt-SE	305097

ProMinent® DULCOTEST® Sensors

ORP Combination Sensors With SN6

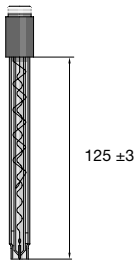


pk_6_032

RHEN-Pt-SE

Temperature: 32-176 °F (0-80 °C)
Max. pressure: Atmospheric pressure operation
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
KCl electrolyte, refillable
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Waste water
Supplied without PE storage container and tubing

		Part No.
RHEN-Pt-SE		305091
Accessories:		
PE storage container with connectors and tubing		305058
We recommend installation approx. 1.6 - 3.3 ft. (0.5-1 m) above sample fluid level.		
KCl solution 3 molar	250 ml	791440
KCl solution 3 molar	1000 ml	791441

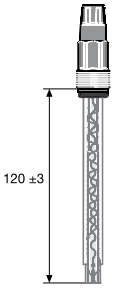


pk_6_036

RHEK-Pt-S

Temperature: 32-140 °F (0-60 °C)
Max. pressure: Atmospheric pressure operation
Min. conductivity: >150 µS/cm
Diaphragm: Glass fibre
No internal thread
Typical applications: Manual measurements of e.g. swimming pool, potable water etc.

	Part No.
RHEK-Pt-S	305052

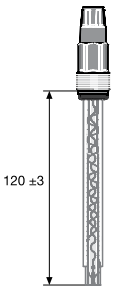


pk_6_091

RHEK-Pt-SE

Temperature: 32-140 °F (0-60 °C)
Max. pressure: 44 psi (3.0 bar)
Min. conductivity: 150 µS/cm
Diaphragm: Ceramic
Thread: PG 13.5
Typical applications: Swimming pool at elevated sample water pressures, drinking water, lightly contaminated waste water.

	Part No.
RHEK-Pt-SE	1028459



pk_6_091

RHEK-L-Pt-SE

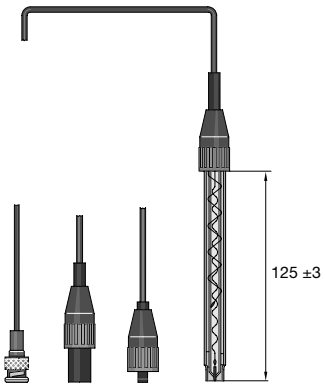
Temperature: 32-140 °F (0-60 °C)
Max. pressure: 44 psi (3.0 bar)
Min. conductivity: 150 µS/cm
Diaphragm: Ceramic
Electrode shaft: Polycarbonate
Dimensions: length: 120mm, diameter 12mm
Installation position: vertically to horizontally (0-90°)
Thread: PG 13.5
Typical applications: swimming pool at elevated sample water pressures, drinking water, slightly contaminated wastewater.

	Part No.
RHEK-L-Pt-SE	1034919

pk_6_037

ProMinent® DULCOTEST® Sensors

ORP Combination Sensors With Fixed Cable



Type RHE-Pt-FE

ORP combination probes with Pt electrode probe gel-filled, with glass shaft, internal mounting thread PG 13.5 with fixed coax cable and device plug.

Type	Cable length	Connector	Part No.
RHE-Pt-FE 310 B	32.8 ft. (10 m)	BNC	304993

Type RHE-Pt-F

As above but without internal mounting thread.

Type	Cable length	Connector	Part No.
RHE-Pt-F 303 B	9.8 ft. (3 m)	BNC	304983

Type RHK-Pt-F

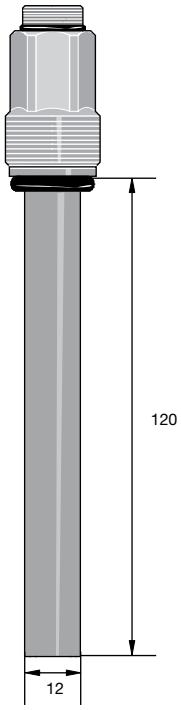
ORP combination probes with plastic shaft, Pt electrode with cover.

Fixed coax cable and device plug, no internal mounting thread.

Type	Cable length	Connector	Part No.
RHEK-Pt-F 301 S	3 ft. (1 m)	SN6	304997
RHEK-Pt-F 501 D	3 ft. (1 m)	DIN	304998

ProMinent® DULCOTEST® Sensors

Fluoride Sensors



pk_6_095

DULCOTEST® fluoride electrodes are ion-selective electrodes based on the potentiometic measurement principle. They are designed for determining the concentration of fluoride anions in aqueous solutions. These electrodes have been optimised for use in monitoring the fluoridation of potable water in waterworks. Corresponding conditions must be observed. 5.1.16 shows a complete measuring station.

FLEP 010

A 4-20 mA measurement transducer, a reference electrode and a temperature sensor for temperature compensation are required as well as the fluoride electrode.Measured variable: Fluoride ion concentration

Reference method:	photometric, see section 5.4.5: DT2A and DT2B photometers
Measurement range with measurement transducer:	0.05-10.00 mg/l
pH range:	5.5-9.5
Temp. range:	34-95 ºF (1-35 °C)
Max. Pressure:	100 psi (no pressure surges)
Intake flow:	recommended 5.3 gph (20 l/h): 2.6-26.4 gph (10 - 200 l/h)
Conductivity range:	> 100 µS/cm
Response time T95 (open):	< 30 s (for conc. > 0.5 ppm)
Enclosure rating:	IP 65
Shelf life:	approx. 6 months
Length when fitted:	4.72“ (120 mm)
Shaft diameter:	0.472“ (12 mm)
Typical application:	monitoring the fluoridation of potable water
Measurement and control equipment:	D1C
in-line probe housing:	DLG IV

	Part No.
FLEP 010 (fluoride sensor)*	1028279

Accessories

4-20 mA measurement transducer FPV1**	1028280
Sensor cable	725122
Reference electrode, REFP-SE	1018458
Temperature sensor, Pt 100	305063
Polishing paste	559810

* replaces flouride sensor (part no. 1010311)

** replaces transducer (part no. 1009962)

ProMinent® DULCOTEST® Sensors

Overview: Amperometric Sensors

For optimum functioning of chlorine, bromine, chlorine dioxide, chlorite, peracetic acid, hydogen peroxide and ozone measuring sensors please note the following guidelines:

- Use DULCOMETER® measurement and control systems.
- Install only in ProMinent® DGM or DLG III in-line probe housings.
- Defined flow between 30 and 60 l/h.
- Chlorine measurement must **only** take place **when pH is stable** (CLE 3).
- Regular calibration with a Photometer (e.g. Type DT 1).

Important:

Amperometric sensors are not electrically isolated. When installing in external appliances (e.g. PLC), you should electrically isolate the supply voltage and the analogue input signal.

Summary of features:

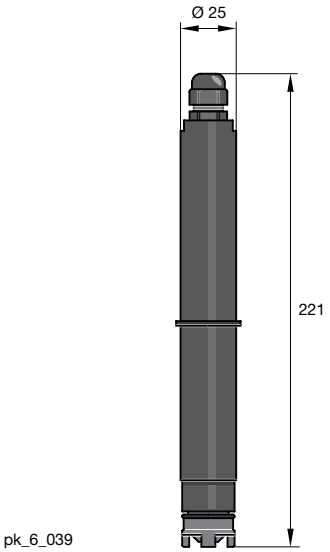
- High zero point stability
- Compact design
- Integrated temperature correction
- Simple to install
- Simple to maintain
- Short warm up period time
- Measurement signal virtually unaffected by flow

Chlorine Sensors

Chlorine dissolved in water is present in different forms:

Free (active) chlorine:	Cl_2, HOCl (hypochlorous acid), OCl^- (hypochlorite) recommended sensors: **CLE** (analysis: DPD 1).
Combined chlorine:	mono, di, trichloramine (analysis: DPD 4 - DPD 1).
Organic combined chlorine:	Of isocyanuric acid/isocyanurate bound chlorine (total available chlorine) and the resulting free (effective) chlorine; recommended sensor: **CGE** (analysis: DPD1).
Total chlorine:	Sum of free and combined chlorine; recommended sensor: **CTE** (analysis: DPD 4).
Applications:	Chlorine measurement in drinking, swimming pool, process, industrial water and water of similar quality e.g. seawater/brine with up to 15 % chloride content. We recommend the CGE, CTE chlorine sensors for measuring chlorine if pH value is high (8..9.5).
Guidelines for device usage:	The sensors with the suffix -mA are used with the measurement and control devices D1C, D2C and DULCOMARIN®. The sensors with the suffix -4P are used with the earlier WS controllers and for metering pumps with integrated chlorine controllers. DMT-type sensors are used for the DMT transducer. CAN-type sensors are used with the DULCOMARIN® II swimming pool controller.
Note CLE sensors:	The CLE type sensors cannot be used in liquids containing isocyanuric acid/chlorine stabilisers.

Chlorine Sensors



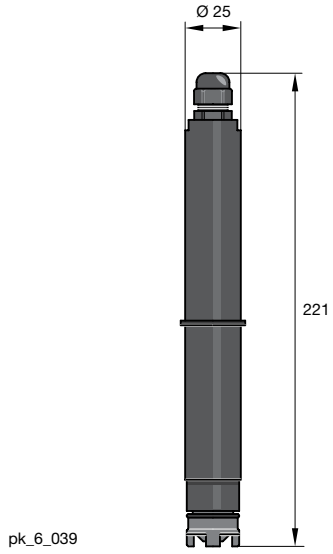
pk_6_039

Measurement of free chlorine

CLE 3-mA

Measured variable:	**Free chlorine (hypochlorus acid HOCl)**
Analysis:	DPD 1
pH range:	5.5-8.0 (up to pH 8.5 with D1C pH correction)
Temperature range:	41-113 °F (5-45 °C) temperature compensated
Max. pressure:	14.5 psi (1 bar)
Flow:	7.9-14.9 gph (30-60 l/h) in DGM or DLG III
Power supply:	16-24 V DC (two-wire technology)
Output signal:	4-20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Typical applications:	CLE 3-mA-0.5 ppm, potable water CLE 3-mA-2/5/10 ppm, swimming pool, potable, industrial, process water (surfactant free)
Measurement and control devices:	D1C, D2C, DULCOMARIN® (2/10 ppm only)
In-line probe housing:	DGM, DLG III

	Part No.
CLE 3-mA-0.5 ppm set, with 100 ml electrolyte	792927
CLE 3-mA-2 ppm set, with 100 ml electrolyte	792920
CLE 3-mA-5 ppm set, with 100 ml electrolyte	1033392
CLE 3-mA-10 ppm set, with 100 ml electrolyte	792919
CLE 3-mA-20 ppm set, with 100 ml electrolyte	1002964
CLE 3-mA-50 ppm set, with 100 ml electrolyte	1020531
CLE 3-mA-100 ppm kpl. with 100 ml electrolyte	1022786



pk_6_039

CLE 3.1-mA

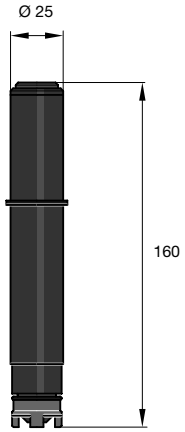
Measured variable:	**free chlorine (hypochlorous acid HOCl) where there is a high rate of combined chlorine and/or in the case of pH values up to 8.5 (with D1C pH correction)**
Reference method:	DPD1
Measurement range:	0.01-0.50 mg/l (CLE 3.1-mA-0.5 ppm) 0.02-2.00 mg/l (CLE 3.1-mA-2 ppm) 0.01-5.00 mg/l (CLE 3.1-mA-5 ppm) 0.1-10.0 mg/l (CLE 3.1-mA-10 ppm)
pH range:	5.5-8.0 (up to pH 8.5 with D1C pH correction)
Temp. range:	41-113 °F (5-45 °C) temperature compensated
Max. pressure:	14.5 psi (1 bar)
Inflow:	7.9-14.9 gph (30-60 l/h) in the DGM or DLG III
Supply voltage:	16-24 V DC (two wire technology)
Output signal:	4-20 mA = measurement range (uncalibrated) **Important:** not electrically isolated!
Typical applications:	swimming pool, industrial and process water with higher proportions of combined chlorine and/or higher pH values to pH 8.5
Measurement and control equipment:	D1C, D2C, DULCOMARIN®
In-line probe housing:	DGM, DLG III

	Part No.
CLE 3.1-mA-0.5 ppm set, with 100 ml electrolyte	1020530
CLE 3.1-mA-2 ppm set, with 100 ml electrolyte	1018369
CLE 3.1-mA-5 ppm set, with 100 ml electrolyte	1019398
CLE 3.1-mA-10 ppm set, with 100 ml electrolyte	1018368

Signal leads, see sensor accessories, section 6.5.1

ProMinent® DULCOTEST® Sensors

Chlorine Sensors



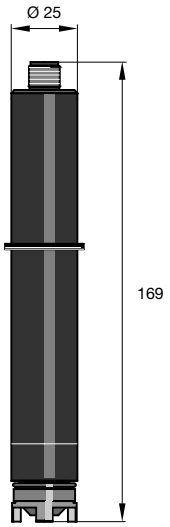
pk_6_042

CLE 2.2-4P

Measured variable:	**Free chlorine, (hypochlorous acid HOCl)**
Reference method:	DPD1
Measurement range:	0.1-20 mg/l
Remaining data as for CLE 3-mA	
Measurement and control devices:	D_4a (metering pump with integrated controller), CLWS
In-line probe housing:	DGM, DLG III

	Part No.
CLE 2.2-4P set, with 100 ml electrolyte	914958

Signal leads, see sensor technology accessories, chapter 6.5.1



pk_6_038

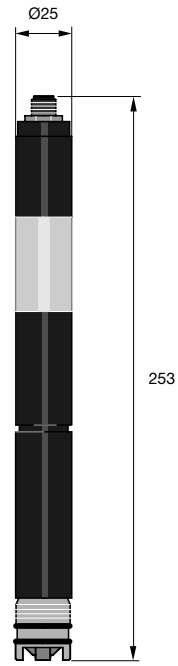
CLE 3-DMT

Measuring cell for use with the DMT “chlorine” measurement transducer.

