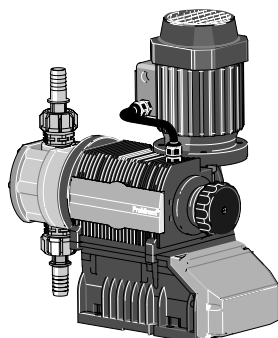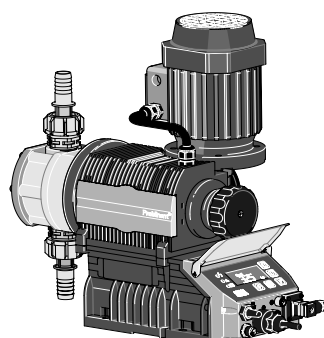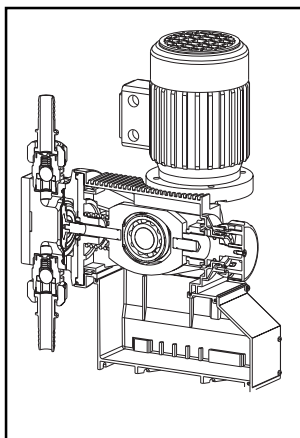# ProMinent® Sigma/1 Motor-Driven Metering Pumps

**Basic Version
(S1Ba HM)**

**Control Version
(S1Ca HM)**

ProMinent®

Sigma/1 Metering Pumps

The ProMinent Sigma/1 series pumps are motor driven metering pumps with a mechanically actuated diaphragm-type liquid end (Sigma HM). It is constructed of a corrosion resistant plastic outer housing. The standard materials for the liquid end are PVDF or 316 stainless steel, both with PTFE seals.

Sigma/1 HM pumps are designed with a convex DEVELOPAN diaphragm which seals to a concave curve in the liquid end. This allows for precise metering of media with various viscosities and reduces stress for long diaphragm life. Three gear ratios and two liquid end sizes provide maximum capacities ranging from 5.2 to 38 gph (20 to 144 l/h) (basic) and 5.2 to 31.7 gph (20 to 120 l/h) (control) at maximum backpressures of 174 to 58 psig (12 to 4 bar). The capacity can be infinitely varied in steps of 1% by adjustment of the self-locking stroke length adjusting knob or via an optional stroke positioning motor. Maximum stroke length is 0.16 (4mm). Under defined conditions and with correct installation, the repeatability is better than $\pm$ 2% in the stroke length range of between 30 - 100%.

Control Versions

Basic type   The Sigma basic version (S1Ba) is suitable for simple metering pump applications. The pump may be operated manually by adjusting the stroke length knob (displacement per stroke). Automatic control of displacement per stroke via a 4-20 mA analog or 3P signal is possible with an optional servomotor. See identity code for motor options.

Control type   The Sigma/1 microprocessor controlled metering pump (S1Ca) is supplied with an integral TEFC motor. Pump settings are programmable and viewed on an illuminated LCD. Functions include stroke frequency, batch delivery and external control by pulse or analog signal.

The Sigma/1 control version features information displays for flow rate (in gph or l/h) and totalized flow (gallons or litres); accumulative stroke count with clear/reset capabilities; and stroke length adjustment displayed in increments of 1%. Three LED lights indicate operating status. Options include a programmable access code, flow monitoring, fault and pacing relays, calibration, timer and 4-20 mA output.
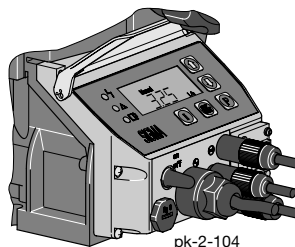
pk-2-104

CE Approved

CSA® Available (standard in Canada)

Technical Data: Sigma/1 HM Diaphragm Pumps

Sigma/1 Basic Version

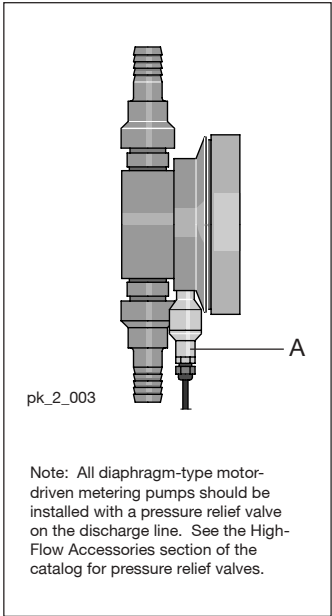| Technical data:	60 Hz (1750 RPM) operation Capacity at Maximum Pressure			Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor
Pump Version S1Ba HM	psig (bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	(water) ft. (m)		psig (bar)		DN	in.	(approx.) lbs. (kg)
12017 PVT	145 (10)	5.2	(20)	88	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
12017 SST	174 (12)	5.2	(20)	88	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
12035 PVT	145 (10)	11.1	(42)	172	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
12035 SST	174 (12)	11.1	(42)	172	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10050 PVT	145 (10)	15.8	(60)	240	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10050 SST	145 (10)	15.8	(60)	240	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10022 PVT	145 (10)	6.8	(26)	88	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10022 SST	145 (10)	6.8	(26)	88	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10044 PVT	145 (10)	14	(53)	172	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10044 SST	145 (10)	14	(53)	172	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
07065 PVT	102 (7)	20.6	(78)	240	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
07065 SST	102 (7)	20.6	(78)	240	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
07042 PVT	102 (7)	13.2	(50)	88	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
07042 SST	102 (7)	13.2	(50)	88	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)
04084 PVT	58 (4)	26.7	(101)	172	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
04084 SST	58 (4)	26.7	(101)	172	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)
04120 PVT	58 (4)	38	(144)	240	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
04120 SST	58 (4)	38	(144)	240	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)

