

# Product overview

## QUICK REFERENCE

### “Product Overview” T.O.C.



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# 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.

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** = suction lift of water in ft  
(pump capacity data) / 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.

##### – Positive 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.
- The suction piping should be sized up by one pipe size and a pulsation dampener used.
- Select PVT4 series pumps with special liquid ends for extremely high viscosities. Positive suction recommended.

### – Calibration column

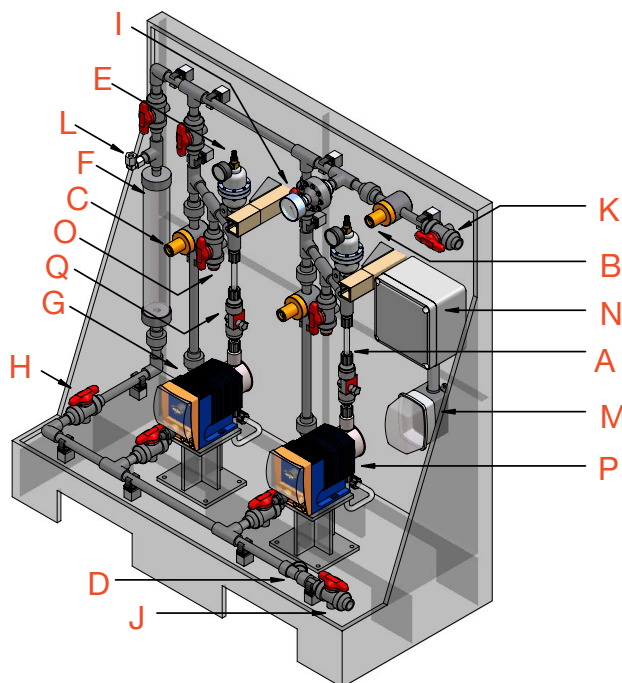
- Draw down, graduated cylinder.
- Useful for setting up metering pump to reach desired capacity.
- Single pump dosing package can be equipped with a self-filling calibration assembly for application where the pump is installed above the tank (eliminates chemical handling).

#### 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	GPD	Capacity gph	cc/Min	Max. PSIG	Std. MNPT Fittings (in.)	Manual Freq Adj	Pulse 1:01	M/D	Analog 4-20mA
beta/4b 1000	5	0.19	12	145	1/4" x 3/16"	0-180	STD	STD	N/A
gamma/L 1000	5	0.19	12	145	1/4" x 3/16"	0-180	STD	OPT	OPT
beta/4b 1601	7	0.29	18	232	1/4" x 3/16"	0-180	STD	STD	N/A
gamma/L 1601	7	0.29	18	232	1/4" x 3/16"	0-180	STD	OPT	OPT
beta/4b 2001	7	0.29	18	290	1/4" x 3/16"	0-180	STD	STD	N/A
beta/4b 1602	14	0.58	36	232	1/4" x 3/16"	0-180	STD	STD	N/A
gamma/L 1602	14	0.58	36	232	1/4" x 3/16"	0-180	STD	OPT	OPT
beta/b 2002	14	0.58	48	290	1/4" x 3/16"	0-180	STD	STD	N/A
beta/5 b 2504	18	0.77	49	363	8 x 4 mm	0-180	STD	STD	N/A
beta/4 b 1604	24	1	63	232	1/2" x 3/8"	0-180	STD	STD	N/A
ProMus (17) 3/8" Plunger	24	1	63	3500	1/4" FNPT	29-58	N/A	N/A	OPT
beta/5b 1605	26	1.1	69	232	1/2" x 3/8"	0-180	STD	STD	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/4b 1005	26	1.1	69	145	1/2" x 3/8"	0-180	STD	STD	N/A
ProMus (17) 7/16" Plunger	33	1.38	87	3500	1/4" FNPT	29-58	N/A	N/A	OPT
beta/5b 1008	43	1.8	114	145	1/2" x 3/8"	0-180	STD	STD	N/A
gamma/L 1008	43	1.8	114	145	1/2" x 3/8"	0-180	STD	OPT	OPT
beta/4b 0708	46	1.9	120	101	1/2" x 3/8"	0-180	STD	STD	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/5b 0713	70	2.9	183	101	1/2" x 3/8"	0-180	STD	STD	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
beta/4 b 0413	77	3.2	202	58	1/2" x 3/8"	0-180	STD	STD	N/A
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/5b 0420	108	4.5	284	58	1/2" x 3/8"	0-180	STD	STD	N/A
gamma/L 0420	108	4.5	284	58	1/2" x 3/8"	0-180	STD	OPT	OPT
beta/4 b 0220	120	5	315	29	1/2" x 3/8"	0-180	STD	STD	N/A
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/5b 0232	202	8.4	530	29	1/2" x 3/8"	0-180	STD	STD	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

product overview

solenoid-driven metering pumps

motor-driven metering pumps

pump spare parts &amp; accessories

DULCOMETER® instrumentation

DULCOTEST® sensors

polymer blending systems

## 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	n	= unknown resistance	] resp. to aqueous solutions
+/0	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
0	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings, please check the resistance of the glue.			

