**ProMinent® Sigma/1 Motor Diaphragm Metering Pumps**

**Overview: Sigma/1**

**Ideal for Economical mid-range applications**  
(see page 128 for spare parts and page 134 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 maximum back pressure of 174-58 psi (12-4 bar). The pump capacity is adjusted by varying the stroke length (4 mm) in 1% increments 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 analog 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.

All PVDF versions are NSF/ANSI 61 approved.

**Diaphragm Failure Indication (A)**

The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator. The diaphragm is coated with PTFE film on both sides, from the drive and working side. This guarantees that no discharge to the outside occur if the diaphragm ruptures. When the diaphragm ruptures, feed chemical enters between the diaphragm layers and triggers a mechanical indication or an alarm via the sensor area. This concept ensures reliable metering - even under critical operating conditions.

In connection with the S1Ca, continued metering, or alternatively, a stopping of the metering pump can be selected.

**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 phase motor.

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

**Sigma/1 Control Type (S1Ca)**

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, LED’s function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

Local or remote control is possible with PROFIBUS® and/or an integrated process timer.  
(see page 134)
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, that 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 liters.

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 with 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 illuminates. The optional fault relay changes state to issue an alarm or activate a standby pump.

“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 illuminates.

“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 illuminates 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 illuminates. The optional fault relay remains activated.
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.

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 isolated 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, 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 and cannot be retrofitted in the field.
ProMinent® Sigma/ 1
Motor Diaphragm Metering Pumps

Specifications

General:
- Maximum stroke length: 0.16” (4.0 mm)
- Power cord: 6 feet (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: PTFE/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), NSF/ANSI 61
- 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 in Hastelloy C
- Repeatability: When used according to the operating instructions, better than ±2%
- Max. fluid operating temperatures:
  - Material
    - PVDF: 149°F (65°C), 212°F (100°C)
    - 316 SS: 194°F (90°C), 248°F (120°C)

Diaphragm failure indication: Visual indicator is mandatory. The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.

Max. solids size in fluid: 0.3 mm

Stroke length adjustment: Manual, in increments of 1%. Motorized stroke length adjustment is available.

Sigma/1 Basic Version

Motor: See available motors in Identcode
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:** (IP 65)

**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
- maximum 50x10^6 switch cycles @ 10 V, 10 mA
- Contact closure: 100 ms (for pacing relay)

**Analog output signal:**
- maximum 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 feet (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 ± 10%, 50/60 Hz

*Capacity Data Notice*

(The following 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted.)
# ProMinent® Sigma/1
## Motor Diaphragm Metering Pumps

### Sigma/1 Basic Version

<table>
<thead>
<tr>
<th>Pump Version</th>
<th>psig (bar)</th>
<th>U.S. gph (L/h)</th>
<th>Stroke/ min.</th>
<th>Output per Stroke (ml/stroke)</th>
<th>Max. Suction Lift (ft)</th>
<th>Max. Suction Pressure (psig)</th>
<th>Suction Discharge Connector DN in</th>
<th>*Shipping Weight w/Motor (approx.) lbs (kg)</th>
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<td>12017 PVT</td>
<td>145 (10)</td>
<td>5.3 (20)</td>
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### Materials In Contact With Chemicals

<table>
<thead>
<tr>
<th>Liquid End</th>
<th>Suction/Discharge connector</th>
<th>Valve</th>
<th>Seals/ ball seat</th>
<th>Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT</td>
<td>PVDF (Polyvinylidenefluoride)</td>
<td>PVDF</td>
<td>PTFE/PTFE</td>
<td>Ceramic</td>
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<td>SST</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>PTFE/PTFE</td>
<td>Stainless steel</td>
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</tbody>
</table>
## Identcode Ordering System (S1Ba)

### S1Ba Drive Type:

- **H**: Main Drive, Diaphragm

### Version: Capacity:

<table>
<thead>
<tr>
<th>Capacity</th>
<th>S1Ba</th>
<th>Version</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>07065 20.6 gph (78 l/h), 102 psi (7 bar)</td>
<td>12017</td>
<td>5.2 gph (20 l/h), 174 psi (10 bar)</td>
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<tr>
<td>07042 13.2 gph (50 l/h), 102 psi (7 bar)</td>
<td>12039</td>
<td>11.1 gph (42 l/h), 174 psi (10 bar)</td>
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</tr>
<tr>
<td>04084 26.7 gph (101 l/h), 58 psi (4 bar)</td>
<td>10000</td>
<td>15.8 gph (60 l/h), 145 psi (10 bar)</td>
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<tr>
<td>04120 38 gph (144 l/h), 58 psi (4 bar)</td>
<td>10044</td>
<td>14 gph (53 l/h), 145 psi (10 bar)</td>
<td></td>
</tr>
</tbody>
</table>

*For PVDF versions. Maximum 145 psig

### Liquid end material:

- **PVT**: PVDF with PTFE gasket
- **SST**: 316 Stainless Steel with PTFE gasket

### Diaphragm type:

- **A**: Safety diaphragm w/ pump stop function
- **S**: Safety diaphragm w/ visual indicator

### Liquid end version:

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

### Hydraulic connections:

- **7**: PVDF clamping nut & insert
- **8**: SS clamping nut & insert

### Logo:

- **0**: Standard with logo

### Electrical Connection (± 10%):

- **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

### Enclosure rating:

- **0**: Standard

### Stroke sensor:

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

### Stroke length adjustment:

- **0**: Manual (Standard)
- **1**: with 3P stroke positioning motor, 230 V 50/60 Hz
- **2**: with 3P stroke positioning motor, 115 V 50/60 Hz
- **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

**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. 7744261

1/2 HP, 3 ph, 1D, 208-230/460 VAC EPFC

(class 1 Group C & D or class 2 Group F & G T3B)
**Identcode Ordering System (S1Ca)**

<table>
<thead>
<tr>
<th>S1Ca</th>
<th>Drive Type</th>
<th>Motor Drive, Diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>H  Main Drive, Diaphragm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Version</th>
<th>Capacity</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12017*</td>
<td>5.2 gph (20 l/h), 145 psi (10 bar)</td>
<td>07065</td>
<td>17.2 gph (65 l/h), 102 psi (7 bar)</td>
</tr>
<tr>
<td>12035*</td>
<td>11.1 gph (42 l/h), 145 psi (10 bar)</td>
<td>07042</td>
<td>13.2 gph (50 l/h), 102 psi (7 bar)</td>
</tr>
<tr>
<td>10050</td>
<td>13.2 gph (50 l/h), 145 psi (10 bar)</td>
<td>04084</td>
<td>26.7 gph (101 l/h), 58 psi (4 bar)</td>
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<tr>
<td>10022</td>
<td>6.8 gph (26 l/h), 145 psi (10 bar)</td>
<td>04120</td>
<td>13.2 gph (50 l/h), 102 psi (7 bar)</td>
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<tr>
<td>10044</td>
<td>14 gph (53 l/h), 145 psi (10 bar)</td>
<td>04144</td>
<td>14 gph (53 l/h), 145 psi (10 bar)</td>
</tr>
</tbody>
</table>

* For PVDF versions. Max. 145 psig

**NOTE:** Refer to technical data for capacities and stroke rates

<table>
<thead>
<tr>
<th>Liquid end material:</th>
<th>PVT</th>
<th>PVDF with PTFE gasket</th>
</tr>
</thead>
<tbody>
<tr>
<td>SST</td>
<td>316 Stainless Steel with PTFE gasket</td>
<td></td>
</tr>
</tbody>
</table>

