ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Overview: Sigma/ 1 control type (S1Cb)

The Sigma/1 motor diaphragm metering pumps are produced with a high-strength inner housing for parts subject to load as well as an additional plastic housing to protect against corrosion. The capacity range extends from 5.3 to 38 gph (20 - 144 l/h) and pressures up to 174 psig (12 bar). Stroke length is 0.16 in

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

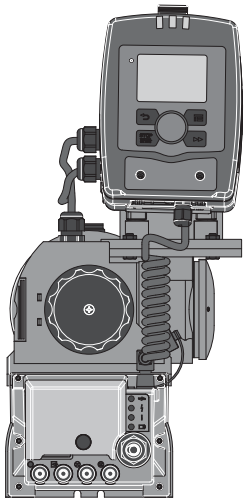
In all motor-driven metering pumps without integrated overload protection, for safety reasons, suitable overload protection must be provided during installation. (see page 148 for spare parts)

Sigma/ 1 Basic Type (S1Ba)

The Sigma/ 1 basic type is a motor-driven metering pump without internal electronics. Various NEMA 56C frame motors can be used depending upon the application requirements. The Sigma 1 Basic pump is also suitable for use with inverter duty and DC motors for varying flow requirements.

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Sigma/ 1 control type (S1Cb)



For optional control via contact or analog signals (e.g. 0/4 - 20 mA) the Sigma control type results in good adaptability, even in fluctuating metering requirements.

The microprocessor control is an optimum combination of speed control and stop & go operation, i.e. it works in a wide control field with customized fine adjustment. Moreover it enables an optimum metering result thanks to the metering behavior of the metering pump being matched to the chemicals or application.

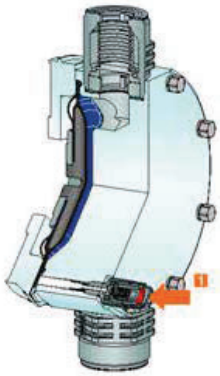
The control system measures the movement and speed profile in conjunction with the power demand. This leads to a real reduction in the actually required power, which means an increase in efficiency.

Detachable operating unit (HMI)

The operating unit (HMI) can be attached directly to the metering pump or mounted on the wall alongside the pump or completely removed. This provides the operator with a wide range of options for the integration of a metering system into the overall system that it is readily accessible and easy to use. Moreover, the removable operating unit offers additional protection against unauthorized operation of the metering pump or against changing of the pump settings.

The Sigma X features a NEW removable HMI control unit with innovative click-wheel and 4 operating buttons. An illuminated LCD display provides information about the relevant operating status. LEDs on the operating unit and the control unit indicate the active pump functions or the pump status.

Diaphragm rupture warning system



The liquid end has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.

The diaphragm is coated on both sides with PTFE film. This coating ensures that no leakage to the outside occurs even if the diaphragm ruptures. If the diaphragm ruptures, feed chemical enters between the diaphragm layers and thus triggers a mechanical indication or an alarm via the sensor area. This concept ensures reliable metering - even under critical operating conditions.

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Sigma/ 1 control type (S1Cb)

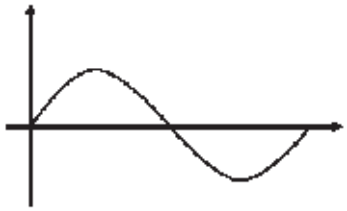


Diagram 1: Discharge stroke, suction stroke equal

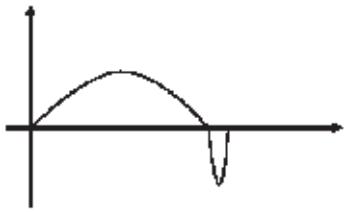


Diagram 2: long discharge stroke, short suction stroke

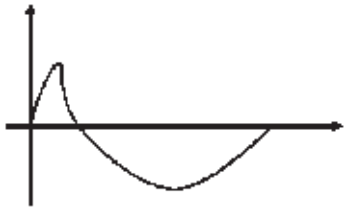


Diagram 3: short discharge stroke, long suction stroke

Metering profiles

Metering profiles ensure optimum metering results, thanks to the metering behavior of the metering pump being matched to the chemicals or application.

