ProMinent® Sigma/ 2
Motor Diaphragm Metering Pumps

Overview: Sigma/ 2

Ideal for mid-range applications
(see page 133 for spare parts and page 138 for control cables)

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

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

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

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

Sigma/ 2 Basic Type (S2Ba)

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

Sigma/ 2 Control Type (S2Ca)

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

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

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

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

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

(see page 138)
Feed rate is determined by stroke length and stroke rate. Stroke length is manually adjustable from 1 to 100% in increments of 1% via the stroke length knob.

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

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

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

Control Modes

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

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

Standard Functions

“Calibrate”

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

“Auxiliary Frequency”

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

“Flow”

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

“Float Switch”

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

“Pause”

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

“Stop”

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

“Prime”

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

Function and Error Indicators

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

Indicators

Motor Diaphragm Metering Pumps

ProMinent® Sigma/ 2

Product Overview

Standard Mode and Functions

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Optional Modes and Functions

Optional Control Modes

"Analog" Mode

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

"Contact" Mode with Pulse Control

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

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

By simply entering a factor in the 0.01-99.99 range, the step-up or step-down ratio is set.

For example:

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

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

"Batch" Mode

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

Access Code

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

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. Profibus is not field retrofittable.
ProMinent® Sigma/2
Motor Diaphragm Metering Pumps

Specifications

General:

- Maximum stroke length: 0.196” (5.0 mm) HM; 0.6” (15 mm) HK
- Power cord: 6 foot (2 m) 2 wire + ground (supplied on control versions)
- Stroke frequency control: S2Ba: Constant speed or optional DC/SCR drive or AC inverter
  S2Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.
- Stroke counting: Standard on S2Ca
- Materials of construction
  Inner casing: Cast aluminum
  Housing: Glass-filled Luranyl™ (PPE)
- Wetted materials of construction:
  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; ProMinent Part no. 555325
- Oil quantity: Approximately 0.6 quart (550 mL)
- Recommended oil change interval: 5,000 hours
- Warranty: Two years on drive, one year on liquid end.
- Factory testing: Each pump is tested for rated flow at maximum pressure.
- Industry Standard: CE approved, CSA available (standard in Canada)

Sigma/2 HM:

- Diaphragm materials: PTFE faced EPDM with Nylon reinforcement and steel core
- Liquid end options: Polyvinylidene Fluoride (PVDF) or 316 SS, with PTFE seals
- Check valves: Single ball check, PVDF and SS versions.
  Optional springs available (Hastelloy C4)
- Repeatability: When used according to the operating instructions, better than ±2%
- Max. fluid operating temperatures:
  \[
  \begin{array}{ccc}
  \text{Material} & \text{Constant} & \text{Short Term} \\
  & (Max. Backpressure) & (15 min. @ max.30 psi) \\
  \text{PVDF} & 149°F (65°C) & 212°F (100°C) \\
  \text{316 SS} & 194°F (90°C) & 248°F (120°C) \\
  \end{array}
  \]
- Diaphragm failure indication: Optional, see accessories. Switch is N.C., opens to indicate failure.
  Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC, 1.0 A resistive.
  Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.
- Separation of drive from liquid end: An air gap with secondary safety diaphragm separates the drive from the liquid end to prevent cross contamination of oil and process fluid (with or without optional diaphragm failure indication).
- Max. solids size in fluid: 0.3 mm
- Stroke length adjustment: Manual, in increments of 0.5%. Motorized stroke length adjustment available.