**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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Acetaldehyde	CH <sub>3</sub> CHO	100%	-	-	+	+	0	-	+ / 0	+	+
Acetamide	CH <sub>3</sub> CONH <sub>2</sub>	S	+	+	+	+	+	0	+	+	+
Acetic Acid	CH <sub>3</sub> COOH	100%	-	+(50%)	+	+(70%)	+	-	0	+	+
Acetic Anhydride	(CH <sub>3</sub> CO) <sub>2</sub> O	100%	-	-	+	0	0	-	+ / 0	-	+
Acetone	CH <sub>3</sub> COCH <sub>3</sub>	100%	-	-	+	+	+	-	-	0	+
Acetophenone	C <sub>6</sub> H <sub>5</sub> COCH <sub>3</sub>	100%	-	n	+	+	+	-	+	+	+
Acetyl Chloride	CH <sub>3</sub> COCl	100%	-	+	0	-	-	+	-	-	+
Acetylacetone	C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>	100%	-	-	+	+	+	-	+	-	+
Acetylene Dichloride=>	Dichloroethylene										
Acetylene Tetrachloride=>	Tetrachloroethane										
Acrylonitrile	CH <sub>2</sub> =CH-CN	100%	-	-	+	+	+	-	-	+	+
Adipic Acid	C <sub>6</sub> H <sub>10</sub> O <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Allyl Alcohol	CH <sub>2</sub> CHCH <sub>2</sub> OH	96%	-	0	+	+	+	-	+	+	+
Aluminum Acetate	Al (CH <sub>3</sub> COO) <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Aluminum Bromide	AlBr <sub>3</sub>	S	+	+	n	+	+	+	+	+	+
Aluminum Chloride	AlCl <sub>3</sub>	S	+	+	-	+	+	+	+	+	+
Aluminum Fluoride	AlF <sub>3</sub>	10%	+	+	-	+	+	+	+	+	+
Aluminum Hydroxide	Al (OH) <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Aluminum Nitrate	Al (NO <sub>3</sub> ) <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Aluminum Phosphate	AlPO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Aluminum Sulfate	Al (SO <sub>4</sub> ) <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Ammonium Acetate	CH <sub>3</sub> COONH <sub>4</sub>	S	+	+ / 0	+	+	+	+	+	+	+
Ammonium Aluminum Sulfate	NH <sub>4</sub> Al(SO <sub>4</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Ammonium Bicarbonate	NH <sub>4</sub> HCO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Ammonium Carbonate	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+
Ammonium Chloride	NH <sub>4</sub> Cl	S	+	+	-	+	+	+	+	+	+
Ammonium Fluoride	NH <sub>4</sub> F	S	+	0	0	+	+	+	+	+	+
Ammonium Hydrogen Carbonate	NH <sub>4</sub> HCO <sub>3</sub>	A.C.	+	+	+	+	+	+	+	+	+
Ammonium Hydroxide	NH <sub>4</sub> OH	S	+	+	+	+	+	-	+	+	+
Ammonium Nitrate	NH <sub>4</sub> NO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Ammonium Oxalate	(NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Ammonium Perchlorate	NH <sub>4</sub> ClO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+
Ammonium Peroxodisulfate	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	S	+	+	+(5%)	+	+	+	+	+	+
Ammonium Persulfate	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	A.C.	+	+	+	+	+	+	+	+	+
Ammonium Phosphate	(NH <sub>4</sub> ) <sub>3</sub> PO <sub>4</sub>	A.C.	+	+	+(10%)	+	+	+	+	+	+
Ammonium Sulfate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	A.C.	+	+	+(10%)	+	+	+	+	+	+
Ammonium Sulfide	(NH <sub>4</sub> ) <sub>2</sub> S	S	+	+	n	+	+	+	+	+	+
Amyl Alcohol	C <sub>5</sub> H <sub>11</sub> OH	100%	+	+	+	+	+	-	+	+	+
Aniline	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	100%	-	-	+	+	+	-	+ / 0	+	+
Aniline Hydrochloride	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> HCl	S	n	+	-	+	+	+ / 0	+ / 0	+	+
Antimony Trichloride	SbCl <sub>3</sub>	S	+	+	-	+	+	+	+	+	+
Aqua Regia	3HCl+HNO <sub>3</sub>	100%	-	+	-	-	-	-	0	+	+
Arsenic Acid	H <sub>3</sub> AsO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Barium Carbonate	BaCO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Barium Chloride	BaCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Barium Hydroxide	Ba(OH) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Barium Nitrate	Ba(NO <sub>3</sub> ) <sub>2</sub>	A.C.	+	+	+	+	+	+	+	+	+
Barium Sulfate	BaSO <sub>4</sub>	A.C.	+	+	+	+	+	+	+	+	+
Barium Sulfide	BaS	A.C.	+	+	+	+	+	+	+	+	+
Beer	-	100%	+	+	+	+	+	+	+	+	+

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# 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	n	= unknown resistance	] resp. to aqueous solutions
+/0	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
0	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings, please check the resistance of the glue.			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Benzaldehyde	C <sub>6</sub> H <sub>5</sub> CHO	100%	-	-	+	0	+	+	+	+	+
Benzene	C <sub>6</sub> H <sub>6</sub>	100%	-	-	+	0	0	0	-	+	+
Benzene Sulfonic Acid	C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> H	10%	n	n	+	n	+	+	-	+	+
Benzoic Acid	C <sub>6</sub> H <sub>5</sub> COOH	S	+	+	+	+	+	+	+	+	+
Benzoyl Chloride	C <sub>6</sub> H <sub>5</sub> COCl	100%	-	n	0	0	0	+	+	n	+
Benzyl Alcohol	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> OH	100%	-	-	+	+	+	+	-	+	+
Benzyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOC <sub>7</sub> H <sub>7</sub>	100%	-	-	+	0	+	+	-	0	+
Benzyl Chloride	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl	90%	-	n	+	0	0	+	-	+	+
Bleach=>	Sodium Hypochlorite										
Bleaching Powder	Ca(OCl) <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Borax	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub>	A.C.	+	+	+	+	+	+	+	+	+
Boric Acid	H <sub>3</sub> BO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Brine		S	+	+/0	+/0	+	+	+	+	+	+
Bromine	Br <sub>2</sub>	100%	-	-	-	-	-	-	-	+	+
Bromine Liquid	Br <sub>2</sub>	100%	-	-	-	-	-	-	-	+	+
Bromine Water	-	S	-	+	-	-	-	-	-	+	+
Bromo Benzene	C <sub>6</sub> H <sub>5</sub> Br	100%	n	n	+	0	0	0	-	+	+
Bromochloro Methane	CH <sub>2</sub> BrCl	100%	-	-	+	0	-	n	+/0	+	+
Bromochlorotrifluoroethane	HCClBrCF <sub>3</sub>	100%	-	-	+	0	0	+	-	+	+
Butanediol	HOC <sub>4</sub> H <sub>9</sub> OH	10%	n	+	+	+	+	0	+	+	+
Butanetriol	C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>	S	+	+	+	+	+	0	+	+	+
Butanol	C <sub>4</sub> H <sub>9</sub> OH	100%	-	+	+	+	+	0	+/0	+	+
Butyl Acetate	CH <sub>3</sub> COOC <sub>4</sub> H <sub>9</sub>	100%	-	-	+	-	0	-	+/0	+	+
Butyl Acrylate	C <sub>7</sub> H <sub>13</sub> O <sub>2</sub>	100%	-	-	+	+	+	-	-	+	+
Butyl Amine	C <sub>4</sub> H <sub>9</sub> NH <sub>2</sub>	100%	n	n	+	+	n	-	-	0	+
Butyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOC <sub>4</sub> H <sub>9</sub>	100%	-	-	+	0	0	+	+	n	+
Butyl Ether	(C <sub>4</sub> H <sub>9</sub> ) <sub>2</sub> O	100%	-	-	+	+	+	-	0	+	+
Butyl Mercaptan	C <sub>4</sub> H <sub>9</sub> SH	100%	n	n	n	n	n	+	-	+	+
Butyl Oleate	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>	100%	n	n	+	n	n	+	+/0	+	+
Butyl Stearate	C <sub>22</sub> H <sub>44</sub> O <sub>2</sub>	100%	0	n	+	n	n	+	-	+	+
Butylaldehyde	C <sub>3</sub> H <sub>7</sub> CHO	100%	-	n	+	+	+	-	+/0	n	+
Butyric Acid	C <sub>3</sub> H <sub>7</sub> COOH	100%	+(5%)	+(20%)	+	+	+	+	+	+	+
Calcium Acetate	(CH <sub>3</sub> COO) <sub>2</sub> Ca	S	+	+	+	+	+	+	+	+	+
Calcium Bisulfite	Ca(HSO <sub>3</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Calcium Carbonate	CaCO <sub>3</sub>	A.C.	+	+	+	+	+	+	+	+	+
Calcium Chloride	CaCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Calcium Cyanide	Ca(CN) <sub>2</sub>	S	+	+	n	+	+	+	+	+	+
Calcium Hydrogen Sulfite	CaHSO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
*Calcium Hydroxide	Ca(OH) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Calcium Hypochlorite	Ca(OCl) <sub>2</sub>	S	+	+	-	+	0	0	+	+	+
Calcium Nitrate	Ca(NO <sub>3</sub> ) <sub>2</sub>	S	+	+(50%)	+	+	+(50%)	+	+	+	+
Calcium Phosphate	Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Calcium Sulfate	CaSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Calcium Sulfide	CaS	S	+	+	n	+	+	+	+	+	+
Calcium Sulfite	CaSO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Calcium Thiosulfate	CaS <sub>2</sub> O <sub>3</sub>	S	+	+	-	+	+	+	+	+	+
Camphor	C <sub>10</sub> H <sub>16</sub> O	100%	-	-	+	-	+	0	-	+	+
Carbolic Acid (see Phenol)	C <sub>6</sub> H <sub>5</sub> OH	100%	-	0	+	0	+	+	-	+	+
Carbon Disulfide	CS <sub>2</sub>	100%	-	-	+	0	0	+	-	+	+
Carbon Tetrachloride	CCl <sub>4</sub>	100%	0	-	+	0	-	+	-	+	+
Carbonic Acid	H <sub>2</sub> CO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+