Sigma/1 Control Version

Technical data:	60 Hz operation Capacity at Maximum Pressure			Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor
Pump Version S1Ca HM	psig (bar)	U.S. GPH	(L/h)	Stroke/ min.	mL/ stroke	(water) ft. (m)		psig (bar)		DN	in.	(approx.) lbs. (kg)
12017 PVT	145 (10)	5.2	(20)	90	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
12017 SST	174 (12)	5.2	(20)	90	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
12035 PVT	145 (10)	11.1	(42)	170	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
12035 SST	174 (12)	11.1	(42)	170	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10050 PVT	145 (10)	13.2	(50)	200	4	23	(7)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10050 SST	145 (10)	13.2	(50)	200	4	23	(7)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10022 PVT	145 (10)	6.8	(26)	90	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10022 SST	145 (10)	6.8	(26)	90	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
10044 PVT	145 (10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
10044 SST	145 (10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
07065 PVT	102 (7)	17.2	(65)	200	5.1	19.6	(6)	14.5	(1)	10	1/2 MNPT	19.8 (9)
07065 SST	102 (7)	17.2	(65)	200	5.1	19.6	(6)	14.5	(1)	10	3/8 FNPT	26.5 (12)
07042 PVT	102 (7)	13.2	(50)	90	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
07042 SST	102 (7)	13.2	(50)	90	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)
04084 PVT	58 (4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
04084 SST	58 (4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)
04120 PVT	58 (4)	31.7	(120)	200	9.7	9.8	(3)	14.5	(1)	15	3/4 MNPT	21 (9.5)
04120 SST	58 (4)	31.7	(120)	200	9.7	9.8	(3)	14.5	(1)	15	1/2 FNPT	29.8 (13.5)

Wetted Materials of Contruction

Material Code	Liquid end	Suction/Discharge Connectors	Seals	Balls
PVT	PVDF (Polyvinylidene fluoride)	PVDF (Polyvinylidene fluoride)	PTFE/ Viton®	Ceramic
SST	316 Stainless steel	316 Stainless steel	PTFE/ Viton®	SS

Technical Data: Sigma/1 HM Diaphragm Pumps

ProMinent®

Diaphragm Failure Indicators

pk_2_003

A

Note: All diaphragm-type motor-driven metering pumps should be installed with a pressure relief valve on the discharge line. See the High-Flow Accessories section of the catalog for pressure relief valves.

Diaphragm Failure Monitor (A)

As an option, the liquid end can be equipped with diaphragm failure monitor. This consists of a PVDF spacer with leak detector positioned between the primary (fluid side) diaphragm and a hermetically sealed backer diaphragm. A normally closed diaphragm-isolated pressure switch (A) opens upon the increase of pressure resulting from main diaphragm failure, based on minimum backpressure of 21 psig (1.5 bar). This offers the distinct advantage that the metered fluid cannot flow uncontrolled out of the pump. The diaphragm failure is signalled on an LCD display and the pump is stopped on S1Ca models, and triggers the optional fault indicating relay. A contact is opened on S1Ba HM models to allow fault annunciation or to stop the pump.

Diaphragm Failure Kits

For conversion of a standard Sigma pump to one with diaphragm failure indication. Includes safety diaphragm, backplate, secondary containment diaphragm and hub, leak detection spacer, leak detection pressure switch assembly, diaphragm, pump head bolts.

50 S1Ba (version 12017, 12035, 10050)	1009846
50 S1Ca (version 12017, 12035, 10050)	1009847
65 S1Ba (version 10022, 10044, 07065)	1009848
65 S1Ca (version 10022, 10044, 07065)	1009849
120 S1Ba (version 07042, 04084, 04120)	1009850
120 S1Ca (version 07042, 04084, 04120)	1009851

Specifications: Sigma/1

ProMinent®

General:

Maximum stroke length:	0.16" (4.0 mm)
Power cord:	6 foot (2 m) 2 wire + ground (supplied on control versions)
Stroke frequency control:	S1Ba: Constant speed or 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:

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

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

Optional springs available (Hastelloy C4)

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

Max. fluid operating temperatures:

Material	Constant (Max. Backpressure)	Short Term (15 min. @ max.30 psi)
PVDF	149½F (65½C)	212½F (100½C)
316 SS	194½F (90½C)	248½F (120½C)

Diaphragm failure indication:	Optional, see accessories. Switch is N.C., opens to indicate failure.