Sigma/2 HK:

- Piston materials: Ceramic oxide; packing rings of PTFE, packing spring of 316 SS.
- Liquid end options: 316 SS with PTFE seals
- Check valves: Double ball, stainless steel; optional springs (Hastelloy C4).
- Repeatability: When used according to the operating instructions, better than ±0.5%
- Max. fluid operating temperatures:
  \[
  \begin{array}{ccc}
  \text{Material} & \text{Constant} & \text{Short Term} \\
  & (Max. Backpressure) & (15 min. @ max.30 psi) \\
  \text{316 SS} & 392°F (200°C) & 428°F (220°C) \\
  \end{array}
  \]
- Stroke length adjustment: Manual, in increments of 0.2%. Motorized stroke length control optional.
**Sigma/2 Basic Version**

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

**Sigma/2 Control Version**

- **Control Function:** At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
- **Enclosure rating:** NEMA 3 (IP 55)
- **Motor data:** Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.18 kW (0.24 HP) 230 3 phase (1.9 A)

**Relay load**

- **Fault relay only (options 1 & 3):**
  - Contact load: 250 VAC, 2 A, 50/60 Hz
  - Operating life: > 200,000 switch functions

- **Fault and pacing relay (options 4 & 5):**
  - Contact load: 24 V, 2 A, 50/60 Hz
  - Operating life: > 200,000 switch functions
  - Residual impedance in ON-position \( R_{\text{on}} \): < 8 Ω
  - Residual current in OFF-position: <1μA
  - Maximum voltage: 24 VDC
  - Maximum current: < 100 mA (for pacing relay)
  - Switch functions: 750x10^6
  - Contact closure: 100 ms (for pacing relay)

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

**Profibus - DP fieldbus options:**

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

**Relay cable (optional):**

- **6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A**

**Pulse contact/remote pause contact:** With voltage-free contact, or semiconductor sink logic control (not source logic) with a residual voltage of <700 mV. The contact load is approximately 0.5 mA at + 5 VDC. *(Note: Semiconductor contacts that require >700 mV across a closed contact should not be used).*

- **Max. pulse frequency:** 25 pulses/sec
- **Contact impedance:** 10 kOhm
- **Max. pulse memory:** 65,535 pulses
- **Necessary contact duration:** 20ms
- **Analog - current input burden:** Approximately 120 Ohm
- **Max. allowable input current:** 50 mA
- **Power requirements:** single phase, 115-230 VAC
## Capacity Data

### Sigma/2 Basic Version

<table>
<thead>
<tr>
<th>Pump Version</th>
<th>U.S. GPH</th>
<th>Stroke/ min.</th>
<th>mL/ stroke</th>
<th>psig (bar)</th>
<th>ft. (m)</th>
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</thead>
<tbody>
<tr>
<td>S2Ba HM</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>
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<tr>
<td>12050 PVT</td>
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**Note:** Universal control cable necessary for external Sigma control. (see page 138)

## Materials In Contact With Chemicals

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<th>Suction/Discharge connector</th>
<th>Valve</th>
<th>Seals/ ball seat</th>
<th>Balls</th>
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<td>PVT</td>
<td>PVDF (Polyvinylidenefluoride)</td>
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<td>PTFE/PTFE</td>
<td>Ceramic/Glass*</td>
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</tbody>
</table>

*for 07120, 07220, 04350
## Identcode Ordering System (S2Ba)

<table>
<thead>
<tr>
<th>S2Ba</th>
<th>HM</th>
<th>Main Drive, Diaphragm</th>
</tr>
</thead>
</table>

### Pump version:

- 12050*
- 12090*
- 12130*
- 07120
- 07220
- 04350

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

### Liquid end material:

- PV
- SS

### Liquid end material:

- PVDF
- 316 Stainless steel

### Seal material:

- T
- PTFE

### Diaphragm type:

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

### Liquid end version:

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

### Connectors:

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

### Labeling:

- 0 Standard with logo

### Motor mount:

- 2 Without motor, with NEMA 56C flange

### Enclosure rating:

- 0 Standard

### Stroke sensor:

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

### Stroke length adjustment:

- 0 Manual (Standard)
- 4 W/ stroke positioning motor 4 - 20 mA, 230 V 50/60 Hz
- 6 W/ stroke positioning motor 4 - 20 mA, 115 V 50/60 Hz
### ProMinent® Sigma/2