**Diaphragm type:**
- A Safety diaphragm w/ pump stop function
- B Safety diaphragm w/alarm indication
- S Safety diaphragm w/ visual indicator

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

**Hydraulic connections:**
- 7 PVDF clamping nut & insert
- 8 SS clamping nut & insert

**Electrical Connection (± 10%):**
- U 1 ph, 115-230 V (± 10%), 50/60 Hz

**Cable and plug with 6 ft (2 m) power cord, single phase:**
- A 6 ft European
- B 6 ft Australia
- D 6 ft USA
- U 6 ft USA, 230 V

**Relay:**
- 0 No 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 variant:**
- 0 Manual + External with pulse control (multiplier/divider)
- 1 Manual + External with pulse controls & 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
# ProMinent® Sigma/1
## Motor Diaphragm Metering Pumps

### Dimensional Drawing: (S1Ba)

![Dimensional Drawing](image)

### Dimensions in inches (mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>Sigma/1</th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>D1**</th>
<th>E</th>
<th>E1**</th>
<th>ØF</th>
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</thead>
<tbody>
<tr>
<td>PVT</td>
<td>12017, 12035, 10050, 10022, 10044, 07065</td>
<td>11</td>
<td>9.38</td>
<td>1/2&quot; MNPT</td>
<td>3.54</td>
<td>4.33</td>
<td>10.8</td>
<td>11.6</td>
<td>3.8</td>
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<tr>
<td></td>
<td>PVT</td>
<td>(279)</td>
<td>(238)</td>
<td></td>
<td>(90)</td>
<td>(110)</td>
<td>(275)</td>
<td>(295)</td>
<td>(96)</td>
</tr>
<tr>
<td>SST</td>
<td>9.75</td>
<td>7.13</td>
<td>3/8&quot; FNPT</td>
<td>3.5</td>
<td>4.29</td>
<td>10.8</td>
<td>11.6</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SST</td>
<td>(248)</td>
<td>(181)</td>
<td></td>
<td>(89)</td>
<td>(109)</td>
<td>(275)</td>
<td>(295)</td>
<td>(96)</td>
</tr>
<tr>
<td>PVT</td>
<td>07042, 04084, 04120</td>
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<td>10</td>
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<td>3.74</td>
<td>4.52</td>
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<td>12</td>
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<tr>
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<td>(305)</td>
<td>(122)</td>
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<tr>
<td>SST</td>
<td>10.25</td>
<td>8.13</td>
<td>1/2&quot; FNPT</td>
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<td>4.48</td>
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<td>12</td>
<td>4.8</td>
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<tr>
<td></td>
<td>SST</td>
<td>(260)</td>
<td>(206)</td>
<td></td>
<td>(94)</td>
<td>(114)</td>
<td>(285)</td>
<td>(305)</td>
<td>(122)</td>
</tr>
</tbody>
</table>

* 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)

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<thead>
<tr>
<th>Type Sigma/1</th>
<th>A</th>
<th>B</th>
<th>C*</th>
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<th>D1**</th>
<th>E</th>
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* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.
ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Overview: Sigma/ 2

Ideal for Economical mid-range applications
(see page 128 for spare parts and page 134 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 back pressure of 58-232 psi (16-4 bar). The pump capacity is adjusted by varying the stroke length (5 mm) in .05% increments 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 analog 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.

All PVDF versions are NSF/ANSI 61 approved.

Diaphragm Failure Indication (A)

The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator. The diaphragm is coated with PTFE film on both sides, from the drive and working side. This guarantees that no discharge to the outside occur if the diaphragm ruptures. When the diaphragm ruptures, feed chemical enters between the diaphragm layers and triggers a mechanical indication or an alarm via the sensor area. This concept ensures reliable metering - even under critical operating conditions.

In connection with the S2Ca, continued metering, or alternatively, a stopping of the metering pump can be selected.

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)

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, LED’s function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

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

(see page 134)
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, that 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 with 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/2 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 illuminates. The optional fault relay changes state to issue an alarm or activate a standby pump.

- **“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 illuminates.
Optional Modes and Functions

Optional Control Modes

“Analog” Mode
With this option, the stroking rate of the Sigma/2 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.

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 isolated 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 and cannot be retrofitted in the field.
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 feet (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**
  - Liquid End: PVDF 316 SS
  - 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
- **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), NSF/ANSI 61

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 in Hastelloy C**
- **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:** Visual indicator is mandatory. The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.
- **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 is 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 is 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 (0.25 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 ($R_{DS_{ON}}$): < 8 Ω
Residual current in OFF-position: <1 µA
Maximum voltage: 24 VDC
Maximum current: < 100 mA (for pacing relay)
Switch functions: 750x10⁶
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 feet (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 kΩh
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
## Capacity Data

### Sigma/2 Basic Version

<table>
<thead>
<tr>
<th>Technical data:</th>
<th>60 Hz (1750 RPM) operation</th>
<th>Max. Stroke Rate</th>
<th>Output per Stroke</th>
<th>Max. Suction Lift (water)</th>
<th>Max. Suction Pressure</th>
<th>Suction/Discharge Connector</th>
<th>Shipping Weight w/Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Version</td>
<td>psig (bar)</td>
<td>U.S. (l/h)</td>
<td>Stroke/ min</td>
<td>mL/stroke</td>
<td>ft (m)</td>
<td>psig (bar)</td>
<td>DN in</td>
</tr>
<tr>
<td>S2Ba HM</td>
<td>145 (10)</td>
<td>15.9 (60)</td>
<td>87</td>
<td>11.4</td>
<td>23 (7)</td>
<td>44 (3)</td>
<td>15 1/2 MNPT</td>
</tr>
<tr>
<td>16050 SST</td>
<td>232 (12)</td>
<td>15.2 (57)</td>
<td>87</td>
<td>11.4</td>
<td>23 (7)</td>
<td>44 (3)</td>
<td>15 1/2 FNPT</td>
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<td>16090 SST</td>
<td>145 (10)</td>
<td>28.5 (108)</td>
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<td>23 (7)</td>
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<td>15 3/4 MNPT</td>
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<td>44 (3)</td>
<td>15 1/2 FNPT</td>
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<tr>
<td>07120 SST</td>
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<td>38 (144)</td>
<td>87</td>
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<td>16 (5)</td>
<td>15 (1)</td>
<td>25 1 MNPT</td>
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### Sigma/2 Control Version

<table>
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<tr>
<th>Technical data:</th>
<th>60 Hz operation</th>
<th>Max. Stroke Rate</th>
<th>Output per Stroke</th>
<th>Max. Suction Lift (water)</th>
<th>Max. Suction Pressure</th>
<th>Suction/Discharge Connector</th>
<th>Shipping Weight w/Motor</th>
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<tr>
<td>Pump Version</td>
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<td>U.S. GPH</td>
<td>Stroke/ min</td>
<td>mL/stroke</td>
<td>ft (m)</td>
<td>psig (bar)</td>
<td>DN in</td>
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<tr>
<td>S2Ca HM</td>
<td>145 (10)</td>
<td>15.9 (60)</td>
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<td>15 1/2 MNPT</td>
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<tr>
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<tr>
<td>16130 SST</td>
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<td>15 3/4 MNPT</td>
</tr>
<tr>
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<td>07120 SST</td>
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<td>90</td>
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</tr>
<tr>
<td>07220 SST</td>
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<td>27.7</td>
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<td>15 (1)</td>
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<tr>
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<td>69.7 (264)</td>
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<tr>
<td>04350 PST</td>
<td>58 (4)</td>
<td>92.5 (350)</td>
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<td>58 (4)</td>
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<td>29.4</td>
<td>16 (5)</td>
<td>15 (1)</td>
<td>25 1 MNPT</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted.)