Switch rated 250 VAC, 0.3 A inductive or 0.5 A resistive; 30 VDC,1.0 A resistive. Requires minimum 21 psig (1.5 bar) backpressure on pump. N.O. switch available upon request. Includes double diaphragm leak prevention.

Max. solids size in fluid:	0.3 mm
Stroke length adjustment:	Manual, in increments of 1%. Motorized stroke length adjustment available.

Sigma/1 Basic Version

Motor:	See available motors in identity code

Sigma/1 Control Version

Control Function:	At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
Enclosure rating:	NEMA 3 (IP 55)
Motor data:	Totally enclosed, fan cooled (IP55); class F insulation; IEC frame; 1/8 HP (0.09 kW) 230 V, 3 phase (0.7 A)

Specifications cont.

Sigma/1 Control Version (cont)

Relay load	
Fault relay only (options 1 & 3):	Contact load: 250 VAC, 2 A, 50/60 Hz Operating life: > 200,000 switch functions
Fault and pacing relay (options 4 & 5):	Contact load: max. 24 V, AC/DC, max. 100 mA max. $50x10^6$ switch cycles @ 10 V, 10 mA Contact closure: 100 ms (for pacing relay)
Analog output signal:	max. impedance 300 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 $\pm$ 10%, 50/60 Hz

Data required to size metering pumps and accessories

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 selection.

Desired capacity min./max.   GPH (l/h)_____

Available power supply   _____V, _____ Hz, _____ phase

Working temperature min./max.   °F (°C)_____

Description of process fluid   _____

Concentration %   _____

Solids content %   _____

Absolute viscosity, cP   _____

Vapor pressure at working temperature   psig (bar) _____

Remarks (e.g. abrasive, developing   _____
gases and fumes, flammable, corrosive)   _____

Suction conditions:

Suction lift min./max., or   ft. (m) _____

Positive suction head min./max., or   ft. (m)_____

Pressure in chemical tank   psig (bar)_____

Length of suction line   ft. (m) _____

Size (I.D.) of suction line   in. (mm)_____

Number of valves and fittings in suction line   _____

Discharge conditions:

Back-pressure min./max.   psig (bar) _____

Discharge head min./max.   ft. (m) _____

Negative discharge head min./max.   ft. (m) _____

Length of discharge line   ft. (m) _____

Size (I.D.) of discharge line   in. (mm)_____

Number of valves and fittings in discharge line   _____

System sketch
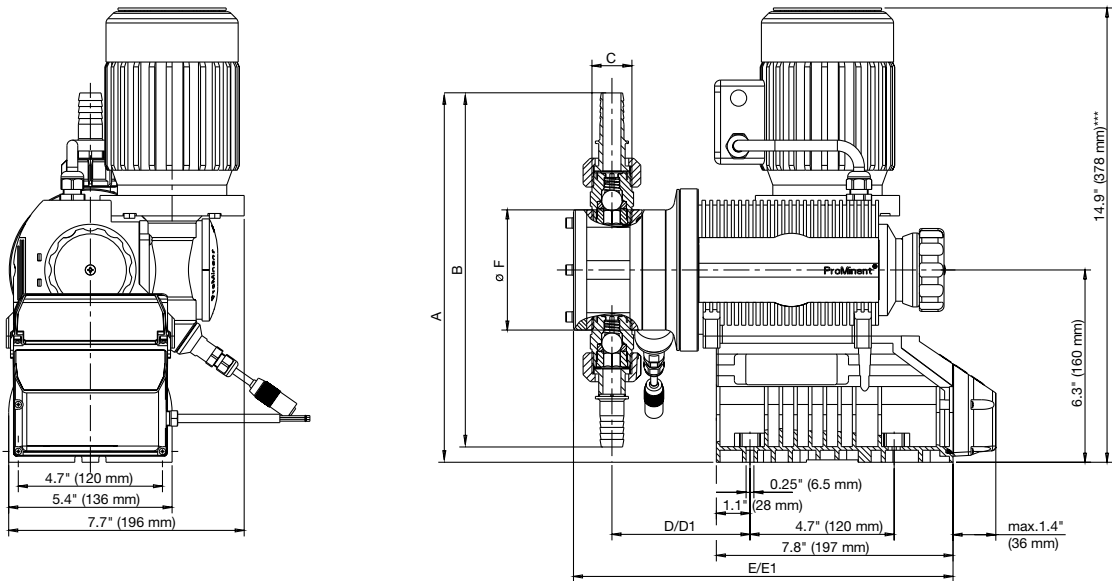
Identity code: Basic Version Sigma/1 HM (S1Ba)