\* Requires flushing.



## 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	n	= unknown resistance	] resp. to aqueous solutions
+/o	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
o	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings please check the resistance of the glue			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Caustic Soda=>	Sodium Hydroxide										
Chloric Acid	HClO <sub>3</sub>	20%	+	+	-	+10%	-	0	0	+	+
Chlorine Dioxide Solution	ClO <sub>2</sub> +H <sub>2</sub> O	0.5%	0	+	-	0	0	0	-	+	+
Chloroacetic Acid	CH <sub>2</sub> ClCOOH	A.C.	-	-	-	-	+	+	+	+	+
Chlorine Water	Cl <sub>2</sub> +H <sub>2</sub> O	S	+	+	-	0	0	+	+	+	+
Chlorobenzene	C <sub>6</sub> H <sub>5</sub> Cl	100%	-	-	+	0	+	+	-	+	+
Chloroethanol	ClCH <sub>2</sub> CH <sub>2</sub> OH	100%	-	-	+	+	+	-	0	0	+
Chloroethylbenzene	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> CH <sub>3</sub>	100%	-	-	+	0	0	0	-	n	+
Chlorophenol	C <sub>6</sub> H <sub>4</sub> OHCl	100%	n	n	+	+	+	n	-	+	+
Chlorotoluene	C <sub>6</sub> H <sub>5</sub> Cl	100%	-	-	+	n	n	+	-	+	+
Chloroacetone	ClCH <sub>2</sub> COCH <sub>3</sub>	100%	-	-	+	n	n	-	+	n	+
Chlorobutadiene	C <sub>4</sub> H <sub>5</sub> Cl	100%	-	-	+	n	n	+	-	n	+
Chloroform	CHCl <sub>3</sub>	100%	-	-	+	-	0	+	-	+	+
Chlorohydrin	C <sub>3</sub> H <sub>7</sub> O <sub>2</sub> Cl	100%	n	n	+	+	+	+	0	-	+
Chloroprene=>	Chlorobutadiene										
Chlorosulfonic Acid	SO <sub>2</sub> (OH)Cl	100%	-	-	-	-	-	-	-	-	+
Chrome Sulfate	Cr <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Chromic Acid	H <sub>2</sub> CrO <sub>4</sub>	50%	-	+	+(10%)	+	0	+	-	+	+
Chromic Sulfuric Acid	K <sub>2</sub> CrO <sub>4</sub> +H <sub>2</sub> SO <sub>4</sub>	S	-	+	n	-	-	n	n	+	+
Citric Acid	C <sub>6</sub> H <sub>8</sub> O <sub>7</sub>	S	+	+	+	+	+	+	+	+	+
Cobalt Chloride	CoCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Copper II Acetate	Cu(CH <sub>3</sub> COO) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Arsenite	Cu <sub>3</sub> (AsO <sub>3</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Carbonate	CuCO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Chloride	CuCl <sub>2</sub>	S	+	+	+(1%)	+	+	+	+	+	+
Copper II Cyanide	Cu(CN) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Fluoride	CuF <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Nitrate	Cu(NO <sub>3</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Copper II Sulfate	CuSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Cresole	C <sub>6</sub> H <sub>4</sub> CH <sub>3</sub> OH	100%	0	0	+	+	+	+	-	+	+
Crotonaldehyde	CH <sub>3</sub> C <sub>2</sub> H <sub>2</sub> CHO	100%	n	-	+	+	+	-	+	+	+
Cyclohexane	C <sub>6</sub> H <sub>12</sub>	100%	+	-	+	+	+	+	-	+	+
Cyclohexanol	C <sub>6</sub> H <sub>11</sub> OH	100%	0	+/0	+	+	+	+	-	+	+
Cyclohexanone	C <sub>6</sub> H <sub>10</sub> O	100%	-	-	+	+	+	-	+/0	+	+
Cyclohexyl Alcohol=>	Cyclohexanol										
Cyclohexylamine	C <sub>6</sub> H <sub>13</sub> N	100%	0	0	+	n	n	-	n	n	+
Decahydronaphthalene	C <sub>10</sub> H <sub>18</sub>	100%	-	+/0	n	0	0	0	-	+	+
Decalin=>	Decahydronaphthalene										
Diisononyl Phthalate	C <sub>26</sub> H <sub>42</sub> O <sub>4</sub>	100%	-	-	+	+	+	n	n	+	+
Diacetone Alcohol	C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>	100%	-	-	+	+	+	-	+	+	+
Diamine Ethylene	(CH <sub>2</sub> NH <sub>2</sub> ) <sub>2</sub>	100%	n	0	0	+	+	-	+	+	+
Dibromoethane	C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	100%	-	-	+	-	n	+	-	+	+
Dibutyl Ether	C <sub>4</sub> H <sub>9</sub> OC <sub>4</sub> H <sub>9</sub>	100%	0	-	+	0	0	-	0	+	+
Dibutyl Phthalate	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	100%	-	-	+	0	+	+	+/0	+	+
Dibutylamine	(C <sub>4</sub> H <sub>9</sub> ) <sub>2</sub> NH	100%	n	n	+	+	+	-	-	+	+
Dichloro Acetic Acid	Cl <sub>2</sub> CHCOOH	100%	-	+	+	+	+	-	+	+	+
Dichloro Benzene	C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	100%	-	-	+	0	0	+	-	+	+
Dichloro Butane	C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub>	100%	-	-	+	0	0	+	-	+	+
Dichloro Butene	C <sub>4</sub> H <sub>6</sub> Cl <sub>2</sub>	100%	-	-	+	0	0	0	-	+	+
Dextrose	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	A.C.	+	+	+	+	+	+	+	+	+
Dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	100%	-	-	+	-	0	+	-	+	+
Dichloroethylene	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	100%	-	-	+	-	0	0	-	+	+
Dichloroisopropyl Ether	(C <sub>3</sub> H <sub>5</sub> Cl) <sub>2</sub> O	100%	-	-	+	0	0	0	0	n	+
Dicyclohexylamine	C <sub>12</sub> H <sub>23</sub> N	100%	0	0	+	+	+	-	+	n	+