Measured variable:	**Free chlorine (hypochlorous acid HOCl)**
Reference method:	DPD1
Measurement range:	0.01-5.0 mg/l 0.05-50 mg/l
Supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temp. measurement:	Via integrated Pt 1000: compensation carried out in DMT
Measuring cell output:	5-pin plug
Other data as for CLE-3 mA.	

	Part No.
CLE 3-DMT-5 ppm set with 100 ml electrolyte	1005511
CLE 3-DMT-50 ppm set with 100 ml electrolyte	1005512

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine sensors into the DLM III in-line probe housing.Signal leads, see sensor technology accessories, chapter 6.5.1



pk_6_096

CLE 3-CAN

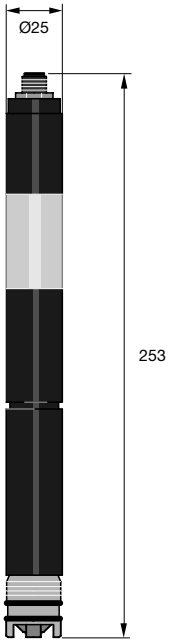
Sensors for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

Measured variable:	**free chlorine (hypochlorous acid)**
Reference method:	DPD 1
Measurement range:	0.01 -10 mg/l
Power supply:	via CAN interface (11-30 V)
Temperature measurement:	via installed digital semiconducter element
Output signal:	uncalibrated, temperature compensated, electrically isolated
Compatibility:	CAN-Open bus systems
Additional data see CLE 3-mA	

	Part No.
CLE 3-CAN-10 ppm set with 100 ml electrolyte	1023425

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine sensors into the DLM III in-line probe housing.

Chlorine Sensors



pk_6_096

CLE 3.1-CAN

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

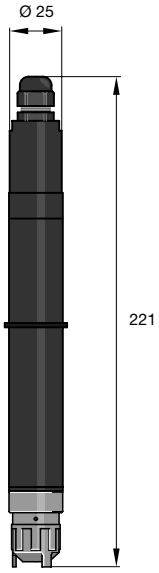
Measured variable:	**free chlorine (hypochlorous acid) with high proportion of bound chlorine and/or pH value up to 8.5 (with pH correction via D1C)**
Reference method:	DPD 1
Measurement range:	0.01 -10 mg/l
Power supply:	via CAN-interface (11-30 V)
Temperature measurement:	via installed digital semiconducter element
Output signal:	uncalibrated, temperature compensated, electrically isolated
Compatibility:	CAN-Open bus systems

Additional data see CLE 3.1-mA

	Part No.
CLE 3.1-CAN-10 ppm set with 100 ml electrolyte	1023426

Note: You require assembly kit Part No. 815079 for the initial installation of the chlorine sensors into the DLM III in-line probe housing.

Measured variable of organic combined chlorine and free chlorine (total available chlorine)

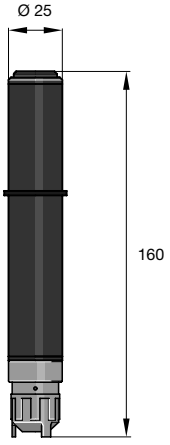


pk_6_040

CGE 2-mA

Measured variable:	**Total available chlorine: sum of organically combined chlorine (e.g. combined in cyanuric acid) and free chlorine**
Reference method:	DPD1
Measurement range:	0.02-2.00 mg/l (CGE 2-mA-2 ppm) 0.1-10.0 mg/l (CGE 2-mA-10 ppm)
pH range:	5.5-9.5
Temperature range:	41-113 ºF (5-45 °C) temperature compensated
Max. pressure:	43.5 psi (3 bar)
Flow:	7.9-15.9 gph (30-60 l/h) in DGM or DLG III
Power supply:	16-24 V DC (two-wire technology)
Output signal:	4-20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Typical applications:	Swimming pools and in water with high pH-value
Measurement and control devices:	D1C, D2C, DULCOMARIN®
In-line probe housing:	DGM, DLG III

	Part No.
CGE 2-mA-2 ppm set, with 50 ml electrolyte	792843
CGE 2-mA-10 ppm set, with 50 ml electrolyte	792842



pk_6_041

CGE 2-4P-10 ppm

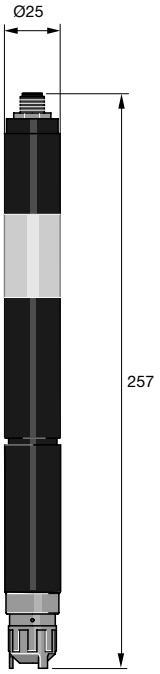
Measured variable:	**Organic combined chlorine and free chlorine**
Reference method:	DPD1
Measurement range:	0.1-10.0 mg/l

Remaining data as for CGE 2-mA

Measurement and control devices:	D_4a (metering pump with integrated controller)
In-line probe housing:	DGM, DLG III

	Part No.
CGE 2-4P-10 ppm set, with 50 ml electrolyte	792838

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine sensors into the DLM III in-line probe housing.



pk_6_084

CGE 2-CAN

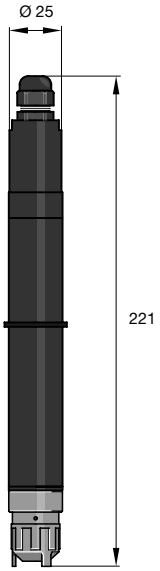
Probe for connection to a CANopen interface (e.g. DULCOMARIN® II swimming pool controller)

Measured variable:	**total available chlorine: sum of organically combined chlorine (e.g. combined in cyanuric acid) and free chlorine**
Reference method:	DPD1
Range:	0.01-10.00 ppm
pH range:	5.5-9.5
Temp. range:	5-45 °C (temperature compensated)
Max. pressure:	3 bar
Incident flow;	30-60 l/h (with DGMa or DLG III)
Supply:	via CAN interface (11-30 V)
Temperature measurement:	via built-in digital semiconductor device
Output signal:	calibrated, temperature-compensated, electrically-isolated
Compatibility:	CANopen bus systems

See CGE 2-mA for other information

	Part No.
CGE 2-CAN-10 ppm c/w with 100 ml of electrolyte	1024420

Note: a mounting kit (Part No. 815079) is required for the initial installation of the chlorine probe in the DLG III in-line probe housing.



pk_6_040

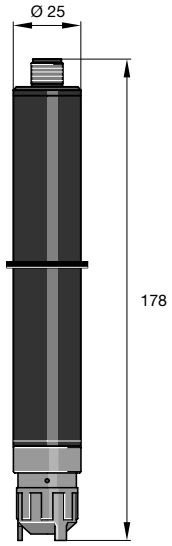
Measured variable of total chlorine

CTE 1-mA

Measured variable:	**total chlorine**
Reference method:	DPD4
Measurement range:	0.01…0.50 mg/l (CTE 1-mA-0.5 ppm) 0.02… 2.00 mg/l (CTE 1-mA-2 ppm) 0.05… 5.00 mg/l (CTE 1-mA-5 ppm) 0.1…10.0 mg/l (CTE 1-mA-10 ppm)
pH range:	5.5…9.5
Temperature range:	5…45 °C (temperature compensated)
Max. pressure:	3 bar
Flow:	30…60 l/h (in DGM or DLG III)
Power supply:	16…24 V DC (two-wire technology)
Output signal:	4…20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Typical applications:	CTE 1-mA-0.5 ppm, potable water CTE 1-mA-2/5/10 ppm: Potable, process, industrial and cooling water. In swimming pools in combination with CLE 3.1 for determining combined chlorine.
Measurement and control devices:	D1C, DULCOMARIN® (2/10 ppm only)
In-line probe housing:	DGM, DLG III

	Part No.
CTE 1-mA-0.5 ppm set, with 50 ml electrolyte	740686
CTE 1-mA-2 ppm set, with 50 ml electrolyte	740685
CTE 1-mA-5 ppm set, with 50 ml electrolyte	1003203
CTE 1-mA-10 ppm set, with 50 ml electrolyte	740684

Chlorine Sensors



pk_6_015

CTE 1-DMT

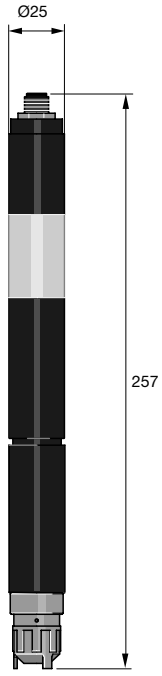
Measuring cell for use with the DMT “chlorine” measurement transducer.

Measured variable:	**Total chlorine**
Reference method:	DPD4
Measurement range:	0.01-10.0 mg/l
Power supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temperature measurement:	Via integrated Pt 1000: compensation carried out in DMT
Sensor output:	5-pin plug

Other data as for CTE 1 mA

	Part No.
CTE 1-DMT-10 ppm set with 50 ml electrolyte	1007540

Note: An assembly set 815079 is required for DLG III for initial installation of chlorine measuring cells.Signal leads, see sensor technology accessories, chapter 6.5.1



pk_6_084

CTE 1 -CAN

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

Measured variable:	**total chlorine**
Reference method:	DPD 4
Measurement range:	0.01 -10 mg/l
Power supply:	via CAN interface (11-30 V)
Temperature measurement:	via installed digital semiconducter element
Output signal:	uncalibrated, temperature compensated, electrically isolated
Compatibility:	CAN-Open bus systems

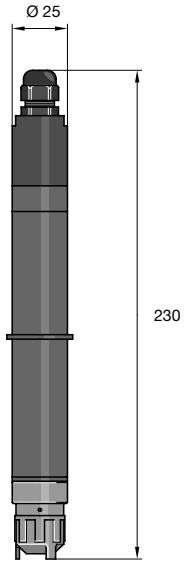
Additional data see CLE 3-mA

	Part No.
CTE 1-CAN-10 ppm set with 100 ml electrolyte	1023427

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine-sensors into the DLM III in-line probe housing

ProMinent® DULCOTEST® Sensors

Bromine Sensors



pk_6_074

The following bromating agents are used as disinfectants:

organic bromating agent

a) DBDMH (1.3-dibrom-5.5-dimethyl-hydantoin) e. g. sold as Albrom 100®

b) BCDMH (1-bromine-3-chlorine-5.5-dimethyl-hydantoin) e.g. sold as Brom-Sticks®

These bromating agents are solid and are metered as saturated solutions via brominators.

Inorganic free bromine

Free bromine is produced via the so-called Acti-Brom process® (Nalco) chlorine bleach + acid +sodium bromide.