ProMinent®

S1Ba	**Series:** Sigma/1 Basic Version a

H	Main Drive, Diaphragm

Pump version:

12017*	07042
12035*	04084
10050	04120
10022	
10044	
07065	

* For PVDF versions. Max. 145 psig

Note: Refer to technical data for capacities and stroke rates

Liquid end material:

PV	PVDF
SS	316 Stainless steel

Seal material:

T	PTFE/Viton® seal

Viton® is a registered trademark of DuPont Dow Elastomers

Diaphragm type:

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

Liquid end version:

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

Connectors:

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

Labeling:

0	Standard with logo

Motor mount:

S	3 ph, 230 V/400 V, 50/60 Hz * Not Inverter Rated
M	1 ph, AC, 230 V, 50/60 Hz
N	1 ph, AC, 115 V, 60 Hz

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

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

Dimensions: Sigma/1 HM Basic (S1Ba)

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Dimensions in inches (mm)

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

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

ProMinent® Sigma/1 Motor-Driven Metering Pumps Control Version S1Ca

Sigma/1 Control Version

The microprocessor-based electronics for the Sigma/1 control version are the same as the Sigma/2 and Sigma/3 metering pumps. Programming functions enable the user to set and retrieve pertinent information easily.

- flow can be set and displayed in either U.S. gph or l/h
- totalized flow is displayed in gallons or litres
- accumulative stroke counter is displayed
- optional access code can be programmed to prevent unauthorized adjustment to settings
- three LED lights indicate operational status

The S1Ca pump is available with contact , 4-20 mA analog signal control and Profibus.

Optional monitoring indicators include

- fault annunciating relay for low tank level, loss of flow, system faults and fuse/power supply failure, loss of analog signal, diaphragm rupture
- pacing relay to pace a second pump or totalize flow with an external stroke counter
- Profibus field bus connection for remote monitor and control

Pumps can also be ordered with a diaphragm failure monitor.

Sigma/1 Microprocessor Control Standard Control Modes and Functions

ProMinent®

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

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

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

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

Control Modes

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

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

Standard Functions

"Calibrate"

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

"Auxiliary Frequency"

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

"Flow"

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

"Float Switch"

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

"Pause"

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

"Stop"

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

"Prime"

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

Function and Error Indicators

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

Sigma/1
Optional Control Modes and Features

® ProMinent

Optional Control Modes

"Analog" Mode

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

"Contact" Mode with Pulse Control

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

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

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

For example:

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

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

"Batch" Mode

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

Access Code

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

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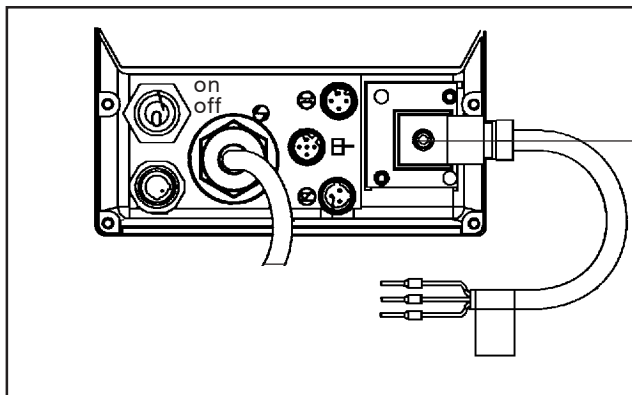
Relay outputs. . .

Fault annunciating relay

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

Fault annunciating and Pacing relay

In addition to the fault annunciating relay, a contact closure is issued with every pump stroke (contact duration 150 ms). This allows a second ProMinent metering pump to be paced synchronously, or to totalize flow with an external stroke counter.