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## 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

+/o = conditional resistance

+ = good resistance

o = 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

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	CONC.	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	$C_2H_2O_5$	30%	+	+	+	+	+	+	n	+	+
Dihexyl Phthalate	$C_{20}H_{26}O_4$	100%	–	–	+	+	+	–	n	+	+
Diisobutylketone	$C_8H_{18}O$	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	+	+	+	–	+	+	+
Diocetyl Phthalate	$C_{26}H_{54}(COOC_8H_{17})_2$	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	$C_2H_5Cl$	100%	–	–	+	–	–	+	–	+	+
Ethyl Chloroacetate	$ClCH_2COOC_2H_5$	100%	–	0	+	+	+	+	–	+	+
Ethyl Chlorocarbonate	$ClCO_2C_2H_5$	100%	n	n	n	n	n	+	–	n	+
Ethylacetylacetate	$C_8H_{10}O_3$	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	+/0	+	+
Ethylhexanol	$C_8H_{18}O$	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	$HFBO_2$	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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o	= limited resistance	S	= saturated solution	
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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	CONC.	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	$C_9H_5(CH_3COO)_3$	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	$C_6H_{11}CHO$	100%	n	n	+	+	+	-	+/0	+	+
Hexane	$C_6H_{14}$	100%	+	+	+	+	+	+	-	+	+
Hexanol	$C_6H_{11}OH$	100%	-	-	+	+	+	n	+	+	+
Hexene	$C_6H_{12}$	100%	n	+	+	+	+	+	-	+	+
Hydrazine Hydrate	$N_2H_4 \cdot H_2O$	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	$(NH_2OH)_2 \cdot H_2SO_4$	10%	+	+	+	+	+	+	+	+	+
Hypochlorous Acid	HOCl	S	+	+	-	0	0	+	+/0	+	+
Iodine	$I_2$	S	0	-	-	0	+	+	+/0	+	+
Isobutyl Alcohol	$C_4H_9CH(OH)CH_3$	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	+	+	+	+	+	+	+	+	+

\*Requires flushing.

# 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	n	= unknown resistance	] resp. to aqueous solutions
+/o	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
o	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings please check the resistance of the glue			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Manganese Sulfate	MnSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Mercuric Chloride	HgCl <sub>2</sub>	S	-	+	-	+	+	+	+	+	+
Mercury	Hg	100%	+	+	+	+	+	+	+	+	+
Mercury II Chloride	HgCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Mercury II Cyanide	Hg(CN) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Mercury II Nitrate	Hg(NO <sub>3</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Mesityl Oxide	C <sub>6</sub> H <sub>10</sub> O	100%	-	-	+	n	n	-	+/-0	n	+
Methacrylic Acid	C <sub>5</sub> H <sub>8</sub> COOH	100%	n	n	+	+	+	0	+/-0	+	+
Methanol	CH <sub>3</sub> OH	100%	-	+	+	+	+	+	+	+	+
Methoxybutanol	CH <sub>3</sub> O(CH <sub>2</sub> ) <sub>4</sub> OH	100%	-	-	+	+	+	+	0	+	+
Methyl Acetate	CH <sub>3</sub> COOCH <sub>3</sub>	60%	-	-	+	+	+	-	+/-0	+	+
Methyl Acrylate	C <sub>2</sub> H <sub>3</sub> COOCH <sub>3</sub>	100%	-	-	+	+	+	-	+/-0	+	+
Methyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOCH <sub>3</sub>	100%	-	-	+	+	+	+	-	0	+
Methyl Catechol	C <sub>6</sub> H <sub>3</sub> (OH) <sub>2</sub> CH <sub>3</sub>	S	+	+	+	+	+	+	-	+	+
Methyl Cellulose		S	+	+	+	+	+	+	+	+	+
Methyl Chloroacetate	ClCH <sub>2</sub> COOCH <sub>3</sub>	100%	-	0	+	+	+	0	-	+	+
Methyl Cyclopentane	C <sub>5</sub> H <sub>9</sub> CH <sub>3</sub>	100%	+	+	+	+	+	+	-	+	+
Methyl Dichloroacetate	Cl <sub>2</sub> CHCOOCH <sub>3</sub>	100%	-	-	+	+	+	-	n	n	+
Methyl Ethyl Ketone (MEK)	CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>	100%	-	-	+	+	+	-	+	-	+
Methyl Glycol	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	100%	+	+	+	+	+	-	+/-0	+	+
Methyl Isobutyl Ketone	CH <sub>3</sub> COC <sub>4</sub> H <sub>9</sub>	100%	-	-	+	+	+	-	0	-	+
Methyl Isopropyl Ketone	CH <sub>3</sub> COC <sub>3</sub> H <sub>7</sub>	100%	-	-	+	+	+	-	+/-0	-	+
Methyl Methacrylate	C <sub>5</sub> H <sub>8</sub> COOCH <sub>3</sub>	100%	-	-	+	+	+	-	-	+	+
Methyl Oleate	C <sub>17</sub> H <sub>33</sub> COOCH <sub>3</sub>	100%	n	n	+	+	+	+	+/-0	+	+
Methyl Salicylate	HOC <sub>6</sub> H <sub>4</sub> COOCH <sub>3</sub>	100%	-	-	+	+	+	n	+/-0	+	+
Methylacetyl Acetate	C <sub>5</sub> H <sub>8</sub> O <sub>3</sub>	100%	-	-	+	+	+	-	+/-0	+	+
Methylamine	CH <sub>3</sub> NH <sub>2</sub>	32%	+	0	+	+	+	-	+	0	+
Methylene Chloride	CH <sub>2</sub> Cl <sub>2</sub>	100%	-	-	0	-	0	+	-	0	+
Milk	-	-	+	+	+	+	+	+	+	+	+
Morpholine	C <sub>4</sub> H <sub>9</sub> NO	100%	-	-	+	+	+	n	n	+	+
Naphthalene	C <sub>10</sub> H <sub>8</sub>	S	-	-	+	-	+	+	-	+	+
Nickel II Acetate	(CH <sub>3</sub> COO) <sub>2</sub> Ni	S	+	+	+	+	+	-	+	+	+
Nickel Chloride	NiCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Nickel Nitrate	Ni(NO <sub>3</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Nickel Sulfate	NiSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Nitric Acid	HNO <sub>3</sub>	99%	n	+(50%)	+(90%)	+(50%)	+(50%)	+(65%)	+(40%)	0	+
Nitro Benzene	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	100%	-	-	+	-	+	-	-	+	+
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	100%	-	-	+	+	+	-	+/-0	0	+
Nitro Propane	(CH <sub>3</sub> ) <sub>2</sub> CHNO <sub>2</sub>	100%	-	-	+	+	+	-	+/-0	n	+
Nitro Toluene	C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> CH <sub>3</sub>	100%	-	-	+	+	+	0	-	+	+
Oxalic Acid	(COOH) <sub>2</sub>	S	+	+	+(10%)	+	+	+	+	+	+
Octane	C <sub>8</sub> H <sub>18</sub>	100%	+	+	+	+	+	+	-	+	+
Octanol	C <sub>8</sub> H <sub>17</sub> OH	100%	-	-	+	+	+	+	+	+	+
Octyl Cresole	C <sub>15</sub> H <sub>24</sub> O	100%	-	-	+	+	+	0	n	+	+
Oleum	H <sub>2</sub> SO <sub>4</sub> +SO <sub>3</sub>	10%	n	-	+	-	-	+	-	-	+
Perchloric Acid	HClO <sub>4</sub>	70%	-	+(10%)	-	+	+(10%)	+	+/-0	+	+
Pentane	C <sub>5</sub> H <sub>12</sub>	100%	+	+	+	+	+	+	-	+	+
Pentanol=>	Amyl Alcohol										
Peracetic Acid	C <sub>2</sub> H <sub>4</sub> O <sub>3</sub>	50%	-	0	+	0	0	+	0	+	+
Petroleum Ether	C <sub>n</sub> H <sub>2n+2</sub>	100%	+	+/-0	+	+	+	+	-	+	+
Phenol	C <sub>6</sub> H <sub>5</sub> OH	100%	-	-	+	+	+	+	-	+	+
Phenyl Ethyl Ether	C <sub>6</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>	100%	-	-	+	+	+	-	-	n	+
Phenyl Hydrazine	C <sub>6</sub> H <sub>5</sub> NHNH <sub>2</sub>	100%	-	-	+	0	0	0	-	+	+
Phosphoric Acid	H <sub>3</sub> PO <sub>4</sub>	85%	+(50%)	+	+	+	+	+	+	+	+