## Materials In Contact With Chemicals

<table>
<thead>
<tr>
<th>Liquid End</th>
<th>Suction/Discharge connector</th>
<th>Valve</th>
<th>Seals/ ball seat</th>
<th>Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT</td>
<td>PVDF (Polyvinylidenefluoride)</td>
<td>PVDF (Polyvinylidenefluoride)</td>
<td>PTFE/PTFE</td>
<td>Ceramic</td>
</tr>
<tr>
<td>SST</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>PTFE/PTFE</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>S2Ba</td>
<td>Drive Type</td>
<td>Main Drive, Diaphragm</td>
<td>Version</td>
<td>Capacity</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>----------------------</td>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td>HM</td>
<td>HM</td>
<td>Diaphragm</td>
<td>16050*</td>
<td>5.9 gph (60 l/h), 145 psi (10 bar)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16090*</td>
<td>28.5 gph (108 l/h), 145 psi (10 bar)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16130*</td>
<td>41 gph (156 l/h), 145 psi (10 bar)</td>
</tr>
</tbody>
</table>

* For PVDF versions. Maximum 145 psig (10 bar)

**Liquid end material:**
- PVT: PVDF with PTFE gasket
- SST: 316 Stainless Steel with PTFE gasket

**Diaphragm type:**
- A: Safety diaphragm w/ pump stop function
- S: Safety diaphragm w/ visual indicator

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

**Hydraulic connections:**
- 0: No nuts, No inserts
- 7: PVDF clamping nut & insert
- 8: SS clamping nut & insert

**Logo:**
- 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)
- 1: With 3P stroke positioning motor, 230 V 50/60 Hz
- 2: With 3P stroke positioning motor, 115 V 50/60 Hz
- 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
<table>
<thead>
<tr>
<th>S2Ca</th>
<th>Drive Type</th>
<th>Main Drive, Diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HM</td>
<td></td>
</tr>
</tbody>
</table>

**Identcode Ordering System (S2Ca)**

<table>
<thead>
<tr>
<th>Version</th>
<th>Capacity:</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16050*</td>
<td>15.9 gph (60 l/h), 145 psi (10 bar)</td>
<td>07120</td>
</tr>
<tr>
<td>16090*</td>
<td>28.5 gph (108 l/h), 145 psi (10 bar)</td>
<td>07220</td>
</tr>
<tr>
<td>16130**</td>
<td>34.3 gph (130 l/h), 145 psi (10 bar)</td>
<td>04350**</td>
</tr>
</tbody>
</table>

* For PVDF versions. Maximum 145 psig
** Maximum 200 strokes per minute

**Liquid end material:**
- PVT: PVDF with PTFE
- SST: 316 Stainless Steel with PTFE

**Diaphragm type:**
- A: Safety diaphragm w/ pump stop function
- B: Safety diaphragm w/alarm indication
- S: Safety diaphragm w/ visual indicator

**Liquid end options:**
- 0: Without valve springs
- 1: With 2 valve springs (Hastelloy C4, 1 psig)

**Hydraulic connections:**
- 0: No nuts, No inserts
- 7: PVDF clamping nut & insert
- 8: SS clamping nut & insert

**Logo:**
- 0: Standard with logo

**Electrical Connection (+ 10%):**
- U: 1 ph, 115-230 V ± 10%, 50/60 Hz
- C: 4-20 mA output, drops out
- D: 4-20 mA output, pulls in
- E: 4-20 mA output, pacing relay

**Control variant:**
- 0: Manual + External with pulse control (multiplier/divider)
- 1: Manual + External with pulse controls & 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
- 0: Stroke length adjust, Manual

| SC2a | HM | 12050 | PVT | 0 | 0 | 0 | 0 | U | A | 0 | 0 | 0 | C |
## ProMinent® Sigma/2
Motor Diaphragm Metering Pumps

**Dimensions in inches (mm)**

<table>
<thead>
<tr>
<th>Type Sigma/2</th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>D1**</th>
<th>E</th>
<th>E1**</th>
<th>ØF</th>
</tr>
</thead>
<tbody>
<tr>
<td>16050, 16090, 16130 PVT</td>
<td>10.1</td>
<td>6.95</td>
<td>DN 15</td>
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<td>4.9</td>
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<td>4.0</td>
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<tr>
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<td>13.1</td>
<td>DN 25</td>
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<td>5.3</td>
<td>13.4</td>
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<td>DN 25</td>
<td>4.5</td>
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<td>04350 PVT</td>
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<td>5.8</td>
</tr>
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</table>

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector.

---

* 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)

<table>
<thead>
<tr>
<th>Type Sigma/2</th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>D1**</th>
<th>E</th>
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<tr>
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<td></td>
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<tr>
<td>PVT</td>
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<td>07120, 07220</td>
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<tr>
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<td>5.3</td>
<td>13.3</td>
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<td>(115)</td>
<td>(135)</td>
<td>(337)</td>
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<td>(148)</td>
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</tr>
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<td>5.3</td>
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<td>(115)</td>
<td>(135)</td>
<td>(337)</td>
<td>(357)</td>
<td>(148)</td>
<td></td>
</tr>
</tbody>
</table>

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector
Ideal for high pressure applications requiring significant turndown

The ProMinent® Sigma/2 HK is a motor driven plunger metering pump with 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 (60-420 l/h) at a maximum back pressure of 174-4,640 psi (12-320 bar). The pump capacity is adjusted by varying the stroke length 0.2 in (5 mm) in .2% increments 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 analog 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 HK Basic Type (S2Ba)

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 phase motor.

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

Sigma/2 HK Control Type (S2Ca)

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, LED’s function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

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

(see page 134)
General:

- **Maximum stroke length**: 0.196” (5.0 mm) HM; 0.6” (15 mm) HK
- **Power cord**: 6 feet (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 HK
- **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**: Glass SS
- **Drive**: Cam and spring-follower (lost motion)
- **Lubrication**: Oil lubricated
- **Recommended oil**: ISO VG 460, such as Mobil Gear Oil 634
- **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 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 C).
- **Repeatability**: When used according to the operating instructions, better than ±0.5%
- **Max. fluid operating temperatures**:
<table>
<thead>
<tr>
<th>Material</th>
<th>Constant</th>
<th>Short Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>316 SS</td>
<td>392°F (200°C)</td>
<td>428°F (220°C)</td>
</tr>
</tbody>
</table>
- **Stroke length adjustment**: Manual, in increments of 0.2%. Motorized stroke length control is optional.
ProMinent® Sigma/ 2 HK
Plunger Metering Pumps

Specifications

Sigma/2 HK 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 HK 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 ($R_{on}$): < 8 Ω
Residual current in OFF-position: <1µA
Maximum voltage: 24 VDC
Maximum current: < 100 mA (for pacing relay)
Switch functions: 750×10⁶
Contact closure: 100 ms (for pacing relay)

Analog output signal:
maximum 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 feet (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
## Sigma/2 HK Basic Version