For measuring DBDMH or free bromine as a bromating agent in the measurement range: 0.2 -10 ppm bromine the BRE 2-mA-10 ppm sensor is recommended along with DPD1-method calibration.

Alternatively, to measure BCDMH in the same measurement range, the BRE 1-mA-10 ppm sensor is recommended along with DPD4-method calibration.

Typical applications are in swimming pools, jacuzzis and cooling systems. Particularly in cooling systems the quality of the sample water must be tested and, where applicable, compatibility with other chemicals employed (e.g. corrosion inhibitors). Dissolved copper (>0.1 mg/l) will interfere with the measurement.

Photometric DPD measurement is the recommended method for calibrating the bromine sensor (e.g. with DT 1), calculated and displayed as bromine. If bromine is determined as “chlorine” with DPD, note when selecting the measurement range that you need to lower the result by a factor of 2.25.

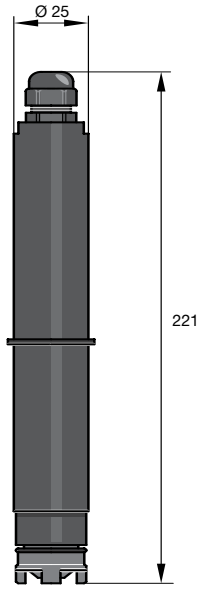
Bromine measured variable

Measured variable:	**Total available bromine (free and organic bound bromine)**
Bromine chemicals:	DBDMH (1.3-dibromine 5.5-dimethyl hydantoin) BCDMH (1-bromine-3-chlorine-5.5-dimethyl hydantoin), free bromine
Reference method:	DBDMH, free bromine: DPD1 BCDMH: DPD4
Measurement range:	DBDMH free bromine: 0.2-10.0 mg/l with type BRE 2-mA-10 ppm BCDMH: 0.2-10.0 mg/l with type BRE 1-mA-10 ppm
pH dependence:	if pH 7 changes to pH 8 the sensor sensitivity is reduced accordingly a) in the case of DBDMH and free bromine by approx. 10 % b) in the case of BCDMH by approx. 25 %
Temperature range:	5-41-113 °F (45 °C)
Max. pressure:	43.5 psi (3 bar)
Sample flow:	7.9-15.9 gph (30-60 l/h) in DGM or DLG III
Voltage:	16-24 V DC (two-wire technology)
Output signal:	4-20 mA = measurement range (not calibrated) **Warning:** not electrically isolated!
Typical applications:	Swimming pools / whirlpools and cooling water; can also be used in seawater
Measurement and control device:	D1C-bromine
In-line probe housing:	DGM, DLG III

	Part No.
BRE 1-mA-2 ppm kit with 50 ml electrolyte Measurement range relates to BCDMH	1006894
BRE 1-mA-10 ppm kit with 50 ml electrolyte Measurement range relates to BCDMH	1006895
BRE 2-mA-10 ppm kit with 50 ml electrolyte Measurement range relates to DBDMH, free bromine	1020529
BRE 1-mA-0.5 ppm kit with 50 ml electrolyte	1033390
BRE 2-mA-2 ppm kit with 50 ml electrolyte	1033391

Note: Requires assembly kit (Part No. 815079) for the initial installation of the bromine sensors into the DLM III in-line probe housing.Signal leads, see sensor technology accessories.

Chlorine Dioxide Sensors



pk_6_039

CDE 2-mA

Measured variable:	**Chlorine dioxide (ClO_2)**
Reference method:	DPD1
Measurement range:	0.01 - 0.50 mg/l (CDE 2-mA-0.5 ppm) 0.02-2.00 mg/l (CDE 2-mA-2 ppm) 0.1-10.0 mg/l (CDE 2-mA-10 ppm)
Cross sensitivity:	to chlorine <2 %
pH range:	ClO_2 stability range
Temperature range:	5-41-113 °F (45 °C) temperature compensated, no significant temperature fluctuations
Max. pressure:	14.5 psi (1 bar)
Flow:	7.9-15.9 gph (30-60 l/h) in DGM or DLG III
Power supply:	16-24 V DC (two-wire technology)
Output signal:	4-20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Typical applications:	Potable, industrial, process water (surfactant free)
Measurement and control device:	D1C
In-line probe housing:	DGM, DLG III

	Part No.
CDE 2-mA-0.5 ppm set, with 100 ml electrolyte	792930
CDE 2-mA-2 ppm set, with 100 ml electrolyte	792929
CDE 2-mA-10 ppm set, with 100 ml electrolyte	792928

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine sensors into the DLM III in-line probe housing.

CDE 2.1-mA

Technical data:	as Type CDE 2-mA, but max. temperature 60 °C
Typical application:	chlorine dioxide treatment to combat legionella

CDE 2.1-mA

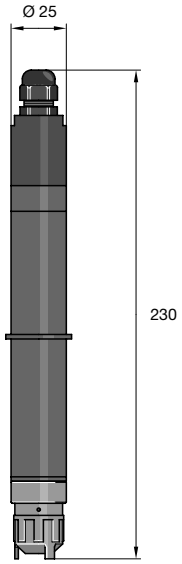
0.5 ppm comes complete with 100 ml of electrolyte

Order on request

Note: a mounting kit (Part No. 815079) is required for the initial installation of the chlorineprobe in the DLG III in-line probe housing.

ProMinent® DULCOTEST® Sensors

Chlorine Dioxide Sensors



pk_6_047

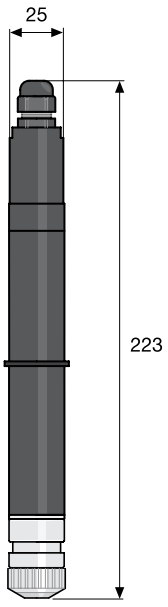
CDP 1-mA-2 ppm (ClO_2-process probe)

Applications:	Bottle washing machines and water containing surfactants
Measured variable:	**Chlorine dioxide (ClO_2)**
Reference method:	DPD1
Measurement range:	0.02-2.00 mg/l
pH range:	5.5-10.5
Temperature range:	50-113 °F (10-45 °C) short term periods 131 °F (55 °C) with **external temperature correction** via **Pt 100** (no internal temperature correction!)
Temperature variation speed:	Up to 10 K/min
Max. pressure:	43.5 psi (3 bar) no pressure surges
Flow:	7.9-15.9 gph (30-60 l/h) in DGM
Supply voltage:	16-24 V DC (two-wire technology)
Output signal:	4-20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Type application:	Process water containing surfactants (bottle washing machines)
Measuring and control device:	**D1C with automatic temperature compensation only**
In line probe housing:	the following is recommended (see fig.) Probe housing quote on request.

	Part No.
CDP 1-mA-2 ppm set with 100 ml electrolyte	1002149

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorine dioxide sensors into the DLM III in-line probe housing.

Chlorine Dioxide Sensors



pk_6_083

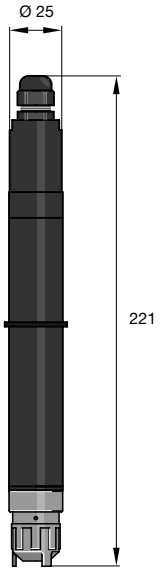
CDR 1-mA-2 ppm

Measured variable:	**Chlorine dioxide (ClO_2)**
Reference method:	DPD1
pH range:	1-10
Temperature range:	1-131 °F (-17-7 °C) short term periods 140 °F (60 °C)
Max. pressure:	44 psi (3 bar) no pressure surges
Respones time T_{90}:	2-3 min
Intake flow:	8-16 gph (30-61 l/h)
Supply Voltage:	16-24 VDC
Output signal:	4-20 mA (temperature compensated, not calibrated)
Measuring and control device:	D1C
In line probe housing:	DGMa / DLGIII

	Measuring ranges	Part No.
CDR 1-mA-0.5 ppm	0.01-0.50 ppm	1033762
CDR 1-mA-2 ppm	0.02-2.00 ppm	1033393
CDR 1-mA-10 ppm	0.01-10 ppm	1033404

ProMinent® DULCOTEST® Sensors

Chlorite Sensors



pk_6_040

Measured variable chlorite CLT 1-mA

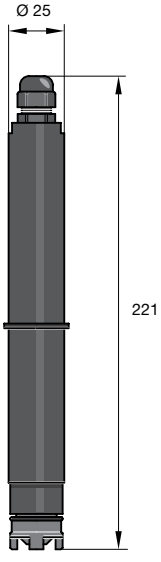
Measured variable:	**chlorite anion (ClO_2^-)**
Reference method:	DPD method Chlorite in presence of chlorine dioxide
Measurement range:	0.020-0.500 mg/l (CLT 1-mA-0.5 ppm) 0.10-2.00 mg/l (CLT 1-mA-2 ppm)
pH range:	6.5-9.5
Temp. Range:	33.8-104 °F (1-40 °C) temperature compensated
max. pressure:	1 bar
Intake flow:	7.9-15.9 gph (30-60 l/h) in DGM or DLG III
Power supply:	16-24 V DC (two-wire)
Output signal:	4-20 mA = measurement range (uncalibrated) **Important** not electrically isolated!
Model Use:	Monitoring potable water treated with chlorine dioxide or similar. Selective measurement of chlorite in presence of chlorine dioxide, chlorine and chlorate is also possible.
Measurement and control equipment:	D1C
In-line probe housing:	DGM, DLG III

	Part No.
CLT 1-mA-0.5 ppm set with 50 ml electrolyte	1021596
CLT 1-mA-2 ppm set with 50 ml electrolyte	1021595

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorite sensors into the DLM III in-line probe housing. A complete panel-mounted system with D1C-operating languages: E, F, P., I is shown in section 5.1.16.

We recommend the DT4 photometer for calibration of the chlorite sensor.

Ozone Sensors



pk_6_039

OZE 3-mA

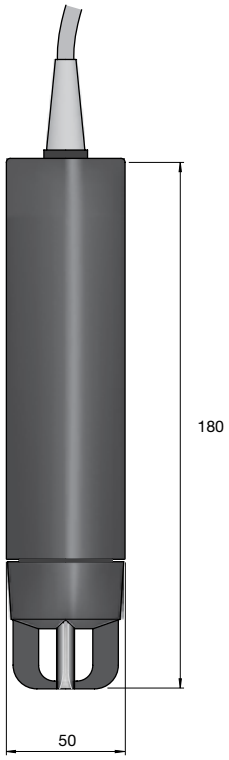
Measured variable:	**Ozone (O_3)**
Reference method:	DPD4
Measurement range:	0.02-2.00 mg/l
pH range:	Ozone stability range
Temperature range:	41-104 °F (5-40 °C) temperature compensated, no significant Temperature fluctuations
Max. pressure:	1 bar
Flow:	7.9-15.9 gph (30-60 l/h) in DGM or DLG III
Power supply:	16-24 VDC (two-wire technology)
Output signal:	4-20 mA = measurement range (un-calibrated) **Warning:** no electrical isolation!
Typical applications:	Swimming pools, potable, industrial, process water, surfactant free
Measurement and control devices:	D1C
In-line probe housing:	DGM , DLG III

	Part No.
OZE 3-mA-2 ppm set, with 100 ml electrolyte	792957

Note: You require assembly kit Part No. 815079 for the initial installation of the ozone sensors into the DLM III in-line probe housing.

ProMinent® DULCOTEST® Sensors

Dissolved Oxygen Sensors



pk_6_050_1

The measured variable “dissolved oxygen” gives the quantity of the gaseous physical dissolved oxygen in its aqueous phase in mg/l (ppm).

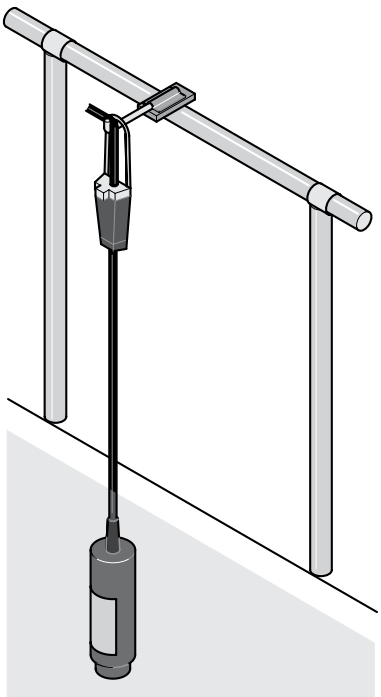
The “dissolved oxygen” is thereby an important parameter for controlling the quality of surface water and water which needs to be oxygenated for use in aqua culture and aqua zoos. The dissolved oxygen is also used to control processes in sewage plants and waterworks.