## Introduction

## Chemical Resistance List

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

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o	= limited resistance	S	= saturated solution	
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+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings, please check the resistance of the glue.			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Phosphorous Oxychloride	POCl <sub>3</sub>	100%	-	-	n	+	+	+	+	+	+
Phosphorous Trichloride	PCl <sub>3</sub>	100%	-	-	+	+	+	0	0	+	+
Phthalic Acid	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Picric Acid	C <sub>6</sub> H <sub>2</sub> (NO <sub>3</sub> ) <sub>3</sub> OH	S	+	+	+	+	+	+	+	+	+
Piperidine	C <sub>5</sub> H <sub>11</sub> N	100%	-	-	+	n	n	-	-	n	+
Polyphosphate =>	Sodium Tripolyphosphate										
Potassium Acetate	CH <sub>3</sub> COOK	S	+	+	+	+	+	+	+	+	+
Potassium Aluminum Sulfate	KAl(SO <sub>4</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Bicarbonate	KHCO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+
Potassium Bifluoride	KHF <sub>2</sub>	S	n	+	+	+	+	+	+	+	+
Potassium Bisulfate	KHSO <sub>4</sub>	5%	+	+	+	+	+	+	+	+	+
Potassium Bitartrate	KC <sub>4</sub> H <sub>2</sub> O <sub>6</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Borate	KBO <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Bromate	KBrO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Bromide	KBr	S	+	+	+(10%)	+	+	+	+	+	+
Potassium Carbonate	K <sub>2</sub> CO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Chlorate	KClO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Chloride	KCl	S	+	+	-	+	+	+	+	+	+
Potassium Chromate	K <sub>2</sub> CrO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+
Potassium Chrome Sulfate	KCr(SO <sub>4</sub> ) <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Cyanate	KOCN	S	+	+	+	+	+	+	+	+	+
Potassium Cyanide	KCN	S	+	+	+(5%)	+	+	+	+	+	+
Potassium Cyanoferrate II	K <sub>2</sub> Fe(CN) <sub>6</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Cyanoferrate III	K <sub>3</sub> Fe(CN) <sub>6</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Dichromate	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	S	+	+	+(25%)	+	+	+	+	+	+
Potassium Ferricyanide	K <sub>3</sub> Fe(CN) <sub>6</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Ferrocyanide	K <sub>4</sub> Fe(CN) <sub>6</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Fluoride	KF	S	+	+	+	+	+	+	+	+	+
Potassium Hydroxide	KOH	50%	n	+	+	+	+	-	+	+	+
Potassium Iodide	KI	S	+	+	+	+	+	+	+	+	+
Potassium Nitrate	KNO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Perchlorate	KClO <sub>4</sub>	S	+	+	n	+	+	+	+	+	+
Potassium Permanganate	KMnO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Persulfate	K <sub>2</sub> SO <sub>8</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Phosphate	KH <sub>2</sub> PO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Sulfate	K <sub>2</sub> SO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Potassium Sulfite	K <sub>2</sub> SO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Propanol	C <sub>2</sub> H <sub>5</sub> OH	100%	-	+	+	+	+	+	+	+	+
Propionic Acid	C <sub>2</sub> H <sub>5</sub> COOH	100%	0	+	+	+	+	+	+	+	+
Propionitrile	CH <sub>3</sub> CH <sub>2</sub> CN	100%	n	n	+	+	+	+	-	+	+
Propyl Acetate	CH <sub>3</sub> COOC <sub>3</sub> H <sub>7</sub>	100%	-	-	+	+	+	-	+/0	+	+
Propylene Glycol	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	100%	+	+	+	+	+	+	+	+	+
Pyridine	C <sub>5</sub> H <sub>5</sub> N	100%	-	-	+	+	0	-	-	-	+
Pyrrole	C <sub>4</sub> H <sub>4</sub> N	100%	n	n	+	+	+	-	-	n	+
Salicylic Acid	HOC <sub>6</sub> H <sub>4</sub> COOH	S	+	+	+	+	+	+	+	+	+
Sea Water	-	-	+	+	0	+	+	+	+	+	+
Silic Acid	SiO <sub>2</sub> +H <sub>2</sub> O	S	+	+	+	+	+	+	+	+	+
Silver Bromide	AgBr	S	+	+	+/0	+	+	+	+	+	+
Silver Chloride	AgCl	S	+	+	-	+	+	+	+	+	+
Silver Nitrate	AgNO <sub>3</sub>	S	+	+	+	+	+	+	-	+	+
Soda Ash=>	Sodium Carbonate										
Sodium Acetate	CH <sub>3</sub> COONa	S	+	+	+	+	+	+	+	+	+
Sodium Benzoate	C <sub>6</sub> H <sub>5</sub> COONa	S	+	+	+	+	+	+	+	+	+
Sodium Bicarbonate	NaHCO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Bisulfate	NaHSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Bisulfite	NaHSO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+