<table>
<thead>
<tr>
<th>Pump Version</th>
<th>psig (bar)</th>
<th>U.S. gph (l/h)</th>
<th>Stroke/ min.</th>
<th>ml/ stroke</th>
<th>ft (m)</th>
<th>psig (bar)</th>
<th>in. FNPT</th>
<th>lbs (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2Ba HK</td>
<td>32002 SST</td>
<td>4640 (320)</td>
<td>0.6 (2.3)</td>
<td>84</td>
<td>0.46</td>
<td>16 (5)</td>
<td>2175 (150)</td>
<td>1/4</td>
</tr>
<tr>
<td></td>
<td>23004 SST</td>
<td>3335 (230)</td>
<td>1.2 (4.8)</td>
<td>153</td>
<td>0.52</td>
<td>16 (5)</td>
<td>2175 (150)</td>
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<td></td>
<td>10006 SST</td>
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<td>2.0 (7.6)</td>
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<td>0.55</td>
<td>16 (5)</td>
<td>2175 (150)</td>
<td>1/4</td>
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<td></td>
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<td>2030 (140)</td>
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<td>1.42</td>
<td>13 (4)</td>
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<td>2.91</td>
<td>13 (4)</td>
<td>435 (30)</td>
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<td></td>
<td>02534 SST</td>
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<td></td>
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## Sigma/2 HK Control Version

<table>
<thead>
<tr>
<th>Pump Version</th>
<th>psig (bar)</th>
<th>U.S. gph (l/h)</th>
<th>Stroke/ min.</th>
<th>ml/ stroke</th>
<th>ft (m)</th>
<th>psig (bar)</th>
<th>in. FNPT</th>
<th>lbs (kg)</th>
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<tr>
<td>S2Ca HK</td>
<td>32002 SST</td>
<td>4640 (320)</td>
<td>0.6 (2.3)</td>
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<td>16 (5)</td>
<td>2175 (150)</td>
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</tr>
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<td></td>
<td>10011 SST</td>
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<td></td>
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<td>725 (50)</td>
<td>5.2 (20)</td>
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<td></td>
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<td>02541 SST</td>
<td>363 (25)</td>
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<td></td>
<td>01264 SST</td>
<td>174 (12)</td>
<td>20.1 (76)</td>
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<td>5.45</td>
<td>13 (4)</td>
<td>218 (15)</td>
<td>3/8</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted.)

## Materials In Contact With Chemicals

<table>
<thead>
<tr>
<th>Liquid End</th>
<th>Suction/ Discharge connector</th>
<th>Seals</th>
<th>Valve Balls</th>
<th>Ball Seat</th>
</tr>
</thead>
<tbody>
<tr>
<td>SST</td>
<td>Stainless steel</td>
<td>PTFE/PTFE</td>
<td>Ceramic</td>
<td>Stainless steel</td>
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</table>
## ProMinent® Sigma/2 HK
### Plunger Metering Pumps

#### Identcode Ordering System (S2Ba HK)

<table>
<thead>
<tr>
<th>S2Ba</th>
<th>Drive Type</th>
<th>HK</th>
<th>Main Drive/Plunger</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Version</th>
<th>Capacity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>32002</td>
<td>0.6 gph (2.3 l/h), 4640 psi (320 bar)</td>
</tr>
<tr>
<td>14006</td>
<td>1.8 gph (7.1 l/h), 2030 psi (140 bar)</td>
</tr>
<tr>
<td>07012</td>
<td>3.9 gph (14.8 l/h), 1015 psi (70 bar)</td>
</tr>
<tr>
<td>04022</td>
<td>7.0 gph (26.5 l/h), 580 psi (40 bar)</td>
</tr>
<tr>
<td>23004</td>
<td>1.2 gph (4.8 l/h), 3335 psi (230 bar)</td>
</tr>
<tr>
<td>10011</td>
<td>3.4 gph (13.1 l/h), 1450 psi (100 bar)</td>
</tr>
</tbody>
</table>

### Liquid end material:
- SS 316 Stainless Steel

### O-ring:
- T PTFE seal

### Plunger assembly:
- 4 Plunger (Ceramic)

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

### Hydraulic connections:
- 0 Standard (In accordance with technical data)

### Logo:
- 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 (Standard)
- 1 With 3P stroke positioning motor, 230 V 50/60 Hz
- 2 With 3P stroke positioning motor, 115 V 50/60 Hz
- 4 With stroke positioning motor 4-20 mA, 230 V 50/60 Hz
- 6 With stroke positioning motor 4-20 mA, 115 V 50/60 Hz

### S2Ba HK 32002 SS T 4 0 0 0 2 0 0 0
<table>
<thead>
<tr>
<th>S2Ca</th>
<th>Drive Type</th>
<th>Main drive/Plunger</th>
</tr>
</thead>
<tbody>
<tr>
<td>HK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Version</th>
<th>Capacity</th>
<th>Sigma/2 Control (HK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32002</td>
<td>0.6 gph, 4640 psi, 2.3 l/h, 320 bar</td>
<td>04522 7.0 gph, 27.6 l/h, 45 bar</td>
</tr>
<tr>
<td>14006</td>
<td>1.8 gph, 2030 psi, 7.1 l/h, 140 bar</td>
<td>02541 13.0 gph, 49.2 l/h, 25 bar</td>
</tr>
<tr>
<td>07012</td>
<td>3.9 gph, 1015 psi, 14.8 l/h, 70 bar</td>
<td>10006 1.7 gph, 1450 psi, 6.5 l/h, 100 bar</td>
</tr>
<tr>
<td>04022</td>
<td>7.0 gph, 580 psi, 26.5 l/h, 40 bar</td>
<td>05016 4.5 gph, 725 psi, 17.2 l/h, 50 bar</td>
</tr>
<tr>
<td>23004</td>
<td>1.2 gph, 3335 psi, 4.8 l/h, 230 bar</td>
<td>02534 9.2 gph, 363 psi, 35.0 l/h, 25 bar</td>
</tr>
<tr>
<td>10011</td>
<td>3.4 gph, 1450 psi, 13.1 l/h, 100 bar</td>
<td>01264 17.3 gph, 174 psi, 65.4 l/h, 12 bar</td>
</tr>
</tbody>
</table>

**Liquid end material:**
- SS 316 Stainless Steel

**Seal material:**
- T PTFE seal

**Plunger:**
- 4 Plunger (Ceramic)

**Liquid end version:**
- 0 Without valve springs
- 1 With 2 valve springs (Hastelloy C, 1 psig)

**Hydraulic connections:**
- 0 Standard (In accordance with technical data)

**Logo:**
- 0 Standard with logo

**Electrical Connection:**
- U 1 ph, 115-230 V ± 10%, 50/60 Hz

**Cable and plug with 6 ft (2 m) power cord, single phase:**
- A 6 ft European
- D 6 ft USA
- U 6 ft USA, 230 V

**Relay:**
- 0 No relay
- 1 Fault annunciating relay, drops out
- 3 Fault annunciating relay, pulls in
- 4 Option 1 + pacing relay
- 5 Option 3 + pacing relay

**Control variant:**
- 0 Manual + External with pulse control (multiplier/divider)
- 1 Manual + External with pulse controls & 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)

**Stroke length adjustment:**
- 0 Manual
**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)

<table>
<thead>
<tr>
<th>Model</th>
<th>Connector</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>ØG</th>
</tr>
</thead>
<tbody>
<tr>
<td>32002</td>
<td>1/4&quot;</td>
<td>10.9</td>
<td>8.5</td>
<td>R1/4&quot;</td>
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<td>17.3</td>
<td>3.1</td>
</tr>
<tr>
<td>23004</td>
<td>DN 8</td>
<td>(277)</td>
<td>(216)</td>
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<td>(217)</td>
<td>(439)</td>
<td>(79.5)</td>
</tr>
<tr>
<td>10006</td>
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<td>R1/4&quot;</td>
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</table>
## ProMinent® Sigma/ 2 HK
**Plunger Metering Pumps**

### Dimensional Drawing: (S2Ca HK)

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

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<tbody>
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<tr>
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<td>DN 10</td>
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</tr>
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<td>01264</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(79.5)</td>
</tr>
</tbody>
</table>
ProMinent® Sigma/3
Motor Diaphragm Metering Pumps

Overview: Sigma/3

Ideal for applications requiring automation, large turndown and/or feed verification
(see page 128 for spare parts and page 134 for control cables)

The ProMinent® Sigma/3 is a mechanically actuated diaphragm metering pump. It has a capacity range of 46-264 gph (174-1000 l/h) at a maximum back pressure of 58-174 psi (4-12 bar). The pump capacity is adjusted by varying the stroke length (5 mm) in .05% increments 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 analog 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.