The stroke movement of the diaphragm pump is continuously measured and controlled, so that the stroke is executed according to the desired metering profile. The pump can be operated in normal mode **(Diagram 1)**, with optimized discharge stroke **(Diagram 2)** or with optimized suction stroke **(Diagram 3)**. Three typical metering profiles are shown schematically with the behavior over time.

In normal operating mode the time behavior for the suction stroke and the discharge stroke is similar **(Diagram 1)**. In the mode with optimized discharge stroke **(Diagram 2)** the discharge stroke is lengthened while the suction stroke is executed as quickly as possible. This setting is, for example, useful for applications that require optimum mixing behavior and optimized chemical mixing.

In the mode with the optimized suction stroke **(Diagram 3)**, the suction stroke is carried out as slowly as possible, which permits precise and trouble-free metering of viscous and gaseous media. This setting should also be chosen to minimize the NPSH value.

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Specifications (S1Ba and S1Cb)

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 S1Cb: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.		
Stroke counting:	Standard on S1Cb		
Materials of construction			
Housing:	Glass-filled Luranyl™ (PPE)		
Wetted materials of construction:	**Liquid End**	**PVDF**	**316 SS**
	Suct./Dis. Connectors	PVDF	316 SS
	Seals	PTFE/Viton®	PTFE/Viton®
	Check Balls	Ceramic SS	
	Pressure Relief Valves:	PVDF/Viton® O-rings	SS/Viton® O-rings
Viscosity ranges:	**Liquid end version**	**Max. strokes/min**	**Viscosity (mPas)**
	Standard	180 0-200	
	With valve springs	130	200-500
	With valve springs and suction-side feed	90	500-1000*
	* Only when properly installed & adjusted		
Sound pressure level:	Sound pressure level LpA < 70 dB in accordance with EN ISO 20361:2010-10 at max. stroke length, max. stroke rate, max. back pressure (water)		
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 temp:	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.		
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		

Certified to NSF/ANSI 61

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Specifications (S1Ba and S1Cb) Cont.

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)
Pump power requirements:	ph, 115V-230V, 50/60 Hz (internally converted to drive below motor)
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 (option 1):	Contact load: 230 VAC, 8 A, 50/60 Hz
Operating life: > 200,000 switch functions	
Fault and pacing relay Contact load:	max. 24 V, AC/DC, max. 100 mA
(Option 3):	maximum 200,000 switch cycles
Contact closure:	100 ms (for pacing relay)
Analog output signal:	maximum impedance 300 W
Isolated 4-20 mA output signal	
BUS interface options available:	CANopen, PROFIBUS DP
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

ProMinent® Sigma X: Sigma/1 S1Cb Motor Diaphragm Metering Pumps

Capacity Data (S1Ba)

Capacity data: Sigma/ 1 Basic Version

Pump version	Capacity at Max. Backpressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor (approx.)	
S1Ba H	psig	(bar)	GPH	(L/h)	spm	mL/ stroke	ft	(m)	psig	(bar)	in	(DN)	lbs	(kg)
12017 PVT	145	(10)	5.3	(20.4)	88	3.8	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12017 SST	174	(12)	5.3	(20.4)	88	3.8	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
12035 PVT	145	(10)	11	(42)	172	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12035 SST	174	(12)	11	(42)	172	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10050 PVT	145	(10)	15.8	(60)	246	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10050 SST	145	(10)	15.8	(60)	246	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10022 PVT	145	(10)	6.9	(26.4)	88	5	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10022 SST	145	(10)	6.9	(26.4)	88	5	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10044 PVT	145	(10)	13.9	(52.8)	172	5.1	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10044 SST	145	(10)	13.9	(52.8)	172	5.1	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07065 PVT	102	(7)	20.6	(78)	246	5.2	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
07065 SST	102	(7)	20.6	(78)	246	5.2	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07042 PVT	102	(7)	13.3	(50)	88	9.5	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
07042 SST	102	(7)	13.3	(50)	88	9.5	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04084 PVT	58	(4)	26.6	(100)	172	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04084 SST	58	(4)	26.6	(100)	172	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04120 PVT	58	(4)	38	(144)	246	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04120 SST	58	(4)	38	(144)	246	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)