# Introduction

## Chemical Resistance List

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

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+/o	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
o	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings, please check the resistance of the glue.			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Sodium Borate	NaBO <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Bromate	NaBrO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Bromide	NaBr	S	+	+	+	+	+	+	+	+	+
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	S	+	+	+/0	+	+	+	+	+	+
Sodium Chlorate	NaClO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Chloride	NaCl	S	+	+	-	+	+	+	+	+	+
Sodium Chlorite	NaClO <sub>2</sub>	24%	+	+	+(10%)	+	+	+	+	+	+
Sodium Chromate	Na <sub>2</sub> CrO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Cyanide	NaCN	S	+	+	+	+	+	+	+	+	+
Sodium Dichromate	NaCr <sub>2</sub> O <sub>7</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Dithionite	Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub>	S	+	+10%	+	+10%	+10%	n	n	+	+
Sodium Fluoride	NaF	S	+	+	+(10%)	+	+	+	+	+	+
Sodium Hydrogen Sulfate	NaHSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Hydrogen Sulfide	NaHSO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Hydroxide	NaOH	50%	+	+	+	+	+	-	+	+	+
Sodium Hypochlorite	NaOCl	12-15%	+	+	-	+	0	0	+	+	+
Sodium Iodide	NaI	S	+	+	+	+	+	+	+	+	+
Sodium Metaphosphate	(NaPO <sub>3</sub> ) <sub>n</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Nitrate	NaNO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Nitrite	NaNO <sub>2</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Perborate	NaBO <sub>2</sub> +*H <sub>2</sub> O <sub>2</sub>	S	+	+/0	+	+	+	+	+	+	+
Sodium Perchlorate	NaClO <sub>4</sub>	S	+	+	+(10%)	+	+	+	+	+	+
Sodium Peroxide	Na <sub>2</sub> O <sub>2</sub>	S	+	+	+	-	+	+	+	+	+
Sodium Persulfate	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	S	n	+	+	+	+	+	+	+	+
Sodium Pyrosulfite	Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	S	+	+	+	+	+	n	n	+	+
Sodium Salicylate	C <sub>6</sub> H <sub>4</sub> (OH)COONa	S	+	+/0	+	+	+	+	+	+	+
Sodium Silicate	Na <sub>2</sub> SiO <sub>3</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Sulfate	Na <sub>2</sub> SO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sodium Sulfide	Na <sub>2</sub> S	S	+	+	+	+	+	+	+	+	+
Sodium Sulfite	Na <sub>2</sub> SO <sub>3</sub>	S	+	+	+(50%)	+	+	+	+	+	+
Sodium Tetraborate	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> *10H <sub>2</sub> O	S	+	+	+	+	+	+	+	+	+
Sodium Thiosulfate	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	S	+	+	+(25%)	+	+	+	+	+	+
Sodium Tripolyphosphate	Na <sub>5</sub> P <sub>3</sub> O <sub>10</sub>	S	+	+	+	+	+	+/0	+	+	+
Stannic Chloride	SnCl <sub>4</sub>	100%	+	+	-	+	+	+	+	+	+
Stannous Chloride	SnCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Starch	(C <sub>6</sub> H <sub>10</sub> O <sub>5</sub> ) <sub>n</sub>	S	+	+	+	+	+	+	+	+	+
Stearic Acid	C <sub>17</sub> H <sub>35</sub> COOH	100%	+	+	+	+	+	+	-	+	+
Styrene	C <sub>6</sub> H <sub>5</sub> CHCH <sub>2</sub>	100%	-	-	+	0	0	0	-	+	+
Succinic Acid	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Sugar Syrup		S	+	+	+	+	+	+	+	+	+
Sulfuric Acid	H <sub>2</sub> SO <sub>4</sub>	98%	+30%	+50%	+20%	+80%	+85%	+	+	+	+
Sulfurous Acid	H <sub>2</sub> SO <sub>3</sub>	A.C.	+	+	+(10%)	+	+	+	+	+	+
Sulfuryl Chloride	SO <sub>2</sub> Cl <sub>2</sub>	100%	-	-	n	-	-	+	0	n	+
Tannic Acid	C <sub>76</sub> H <sub>52</sub> O <sub>46</sub>	50%	+	+	+	+	+	+	+	+	+
Tartaric Acid	C <sub>4</sub> H <sub>6</sub> O <sub>6</sub>	S	+(50%)	+	+	+	+	+	+/0	+	+
Tetrachloroethane	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	100%	-	-	+	0	0	0	-	+	+
Tetrachloroethene	C <sub>2</sub> Cl <sub>4</sub>	100%	-	-	+	0	0	0	-	+	+
Tetrahydrofuran	C <sub>4</sub> H <sub>8</sub> O	100%	-	-	+	0	0	-	-	-	+
Tetrahydro Naphthalene	C <sub>10</sub> H <sub>8</sub>	100%	-	-	+	0	-	+	-	+	+
Thionyl Chloride	SOCl <sub>2</sub>	100%	-	-	n	-	-	+	+	-	+
Thiophene	C <sub>4</sub> H <sub>4</sub> S	100%	n	-	+	0	0	-	-	n	+
Tin II Chloride	SnCl <sub>2</sub>	S	+	0	-	+	+	+	+	+	+
Tin II Sulfate	SnSO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Tin IV Chloride	SnCl <sub>4</sub>	S	n	+	-	+	+	+	+	+	+

# 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	n	= unknown resistance	] resp. to aqueous solutions
+/o	= conditional resistance	=>	= refer to . . .	
+	= good resistance	A.C.	= any concentration	
o	= limited resistance	S	= saturated solution	
-	= no resistance	Conc.	= concentrated	
+(x%)	= good resistance to x% concentration	D	= weak solution	
*	= With glued fittings, please check the resistance of the glue.			

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	CONC.	Acrylic	PVC	316 SS	PE	PP	Viton®	EPDM	PVDF	Teflon
Titanium Tetrachloride	TiCl <sub>4</sub>	100%	n	n	n	n	n	0	-	+	+
Toluene	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	100%	-	-	+	0	0	0	-	+	+
Toluene Diisocyanate	C <sub>7</sub> H <sub>8</sub> (NCO) <sub>2</sub>	100%	n	n	+	+	+	-	+/-	n	+
Tributyl Phosphate	(C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> PO <sub>4</sub>	100%	n	-	+	+	+	-	+	+	+
Trichloroacetaldehyde Hydr.	CCl <sub>3</sub> CH(OH) <sub>2</sub>	S	-	-	+	+	0	0	0	-	+
Trichloroethane	CCl <sub>3</sub> CH <sub>3</sub>	100%	-	-	+	0	0	+	-	+	+
Trichloroethene	C <sub>2</sub> HCl <sub>3</sub>	100%	-	-	+/-	0	0	0	-	+	+
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	100%	-	-	+	0	0	0	-	+	+
Trichloroacetic Acid	CCl <sub>3</sub> COOH	50%	-	+	-	+	+	-	0	+	+
Tricresyl Phosphate	(C <sub>6</sub> H <sub>4</sub> ) <sub>3</sub> PO	90%	n	-	+	+	+	0	+	n	+
Triethanolamine	N(C <sub>2</sub> H <sub>4</sub> OH) <sub>3</sub>	100%	-	0	+	+	+	-	+/-	+	+
Triethyl Phosphate	(C <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> PO <sub>4</sub>	100%	n	-	+	+	+	0	+	+	+
Trisodium Phosphate	Na <sub>3</sub> PO <sub>4</sub>	S	+	+	+	+	+	+	+	+	+
Urea	CO(NH <sub>2</sub> ) <sub>2</sub>	S	+	+/-	+	+	+	+	+	+	+
Vinyl Acetate	CH <sub>2</sub> CHOOCCCH <sub>3</sub>	100%	-	-	+	0	-	0	-	+	+
Xylene	C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	100%	-	-	+	0	-	0	-	0	+
Zinc Acetate	(CH <sub>3</sub> COO) <sub>2</sub> Zn	S	+	+	+	+	+	-	+	+	+
Zinc Chloride	ZnCl <sub>2</sub>	S	+	+	-	+	+	+	+	+	+
Zinc Sulfate	ZnSO <sub>4</sub>	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