The following sensors are assigned to the different applications and can be supplied separately as 4-20 mA-transmitters to central controllers or together with the D1C as a stand alone solution (measured variable: “dissolved oxygen”: X. s. chapter 5).

DO 1-mA

Measured variable:	**dissolved oxygen**
Calibration:	of oxygen in air
Measurement range:	0-20 mg/l
Reproducibility of measurement:	± 0.5 % of measurement limit value
Temp. range:	32-122 °F (0 -50 °C)
Max. pressure:	14.5 psi (1 bar)
Velocity of sample water:	minimum: 0.16 ft./s (0.05 m/s)
Enclosure rating:	IP 68
Power supply:	12-30 V DC
Output signal:	4-20 mA. Measurement range calibrated, temperature corrected and electrically isolated
Process integration:	a) immersion, suspended on cable with or without mountain bracket for cable (see accessories. section. 6.5.5) b) Immersion of immersion pipe 1. Immersion pipe with 1.97“ (50 mm) outside diameter and 1-1/4“ (31.75 mm) internal thread (provided by the customer). Connection via immersion pipe adapter (see accessories, section. 6.5.5). 2. PVC immersion pipe with 1.97“ (50 mm) outside diameter (provided by the customer). Connection via standard PVC adhesive union (provided by the customer). c) In-flow operation to order
Typical applications	Fish and shrimp farming. Conditioning of water in large aquaria in zoological systems. Control of oxygen input in waterworks Appraisal of the biological status of surface waters

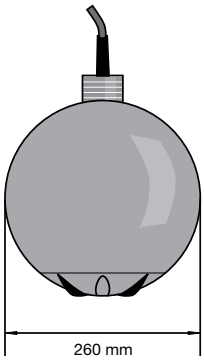
	Part No.
DO 1-mA-20 ppm	1020532



pk_6_011

ProMinent® DULCOTEST® Sensors

Dissolved Oxygen Sensors

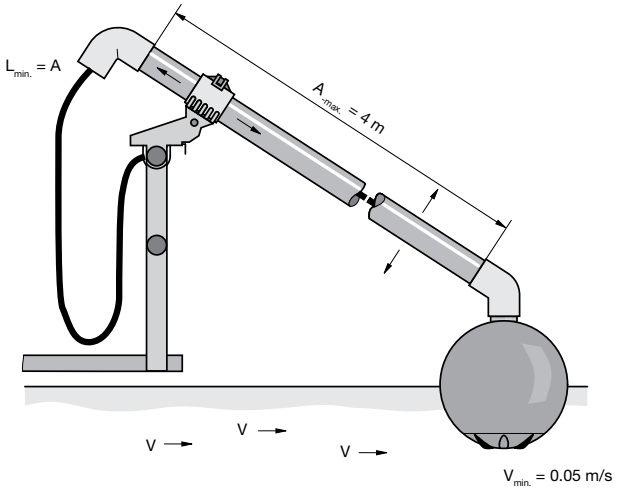


pk_6_051

DO 2-mA

Measured variable:	dissolved oxygen
Calibration:	of oxygen in air
Measurement range:	0-10 mg/l
Reproducibility of measurement:	± 0.5 % of measurement limit value
Temp. Range:	32-122 ºF (0 -50 °C)
Max. pressure:	14.5 psi (1 bar)
Velocity of sample water:	minimum: 0.16 ft./s (0.05 m/s)
Enclosure rating:	IP 68
Supply voltage:	12-30 V DC
Output signal:	4-20 mA. Measurement range calibrated, temperature corrected and electrically isolated
Process integration:	as float with venturi grooves to increase the flow of sample water for the self-cleaning of the sensor part. Supplied with adapter for connection to PVC-pipes with outside diameter: 1.97“ (50 mm) and railing bracket, also for PVC pipes with outside diameter: 1.97“ (50 mm) (see accessories section.6.5.5). The customer must provide the straight PVC tube and a 45 ° standard elbow for gluing to PVC pipes (outside diameter 50 mm).
Typical application	Control of the oxygen input in activated sludge pools (sewage plant) for the purpose of energy conservation

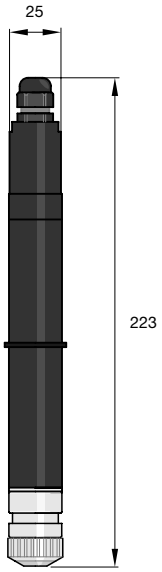
	Part No.
DO 2-mA-10 ppm	1020533



pk_6_012

ProMinent® DULCOTEST® Sensors

Peracetic Acid Sensors



pk_6_083

The DULCOTEST® PAA 1 sensor models are membrane-covered amperometric 2-electrode sensors for the selective measurement of peracetic acid. Peracetic acid is used as a disinfectant particularly in the food and beverage industries as well as in the cosmetic, pharmaceutical and medical industries. The continuous measurement and control of the peracetic acid is essential to comply with demanding disinfection requirements and for quality control. Unlike with the sensors in the earlier Perox PES system the PAA 1-mA can be used with the D1Ca controller. Commissioning and maintenance is greatly simplified The sensors can even be used in the presence of surfactants (tensides).

PAA 1-mA

Measured variable:	**peracetic acid**
Reference method:	titration
Measurement range	10-200 mg/l (PAA 1-mA-200 ppm) 100-2000 mg/l (PAA 1-mA- 2000 ppm)
pH range:	1-9 (peracetic acid stability range)
Temp. range:	33.8113 ºF (1-45 °C) temperature compensated
Admissible temperature fluctuation:	0.3 °/min
Response time T_{90}	3 min.
Max. Pressure.:	14.5 psi (3 bar) at 86 ºF (30 °C), in DGM
Intake flow:	7.9-15.9 gph (30- 60 l/h) with DGM or DLG III in-line probe housing
Power supply	16-24 V DC (two wire)
Output signal:	4-20 mA measurement range (uncalibrated) **Important** not electrically isolated
Typical application:	scouring in Cleaning in Place (CIP) and rinsing systems, also designed for use in the presence of cationic and anionic tensides. Selective measurement of peracetic acid as well as hydrogen peroxide is possible.
Measurement and control equipment:	D1C
In-line probe housing:	DGM, DLG

	Part No.
PAA 1-mA-200ppm	1022506
PAA 1-mA-2000ppm	1022507

ProMinent® DULCOTEST® Sensors

Hydrogen Peroxide Sensors

The DULCOTEST® PEROX and PER1 probes are membrane-covered amperometric sensors for online determination of hydrogen peroxide concentration. Because it is totally biologically degradable, hydrogen peroxide is frequently used as a disinfectant and oxidant in water treatment and production:

- Chemical bleaching in the timber, paper, textile and mineral salt industries
- Organic synthesis in the chemical, pharmaceutical and cosmetics industries
- Oxidation of drinking water, landfill seepage water, contaminated ground water
- Disinfection of cooling water, service water and production water in the pharmaceutical and food and beverages industries, and in swimming pools
- Deodorisation (gas scrubber) in municipal and industrial wastewater purification plants
- Dechlorination in chemical processes

Sensors are selected using the following decision table:

Requirement	**Type**	
	PER1	**PEROX**
Probe matrix contaminated by dirt or chemicals	suitable due to impermeable diaphragm	more susceptible due to permeable diaphragm
Electrical interference due to interference potentials in the measured medium	immune as counter electrode is separated from process	more susceptible as counter electrode is in the medium
Temperature range	up to 122 °F (50 °C)	up to 104 °F (40 °C)
Ease of handling during installation and maintenance	suitable due to temperature compensation and transducer integrated in sensor	separate temperature sensor and transducer
Response time for H_2O_2 for fast control	sluggish T_{90} = 6-8 min	fast T_{90} = 20 s
Rapid temperature changes	sluggish due to integrated temperature sensor	fast due to separate temperature sensor
Long process cycles with no H_2O_2 present	unsuitable	suitable due to pulsed polarisation technology
Range can vary in phases by several orders of magnitude, or is not clear at time of ordering	selection of suitable sensor necessary	suitable as range can be manually selected at the sensor transducer
Cost per channel	lower	higher

ProMinent® DULCOTEST® Sensors

Hydrogen Peroxide Sensors

Operating conditions

Requirement	Type	
	PER1	**PEROX**
Measured variable	hydrogen peroxide	hydrogen peroxide
Calibration	photometric with DT4 hand-held photometer, see Chap. 5.4.4	photometric with DT4 hand-held photometer, see Chap. 5.4.4
Ranges	2.0-200.0 mg/l 20-2.000 mg/l different sensors	1-20, 10-200, 100-2000 selectable
pH range	2.5-11	2.5-10
Temperature	0-50 °C	0-40 °C (0-30 °C at > 1.000 ppm)
Permissible temperature changes	< 0.3 °C/min	< 1 °C/min (with external temp. measurement) see O.I.
Sensor response time	T_{90} approx. 480 sec	T_{90} approx. 20 sec
Reproducible accuracy	≥1 ppm or better than ± 5% of measured value	better than 5 % referred to range full scale value
Min. conductivity	0.05-5.00 mS/cm	with 20 mg/l range: 5 µS/cm 200 mg/l range: 200 µS/cm up to 1.000 mg/l: 500 µS/cm up to 2.000 mg/l: 1 mS/cm
Sampled water flow	5.3-26.4 gph (20-100 l/h) with DGMa	15.9 gph (60 l/h) recommended
Max. operating pressure	0-14.5 psi (0-1 bar)	29 psi (2 bar)
Supply	16-24 VDC (2-wire system)	16-24 VDC (3-wire system)
Output signal	4-20 mA, temperature compensated, uncalibrated, not electrically isolated	4-20 mA, temperature compensated, uncalibrated, not electrically isolated
Typical applications	swimming pool, treatment of contaminated wastewater, treatment of process media from production	treatment of clear and chemically uncontaminated water, control systems with necessarily short response times
Measurement and control device	D1Ca...H 7	D1Ca ...H 1
In-line probe housing	DGM, DLG	DGM, DLG

	Part No.
Perox sensor PEROX-H2.10-P	792976
Perox transducer PEROX-micro-H1.20-mA	741129
PER 1- mA - 200 ppm	1022509
PER - mA - 2000 ppm	1022510
PER 1- mA - 50 ppm	1030511

ProMinent® DULCOTEST® Sensors

Overview: Conductivity Sensors

For optimized functioning of conductivity sensors, please note the following guidelines:

- The sensors should be installed with the electrode totally immersed in the sample fluid
- The signal leads should be kept as short as possible
- Temperature compensation is necessary when subject to fluctuating temperatures
- Clean electrodes regularly depending on application
- Cell constant and measurement range must correspond

Summary of features:

- Simple to install
- Reliable measuring
- Simple to maintain

Overview: Conductivity Sensors

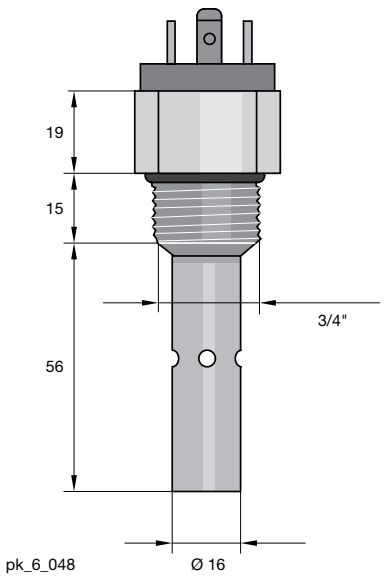
Type	Measurement range	Cell constant [cm^{-1}]	Max. temp [°C]	Max. pressure [bar]	Shaft material	T-correction	Process integration	Electrical connection
LMP 001 see p. 34	0.01 – 50 µS/cm	0.01 ±5%	70	16 (50°C)	PP	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 001-HT see p. 35	0.01 – 50 µS/cm	0.01 ±5%	120	16 (100°C)	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 01 see p. 35	0.1 – 500 µS/cm	0.1 ±5%	70	16 (50°C)	PP	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 01-HT see p. 36	0.1 – 500 µS/cm	0.1 ±5%	120	16 (100°C)	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 01-TA see p. 35	0.1 – 500 µS/cm	0.1 ±5%	70	16 (50°C)	PP	Pt 100	Immersion, including immersible in-line probe housing, 1 m + 5 m cable	5 m fixed cable
LF 1 FE see p. 36	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	No	PG 13.5, flow vvtv (length: 120 mm) or immersion	5 m fixed cable
LFT 1 FE see p. 36	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 100	PG 13.5, flow (length: 120 mm) or immersion	5 m fixed cable
LFTK 1 FE see p. 36	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 1000	PG 13.5, flow (length: 120 mm) or immersion	5 m fixed cable
LF 1 DE see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	No	PG 13.5, flow (length: 120 mm) or immersion	DIN 4 pin angle plug
LFT 1 DE see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 100	PG 13.5, flow (length: 120 mm) or immersion	DIN 4 pin angle plug
LFTK 1 DE see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 1000	PG 13.5, flow (length: 120 mm) or immersion	DIN 4 pin angle plug
LF 1 1/2" see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	No	1/2 inch male thread, flow (length: 120 mm) or immersion	5 m fixed cable
LFT 1 1/2" see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 100	1/2 inch male thread, flow (length: 120 mm) or immersion	5 m fixed cable
LFTK 1 1/2" see p. 37	0.01 - 20 mS/cm	1 ±5%	80	16 (50°C)	PPE	Pt 1000	1/2 inch male thread, flow (length: 120 mm) or immersion	5 m fixed cable
CK 1 see p. 38	0.01 - 20 mS/cm	1 ±5%	150	16 (20°C)	PES	No	Flow R 1" outer thread	DIN 4 pin angle plug
CKPt 1 see p. 38	0.01 - 20 mS/cm	1 ±5%	150	16 (20°C)	PES	Pt 100	Flow R 1" outer thread	DIN 4 pin angle plug
LM 1 see p. 38	0.1 – 20 mS/cm	1 ±5%	70	16 (50°C)	PP	No	Flow R 3/4" outer thread	DIN 4 pin angle plug
LM 1-TA see p. 38	0.1 – 20 mS/cm	1 ±5%	70	16 (50°C)	PP	No	Immersion, including immersible in-line probe housing, 1 m + 5 m cable	5 m fixed cable

ProMinent® DULCOTEST® Sensors

Overview: Conductivity Sensors

Type	Measurement range	Cell constant [cm^{-1}]	Max. temp [°C]	Max. pressure [bar]	Shaft material	T-cor-rection	Process integration	Electrical connection
LMP 1 see p. 38	0.1 – 20 mS/cm	1 ±5%	70	16 (50°C)	PP	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 1-HT see p. 39	0.1 – 20 mS/cm	1 ±5%	120	16 (100°C)	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4 pin angle plug
LMP 1-TA see p. 38	0.1 – 20 mS/cm	1 ±5%	70	16 (50°C)	PP	Pt 100	Immersion, including immersible in-line probe housing, 1 m + 5 m cable	5 m fixed cable
LMP 4EI (4-electrode probe) see p. 38	0.5 – 200 mS/cm	5 ±10%	70	16 (50°C)	PP	Pt 100	Tank, flow DN40 with KV 50 threaded connector	5 m fixed cable
LMP 4EL-TA (4-Elektroden-Zelle) see p. 39	0.5 – 200 mS/cm	5 ±10%	70	16 (50°C)	PP	Pt 100	Immersion, including immersible in-line probe housing, 1 m + 5 m cable	5 m fixed cable
LF 204 (4-electrode probe) see p. 40	1 µs-500 mS/cm	0.475 ±1.5 %	90	2	Epoxy	NTC	Manual immersion	1.5 m fixed cable
ICT 1 (inductive cell) see p. 41	0.2 – 1000 mS/cm		70	8 (40 °C)	PP	Pt 100	Flow DN 50	Fixed cable 7 m
ICT 1-TA (inductive cell) 7 m see p. 41	0.2 – 1000 mS/cm		70	8 (40 °C)	PP	Pt 100	Immersion including in-line	Fixed cable probe housing 1 m
ICT 2 (inductive cell) see p. 42	0 – 2000 mS/cm		125	16	PFA	Pt 100	Installation with SS flange, immersion with immersion pipe fixed cable (Accessories)	Fixed cable 5 m

Conductivity Sensors 2-Electrode



LMP 001

Conductivity sensor with Pt 100 temperature compensation and 0.01 cm^{-1} cell constant

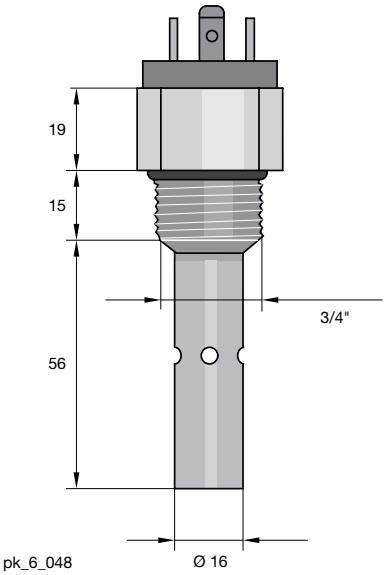
Measurement range:	0.01-50 µS/cm
Cell constant k:	0.01 cm^{-1} ±5 %
Temperature compensation:	Pt 100
Process chemical temperature:	158 °F (70 °C)
Max. pressure:	232 psi up to 122 °F (16 bar up to 50 °C)
Electrodes:	stainless steel 1.4571
Sensor shaft:	PP
Male thread:	3/4"
Length when fitted:	2.8“ (71 mm)
Electrical connector:	DIN 4 pin angle plug
Typical applications:	Clean water applications, monitoring ion exchangers and reverse osmosis systems
Part No.	1020508

Note:

We supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 2-Electrode



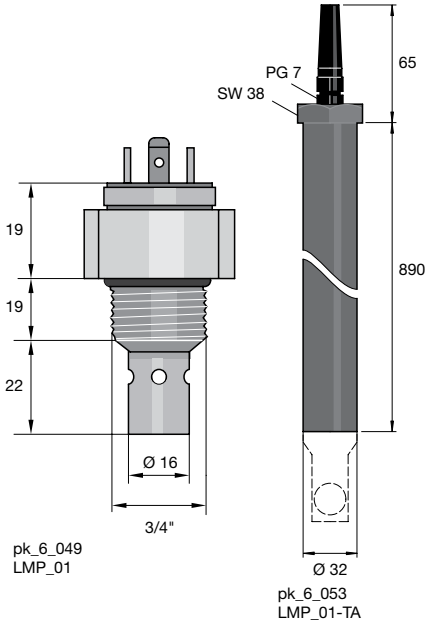
pk_6_048

LMP 001-HT

Conductivity sensor with Pt 100 temperature compensation and 0.01 cm^{-1} cell constant for higher temperatures.

Measurement range:	0.01- 50 µS/cm
Cell constant k:	0.01 cm^{-1} ±5%
Temperature compensation:	Pt 100
Process chemical temperature:	248 ºF (120 °C)
Max. pressure:	232 psi up to 212 ºF (16 bar up to 100 °C)
Electrodes:	stainless steel 1.4571
Sensor shaft:	PVDF
Male thread:	3/4"
Length when fitted:	2.8“ (71 mm)
Electrical connector:	DIN 4 pin angle plug
Typical applications:	General applications at higher temperatures, clean water applications, condensate. **Part No.** 1020509

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal



pk_6_049
LMP_01

pk_6_053
LMP_01-TA

LMP 01 and LMP 01-TA

Conductivity sensor with Pt 100 temperature compensation and 0.1 cm^{-1} cell constant. LMP 01 is fitted with a DIN 4 pin plug and a 3/4" inch male thread. LMP 01-TA has a 5 m fixed cable and fits inside the immersion accembly TA-LM via a M 38 thread, see section 6.5

Measurement range:	0.1- 500 µS/cm	
Cell constant k:	0.1 cm^{-1} ±5 %	
Temperature compensation:	Pt 100	
Process chemical temperature:	158 ºF (70 °C)	
Max. pressure:	232 psi up to 122 ºF (16 bar up to 50 °C)	
Electrodes:	stainless steel 1.4571	
Sensor shaft:	PP	
Male thread:	LMP 01:	3/4"
	LMP 01-TA:	M 28 x 1.5 for TA-LM in line probe housing
Length when fitted:	1.8“ (46 mm)	
Electrical connector:	LMP 01:	DIN 4 pin angle plug
	LMP 01-TA:	5 m fixed cable

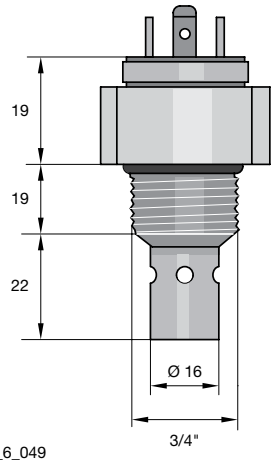
Typical applications: Monitoring ion exchangers, reverse osmosis systems and desalination systems. **Part No.**

LMP 01:	with DIN 4 pin angle plug	1020510
LMP 01-TA:	with 5 m fixed cable fitted inside the immersion assembly TA-LM, see section 6.5	1020512
LMP 01-FE:	spare sensor for LMP 01-TA with 5 m fixed cable	1020626

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 2-Electrode



pk_6_049

LMP 01-HT

Conductivity sensor with Pt 100 temperature compensation and 0.1 cm^{-1} cell constant for higher temperatures

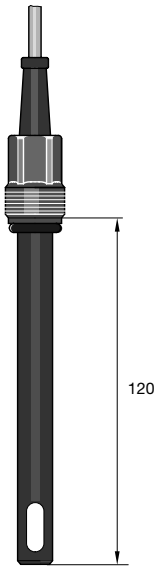
Measurement range:	0.1- 500 µS/cm
Cell constant k:	0.1 cm^{-1} ±5 %
Temperature compensation:	Pt 100
Process chemical temperature:	248 °F (120 °C)
Max. pressure:	232 psi up to 212 °F (16 bar up to 100 °C)
Electrodes:	stainless steel 1.4571
Sensor shaft:	PVDF
Male thread:	3/4"
Length when fitted:	1.8“ (46 mm)
Electrical connector:	DIN 4 pin angle plug
Typical applications:	General applications at higher temperatures, industrial + process water applications, condensate

Part No.
1020511

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

LF 1 FE

Measurement range:	0.01-20 mS/cm
Cell constant k:	1.0 cm^{-1} ±5 %
Fluid temperature:	32-176 °F (0-80 °C)
Max. pressure:	232 psi (16 bar)
Electrodes:	special graphite
Sensor shaft:	Epoxy
Internal thread:	PG 13.5
Length:	4.72“ (120 mm ±3[1)])
Electrical connection:	16.4 ft. (5 m fixed cable) (2 x 0.5 mm^2)
Typical applications:	Potable, cooling, industrial water
	The measuring cells in the LF… series are not wholly suitable for taking measurements in cleaning solutions containing surfactants or liquids containing solvents.



pk_6_085

Part No.
741152

Note: All LF(T) (K)-types are available with an epoxy shaft and a new design. Compared to earlier types, these sensors have increased mechanically stability and therefore a more stable cell constant.