**Motor Diaphragm Metering Pumps**

#### Identcode Ordering System (S2Ca)

<table>
<thead>
<tr>
<th>S2Ca</th>
<th>Sigma/2 Control Version a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main drive</td>
<td></td>
</tr>
<tr>
<td>HM</td>
<td>Main drive/Diaphragm</td>
</tr>
</tbody>
</table>

#### Pump version:

<table>
<thead>
<tr>
<th></th>
<th>12050*</th>
<th>12090*</th>
<th>12130**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07120</td>
<td>07220</td>
<td>04350**</td>
</tr>
</tbody>
</table>

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

#### Liquid end materials:

<table>
<thead>
<tr>
<th></th>
<th>PVT</th>
<th>SST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PVDF with PTFE</td>
<td>316 Stainless steel with PTFE</td>
</tr>
</tbody>
</table>

#### Diaphragm type:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard diaphragm, PTFE</td>
<td>With double diaphragm and failure detector (NC contact opens on fault)</td>
<td>With double diaphragm and failure detector (alarm &amp; continues to operate)</td>
</tr>
</tbody>
</table>

#### Liquid end version:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without valve springs</td>
<td>With 2 valve springs (Hastelloy C4, 1.45 psig)</td>
</tr>
</tbody>
</table>

#### Connectors:

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

#### Labeling:

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

#### Voltage supply:

<table>
<thead>
<tr>
<th></th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 ph, 115-230 V ± 10%, 50/60 Hz</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>D</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>European plug, 230 V</td>
<td>N. American plug, 115 V</td>
<td>N. American plug, 230 V</td>
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</tbody>
</table>

#### Relay:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without relay</td>
<td>Fault annunciating relay, drops out</td>
<td>Fault annunciating relay, pulls in</td>
<td>Option 1 + pacing relay</td>
<td>Option 3 + pacing relay</td>
<td>Option 1 + 4-20 mA output</td>
<td>Option 3 + 4-20 mA output</td>
<td>Pacing relay + 4-20 mA output</td>
</tr>
</tbody>
</table>

#### Control variants:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>4</th>
<th>5</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manual + External with pulse control (multiplier/divider)</td>
<td>Manual + External with pulse control &amp; analog control</td>
<td>Option 0 + timer</td>
<td>Option 1 + timer</td>
<td>Option 1 + Profibus (Relay must be 0)</td>
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</tbody>
</table>

#### Access code:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
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<td>No access code</td>
<td>Access code</td>
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#### Flow monitor:

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</thead>
<tbody>
<tr>
<td></td>
<td>Input for metering monitor signal (pulse)</td>
<td>Input for maintained flow switch signal</td>
</tr>
</tbody>
</table>

#### Stroke length adjustment:

<table>
<thead>
<tr>
<th></th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manual + Calibration</td>
</tr>
</tbody>
</table>
### Prominent® Sigma/2
**Motor Diaphragm Metering Pumps**