All PVDF versions are NSF/ANSI 61 approved.

Diaphragm Failure Indication (A)

The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator. The diaphragm is coated with PTFE film on both sides, from the drive and working side. This guarantees that no discharge to the outside occur if the diaphragm ruptures. When the diaphragm ruptures, feed chemical enters between the diaphragm layers and triggers a mechanical indication or an alarm via the sensor area. This concept ensures reliable metering - even under critical operating conditions.

In connection with the S2Ca, continued metering, or alternatively, a stopping of the metering pump can be selected.

Sigma/3 Basic Type (S3Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S3Ba 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)

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

(see page 134)
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 Luranly™ (PPE)
- Wetted materials of construction
  - Liquid End: PVDF
  - Suction/Discharge Connectors: PVDF
  - Seals: PTFE
  - Check Balls: DN 25 Glass
  - Check Plates: DN 32 Hastelloy C
- Drive: Cam and spring-follower (lost motion)
- Lubrication: Oil lubricated
- Recommended oil: ISO VG 460, such as Mobil Gear Oil 634s
- 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), NSF/ANSI 61
- 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.
  - 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: Visual indicator is mandatory. The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.
- 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 \( R_{\text{DSOn}} \): < 8 Ω
    - Residual current in OFF-position: <1 µA
    - Maximum voltage: 24 VDC
    - Maximum current: < 100 mA (for pacing relay)
    - Switch functions: 750x10⁶
    - 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 kΩhm
  - **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

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Suction/discharge</th>
<th>DN 25</th>
<th>Valve seats</th>
<th>DN 32</th>
<th>Valve seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3Ba/S3Ca</td>
<td>Liquid end</td>
<td>Valve balls</td>
<td>Valve Plate/ Spring</td>
<td>Valve balls</td>
<td></td>
</tr>
</tbody>
</table>

#### Materials In Contact With Chemical

<table>
<thead>
<tr>
<th>Material</th>
<th>Suction/discharge connector</th>
<th>DN 25</th>
<th>Valve balls</th>
<th>DN 32</th>
<th>Valve seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT</td>
<td>PVD (Polyvinylidenefluoride)</td>
<td>PTFE</td>
<td>Glass</td>
<td>Ceramic/ Hast. C + CTFE**</td>
<td>PTFE</td>
</tr>
<tr>
<td>SST</td>
<td>Stainless steel</td>
<td>PTFE</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>PTFE</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted).

Universal control cable necessary for external Sigma control. (see page 134)
# ProMinent® Sigma/3
## Motor Diaphragm Metering Pumps

### S3Ba Drive Type

<table>
<thead>
<tr>
<th>S3Ba</th>
<th>Drive Type</th>
<th>H</th>
<th>Main Drive, Diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Version: Capacity:

<table>
<thead>
<tr>
<th>Value</th>
<th>Capacity</th>
<th>Pressure</th>
<th>Flow Rate</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>120145</td>
<td>46 gph, 145 psi, 174 l/h, 10 bar</td>
<td>070410</td>
<td>130 gph, 100 psi, 492 l/h, 7 bar</td>
<td></td>
</tr>
<tr>
<td>120190</td>
<td>60.2 gph, 145 psi, 228 l/h, 10 bar</td>
<td>070580</td>
<td>184 gph, 100 psi, 696 l/h, 7 bar</td>
<td></td>
</tr>
<tr>
<td>120270</td>
<td>85.6 gph, 145 psi, 324 l/h, 10 bar</td>
<td>040830</td>
<td>264 gph, 58 psi, 1000 l/h, 4 bar</td>
<td></td>
</tr>
</tbody>
</table>

### Liquid end material:

<table>
<thead>
<tr>
<th>Type</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT</td>
<td>PVDF with PTFE gasket</td>
</tr>
<tr>
<td>SST</td>
<td>316 Stainless Steel with PTFE gasket</td>
</tr>
</tbody>
</table>

### Diaphragm type:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Safety diaphragm w/ pump stop function</td>
</tr>
<tr>
<td>S</td>
<td>Safety diaphragm w/ visual indicator</td>
</tr>
</tbody>
</table>

### Liquid end version:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without valve springs</td>
</tr>
<tr>
<td>1</td>
<td>With 2 valve springs (Hastelloy C4, 1 psig)</td>
</tr>
</tbody>
</table>

### Hydraulic connections:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>PVDF clamping nut &amp; insert</td>
</tr>
<tr>
<td>8</td>
<td>SS clamping nut &amp; insert</td>
</tr>
</tbody>
</table>

### Logo:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Standard with logo</td>
</tr>
</tbody>
</table>

### Motor mount:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Without motor, with NEMA 56C flange</td>
</tr>
</tbody>
</table>

### Enclosure rating:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Standard</td>
</tr>
</tbody>
</table>

### Stroke sensor:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without stroke sensor (Standard)</td>
</tr>
<tr>
<td>2</td>
<td>With Pacing relay (Consult Factory)</td>
</tr>
</tbody>
</table>

### Stroke length adjustment:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Manual (Standard)</td>
</tr>
<tr>
<td>1</td>
<td>with 3P stroke positioning motor, 230 V 50/60 Hz</td>
</tr>
<tr>
<td>2</td>
<td>with 3P stroke positioning motor, 115 V 50/60 Hz</td>
</tr>
<tr>
<td>4</td>
<td>W/ stroke positioning motor 4-20 mA, 230 V 50/60 Hz</td>
</tr>
<tr>
<td>6</td>
<td>W/ stroke positioning motor 4-20 mA, 115 V 50/60 Hz</td>
</tr>
</tbody>
</table>
**ProMinent® Sigma/3**

**Motor Diaphragm Metering Pumps**

**Identcode Ordering System (S3Ca)**

<table>
<thead>
<tr>
<th>S3Ca</th>
<th>Drive Type</th>
<th>Capacity</th>
<th>Version: Capacity</th>
<th>Liquid end material:</th>
<th>Diaphragm type:</th>
<th>Liquid end version:</th>
<th>Hydraulic connections:</th>
<th>Logo:</th>
<th>Electrical Connection (± 10%):</th>
<th>Cable and plug with 6 ft (2 m) power cord, single phase:</th>
<th>Control variant:</th>
<th>Access Code:</th>
<th>Flow monitor:</th>
<th>Stroke length adjustment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H Main drive/Diaphragm</td>
<td>46 gph, 145 psi, 174 l/h, 10 bar</td>
<td>120145</td>
<td>PVT</td>
<td>Safety diaphragm w/ pump stop function</td>
<td>0 Without valve springs</td>
<td>7 PVDF clamping nut &amp; insert</td>
<td>0 Standard with logo</td>
<td>1 ph, 115-230 V ± 10%, 50/60 Hz</td>
<td>A European plug, 230 V</td>
<td>0</td>
<td>No access code</td>
<td>0 Manual + External with pulse control (multiplier/divider)</td>
<td>C Manual + Calibration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>130 gph, 100 psi, 492 l/h, 7 bar</td>
<td>120190</td>
<td>SST</td>
<td>Safety diaphragm w/alarm indication</td>
<td>1 With 2 valve springs (Hastelloy C4, 1 psig)</td>
<td>8 SS clamping nut &amp; insert</td>
<td>1 Access code</td>
<td>D N. American plug, 115 V</td>
<td>B European plug, 230 V</td>
<td>1</td>
<td>Access code</td>
<td>1 Manual + External with pulse controls &amp; analog control</td>
<td>0 Stroke length adjustment:</td>
</tr>
</tbody>
</table>
Dimensions in inches (mm)