LFT 1 FE

Technical data as LF 1 FE but incorporates integrated Pt 100 for automatic temperature compensation[1)]

Part No.
1001374

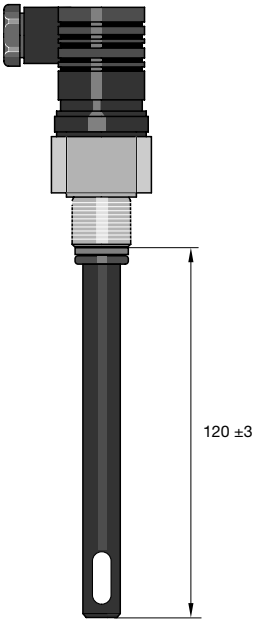
LFTK 1 FE

Technical data as LF 1 FE but with integrated Pt 1000 for automatic temperature compensation[1)]

Part No.
1002821

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 2-Electrode



pk_6_086

LF 1 DE

Technical data as LF 1 FE but with DIN 4-pin plug[1)]

Part No.
1001375

LFT 1 DE

Technical data as LF 1 FE but with DIN 4-pin angle plug and integrated Pt 100 for automatic temperature compensation[1)]

Part No.
1001376

LFTK 1 DE

Technical data as LF 1 FE but with 4-pin angle plug and integrated Pt 1000 for automatic temperature compensation[1)]

Part No.
1002822

LF 1 1/2"

Technical data as LF 1 FE but with DIN 4-pin angle plug and 1/2" internal thread

Part No.
1001377

LFT 1 1/2"

Technical data as LF 1 FE but with DIN 4-pin angle plug, 1/2" internal thread and integrated Pt 100 for automatic temperature compensation

Part No.
1001378

LFTK 1 1/2"

Technical data as LF 1 FE but with 4-pin angle plug and integrated Pt 1000 for automatic temperature compensation[1)]

Part No.
1002823

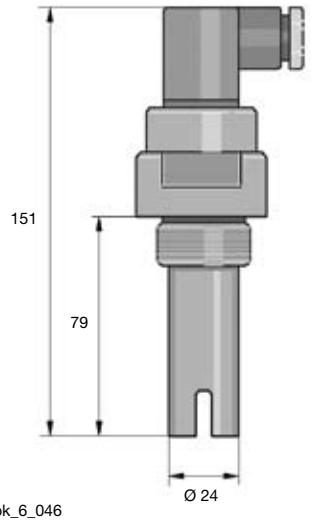
[1)] A PG 13.5 / 1" adapter set (order number 1002190) is required when installing into in-line probe housing type DLG III (1" aperture)

Connection configuration for all DIN 4-pin plugs: electrodes: ⏚ and 2
Pt 100/1000: 1 and 3

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal (see section 5)

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 2-Electrode



pk_6_046

CK 1

Measurement range:	0.1-20 mS/cm
Cell constant k:	1.0 cm^{-1} ±5 %
Fluid temperature:	32-302 °F (0-150 °C)
Max. pressure:	232 psi up to 68 °F (16 bar up to 20 °C)
Electrodes:	special graphite
Sensor shaft:	PES
Internal thread:	R 1"
Length:	3.1“ (79 mm)
Electrical connection:	DIN 4-pin angle plug
Typical applications:	Cooling, industrial, process water, tank and pipe cleaning systems in breweries and dairies, separation of media.

	Part No.
	305605

CKPt 1

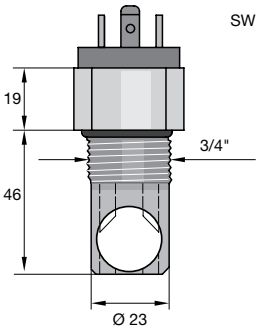
Technical data as CK 1 but with Pt 100 for automatic temperature correction.

	Part No.
	305606

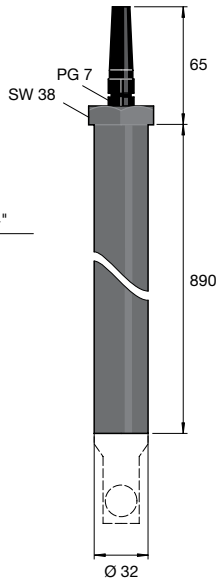
LM 1 und LM 1-TA

Conductivity sensor with cell constant 1. LM 1 is fitted with a Din 4 pin angle plug. LM 1-TA has a 16.4 ft. (5 m) fixed cable and fits inside the immersion assembly TA-LM in-line probe housing, see section 6.5

Measurement range:	0.1-20 mS/cm	
Cell constant k:	1.0 cm^{-1} ±5 %	
Process chemical temperature:	158 °F (70 °C)	
Max. pressure:	232 psi up to 122 °F (16 bar up to 50 °C)	
Electrodes:	graphite	
Sensor shaft:	PP	
Male thread:	LM 1:	3/4"
	LM 1-TA:	M 28 x 1.5 for TA-LM in line probe housing
Length when fitted:	LM 1:	1.8“ (46 mm)
Electrical connector:	LM 1:	DIN 4 pin angle plug
	LM 1-TA:	16.4 ft. (5 m) fixed cable
Typical applications:	Drinking, cooling, industrial, process water, media separation	



pk_6_052
LM(P) 1



pk_6_053
LM(P) 1-TA

		Part No.
LM 1:	with DIN 4 pin angle plug	740433
LM 1-TA:	with 16.4 ft. (5 m) fixed cable and immersion assembly TA-LM in-line probe housing, see section 6.5	1020528
LM 1-FE:	spare sensor for LM 1-TA with 5 m fixed cable	1020627

LMP 1 and LMP 1-TA

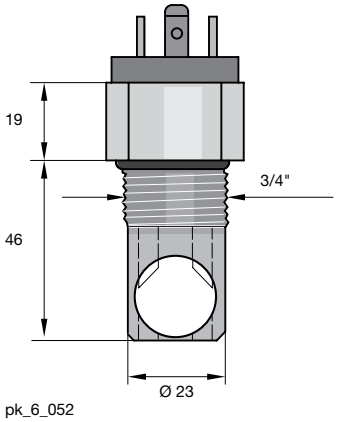
Technical data as for LM 1 and LM 1-TA but with integrated Pt 100 for automatic temperature correction.

		Part No.
LMP 1:	with DIN 4 pin angle plug	1020513
LMP 1-TA:	with 16.4 ft. (5 m) fixed cable and immersion assembly TA-LM, see section 6.5	1020525
LMP 1-FE:	spare sensor for LMP 1-TA with 5 m fixed cable	1020727

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 2-Electrode



pk_6_052

LMP 1-HT

Conductivity sensor with Pt 100 temperature compensation and 1 cm^{-1} cell constant, suitable for higher temperatures

Measurement range:	0.1-20 mS/cm
Cell constant k:	1 cm^{-1} ±5 %
Temperature compensation:	Pt 100
Process chemical temperature:	248 °F (120 °C)
Max. pressure:	232 psi up to 212 °F (16 bar up to 100 °C)
Electrodes:	graphite
Sensor shaft:	PVDF
Male thread:	3/4"
Length when fitted:	18.1" (46 mm)
Electrical connector:	DIN 4 pin angle plug
Typical applications:	General applications at higher temperatures, industrial, process water, media separation, CIP in breweries and dairies

Part No.
1020524

Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

ProMinent® DULCOTEST® Sensors

Conductivity Sensors 4-Electrode

pk_6_076

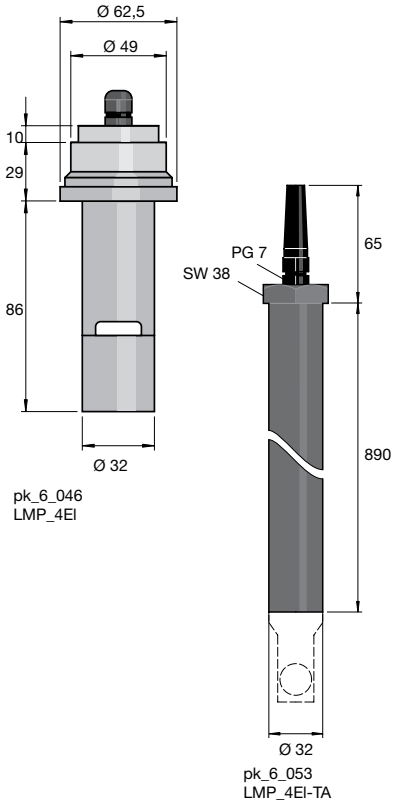
LF 204

4-electrode conductivity sensor for use with the portable manual measurement device Portamess® 911 Cond (see section 5.4)

Measurement range:	1 µS/cm-500 mS/cm
Cell constant:	0.475 cm^{-1} ±1.5 %
No. of electrodes:	4
Shaft:	Epoxy, black
Electrode material:	graphite
Shaft length:	4.72” (120 mm)
Shaft diameter:	0.6” (15.3 mm)
Cable length:	4.9 ft. (1.5 m)
Temperature gauge:	NTC (30 k - 5-+1000 °C)
Immersion depth:	min. 1.4” (36 mm)
Pressure rating:	29 psi (2 bar)
Temperature range:	32-194 °F (0-90 °C)

	Part No.
Conductivity sensor LF 204	1008723

Note: only in conjunction with Portamess® 911 Cond (see section 5.4)



pk_6_046
LMP_4EI

pk_6_053
LMP_4EI-TA

LMP 4EI and LMP 4EI-TA

4-electrode conductivity sensors with Pt 100 temperature compensation and 5.0 cm cell constant. LMP 4EI is fitted with a 5 m fixed cable and a KV 50 threaded connector for installation into tanks or pipe work. LMP 4EI-TA has a 5 m fixed cable and fits into the TA-LM immersion assembly via an M 28-thread, see section 6.5. The sensors are suitable for minimising polarsation effects in media with high conductivity levels and/or media which tend to form deposits.

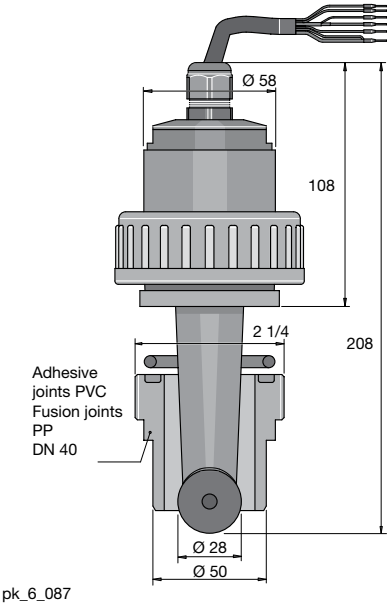
Measurement range:	0.5-200 mS/cm
Cell constant k:	5.0 cm^{-1} ±10 %
Temperature compensation:	Pt 100
Process chemical temperature:	158 °F (70 °C)
Max. pressure:	232 psi up to 122 °F (16 bar up to 50 °C)
Electrodes:	electrographite, titanium
Sensor shaft:	PP
Male thread:	LMP 4EI KV 50 threaded connector
	LMP 4EI-TA: M 28 x 1.5 for TA-LM immersion assembly
Length when fitted:	101 mm
Electrical connector:	LMP 4EI: 16.4 ft. (5m) fixed cable
	LMP 4EI-TA: 16.4 ft. (5m) fixed cable
Typical applications:	General applications for water with high conductivity levels and contaminated wastewaters

		Part No.
LMP 4EI:	KV 50 threaded connector	1020526
LMP 4EI-TA:	with 16.4 ft. (5 m) cable installed in TA-LM in-line, see section 6.5	1020527
LMP 4EI-FE:	Spare sensor for LMP 4EI-TA with 5 m cable	1020628

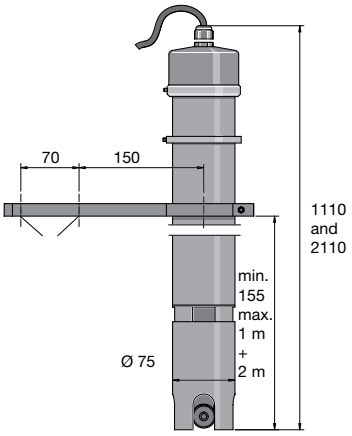
Note: we supply the DMT transducer to convert the measurement signal into a (temperature compensated) 4-20 mA signal

ProMinent® DULCOTEST® Sensors

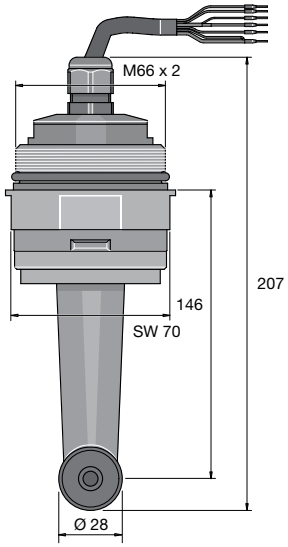
Inductive Conductivity Sensors



pk_6_087



pk_6_088



pk_6_089

Electrode-free inductive conductivity sensors are used to measure the electrolytic conductivity over a wide measurement range in heavily soiled and/or aggressive media and offer a particularly low maintenance operating method. The sensors are particularly suitable for the measurement of high conductivity levels since there is no electrode polarisation.**ICT 1 and ICT 1-IMA-1m/ICT 1-IMA-2m**

Economical inductive conductivity sensors for all soiled water types and for high conductivity levels up to a temperature of 70 °C. The ICT 1 sensor is designed for in-flow measurement and is installed in DN40 pipes (optionally PVC or PP). The ICT 1-IMA-1 m and ICT 1-IMA-2 m immersion sensors comprise the ICT 1-IM sensor and the ready-fitted IMA-ICT1 immersion pipe, length 1 m or 2 m.Measurement range: 0.2-1000 mS/cm