**Dimensional Drawing:** (S2Ba)

---

**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>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>12050, 12090, 12130 PVT</td>
<td>10.1</td>
<td>6.95</td>
<td>DN 15</td>
<td>4.1</td>
<td>4.9</td>
<td>13.0</td>
<td>13.7</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>(257)</td>
<td>(177)</td>
<td></td>
<td>(104)</td>
<td>(124)</td>
<td>(329)</td>
<td>(349)</td>
<td>(101)</td>
</tr>
<tr>
<td>12050, 12090, 12130 SST</td>
<td>10.9</td>
<td>8.2</td>
<td>DN 15</td>
<td>4.1</td>
<td>4.9</td>
<td>13.0</td>
<td>13.7</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>(276)</td>
<td>(208)</td>
<td></td>
<td>(104)</td>
<td>(124)</td>
<td>(329)</td>
<td>(349)</td>
<td>(101)</td>
</tr>
<tr>
<td>07120, 07220, PVT</td>
<td>13.3</td>
<td>13.1</td>
<td>DN 25</td>
<td>4.5</td>
<td>5.3</td>
<td>13.4</td>
<td>14.2</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>(337)</td>
<td>(332)</td>
<td></td>
<td>(115)</td>
<td>(135)</td>
<td>(340)</td>
<td>(360)</td>
<td>(148)</td>
</tr>
<tr>
<td>07120, 07220, SST</td>
<td>13.3</td>
<td>13.1</td>
<td>DN 25</td>
<td>4.5</td>
<td>5.3</td>
<td>13.4</td>
<td>14.2</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>(337)</td>
<td>(332)</td>
<td></td>
<td>(115)</td>
<td>(135)</td>
<td>(340)</td>
<td>(360)</td>
<td>(148)</td>
</tr>
<tr>
<td>04350 PVT</td>
<td>14.3</td>
<td>14.1</td>
<td>DN 25</td>
<td>4.5</td>
<td>5.3</td>
<td>13.4</td>
<td>14.2</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>(362)</td>
<td>(358)</td>
<td></td>
<td>(115)</td>
<td>(135)</td>
<td>(340)</td>
<td>(360)</td>
<td>(148)</td>
</tr>
<tr>
<td>04350 SST</td>
<td>14.3</td>
<td>14.1</td>
<td>DN 25</td>
<td>4.5</td>
<td>5.3</td>
<td>13.4</td>
<td>14.2</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>(362)</td>
<td>(358)</td>
<td></td>
<td>(115)</td>
<td>(135)</td>
<td>(340)</td>
<td>(360)</td>
<td>(148)</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/2</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>12050, 12090, 12130</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT</td>
<td>10.6(272)</td>
<td>6.95(177)</td>
<td>DN 15</td>
<td>4.1(104)</td>
<td>4.9(124)</td>
<td>12.8(326)</td>
<td>13.6(346)</td>
<td>4.0(101)</td>
</tr>
<tr>
<td>SST</td>
<td>10.4(288)</td>
<td>8.2(208)</td>
<td>DN 15</td>
<td>4.1(104)</td>
<td>4.9(124)</td>
<td>12.8(326)</td>
<td>13.6(346)</td>
<td>4.0(101)</td>
</tr>
<tr>
<td>07120, 07220,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT</td>
<td>13.9(352)</td>
<td>13.1(332)</td>
<td>DN 25</td>
<td>4.5(115)</td>
<td>5.3(135)</td>
<td>13.3(337)</td>
<td>14.1(357)</td>
<td>5.8(148)</td>
</tr>
<tr>
<td>SST</td>
<td>13.9(352)</td>
<td>13.1(332)</td>
<td>DN 25</td>
<td>4.5(115)</td>
<td>5.3(135)</td>
<td>13.3(337)</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT</td>
<td>14.9(377)</td>
<td>14.1(358)</td>
<td>DN 25</td>
<td>4.5(115)</td>
<td>5.3(135)</td>
<td>13.3(337)</td>
<td>14.1(357)</td>
<td>5.8(148)</td>
</tr>
<tr>
<td>SST</td>
<td>14.9(377)</td>
<td>14.1(358)</td>
<td>DN 25</td>
<td>4.5(115)</td>
<td>5.3(135)</td>
<td>13.3(337)</td>
<td>14.1(357)</td>
<td>5.8(148)</td>
</tr>
</tbody>
</table>

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector
**Overview: Sigma/2 HK**

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

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

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

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

**Sigma/2 HK Basic Type (S2Ba)**

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

**Sigma/2 HK Control Type (S2Ca)**

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

The control unit has the same control surface as the ProMinent® gamma/ L metering pump. The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

With five programming keys the individual pump functions are easy to set. A backlit LCD gives information about the prevailing operating status. LEDs along with a fault-indicating or pacing relay act as operating and warning indicators to ensure monitoring of the pump function.
**ProMinent® Sigma/2 HK**