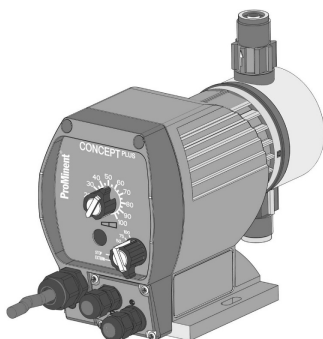
RIDC Park West  
136 Industry Drive  
Pittsburgh, PA 15275-1014  
(412)787-2484





# Solenoid-Driven Metering Pump Overview

Concept<sup>PLUS</sup>

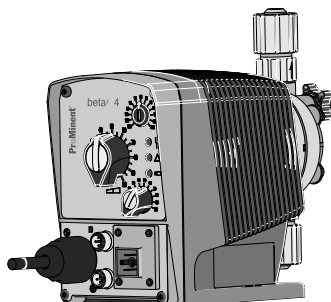


## Ideal for basic chemical feed applications

[\(see page 29 for complete details\)](#)

- 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
- NSF/ANSI 61 approved

Beta<sup>®</sup>



## Ideal for basic chemical feed applications

[\(see page 33 for complete details\)](#)

- Solenoid driven diaphragm pump
- Capacities: 0.19 gph (0.74 lph) to 8.4 gph (32 lph)
- Maximum pressure: 363 psi
- Turndown: 100:1
- External contact input for pulse control with a range of 1:64 to 64:1
- 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
- NSF/ANSI 61 approved

gamma/ L



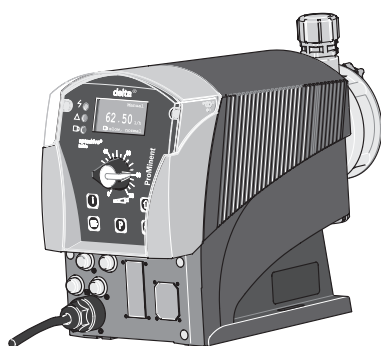
## Ideal for applications requiring automation, large turndown and/or feed verification

[\(see page 40 for complete details\)](#)

- Solenoid driven diaphragm pump
- Capacities: 0.19 gph (0.74 lph) to 8.4 gph (32 lph)
- Maximum pressure: 232 psi
- Turndown: 1800:1
- 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
- NSF/ANSI 61 approved

# Solenoid-Driven Metering Pump Overview

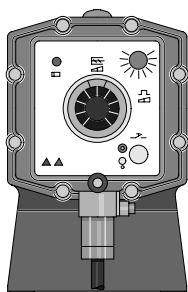
delta®



**Ideal for applications requiring metering pump accuracy with minimal pulsation** ([see page 50 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 lph)
- Maximum pressure: 363 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
- NSF/ANSI 61 approved

EXtronic®

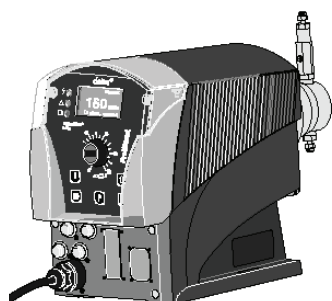


**Ideal for explosion proof applications**

([see page 59 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

mikro delta



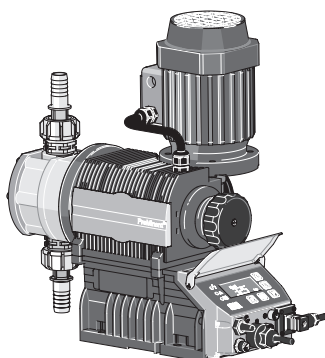
**Ideal for low volume, high pressure applications**

([see page 50 for complete details](#))

- Capacities: 0.04 gph (150 ml/h) to 0.4 gph (1500 ml/h)
- Maximum pressure: 870 psi (60 bar)
- Liquid ends: PTFE and SS
- Continuous or pulsing operation
- External activation by standard signal 0/4-20 mA (optional)
- Interface for PROFIBUS® or CANopen (optional)

# Motor-Driven Metering Pump Overview

## Sigma/1



### Economical mid-range applications

[\(see page 69 for complete details\)](#)

- 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

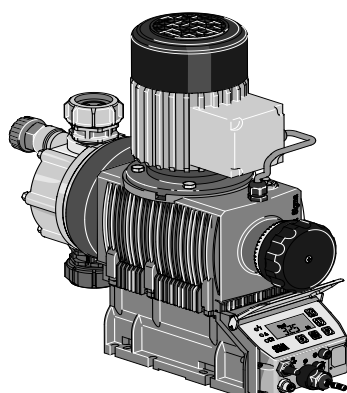
### Basic Version

- 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

## Sigma/2



### Economical mid-range applications

[\(see page 79 for complete details\)](#)

- 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

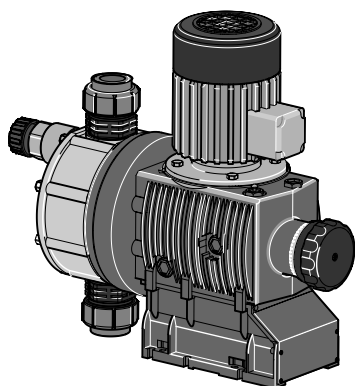
- Capacities: 15.9 gph (60 lph) to 111 gph (420 lph)
- Standard 56-C flange. Motor not included
- Turndown: 100:1 with variable speed motor
- Stroke Frequency: Only with SCR or VFD

### 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

# Motor-Driven Metering Pump Overview

## Sigma/3



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

[\(see page 97 for complete details\)](#)

- 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

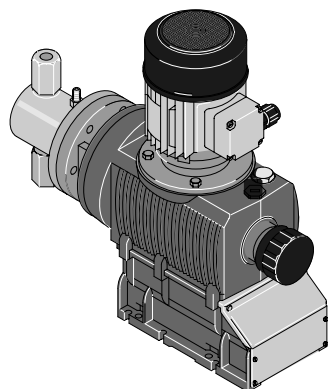
### Basic Version

- 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

## Sigma/2 HK



**Ideal for high pressure applications requiring significant turndown**

[\(see page 89 for complete details\)](#)

- 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

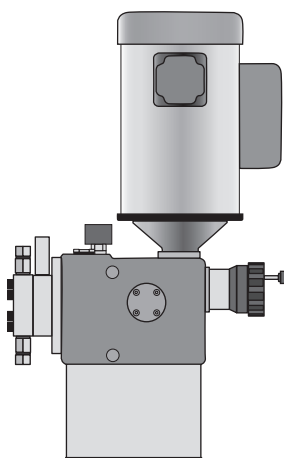
- Capacities: 0.6 gph (2.3 lph) to 20.1 gph (76 lph)
- Standard 56-C flange. Motor not included.
- Turndown: 100:1 with variable speed motor
- Stroke Frequency: Only with SCR or VFD