Capacity Data (S1Cb)

Capacity data: Sigma/ 1 Control Version

Pump version	Capacity at Max. Backpressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor (approx.)	
S1Cb H	psig	(bar)	GPH	(L/h)	spm	mL/ stroke	ft	(m)	psig	(bar)	in	(DN)	lbs	(kg)
12017 PVT	145	(10)	5.5	(21)	90	3.8	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12017 SST	174	(12)	5.5	(21)	90	3.8	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
12035 PVT	145	(10)	11.1	(42)	170	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12035 SST	174	(12)	11.1	(42)	170	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10050 PVT	145	(10)	12.9	(49)	200	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10050 SST	145	(10)	12.9	(49)	200	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10022 PVT	145	(10)	7.1	(27)	90	5	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10022 SST	145	(10)	7.1	(27)	90	5	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10044 PVT	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10044 SST	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07065 PVT	102	(7)	16.6	(63)	200	5.2	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
07065 SST	102	(7)	16.6	(63)	200	5.2	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07042 PVT	102	(7)	13.7	(52)	90	9.5	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
07042 SST	102	(7)	13.7	(52)	90	9.5	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04084 PVT	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04084 SST	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04120 PVT	58	(4)	30.9	(117)	200	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04120 SST	58	(4)	30.9	(117)	200	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)

Materials In Contact With Chemicals

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

ProMinent® Sigma X: Sigma/1 S1Ba Motor Diaphragm Metering Pumps

Identcode Ordering System (S1Ba)

S1Ba	Drive Type:												
	H	Main Drive, Diaphragm											
		Verison Capacity:											
		12017	5.3 gph (20.4 l/h), 145 psi (10 bar)		07065	20.6 gph (78 l/h), 102 psi (7 bar)							
		12035	11 gph (42 l/h), 145 psi (10 bar)		07042	13.3 gph (50 l/h), 102 psi (7 bar)							
		10050	15.8 gph (60 l/h), 145 psi (10 bar)		04084	26.6 gph (100 l/h), 58 psi (4 bar)	Note: For SS versions see capacity data						
		10022	6.9 gph (26.4 l/h), 145 psi (10 bar)		04120	38 gph (144 l/h), 58 psi (4 bar)							
		10044	13.9 gph (52.8 l/h), 145 psi (10 bar)										
			Liquid end material:										
			PV	PVDF									
			SS	316 Stainless Steel									
				Seal:									
				T	PTFE seal								
					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			
									3	Without motor, B5			
										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 moto 4-20 mA, 230 V 50/60 Hz
												6	W/ stroke positioning motor 4-20 mA, 115 V 50/60 Hz
S1Ba	**H**	**12017**	**PV**	**T**	**A**	**0**	**7**	**0**	**S**	**0**	**0**	**0**	

ProMinent® Sigma X: Sigma/1 S1Cb Motor Diaphragm Metering Pumps

Identcode Ordering System (S1Cb)

S1Cb — Drive Type:

H — Main Drive, Diaphragm

Version: Capacity:

12017	5.5 gph (21 l/h), 145 psi (10 bar)	07065	16.6 gph (63 l/h), 102 psi (7 bar)
12035	11.1 gph (42 l/h), 145 psi (10 bar)	07042	13.2 gph (50 l/h), 102 psi (7 bar)
10050	12.9 gph (49 l/h), 145 psi (10 bar)	04084	26.7 gph (101 l/h), 58 psi (4 bar)
10022	7.1 gph (27 l/h), 145 psi (10 bar)	04120	30.9 gph (117 l/h), 58 psi (4 bar)
10044	14 gph (53 l/h), 145 psi (10 bar)		

Note: For SS versions see capacity data

Liquid end material:

- PV — PVDF
- SS — Stainless Steel

Seal:

- T — PTFE seal

Diaphragm type:

- S — Multi-layer safety diaphragm w/ visual indicator
- A — Multi-layer safety diaphragm w/ pump stop function

Liquid end version:

- 0 — Without valve spring
- 1 — With 2 valve springs

Hydraulic connections:

- 7 — PVDF clamping nut & insert
- 8 — Stainless steel clamping nut & insert

Logo:

- 0 — Standard with logo

Electrical Connection (± 10%):

- U — 100 - 240 V

Cable and plug:

- 8 — Open end 3m UL/CSA 115/230V
- D — North American plug, 115 V
- X — Without cable

Relay:

- 0 — No relay
- 1 — Fault indicating relay
- 3 — Option 1 + pacing relay
- 8 — 4-20 mA output + fault/pacing relay

Control variant:

- 0 — Manual + External with pulse control (mult/div)
- 1 — Manual + External with pulse control & analog
- 6 — *Option 1 + PROFIBUS® (M12 plug)

Over Pressure Shut-off:

- 0 — Without over pressure shut-off

Operating unit (HMI):

- 0 — HMI + 1.64' (0.5m) cable
- 4 — HMI + 6.5' (2.0 m) cable
- 5 — HMI + 16.4' (5.0 m) cable
- 6 — HMI + 32.8' (10.0 m) cable
- X — Without HMI

Access Code:

- 0 — No access code
- 1 — Access code

Language:

- EN — English

Approval:

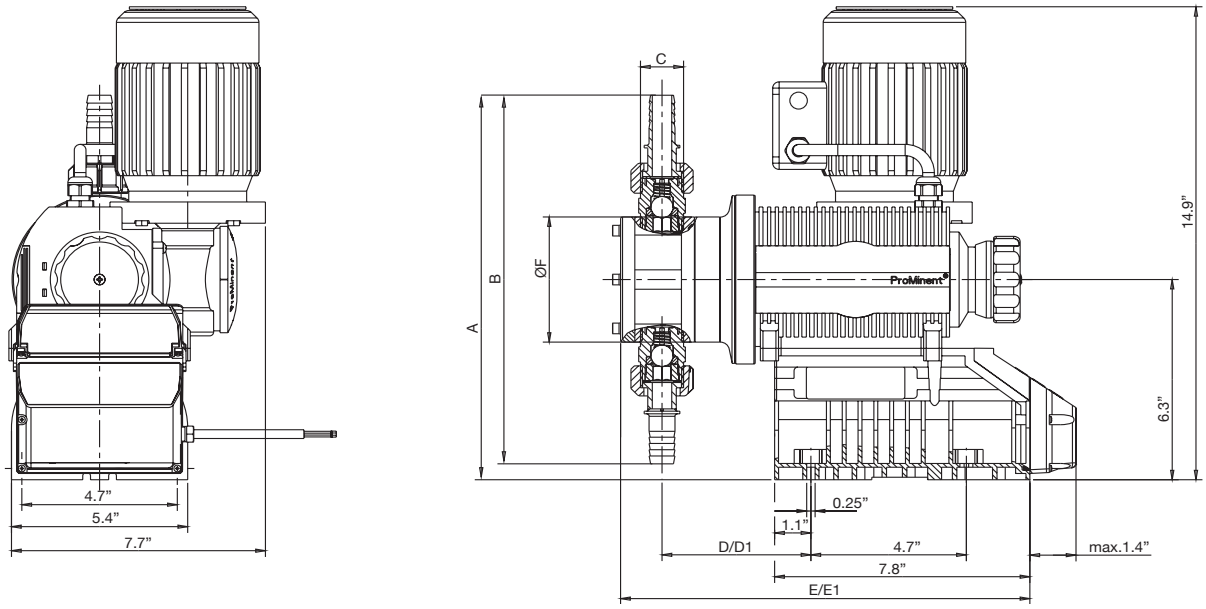
- 01 — CE

S1Cb	H	12017	PV	T	S	0	0	0	U	D	0	0	0	0	S	EN	01	

*With the option PROFIBUS®-DP no relay can be selected

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Dimensional Drawing: (S1Ba)



Dimensions in inches (mm)