<table>
<thead>
<tr>
<th>Type Sigma/3</th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>D1**</th>
<th>E</th>
<th>E1**</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>121045, 120190, 120270</td>
<td>14.1</td>
<td>14.3</td>
<td>1&quot; MNPT</td>
<td>4.7</td>
<td>5.5</td>
<td>13.6</td>
<td>14.4</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>(358)</td>
<td>(364)</td>
<td></td>
<td>(120)</td>
<td>(140)</td>
<td>(346)</td>
<td>(366)</td>
<td>(156)</td>
</tr>
<tr>
<td>SST</td>
<td>14.1</td>
<td>14.3</td>
<td>1&quot; MNPT</td>
<td>4.8</td>
<td>5.6</td>
<td>13.7</td>
<td>14.5</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>(358)</td>
<td>(364)</td>
<td></td>
<td>(121)</td>
<td>(141)</td>
<td>(349)</td>
<td>(369)</td>
<td>(156)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type Sigma/3</th>
<th>A</th>
<th>B</th>
<th>C*</th>
<th>D</th>
<th>D1**</th>
<th>E</th>
<th>E1**</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>070410, 070580, 040830</td>
<td>15.9</td>
<td>17.8</td>
<td>1-1/2&quot; MNPT</td>
<td>5.0</td>
<td>5.7</td>
<td>14.0</td>
<td>14.8</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>(403)</td>
<td>(453)</td>
<td></td>
<td>(127)</td>
<td>(147)</td>
<td>(358)</td>
<td>(378)</td>
<td>(206)</td>
</tr>
<tr>
<td>SST</td>
<td>15.3</td>
<td>16.9</td>
<td>1-1/2&quot; MNPT</td>
<td>5.0</td>
<td>5.7</td>
<td>14.0</td>
<td>14.8</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>(387)</td>
<td>(430)</td>
<td></td>
<td>(127)</td>
<td>(147)</td>
<td>(358)</td>
<td>(378)</td>
<td>(206)</td>
</tr>
</tbody>
</table>

* Piping adapters provided according to technical data.
** Dimensions with diaphragm failure detector.
Dimensions in inches (mm)

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

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

High pressure chemical process metering
(see page 131 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

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
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

<table>
<thead>
<tr>
<th>Size 17</th>
<th>3/8&quot;</th>
<th>230</th>
<th>16</th>
<th>3500</th>
<th>241</th>
<th>0.2</th>
<th>(0.87)</th>
<th>100</th>
<th>18</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>psig Bar</td>
<td>psig Bar</td>
<td>U.S.</td>
<td>Stroke/</td>
<td>Stroke/</td>
<td>Max.</td>
<td>FNPT/</td>
<td>MNPT/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PVDF) (metal)</td>
<td>(PVDF) (metal)</td>
<td>GPH</td>
<td>U.S</td>
<td>(l/h)</td>
<td>Max.</td>
<td>BSP</td>
<td>BSP</td>
<td>(PVDF)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/16&quot;</td>
<td>230</td>
<td>16</td>
<td>3500</td>
<td>241</td>
<td>0.83</td>
<td>(3.1)</td>
<td>50</td>
<td>35</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 30</th>
<th>5/8&quot;</th>
<th>230</th>
<th>16</th>
<th>2080</th>
<th>143</th>
<th>1.8</th>
<th>(6.8)</th>
<th>50</th>
<th>35</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>psig Bar</td>
<td>psig Bar</td>
<td>U.S.</td>
<td>Stroke/</td>
<td>Stroke/</td>
<td>Max.</td>
<td>FNPT/</td>
<td>MNPT/</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(PVDF) (metal)</td>
<td>(PVDF) (metal)</td>
<td>GPH</td>
<td>U.S</td>
<td>(l/h)</td>
<td>Max.</td>
<td>BSP</td>
<td>BSP</td>
<td>(PVDF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/3/4&quot;</td>
<td>230</td>
<td>16</td>
<td>265</td>
<td>18</td>
<td>15.4</td>
<td>(58.2)</td>
<td>50</td>
<td>35</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 40</th>
<th>1-3/4&quot;</th>
<th>230</th>
<th>16</th>
<th>265</th>
<th>18</th>
<th>15.4</th>
<th>(58.2)</th>
<th>50</th>
<th>35</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
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</tr>
</thead>
<tbody>
<tr>
<td>psig Bar</td>
<td>psig Bar</td>
<td>U.S.</td>
<td>Stroke/</td>
<td>Stroke/</td>
<td>Max.</td>
<td>FNPT/</td>
<td>MNPT/</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(PVDF) (metal)</td>
<td>(PVDF) (metal)</td>
<td>GPH</td>
<td>U.S</td>
<td>(l/h)</td>
<td>Max.</td>
<td>BSP</td>
<td>BSP</td>
<td>(PVDF)</td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted.)

#### Materials In Contact With Chemicals

<table>
<thead>
<tr>
<th>Material</th>
<th>Liquid End</th>
<th>Suction/Discharge connector</th>
<th>Seals/ball seat</th>
<th>Valve Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>stainless steel</td>
<td>stainless steel</td>
<td>PTFE/SS</td>
<td>stainless steel</td>
</tr>
<tr>
<td>A2</td>
<td>alloy 20</td>
<td>alloy 20</td>
<td>PTFE/A2</td>
<td>alloy 20</td>
</tr>
<tr>
<td>HC</td>
<td>hastelloy C</td>
<td>hastelloy C</td>
<td>PTFE/HC</td>
<td>hastelloy C</td>
</tr>
<tr>
<td>PVT</td>
<td>PVDF</td>
<td>PVDF</td>
<td>PTFE/PVDF</td>
<td>ceramic</td>
</tr>
</tbody>
</table>
# ProMus1 17A  SS1  0  1  X  0  1  A  0

## Polymer Blending Systems

### ProMus

#### Identcode Ordering System ProMus

<table>
<thead>
<tr>
<th>ProMus1</th>
<th>Pump Version</th>
<th>Size</th>
<th>Plunger Size</th>
<th>Size</th>
<th>Plunger Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>17A</td>
<td>Size 17 liquid end with 3/8&quot; Plunger</td>
<td>30C</td>
<td>Size 30 liquid end with 1-1/8&quot; Plunger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17B</td>
<td>Size 17 liquid end with 7/16&quot; Plunger</td>
<td>40A</td>
<td>Size 40 liquid end with 1-3/4&quot; Plunger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30A</td>
<td>Size 30 liquid end with 5/8&quot; Plunger</td>
<td>40B</td>
<td>Size 40 liquid end with 2&quot; Plunger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30B</td>
<td>Size 30 liquid end with 13/16&quot; Plunger</td>
<td>40C</td>
<td>Size 40 liquid end with 2-1/4&quot; Plunger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Liquid end material:
- **SS1**: Stainless steel Single ball check
- **SS2**: Stainless steel Double ball check (*Needed for applications above 500 psi)
- **SS3**: 316 St. steel Single inlet, Double outlet (Rcmd. for Flooded suction w/ discharge pressure above 500 psi)