### 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

# Motor-Driven Metering Pump Overview

## ProMus

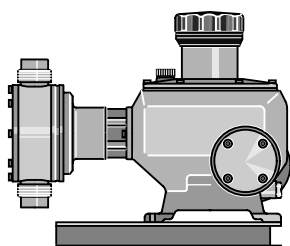


### High pressure chemical process metering

[\(see page 105 for complete details\)](#)

- 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

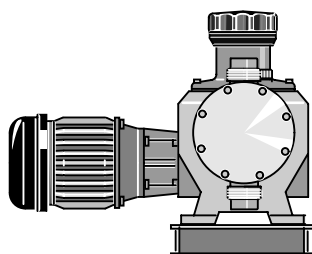
## Makro TZb



### Ideal for high volume and high pressure applications

[\(see page 111 for complete details\)](#)

- 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



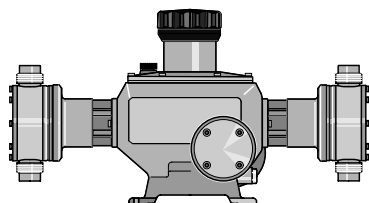
### TZMb

- 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



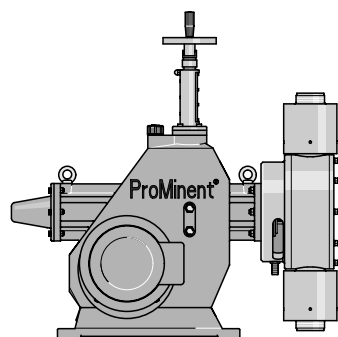
### TZKb

*(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



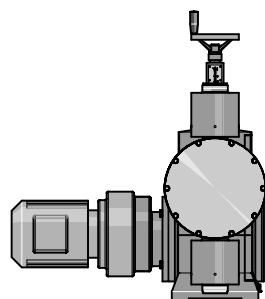
## Ideal for high volume/ high pressure applications

(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

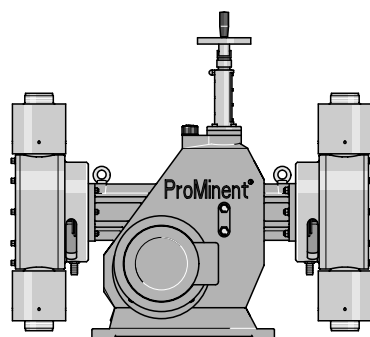
### M5Ma

- 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



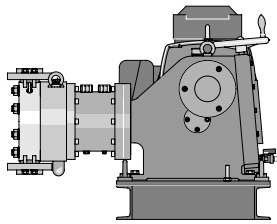
### M5Ka

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



# Motor-Driven Metering Pump Overview

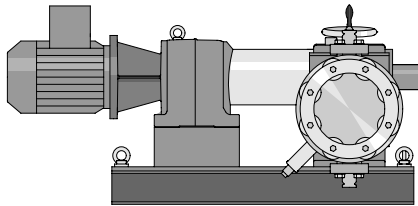
ORLITA®



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

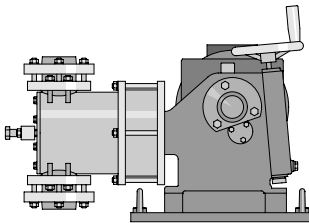
## MfS

- 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



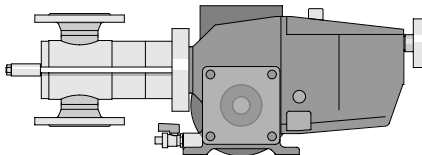
## MhS

- 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

# Motor-Driven Metering Pump Overview

DulcoFlex

**Ideal for high volume applications**

[\(see page 115 for complete details\)](#)

## DFB



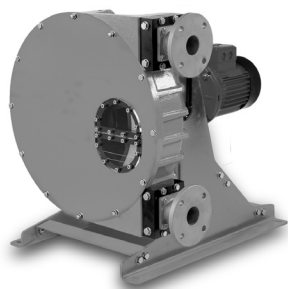
- Peristaltic pump
- Maximum flow: 385 gph
- Maximum pressure: 116 psi
- Incorporates both hose and tubing technology

## DFC



- Peristaltic pump
- Maximum flow: 130 gpm
- Maximum pressure: 116 psi
- Incorporates hose technology

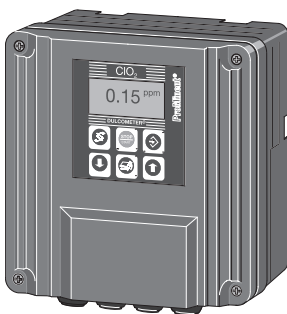
## DFD



- Peristaltic pump
- Maximum flow: 225 gpm
- Maximum pressure: 232 psi
- Suction lifts up to 29 feet

# Analytical Instrumentation Overview

## D1C

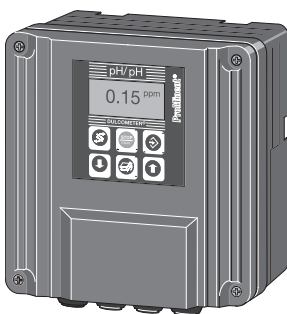


### Microprocessor based single process variable analyzer

[\(see page 185 for complete details\)](#)

- 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

[\(see page 185 for complete details\)](#)

- Controls or measures two variables in one of the following combinations:  
Free and Total chlorine, pH/chlorine, pH/pH, ClO<sub>2</sub>/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

## Dulcometer Compact



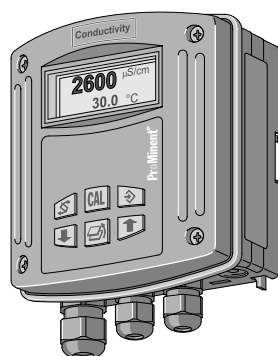
### Microprocessor based single process variable analyzer

[\(see page 204 for complete details\)](#)

- Measured variables pH and ORP (can be changed on the controller)
- Operation independent of the operating language (use of abbreviations, such as CAL, PARAM, CONFIG, ERROR)
- Illuminated display
- 3 LED display operating state (relay 1 / 2 active, Error)
- Sensor monitoring for pH
- P and PID control characteristics
- Selectable control direction (raise or lower measured value)
- Pulse frequency relay for control of metering pump
- Power relay can be configured as an alarm, limit value or pulse width modulated control output for metering pumps (connection function or switch on operating voltage)
- Analog output 4-20 mA can be configured as a writer output or control output
- Digital input to switch off the control or to process a sample water limit contact by remote control
- Temperature sensor input (Pt 1000) for temperature compensation of the pH and chlorine value

# Analytical Instrumentation Overview

## DMT



### Single process variable transmitter

[\(see page 205 for complete details\)](#)

- 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

## DDC



### Microprocessor based multi-variable disinfection analyzer

[\(see page 207 for complete details\)](#)

- 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

## Cooling Tower and Boiler Controllers

### Wide range of controllers for water treatment applications

[\(see page 230 for complete details\)](#)



- 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