4-20 mA Analog Output

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

Timer Relay

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

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

Fieldbus connection

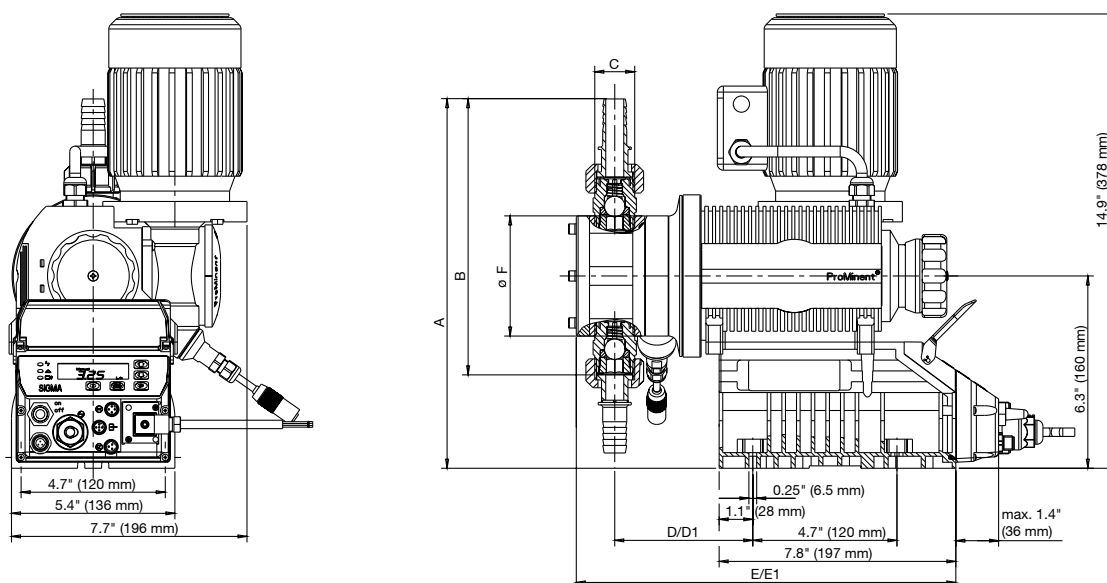Monitor and control remotely via a SCADA/PLC system using the profibus-DP system.

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

Sigma/1-11

Identity code: Control Version Sigma/1 HM (S1Ca)

ProMinent

Series:		
S1Ca	Sigma/1 Control Version a	

	Main drive	
H	Main drive/Diaphragm	

Pump version:

12017*	10022	07042
12035*	10044	04084
10050	07065	04120

*For PVDF versions, max. 145 psig

Note: Refer to technical data for capacities and stroke rates

Liquid end materials:

PVT	PVDF with PTFE/Viton® seal
SST	316 Stainless steel with PTFE/Viton® seal

Viton® is a registered trademark of DuPont Dow

Diaphragm type:

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

Liquid end version:

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

Connectors:

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

Labeling:

0	Standard with logo

Voltage supply:

U	1 ph, 115-230 V ± 10%, 50/60 Hz

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

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

Relay:

0	Without relay
1	Fault annunciating relay, drops out
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay
C	4-20 mA output, drops out
D	4-20 mA output, pulls in
E	4-20 mA output, pacing relay
F	High current relay drops out
G	High current relay pulls in

Control variants:

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

Access code:

0	No access code
1	Access code

Flow monitor:

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

Stroke length adjustment:

C	Manual + Calibration

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

Dimensions: Sigma/1 HM Control (S1Ca)

ProMinent®

Dimensions in inches (mm)

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

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

ProMinent® Sigma/1
Metering monitor

Description	Part No.

Metering monitor

Adjustable metering monitor "Flow Control"

For S1Ca HM with connection cable for assembly directly to liquid end.

Monitors individual strokes according to the float and orifice principle. The partial quantity of chemical flowing past the float is adjusted from the total stroke volume via the adjusting screw so that an alarm is actuated if there is no pump flow. The user can select the number of incomplete strokes permitted (between 1 and 125) in accordance with the actual process requirements.
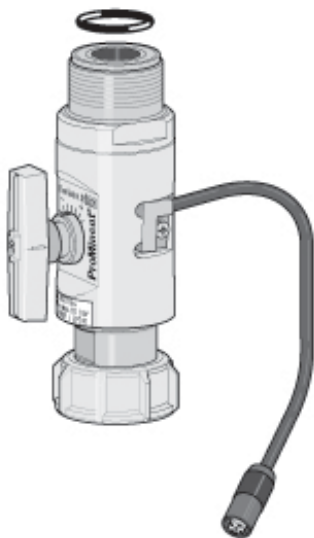
Materials:

Flow meter:	PVDF
Float:	PTFE-coated
Seals:	Viton® /EPDM

Flow Control	Material	for pump type	
Flow Control DN10	PVDF, EPDM	12017, 12035, 10050, 10022, 10044, 07065	1021168
Flow Control DN10	PVDF, Viton®	12017, 12035, 10050, 10022, 10044, 07065	1021169
Flow Control DN15	PVDF, EPDM	07042, 04084, 04120	1021170
Flow Control DN15	PVDF, Viton®	07042, 04084, 04120	1021171

Flow monitor
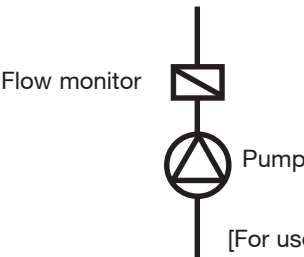
Pump

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

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ProMinent® Sigma/1
Control cables

Description	Part No.

External control cables

Universal control cable

For metering pump control via contact closure (pulse), standard process signal (analog),
and voltage-free contact for remote pause control and auxiliary frequency.

For Sigma pumps with 5-pole round plastic connector and 5-wire cable with loose end.