Cell constant:	8.5 cm^{-1}
Temperature compensation:	Pt 100
Medium temperature:	0 - 70 °C
Max. pressure:	8 bar/40 °C, 1 bar/70 °C
Material:	Sensor: PP, Seals: FPM
Assembly:	
ICT 1: (measurement in flow):	with union nuts, 2¼ imperial internal thread, DN40, PVC incl. DN40 Adhesive joints with 2¼ imperial external thread for installation in DN40 standard PVC pipes (included in scope of supply). The fusion joints for installation in standard PP pipes are available as optional accessories (see section 6.5.5)
ICT 1-IMA-1m (immersion sensor):	supplied with immersion pipe, 1 m
ICT 1-IMA-2m (immersion sensor):	supplied with immersion pipe, 2 m
	The assembly accessories for the IPHa 3-PP in-line probe housing (see 6.5.4) can be used for both immersion sensors.
Power supply:	all versions, 7 m fixed cable
Enclosure rating:	IP65
Measurement and control equipment:	D1C for inductive conductivity (see section 5.1.7)
Typical application:	All types of soiled water, desalination control in cooling towers, control of electroplating baths, Cleaning in Place (CIP), product monitoring

		Part No.
ICT 1	for installation in pipes	1023244
ICT 1-IMA-1 m	ready fitted in in-line probe housing 1 m	1023349
ICT 1-IMA-2 m	ready fitted in in-line probe housing 2 m	1023351
ICT 1-IM	spare sensor for ICT 1-IMA-1 m and ICT-IMA-2 m	1023245

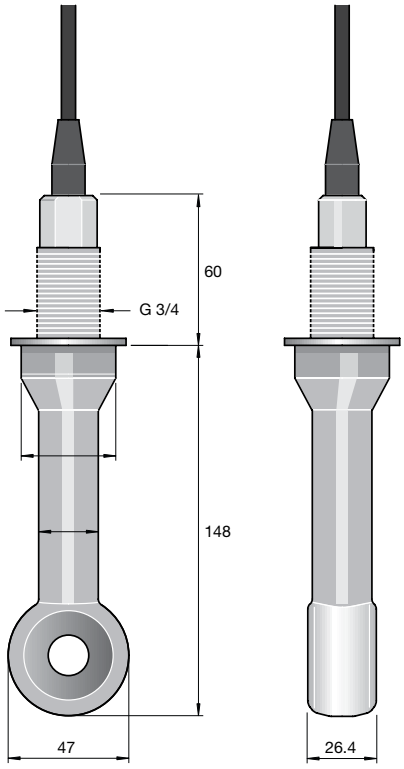
ICT 2

High performance sensors for aggressive media, maximum conductivity and high temperatures up to 125 °C. Available for installation in tanks, pipes or the IMA-ICT 2 in-line probe housing.Measurement range: 0-2000 mS/cm

Cell constant:	2 cm^{-1}
Reproducibility of measurement:	± (5 µS/cm + 0.5 % of the measured value)

ProMinent® DULCOTEST® Sensors

Inductive Conductivity Sensors



pk_6_082

Temperature compensation:	Pt 100, class A, completely extrusion-coated
Medium temperature:	0 °C-125 °C (for use together with D1C, temperature compensation is limited to 100 °C)
Max. pressure:	16 bar
Material: sensor:	PFA, completely extrusion-coated
Assembly:	
installation in pipes, tanks (on the side):	G ¾ stainless steel thread (1.4571)
or flange mounted:	with accessories: Stainless steel flange ANSI 2 imperial 300lbs, SS 316L (can be adapted to DIN counter-flange DN 50 PN 16) (see section 6.5.5)
Installation in immersion pipe for tank from above:	With accessories: IMA-ICT 2 in-line probe housing via stainless steel flange DN 80 PN (see section 6.5.4)
Length when fitted:	1 m, diameter when fitted 70 mm
Power supply:	5 m fixed cable
Measurement and control equipment:	D1C
Enclosure rating:	IP67
Typical applications:	Production processes in the chemical industry, Phase separation of product mixtures, Determining concentrations of aggressive chemicals
	Part No.
	ICT 2 1023352

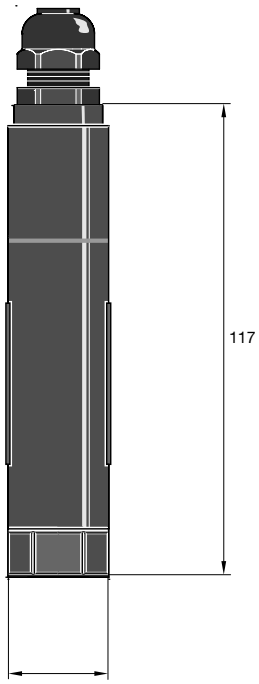
Sensor Accessories

Measurement Transmitter 4 - 20 mA (Two Wire)

Advantages:

- Safer signal transfer, even across large distances
- Interference free 4-20 mA signal
- Simple installation directly onto sensor

Typical applications: Measurement signal transfer over large distances, or to transfer signals subject to disturbance (e.g. pH, redox) in conjunction with D1C, D2C and DULCOMARIN® measurement and control systems, or for direct connection to PC/PLC.



pk_5_064

pH measurement transmitter 4-20 mA, type pH V1

Measurement range:	pH 0…14
Accuracy:	better than pH 0.1 (typical ±pH 0.07)
Socket:	SN6
Input resistance:	10^{12} Ω
Signal output:	4…20 mA ≈ -500…+500 mV ≈ pH 15.45 - -1.45 not calibrated, not electrically isolated
Power supply:	18…24 V DC
Ambient temperature:	-5…50 °C, non-condensing
Enclosure rating:	IP 65
Dimensions:	141 mm length, 25 mm Ø

Part No.
809126

Redox measurement transmitter 4-20 mA, type RH V1

Technical data as for pH transmitter, but:

Measurement range:	0…1000 mV
Accuracy:	better than ±0.5 mV (typical ±3 mV)
Input resistance:	> 5 x 10^{11} Ω
Signal output:	4…20 mA ≈ 0…+1000 mV not electrically isolated

Part No.
809127

Temperature measurement transmitter 4-20 mA, type Pt 100 V1

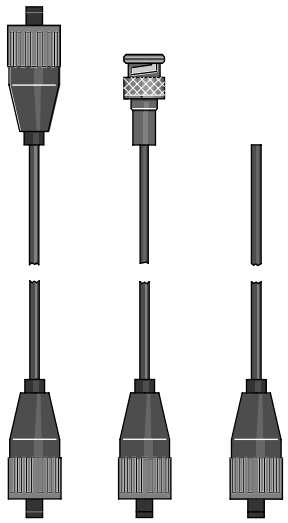
Technical data as for pH transmitter, but:

Measurement range:	0…100 °C
Accuracy:	better than ±0.5 °C (typical ±0.3 °C)
Input resistance:	~ 0 Ω
Signal output:	4…20 mA ≈ 0…+100 °C not electrically isolated

Part No.
809128

Sensor Accessories

Signal Cables



pk_6_054

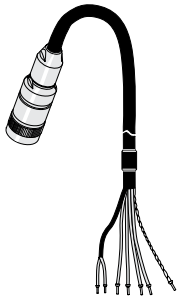
General guidelines:

- Ensure that signal leads are as short as possible.
- Ensure signal leads are separated from power cables running parallel to them.
- Use pre-assembled combined signal leads wherever possible.

Signal leads for pH/ORP measurement

- Pre-assembled to facilitate installation
- Factory tested to ensure function reliability
- IP 65

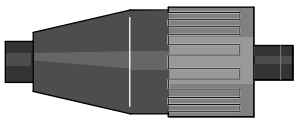
Design	Description		Part No.
2 x SN6	coax Ø 5 mm	3 ft. (0.8 m) - SS	305077
	coax Ø 5 mm	6 ft. (2.0 m) - SS	304955
	coax Ø 5 mm	15 ft. (5.0 m) - SS	304956
	coax Ø 5 mm	30 ft. (10.0 m) - SS	304957
SN6 - open end	coax Ø 5 mm	6 ft. (2.0 m) - S	305030
	coax Ø 5 mm	15 ft. (5.0 m) - S	305039
	coax Ø 5 mm	30 ft. (10.0 m) - S	305040
SN6 - BNC	coax Ø 3 mm	30 ft. (10.0 m) - SB	305099


pk_6_069

Signal leads for electrodes with Vario Pin plug

Pre-assembled 6-core signal lead with Vario Pin plug for connection to electrode type PHEPT 112 VE.

	Part No.
Vario Pin signal lead VP 6-ST/ 2 m	1004694
Vario Pin signal lead VP 6-ST/ 5 m	1004695
Vario Pin signal lead VP 6-ST/10 m	1004696


pk_6_056

SN6 coax connector

K 74 crimping pliers and a soldering iron are required for connecting coax connectors to cables.

	Part No.
SN6 coaxial plug for 5 mm Ø coaxial signal lead	304974
SN6 coaxial plug for 3 mm Ø coaxial signal lead	7304975


pk_6_055

LK coax signal cable

For pH and ORP measurements.

	Part No.
Coax low noise 5 mm Ø, black	723717
Coax low noise 3 mm Ø, black	723718
Please specify length with order.	

Sensor Accessories

Signal Cables

pk_1_085

Signal leads for DMT type chlorine measuring cells

The signal lead is required for connection of DMT type measuring cells to the DMT transducer.

		Part No.
Universal cable, 5-pin round plug; 5-core	6 ft. (2 m)	1001300
Universal cable, 5-pin round plug; 5-core	15 ft. (5 m)	1001301
Universal cable, 5-pin round plug; 5-core	30 ft. (10 m)	1001302

Cable accessories for CAN-type chlorine sensors

	Part No.
T-distributors M12 5 pole CAN	1022155
Moving load M12-joint	1022154
Moving load M12-plug	1022592
Connecting cable - CAN M12 5 pole 0.5 m	1022137
Connecting cable - CAN M12 5 pole 1 m	1022139
Connecting cable - CAN M12 5 pole 2 m	1022140
Connecting cable - CAN M12 5 pole 5 m	1022141
Connecting cable – CAN, sold in meters	1022160
Plug-CAN M12 5 pole Screw terminal	1022156
Coupling-CAN M12 5 pole Screw terminal	1022157

pk_6_054

Signal leads for Pt 100/Pt 1000 (2 x 0.5 mm²)

			Part No.
Length	15 ft. (5 m)	SN6 - open ended	1003208
Length	30 ft. (10 m)	SN6 - open ended	1003209
Length	60 ft. (20 m)	SN6 - open ended	1003210

Sensor adapters

	Part No.
SN6 male to BNC male	7305024
SN6 female to BNC female	7305065
SN6 male to SN6 male	7305025

pk_6_055

LKT signal lead for conductivity measuring cells

4-core, shielded, Ø 6.2 mm

	Part No.
Please specify length with order.	723712

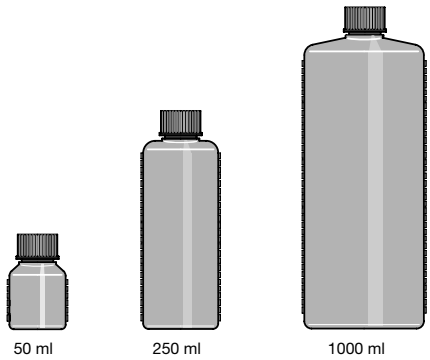
Two-wire signal lead (2 x 0.25 mm²; Ø 4 mm)

For -mA type chlorine/bromine/chlorine dioxide/ozone measuring cells and pH, ORP; Pt 100, conductivity transducers.

	Part No.
Please specify length with order.	725122

Sensor Accessories

Buffer Solutions



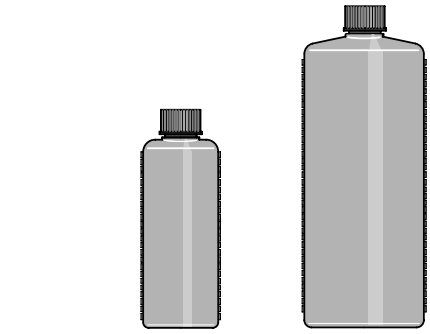
pk_6_058

pH quality buffer solutions

Accuracy ±pH 0.02 (±0.05 at pH 10). The shelf life depends upon frequency of use and the amount of chemical drag-in.