### 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:
- 1 12.5:1 56C
- 2 15:1 56C
- 3 30:1 56C
- 4 40:1 56C
- 5 50:1 56C
- 6 12.5:1 IEC (IEC 71 with B5 flange)
- 7 15:1 IEC (IEC 71 with B5 flange)
- 8 30:1 IEC (IEC 71 with B5 flange)
- 9 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 NEMA 7

### 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/size 30 & 40
- J 200 psi/size 30 & 40
- K 160 psi (30B, C & 40)

### Hydraulic oil:
- 0 Standard
**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.

<table>
<thead>
<tr>
<th>Data Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired capacity min./max.</td>
<td>GPH (l/h)</td>
</tr>
<tr>
<td>Available power supply</td>
<td>V, Hz, phase</td>
</tr>
<tr>
<td>Working temperature min./max.</td>
<td>°F (°C)</td>
</tr>
<tr>
<td>Description of process fluid</td>
<td></td>
</tr>
<tr>
<td>Concentration %</td>
<td></td>
</tr>
<tr>
<td>Solids content %</td>
<td></td>
</tr>
<tr>
<td>Absolute viscosity, cP</td>
<td></td>
</tr>
<tr>
<td>Vapor pressure at working temperature</td>
<td>psig (bar)</td>
</tr>
<tr>
<td>Remarks (e.g. abrasive, developing gases and fumes, flammable, corrosive)</td>
<td></td>
</tr>
</tbody>
</table>

**Suction conditions:**

<table>
<thead>
<tr>
<th>Data Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction lift min./max., or</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Positive suction head min./max., or</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Pressure in chemical tank</td>
<td>psig (bar)</td>
</tr>
<tr>
<td>Length of suction line</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Size (I.D.) of suction line</td>
<td>in. (mm)</td>
</tr>
<tr>
<td>Number of valves and fittings in suction line</td>
<td></td>
</tr>
</tbody>
</table>

**Discharge conditions:**

<table>
<thead>
<tr>
<th>Data Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back-pressure min./max.</td>
<td>psig (bar)</td>
</tr>
<tr>
<td>Discharge head min./max.</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Negative discharge head min./max.</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Length of discharge line</td>
<td>ft. (m)</td>
</tr>
<tr>
<td>Size (I.D.) of discharge line</td>
<td>in. (mm)</td>
</tr>
<tr>
<td>Number of valves and fittings in discharge line</td>
<td></td>
</tr>
</tbody>
</table>
Ideal for high volume and high pressure applications
(see page 132 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)**

<table>
<thead>
<tr>
<th>TZMb Drive Type</th>
<th>H</th>
<th>Main Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Add-on power end</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Double main drive</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Double add-on power end</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump Type</th>
<th>120260</th>
<th>120340</th>
<th>120430</th>
<th>120510</th>
<th>070430</th>
<th>070570</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid end material</td>
<td>82 gph, 174 psi</td>
<td>108 gph, 174 psi</td>
<td>136 gph, 174 psi</td>
<td>162 gph, 174 psi</td>
<td>136 gph, 100 psi</td>
<td>180 gph, 100 psi</td>
</tr>
<tr>
<td>Liquid end version</td>
<td>No valve springs</td>
<td>With valve springs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic connection</td>
<td>Standard connection</td>
<td>PVC union nut and insert</td>
<td>PP union nut and insert</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Versions</td>
<td>0</td>
<td>with ProMinent® logo</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>ATEX power end</td>
<td>4</td>
<td>No motor, with 56 C flange</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stroke sensor</td>
<td>0</td>
<td>No stroke sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke length adjustment</td>
<td>0</td>
<td>Stroke length adjustment, man.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Applications

- 0 Stroke length adjustment, man.
- 230 V stroke actuator
- 115 V stroke actuator
- 230 V 0-20 mA stroke controller
- 230 V 4-20 mA stroke controller
- 115 V 0-20 mA stroke controller
- 115 V 4-20 mA stroke controller
### ProMinent® Makro TZ Diaphragm Metering Pumps

#### Capacity Data (TZMbH)

with 1800 rpm motor at 60 Hz

<table>
<thead>
<tr>
<th>Pump type</th>
<th>gph</th>
<th>l/h</th>
<th>psi</th>
<th>bar</th>
<th>ml/ strokes/</th>
<th>ft (m)</th>
<th>in (DN)</th>
<th>lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TZMbH</td>
<td>stroke</td>
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<td>120260</td>
<td>82</td>
<td>312</td>
<td>174</td>
<td>12</td>
<td>60</td>
<td>86</td>
<td>13.1</td>
<td>1 (25)</td>
</tr>
<tr>
<td>120340</td>
<td>108</td>
<td>408</td>
<td>174</td>
<td>12</td>
<td>60</td>
<td>115</td>
<td>13.1</td>
<td>1 (25)</td>
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<tr>
<td>120430</td>
<td>136</td>
<td>516</td>
<td>174</td>
<td>12</td>
<td>60</td>
<td>144</td>
<td>13.1</td>
<td>1 (25)</td>
</tr>
<tr>
<td>120510</td>
<td>162</td>
<td>612</td>
<td>174</td>
<td>12</td>
<td>60</td>
<td>173</td>
<td>13.1</td>
<td>1 (25)</td>
</tr>
<tr>
<td>120650</td>
<td>–</td>
<td>–</td>
<td>174</td>
<td>12</td>
<td>60</td>
<td>–</td>
<td>13.1</td>
<td>1 (25)</td>
</tr>
<tr>
<td>070430</td>
<td>136</td>
<td>516</td>
<td>100</td>
<td>7</td>
<td>99</td>
<td>86</td>
<td>11.5</td>
<td>1 1/2 (32)</td>
</tr>
<tr>
<td>070570</td>
<td>180</td>
<td>684</td>
<td>100</td>
<td>7</td>
<td>99</td>
<td>115</td>
<td>11.5</td>
<td>1 1/2 (32)</td>
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<tr>
<td>070720</td>
<td>228</td>
<td>864</td>
<td>100</td>
<td>7</td>
<td>99</td>
<td>144</td>
<td>11.5</td>
<td>1 1/2 (32)</td>
</tr>
<tr>
<td>070860</td>
<td>272</td>
<td>1032</td>
<td>100</td>
<td>7</td>
<td>99</td>
<td>173</td>
<td>11.5</td>
<td>1 1/2 (32)</td>
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<tr>
<td>071070</td>
<td>–</td>
<td>–</td>
<td>100</td>
<td>7</td>
<td>99</td>
<td>–</td>
<td>11.5</td>
<td>1 1/2 (32)</td>
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<td>040840</td>
<td>266</td>
<td>1008</td>
<td>58</td>
<td>4</td>
<td>194</td>
<td>86</td>
<td>9.8</td>
<td>2 (40)</td>
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<td>041100</td>
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<td>1320</td>
<td>58</td>
<td>4</td>
<td>194</td>
<td>115</td>
<td>9.8</td>
<td>2 (40)</td>
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<td>1680</td>
<td>58</td>
<td>4</td>
<td>194</td>
<td>144</td>
<td>9.8</td>
<td>2 (40)</td>
</tr>
<tr>
<td>041670</td>
<td>529</td>
<td>2004</td>
<td>58</td>
<td>4</td>
<td>194</td>
<td>173</td>
<td>9.8</td>
<td>2 (40)</td>
</tr>
<tr>
<td>042100</td>
<td>–</td>
<td>–</td>
<td>58</td>
<td>4</td>
<td>194</td>
<td>–</td>
<td>9.8</td>
<td>2 (40)</td>
</tr>
</tbody>
</table>

Stroke length 10 mm

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

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted).