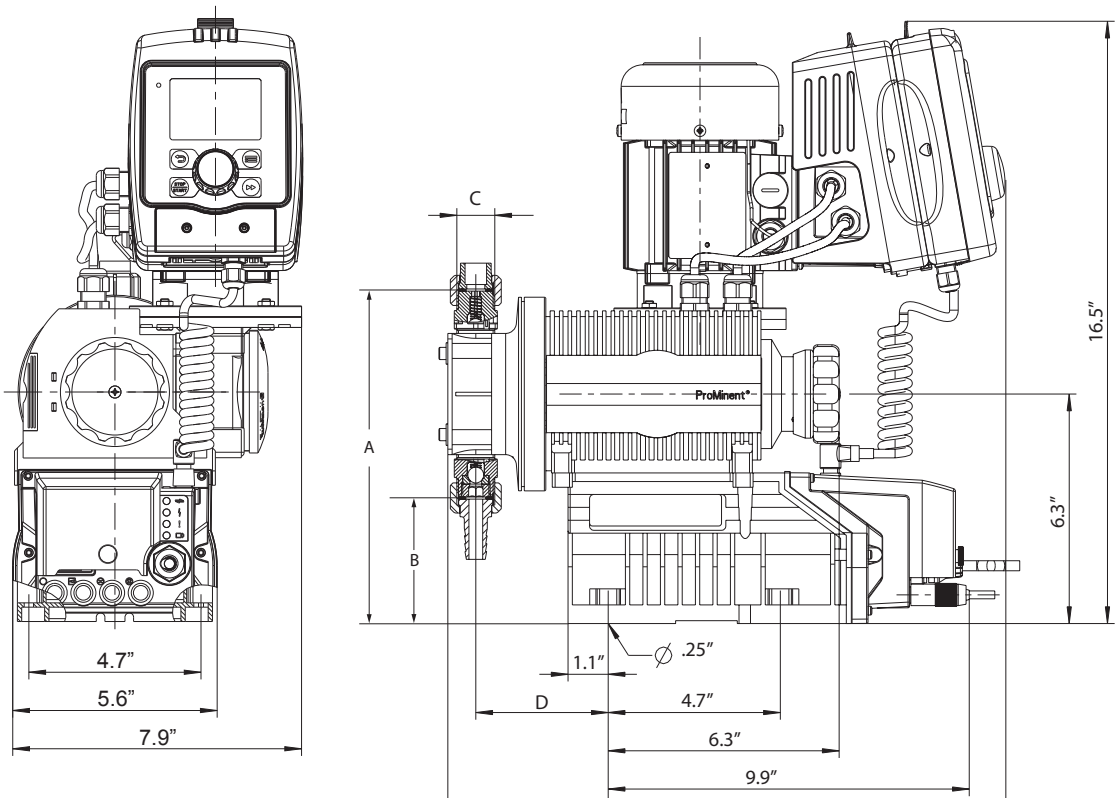
Type Sigma/ 1	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	ØF
12017, 12035, 10050, 10022, 10044, 07065								
PVT	11 (279)	9.38 (238)	1/2” MNPT	3.54 (90)	4.33 (110)	10.8 (275)	11.6 (295)	3.8 (96)
SST	9.75 (248)	7.13 (181)	1/2” FNPT	3.5 (89)	4.29 (109)	10.8 (275)	11.6 (295)	3.8 (96)
07042, 04084, 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	13.3 (337)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector.

ProMinent® Sigma X: Sigma/1 Motor Diaphragm Metering Pumps

Dimensional Drawing: (S1Cb)



Dimensions in inches (mm)

Type Sigma 1	A	B	C*	D	E
12017, 12035, 10050					
PVT	9.2 (234)	3.4 (87)	1/2" (MNPT)	3.7 (93)	4.3 (109)
SS	9.1 (231)	3.5 (89)	3/8" (MNPT)	3.6 (92)	4.3 (109)
10022, 10044, 07065					
PVT	9.2 (234)	3.4 (87)	1/2" (MNPT)	4.6 (117)	4.3 (109)
SS	9.1 (231)	3.5 (89)	3/8" (MNPT)	4.6 (117)	4.3 (109)
07042, 04084, 04120					
PVT	9.6 (243)	3.1 (78)	3/4" MNPT	3.9 (98)	4.7 (119)
SS	9.6 (243)	3.1 (78)	1/2" (MNPT)	3.8 (97)	4.6 (118)

** Suction/ Discharge valve thread*

Piping adapters provided according to technical data