Universal control cable, 5-pole round connector, 5-wire, 6 ft. (2 m)	1001300
Universal control cable, 5-pole round connector, 5-wire, 16.4 ft. (5 m)	1001301
Universal control cable, 5-pole round connector, 5-wire, 32.8 ft. (10 m)	1001302

ON/OFF Control (Pause)

BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. When the contact is closed between the BLACK & BROWN wires, the pump will run. When the contact is open, the pump will stop.

Note: If ON/OFF control is the only control feature being used, WHITE, BLUE & GREY wires are not used and should be cut back.
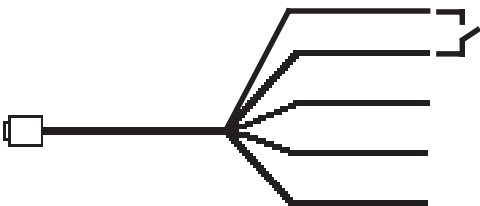
BROWN: Remote On/Off (+) (Pause)

BLACK: Common

GREY: Auxiliary Frequency

WHITE: Pulse (+)

BLUE: Analog (+)

Pulse Control

Pulse control will allow the pump to run in proportion to a pulsing potential free contact closure.

Note: BROWN and BLACK wires have to be connected together via an ON/OFF contact or shorted together. GREY wire is not used and should be cut back.
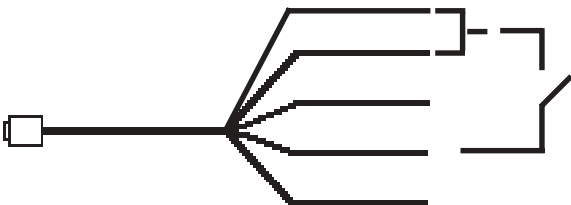
BROWN: Remote On/Off (+) (Pause)

BLACK: Common

GREY: Auxiliary Frequency

WHITE: Pulse (+)

BLUE: Analog (+)

ProMinent® Sigma/1
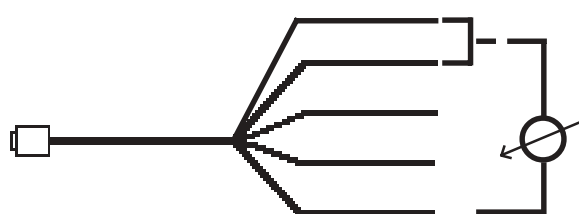# Control cables

Description	Part No.

External control cables

Analog Control

Analog control runs in proportion to an analog signal (4- 20 mA).

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. The BLACK wire is negative and the BLUE wire is positive. GREY wire is not used and should be cut back.

BROWN: Remote On/Off (+) (Pause)

BLACK: Common

GREY: Auxiliary Frequency

WHITE: Pulse (+)

BLUE: Analog (+)

Auxiliary Frequency

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

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together.
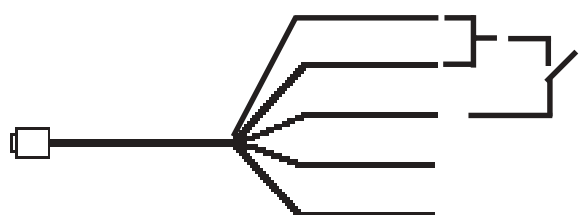
BROWN: Remote On/Off (+) (Pause)
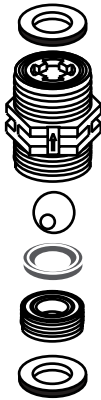
BLACK: Common

GREY: Auxiliary Frequency

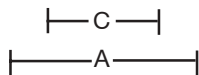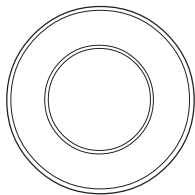WHITE: Pulse (+)

BLUE: Analog (+)

ProMinent Sigma/1
Spare Parts

Spare Parts and Liquid Ends

Valve
Complete

├── C ──┤
├───── A ─────┤

Liquid End	Dim A (mm)	Dim C (mm)
FM 50	70	32
FM 65	70	37
FM 120	86.5	51

Complete liquid ends include pump head, valves, mounting screws, diaphragm and backplate. Clamping nuts and inserts are not included with complete liquid ends, complete valves or spare parts kits (see the High Flow Accessories section for these parts). Spare parts kits include:

PVT Liquid ends
1 Diaphragm
1 Suction valve
1 Discharge valve
2 Valve balls
1 Set of seals

SST Liquid ends
1 Diaphragm
2 Valve balls
1 Set of seals

Material Code	Liquid End Complete	Spare Parts Kit	Valve Complete	Diaphragm
12017, 12035, 10050 with Liquid end FM 50				
PVT	1010560	1010541	1002267	1010279
SST	1010561	1010555	809459	1010279
SST*		1010554		1010279
10022, 10044, 07065 with Liquid end FM 65				
PVT	1010562	1010542	1002267	1010282
SST	1010563	1010557	809459	1010282
SST*		1010556		1010282
07042, 04084, 04120 with Liquid end FM 120				
PVT	1010565	1010543	792517	1010285
SST	1010566	1010559	809404	1010285
SST*		1010558		1010285

* Without valves

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))
PROMINENT FLUID CONTROLS, INC. - SIGMA/1 HM (for flow rates from 5 to 38 gph)

PART 1 - GENERAL

1.1 GENERAL
A. This specification covers the supply, installation, and testing of a complete functional metering pump system including all accessories and appurtenances as shown on the drawings and described herein. A single chemical metering pump manufacturer shall be responsible for supplying all components of the metering feed system.