**Plunger Metering Pumps**

**Specifications**

**General:**

- **Maximum stroke length:** 0.196” (5.0 mm) HM; 0.6” (15 mm) HK
- **Power cord:** 6 foot (2 m) 2 wire + ground (supplied on control versions)
- **Stroke frequency control:**
  - S2Ba: Constant speed or optional DC/SCR drive or AC inverter
  - S2Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.
- **Stroke counting:** Standard on S2Ca
- **Materials of construction**
  - **Inner casing:** Cast aluminum
  - **Housing:** Glass-filled Luran™ (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; ProMinent Part no. 555325
- **Oil quantity:** Approximately 0.6 quart (550 mL)
- **Recommended oil change interval:** 5,000 hours
- **Warranty:** Two years on drive, one year on liquid end.
- **Factory testing:** Each pump is tested for rated flow at maximum pressure.
- **Industry Standard:** CE approved, CSA available (standard in Canada)

**Sigma/2 HM:**

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

**Max. fluid operating temperatures:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Constant</th>
<th>Short Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Max. Backpressure)</td>
<td>(15 min. @ max.30 psi)</td>
</tr>
<tr>
<td>PVDF</td>
<td>149°F (65°C)</td>
<td>212°F (100°C)</td>
</tr>
<tr>
<td>316 SS</td>
<td>194°F (90°C)</td>
<td>248°F (120°C)</td>
</tr>
</tbody>
</table>

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

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

- **Max. solids size in fluid:** 0.3 mm
- **Stroke length adjustment:** Manual, in increments of 0.5%. Motorized stroke length adjustment available.

**Sigma/2 HK:**

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

**Max. fluid operating temperatures:**

<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 optional.
## ProMinent® Sigma/ 2 HK
### Plunger Metering Pumps

### Specifications

#### Sigma/2 Basic Version

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

#### Sigma/2 Control Version

- **Control Function:** At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
- **Enclosure rating:** NEMA 3 (IP 55)
- **Motor data:** Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.18 kW (0.24 HP) 230 3 phase (1.9 A)
- **Relay load**
  - **Fault relay only (options 1 & 3):** Contact load: 250 VAC, 2 A, 50/60 Hz
  - **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_{SO}):** < 8 Ω
  - **Residual current in OFF-position:** <1μA
  - **Maximum voltage:** 24 VDC
  - **Maximum current:** < 100 mA (for pacing relay)
  - **Switch functions:** 750x10^6
  - **Contact closure:** 100 ms (for pacing relay)
- **Analog output signal:** max. impedance 300 Ω
  - **Isolated 4-20 mA output signal**
- **Profibus - DP fieldbus options:**
  - **Transfer:** RS - 485
  - **Wiring:** 2-wired, twisted, shielded
  - **Length:** 3637 ft. (1200 m)/328 ft. (100 m)
  - **Baudrate:** 9600 bits/s; 12 Mbits/s
  - **No. of participants:** 32 with 127 repeaters
  - **Topology:** Line
  - **Access procedure:** Master/master with token ring
- **Relay cable (optional):** 6 foot (2 m) 3 wire (SPDT) 250 VAC, 2 A
- **Pulse contact/remote pause contact:** With voltage-free contact, or semiconductor sink logic control (not source logic) with a residual voltage of <700 mV. The contact load is approximately 0.5 mA at + 5 VDC. (Note: Semiconductor contacts that require >700 mV across a closed contact should not be used).
  - **Max. pulse frequency:** 25 pulses/sec
  - **Contact impedance:** 10 kOhm
  - **Max. pulse memory:** 65,535 pulses
  - **Necessary contact duration:** 20ms
  - **Analog - current input burden:** Approximately 120 Ohm
  - **Max. allowable input current:** 50 mA
  - **Power requirements:** single phase, 115-230 VAC
## Sigma/2 HK 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. GPH</td>
<td>Stroke/min.</td>
<td>mL/ft. (m)</td>
<td>psig (bar)</td>
<td>in.</td>
<td>lbs. (kg.)</td>
</tr>
<tr>
<td>Sigma/2B HK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<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>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>
<td>1/4</td>
</tr>
<tr>
<td>10006 SST</td>
<td>1450 (100)</td>
<td>2.0 (7.6)</td>
<td>233</td>
<td>0.55</td>
<td>16 (5)</td>
<td>2175 (150)</td>
<td>1/4</td>
</tr>
<tr>
<td>14006 SST</td>
<td>2030 (140)</td>
<td>1.8 (7.1)</td>
<td>84</td>
<td>1.42</td>
<td>13 (4)</td>
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## Sigma/2 HK 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>
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<td>Stroke/min.</td>
<td>mL/ft. (m)</td>
<td>psig (bar)</td>
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<td>lbs. (kg.)</td>
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<td>5.45</td>
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<td>218 (15)</td>
<td>3/8</td>
</tr>
</tbody>
</table>