#### Materials In Contact With Chemical In Version

<table>
<thead>
<tr>
<th>Pump Head</th>
<th>Suction/ Discharge Connector</th>
<th>Seals</th>
<th>Valve Balls</th>
<th>Valve Seat</th>
<th>Seals</th>
<th>Valve Plate/ Valve Spring</th>
<th>Valve Seat</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPT Polypropylene</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Ceramic/ Hast. C + CTFE*</td>
<td></td>
</tr>
<tr>
<td>PCT PVC</td>
<td>PVDF</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Ceramic/ Hast. C + CTFE*</td>
<td></td>
</tr>
<tr>
<td>TTT PTFE with carbon</td>
<td>PTFE with carbon</td>
<td>PTFE</td>
<td>Ceramic</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Ceramic/ Hast. C + CTFE*</td>
<td></td>
</tr>
<tr>
<td>SST Stainless steel</td>
<td>Stainless steel</td>
<td>PTFE</td>
<td>Stainless steel</td>
<td>PTFE</td>
<td>PTFE</td>
<td>Stainless steel Hast. C + CTFE*</td>
<td></td>
</tr>
</tbody>
</table>

Multi-layer safety diaphragm with PTFE coating.
** The valve spring is coated with CTFE (similar to PTFE)
Custom designs available to order.
**ProMinent® DulcoFlex Series**

**Overview: DulcoFlex DFB**

The DulcoFlex DFB is a versatile peristaltic pump, which incorporates both hose and tubing technology. The unique roller design offers a lubricant-free housing unlike typical shoe pumps. With pressures up to 116 psi and flow rates to 385 gph, the DFB is a great choice for pumping difficult fluid such as slurries and abrasive chemicals.

**Feature & Benefits**

- 10, 13, 16, 19, 22 mm tubing pumps (30psi)
- 10, 13, 16, 22 mm reinforced hose pumps (116psi)
- Flows to 385 gph (6.5 gpm)
- Halar coating available for the toughest chemicals
- Disaster proof hose connections
- Roller Technology - Lower hose Stress
- Easy maintenance
- Reinforced hose
- Can run dry
- Self priming
- Great for solids
- Reversible
- No seals
- No valves

**DulcoFlex DFB Capacities**

<table>
<thead>
<tr>
<th></th>
<th>DFB10</th>
<th>DFB13</th>
<th>DFB16</th>
<th>DFB19</th>
<th>DFB22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
</tr>
<tr>
<td>Connection</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/4&quot;</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Capacity gal/rev</td>
<td>0.006</td>
<td>0.01</td>
<td>0.024</td>
<td>0.032</td>
<td>0.066</td>
</tr>
<tr>
<td>Max Flow gph</td>
<td>52</td>
<td>84</td>
<td>210</td>
<td>270</td>
<td>385</td>
</tr>
</tbody>
</table>

**Reinforced Hoses**

- Natural Rubber
- Nitrile
- EPDM
- Hypalon
- Natural Rubber Food Grade
- Nitrile Food Grade

**Max Pressure Reinforced Hose**

<table>
<thead>
<tr>
<th></th>
<th>116 psi</th>
<th>116 psi</th>
<th>116 psi</th>
<th>N/A</th>
<th>116 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing</td>
<td>Norprene</td>
<td>Norprene</td>
<td>Norprene Tygon</td>
<td>Norprene Tygon</td>
<td>Norprene</td>
</tr>
<tr>
<td>Max Pressure Tubing</td>
<td>30 psi</td>
<td>30 psi</td>
<td>30 psi</td>
<td>30 psi</td>
<td>30 psi</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted).
The DulcoFlex DFC is a hose pump designed for difficult pumping applications. It incorporates a roller design which eliminates the need for cumbersome lubricants, unlike typical shoe pumps. The DFC can reach pressures up to 116 psi and flow rates up to 130 gpm and is ideal for difficult industrial and municipal applications.

**Feature & Benefits**

- Sizes: 30, 40, 50, 60, 70mm
- Flows to 130 gpm
- Disaster proof hose connections
- Roller Technology - Lower hose stress
- Easy maintenance
- Reinforced hose
- Can run dry
- Self priming
- Great for solids handling
- Reversible
- No seals
- No valves

**DulcoFlex DFC Capacities**

<table>
<thead>
<tr>
<th></th>
<th>DFC30</th>
<th>DFC40</th>
<th>DFC50</th>
<th>DFC60</th>
<th>DFC70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression Connection</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
<td>Roller</td>
</tr>
<tr>
<td>Capacity gal/rev</td>
<td>0.11</td>
<td>0.24</td>
<td>0.39</td>
<td>0.82</td>
<td>2.08</td>
</tr>
<tr>
<td>Max Flow gpm</td>
<td>12</td>
<td>20</td>
<td>30</td>
<td>82</td>
<td>130</td>
</tr>
<tr>
<td>Reinforced Hoses</td>
<td>EPDM, Hypalon, Nitrile Buna Rubber</td>
<td>Natural Rubber, Natural Rubber Food Grade, Nitrile Buna Rubber Food Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Pressure Reinforced Hose Tubing</td>
<td>116 psi</td>
<td>116 psi</td>
<td>116 psi</td>
<td>116 psi</td>
<td>116 psi</td>
</tr>
<tr>
<td>Max Pressure Tubing</td>
<td>N/A</td>
<td>Norprene</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted).
The DulcoFlex DFD is a hose pump designed for pressures up to 232 psi and flow rates up to 225 gpm. The unique shoe design is made of steel for smoother and cooler compression. The DFD uses safe DulcoLube oil for the shoe lubrication. With suction lifts up to 29 feet, the DulcoFlex DFD is a great choice for difficult pumping applications.

### Feature & Benefits

- Sizes: 25, 32, 40, 60, 70, 100mm
- Flows to 225 gpm
- Suction lifts up to 29 ft.
- Disaster proof hose connections
- DulcoLube food grade glycerin lubricant
- Designed heat sink fins for cooler operation
- Steel shoes for a smoother and cooler compression
- Run dry capabilities

### DulcoFlex DFD Capacities

<table>
<thead>
<tr>
<th>Compression</th>
<th>DFD25</th>
<th>DFD32</th>
<th>DFD40</th>
<th>DFD60</th>
<th>DFD70</th>
<th>DFD100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Shoe</td>
<td>Shoe</td>
<td>Shoe</td>
<td>Shoe</td>
<td>Shoe</td>
<td>Shoe</td>
</tr>
<tr>
<td>1”</td>
<td>1”</td>
<td>1 ½”</td>
<td>1 ½”</td>
<td>2 ½”</td>
<td>3”</td>
<td>4”</td>
</tr>
<tr>
<td>Capacity gal/rev</td>
<td>0.08</td>
<td>0.16</td>
<td>0.37</td>
<td>0.85</td>
<td>1.76</td>
<td>5.28</td>
</tr>
<tr>
<td>Max Flow gpm</td>
<td>12</td>
<td>20</td>
<td>30</td>
<td>84</td>
<td>130</td>
<td>225</td>
</tr>
<tr>
<td>Reinforced Hoses</td>
<td>Natural Rubber</td>
<td>Nitrile Buna Rubber</td>
<td>EPDM</td>
<td>Natural Rubber Food Grade</td>
<td>Nitrile Buna Rubber Food Grade</td>
<td></td>
</tr>
<tr>
<td>Max Pressure Reinforced Hose</td>
<td>232 psi</td>
<td>232 psi</td>
<td>232 psi</td>
<td>232 psi</td>
<td>232 psi</td>
<td>232 psi</td>
</tr>
</tbody>
</table>

(Note: 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. Capacities will be slightly reduced from published ratings if pumps are skid mounted).