1.2 QUALITY ASSURANCE
A. For the purpose of establishing quality assurance, experience, and system reliability, the products described herein are based on those metering pumps manufactured by ProMinent Fluid Controls, Inc. All pumps shall be shop-tested for capacity at rated pressure prior to shipment, with documented results provided.

1.3 WARRANTY
A. The chemical metering pump manufacturer shall provide a two year warranty on the metering pump mechanical drive and one year on the liquid end.

PART 2 - PRODUCTS

2.1 GENERAL
A. Manufacturers:
   1. ProMinent Fluid Controls, Inc.
   2. Pre-approved equal.

2.2 DESCRIPTION
A. The chemical metering pump shall be a simplex, motor-driven, reciprocating, mechanically-actuated diaphragm type. The pump shall include integral motor, permanently lubricated gear reducer, cam-and-spring drive mounted and sealed in a non-corrosive plastic outer, with heat sinks for cooling.
B. The power supply shall be ___VAC, ___Hz, ___Phase.
C. The liquid end shall be physically separated from the drive unit by a back plate with weep hole creating air gap separation. An elastomer shaft wiper seal shall prevent contamination of the gear box by confining chemical within the back plate if the primary diaphragm fails. The primary diaphragm shall have a steel core, vulcanized into a nylon-reinforced EPDM backing, with PTFE-faced fluid contact surface.
D. ((OPTIONAL)) The liquid end shall also feature a secondary diaphragm separated from the primary diaphragm by a spacer plate with diaphragm-isolated pressure switch to close a contact for alarm annunciation and to prevent chemical spill or intrusion into pump drive upon failure of the primary diaphragm.

2.3 LIQUID END
A. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize diaphragm wear, liquid end dead volume, and to promote flow of solids in suspension.

((SELECT ONE))
- The liquid end shall be virgin PVDF. The suction and discharge valve shall be PVDF with PTFE faced Viton gasket seals and ceramic valve balls.

Or
- The liquid end shall be 316 stainless steel. The suction and discharge valves shall be 316 stainless steel with PTFE-faced Viton gasket seals and stainless steel valve balls.

2.4 CONTROL ((BASIC VERSION PUMP))

A. Stroke length control of the basic version pump
   ((SELECT ONE))
- shall be adjustable manually by means of a stroke length knob, in increments of 1.0%, from 0% to 100% of stroke length.

Or
- shall be adjustable by means of a stroke positioning motor from 0% to 100% of stroke length. The stroke positioning motor shall feature visual stroke length indication and manual/ external selector switch for local control via toggle switch or external control in proportion to a 4-20 mA signal.

B. Stroke frequency control of the basic version pump
   ((SELECT ONE))
- shall be fixed at the pump's maximum stroke rate. Pump shall include a 1/8 HP, TEFC, four-pole AC motor.

Or
- shall be controlled by DC SCR drive system for stroke frequency control. The SCR shall include a wall mountable NEMA 4 enclosure with on/off switch, manual/external switch and speed potentiometer. The DC voltage output to the motor shall be proportional to the potentiometer setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a 1/8 HP, TENV, permanent magnet 90V DC motor.

Or
- shall be controlled by an AC inverter system for stroke frequency control. The inverter shall include a wall mountable NEMA 4/12 enclosure with keypad and display of % load or output voltage. Selectable for local or remote operation via 4-20 mA signal. Pump shall include a 1/8 HP, inverter duty, 3-phase, 208-230 VAC motor. Minimum speed 3-30 Hz.

2.5 PROGRAMMING AND CONTROL ((CONTROL VERSION PUMP))

A. The metering pump shall be microprocessor-controlled. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD, which is readable at an offset of 45 degrees. Keypad will allow for simple scrolling of programmed parameters.
B. Stroke length control shall be adjustable manually by means of a stroke length, in increments of 1.0%, from 0 to 100% of stroke length. The LCD shall digitally display stroke length in 1% increments in the full range between 100% and 0%.
C. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than +/-10%, a yellow warning light will light and a flashing message "calib" will appear.
D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or l/hr, dosing quantity, mA input being received by pump, and indication of external mode.