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

### 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>
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<tbody>
<tr>
<td>SST</td>
<td>Stainless steel</td>
<td>PTFE/PTFE</td>
<td>Ceramic</td>
<td>Stainless steel</td>
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2/08/2008 - Sigma HK
## ProMinent® Sigma/2 HK
### Plunger Metering Pumps

#### Identcode Ordering System (S2Ba HK)

<table>
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<tr>
<th>S2Ba</th>
<th>Sigma Basic Version a</th>
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<tr>
<td>HK</td>
<td>Main drive/Plunger</td>
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<td></td>
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</table>

**Pump version:**
- 32002 04522
- 14006 02541
- 07012 10006
- 04022 05016
- 23004 02534
- 10011 01264

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

**Seal material:**
- T PTFE seal

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

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

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

**Labeling:**
- 0 Standard with logo

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

**Enclosure rating:**
- 0 Standard

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

**Stroke length adjustment:**
- 0 Manual
- 5 W/ stroke positioning motor 0 - 20 mA, 115 V, 50/60 Hz
- 6 W/ stroke positioning motor 4 - 20 mA, 115 V, 50/60 Hz
## Identcode Ordering System (S2Ca HK)

**S2Ca Sigma Control Version a**

<table>
<thead>
<tr>
<th>HK</th>
<th>Main drive/ Plunger</th>
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<tr>
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<td>02541</td>
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<td>01264</td>
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</table>

### Pump version:
- **Liquid end material:** SS 316 Stainless steel
- **Seal material:** T PTFE seal
- **Plunger:** 4 Plunger (Ceramic)
- **Liquid end version:**
  - 0 Without valve springs (Standard)
  - 1 With 2 valve springs (Hastelloy C4, 1 psig)
- **Connectors:**
  - 0 Standard (in accordance with technical data)
- **Labeling:**
  - 0 Standard with logo
- **Voltage supply:**
  - U 1 ph, 115-230 V ± 10%, 50/60 Hz
- **Cable and plug with 6 ft (2 m) power cord, single phase:**
  - A European plug, 230 V
  - D N. American plug, 115 V
  - U N. American plug, 230 V
- **Relay:**
  - 0 Without relay
  - 1 Fault annunciating relay, drops out
  - 3 Fault annunciating relay, pulls in
  - 4 Option 1 + pacing relay
  - 5 Option 3 + pacing relay
- **Control variants:**
  - 0 Manual + External with pulse control (multiplier/divider)
  - 1 Manual + External with pulse control & analog control
  - 4 Option 0 + timer
  - 5 Option 1 + timer
  - P Option 1 + Profibus (Relay must be 0)
- **Access code:**
  - 0 No access code
  - 1 Access code
- **Flow monitor:**
  - 0 Input for metering monitor signal (pulse)
  - 1 Input for maintained flow switch signal
- **Stroke length adjustment:**
  - C Manual + Calibration
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>G</th>
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*Note: Dimensions in inches (mm) are approximate and may vary.*
Dimensions in inches (mm)

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<tr>
<th>Model</th>
<th>Connector</th>
<th>A</th>
<th>B</th>
<th>C (R1/4&quot;)</th>
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