Alkaline buffer solutions can react with CO_2 if left open. This will affect their values, therefore close after use. Buffer solutions should be replaced after a maximum of three months after opening. The solution contains a biocide to prevent bacteria forming.

		Part No.
pH 4.0 - red	50 ml	506251
	250 ml	791436
	1000 ml	506256
pH 5.0	50 ml	506252
pH 7.0 - green	50 ml	506253
	250 ml	791437
	1000 ml	506258
pH 9.0	50 ml	506254
	1000 ml	506259
pH 10.0 - blue	50 ml	506255
	250 ml	791438
	1000 ml	506260



pk_6_058

ORP quality buffer solutions

Accuracy to ±5 mV. Shelf life depends upon frequency of use and the strength of the chemicals in sample solutions.

Buffer solutions should be replaced after a maximum of three months after opening.

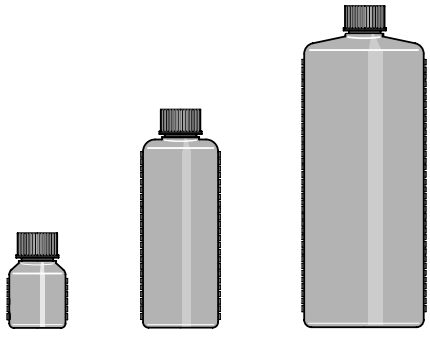
Warning: The 470 mV ORP buffer solution is an irritant!

		Part No.
ORP buffer **470** mV	250 ml	7791439
	1000 ml	7506241

3 molar KCl solutions

3 molar KCl solution is ideally suited to the protection of pH and ORP electrodes (e.g. in electrode case) and as an electrolyte for refillable electrodes (e.g. PHEN, RHEN). However, for earlier version refillable electrodes with reference electrodes without the larger AgCl reservoir we recommend the AgCl saturated KCl solution.

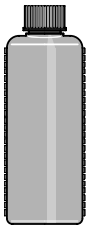
		Part No.
KCl solution, 3 molar	50 ml	505533
KCl solution, 3 molar	250 ml	791440
KCl solution, 3 molar	1000 ml	791441
KCl solution, 3 molar, AgCl saturated	250 ml	791442
KCl solution, 3 molar, AgCl saturated	1000 ml	505534



pk_6_058

Sensor Accessories

Electrolyte Solutions



250 ml

pk_6_058

Cleaning solutions

Pepsin/hydrochloric acid cleaning solutions:

For cleaning pH electrode diaphragms contaminated with protein.

	Part No.
250 ml	791443

Conductivity calibration solution

For the accurate calibration of conductivity sensors we recommend using calibration solutions with known conductivity levels. One pack contains two 25 ml sacks holding **1413 µS/cm** and **12.88 mS/cm**.

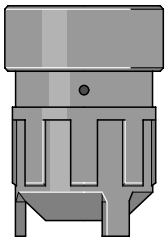
	Part No.
4 pack conductivity calibration solution (4 x 25 ml)	1005212

pk_6_061

Electrolyte for chlorine, bromine, chlorine dioxide and ozone measuring cells

	Part No.
CLE all chlorine measuring cells electrolyte, 100 ml	506270
CDM 1 type chlorine dioxide measuring cells electrolyte, 100 ml	506271
CDE chlorine dioxide measuring cells electrolyte, 100 ml	506272
OZE ozone measuring cells electrolyte, 100 ml	506273
Electrolyte for measuring cells types CGE/CTE/BRE, 50 ml	792892
Electrolyte for chlorine dioxide measuring cells type CDP, 100 ml	1002712
Electrolyte for peracetic acid sensors, type PAA 1, 100 ml	1023896
Electrolyte for chlorine probes, Type CLT 1, 50 ml	1022015

Membrane Caps



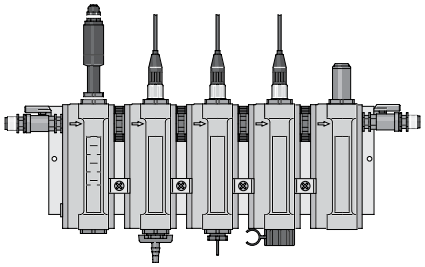
pk_6_075

Spare membrane caps, accessory sets for chlorine, bromine, chlorine dioxide and ozone sensors

	Part No.
Membrane cap for types CLE II T, CDM 1 and OZE 1	790486
Membrane cap for types: CLE 2.2, CLE 3, CDE 1.2, CDE 2, OZE 2 and OZE 3: this membrane cap is marked with a red dot	790488
Membrane cap for CGE/CTE 1 (2/5/10 ppm) and BRE 1 this membrane cap is orange	792862
Membrane cap for CTE 1 (0.5 ppm); this membrane cap is blue	741274
Membrane cap for CDP 1; this membrane cap is black	1002710
Membrane cap for PAA 1	1023895
Membrane cap for CLT 1	1021824
Accessory set for CGE 2/CTE 1 (2/5/10 ppm) and BRE 1 (2 membrane caps + 50 ml electrolyte)	740048
Accessory set CTE 1 (0.5 ppm) (2 membrane caps + 50 ml electrolyte)	741277
Accessory set for CDP 1 (2 membrane caps + 100 ml electrolyte)	1002744
Accessory kit CLT 1	1022100
Accessory kit PAA 1	1024022

Sensor Accessories

DGMa Sensor Housings



pk_6_066

DGM modular in-line probe housing

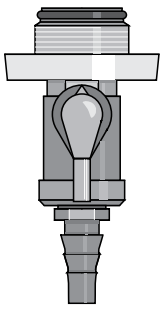
To accept conductivity, Pt 100, pH or ORP probes with PG 13.5 screw-in thread, or amperometric sensors with R 1" screw-in thread.

Advantages:

- Simple to assemble (already mounted on panel up to max. 7 units)
- Simple retrofit expansion possibility (see expansion modules)
- Module for monitoring flow of sampled water
- Simple to calibrate measured variables due to low sample water volume
- Ball valve on either end for adjusting and impeding flow

Each fully-assembled DGM is equipped with a single sampling cock.

Material:	Transparent PVC (all modules) FPM (seals) PP (calibration cup) PVC white (mounting panel)
Max. temperature:	60 °C
Max. pressure:	6 bar (30 °C) 1 bar (60 °C) 2 bar (with flow monitor, 30 °C)
Flow volume:	Up to 80 l/h (40 l/h recommended)
Flow sensor:	Reed contact max. switch power 3 W max. switch voltage 175 V max. switch current 0.25 A max. operating current 1.2 A max. contact resistance 150 m
Switch hysteresis:	approx. 20 %
Enclosure rating:	IP 65
Applications:	Potable, swimming pool water or water of similar quality with no suspended solids
Assembly:	Max. 5 modules pre-assembled onto baseboard: more than 5 modules, pre-assembled onto baseboard as custom version, priced accordingly.FPM = Fluorine Rubber



pk_6_071

Sampling tap for DGM

for PG 13.5 and 25 mm modules designed as a convenient ball valve.

	Part No.
PG 13.5 sampling tap	1004737
25 mm sampling tap	1004739

Expansion modules for DGM

For simple retrofit to an existing DGM.

	Part No.
Flow expansion module with scale in l/h	1023923
Flow expansion module with scale in gph	1023973
Flow sensor for flow expansion module (optional)	791635

Sensor Accessories

DGMa Identcode

DGM **In-line Sensor Housing**

A **Series Version**

Flow monitor module:
- 0 none
- 1 With l/h scale
- 2 With gph scale
- 3 With flow monitor, l/h scale
- 4 With flow monitor, gph scale

Number of PG 13.5 modules:
- 0 none
- 1 One PG 13.5 module
- 2 Two PG 13.5 modules
- 3 Three PG 13.5 modules
- 4 Four PG 13.5 modules

Note: add 15 mm mounting set for PHEP/RHEP sensors

Number of 25 mm modules
- 0 none
- 1 One 25 mm module*
- 2 Two 25 mm modules*

* 25 mm mounting set needed

Material:
- T Transparent PVC

Seal material:
- 0 Viton®

Connections:
- 0 1/2" x 3/8" tubing adapters
- 1 PVC half-union connections with 1/4" MNPT adapter

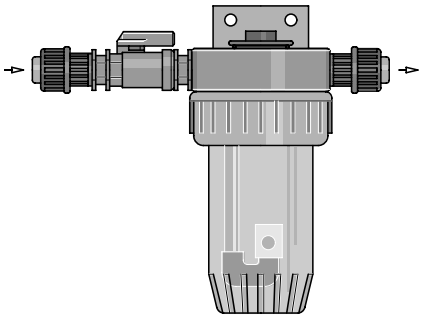
Versions:
- 0 Standard

Recommended accessories:	**Part No.**
reference potential plug with SS pin	791663
flow sensor (spare)	791635
calibration cup (spare)	791229
Sampling Tap for PG 13.5 module	1004737
Sampling Tap for 25 mm module	1004739
Mounting set for 15 mm (PHEP/RHEP)	791219
Mounting set for 25 mm module (CLE, CTE, CGE, CDE, CDP, 0ZE)	791818
Bubble disperser for Cl sensor	740207
Bubble disperser for pH/ORP sensors	791703

DGM A 3 2 1 T 0 0 0

Sensor Accessories

DLG Sensor Housings



pk_6_063

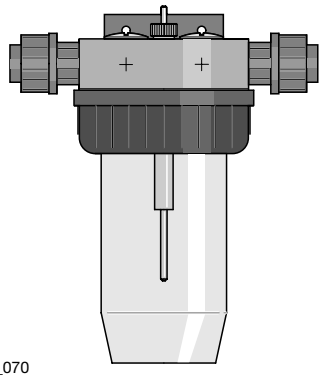
DLG III type in-line probe housing

To accept **2 electrodes** (conductivity, Pt 100, pH or ORP electrodes) with PG 13.5 screw-in thread, **as well as a sensor** with R 1″ thread (amperometric sensors) with integrated stainless steel pin as liquid reference potential.

The DLG III is fitted with a plastic ball valve on the input side for stopping and adjusting the sample water flow.

Material:	Rigid PVC
Transparent housing cup:	Polyamide
Ball valve material:	Rigid PVC
Max. pressure:	1 bar
Max. temperature:	55 °C

	Part No.
DLG III A with PVC hose connectors for 8/5 mm Ø PE tubing	914955
DLG III B with PVC adhesive connectors for 16 mm Ø DN 10 pipe	914956
Assembly kit for fitting amperometric sensors	815079



pk_6_070

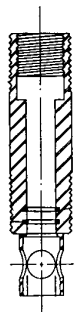
DLG IV type in-line probe housing

To take **4 electrodes** (pH, ORP, Pt 100, conductivity) with PG 13.5 threaded connector, with integrated stainless steel pin as liquid reference potential. Bracket for wall mounting.

Material:	Hard PVC or PP
Transparent housing:	Polyamide
Max. pressure:	1 bar
Max. temperature:	55 °C for PVC version 80 °C for PP version
Sample water connector:	Union with d 16/DN 10 insert

	Part No.
DLG IV PVC for Ø 16/DN 10 pipe work connector	1005332
DLG IV PP for Ø 16/DN 10 pipe work connector	1005331

Sensor Holders



CPVC holder (for pH/ORP)

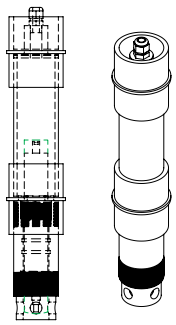
CPVC universal in-line sensor holder with 3/4" MNPT, 5" (127 mm) long body.	7305020

PVDF holder (for pH/ORP)

PVDF universal in-line sensor holder with 3/4" MNPT, 5" (127 mm) long body.	7305021

Stainless steel holder (for pH/ORP)

Stainless steel universal in-line sensor holder with 3/4" MNPT, 5" (127 mm)long body.	7305022



PG 13.5 Submersible holder (for pH/ORP)

CPVC Waterproof sensor holder with 1-1/2" NPT, 5" (127 mm) long body.	7744693

CPVC holder (for 25 mm sensors)

CPVC universal in-line sensor holder with 2" MNPT, 5" (127 mm) long body (needs pn. 791818).	7740719

25 mm Submersible holder (consult factory for details)

CPVC Waterproof sensor holder 1-1/2" FNPT, 5" (127 mm) long body.	7744008