F. An AC inverter shall be integral to the microprocessor control and function of the pump. While 115VAC or 230VAC, 1 phase may be used to power the pump, the inverter shall drive a 1/8 HP, 230VAC, 3 phase motor. Stroke frequency shall be accomplished through microprocessor control with proportional start/stop of the motor, from 0% to 33% of stroke rate. Stroke rate shall be accomplished through variable speed of the motor from 34% to 100% of stroke rate. Stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the LCD. The pump shall be capable of receiving a pulse input via optional external control cable such that one pulse gives one pump stroke rate. The pump shall be capable of remote ON-OFF operation using the pause function via a voltage free contact relay through an optional control cable. In addition, the pump shall be configured with;

((OPTIONAL SELECTIONS))
-   pulse multiplier/divider functionality. The pump shall allow factoring to issue from 1 to 99.99 strokes per pulse input or to issue 1 stroke per 1 to 100 input pulses.

Or
-   analog input functionality. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or
-   pulse multiplier/divider and analog input functionality. The pump shall allow factoring to issue from 1 to 99.99 strokes per pulse input or to issue 1 stroke per 1 to 100 input pulses. The pump shall also accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmed at the pump. The pump shall allow the setting of a maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be acceptable.

Or
-   programmable timer functionality. The pump shall be configured with an integral, programmable 2-week, 81 event timer to change operational state of the pump. Timers external to the metering pump are not acceptable.

Or
-   pulse multiplier/divider, analog input, and programmable timer functionality (as described above).

G. The pump shall be equipped with the programmable function of auxiliary frequency control, allowing for quick priming of the pump or for slug feed of process during initial start up after shutdown. Stroke frequency shall be programmable to the maximum for the pump, and the auxiliary frequency function shall be capable of interfacing with a contact closure relay for control purposes.

2.6 FLOW ASSURANCE ((OPTIONAL))

A. Low Level Control - A 2-stage Float Switch shall be supplied to stop the pump prior to losing prime and annunciate low level on the pump LED.

B. Relay Output - An SPDT relay shall be installed on the pump for:

((SELECT ONE))

- fault indication. ((OPTIONAL)) The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low supply solution early warning/lack of supply solution shut down, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both fault indication and pacing relay. ((OPTIONAL))   The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low supply solution early warning/lack of supply solution shut down, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay. The pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

Or

- both 4-20mA output and fault indication. ((OPTIONAL)) The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The metering pump shall also have an integral relay to allow remote annunciation of a fault condition (i.e. low supply solution early warning/lack of supply solution shut down, loss of chemical output, system faults, and fuse/power supply failure). Configure as ((N/O//N/C)) contact closure relay.

Or

- both 4-20mA output and pacing relay. ((OPTIONAL))   The analog output function shall be a multiplicative factor of both stroke length % and stroke frequency %, reflecting the real time output capacity of the metering pump. The pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second metering pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

2.7 ACCESSORIES ((ALL ARE OPTIONAL AND MAY BE INCLUDED AS SEPARATE ITEMS OR AS COMPONENTS OF A PUMP STAND))

A. The pump shall be mounted on a ((CHOOSE ONE: black, UV-protected polypropylene// 304 stainless steel//FRP grating)) support stand suitable for wall, floor or top-of-tank mounting. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the skid, in addition to testing the skid-mounted metering system under conditions of maximum rated pump pressure, prior to shipment. The stand shall include the following accessories, pre-piped;

B. A foot valve and strainer shall be provided with each pump.

C. An injection check valve shall be provided with each pump.

D. A universal control cable with 5-pole round plastic connector and 5-wire cable with loose ends shall be provided with each pump.

E. A two stage float switch compatible with the chemical metering pump shall be provided for monitoring tank level.

F. An adjustable discharge flow monitoring device mounted on a valved bypass shall be provided. The flow monitor shall be capable of signaling a fault condition to the metering pump.

G. A diaphragm failure detector shall be provided to ((open/close)) a contact in the event of diaphragm failure.

H. An adjustable-pressure, diaphragm-type back pressure/antisiphon valve shall be provided with each metering pump.

I. An in-line, adjustable-pressure, diaphragm-type pressure relief valve shall be provided with each metering pump.

J. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.

K. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump//skid.

2.8 APPLICATION

A. Quantity:

B. Chemical Service:

C. Capacity (U.S. gph):

D. Back Pressure (psig):

END OF SECTION

Sigma/1 Metering Pumps

Special Notes _____

- S1Ba basic version:
  - Motor **included**
  - **No** control panel

- S1Ca control version:
  - Braking motor **included**
  - Includes a control panel for manual frequency adjustment or external control

- For external control (remote on/off, contact pulse, analog, auxiliary frequency) a ProMinent control cable is required.

- Foot valves and injection valves are **not included**. Please refer to High Flow Accessory Section.

- A pressure relief valve **is required** when pumping into a pressurized discharge line.

- Pulsation dampeners are recommended for applications where discharge lines are over 100 ft. or if hydraulic circumstances require it.