

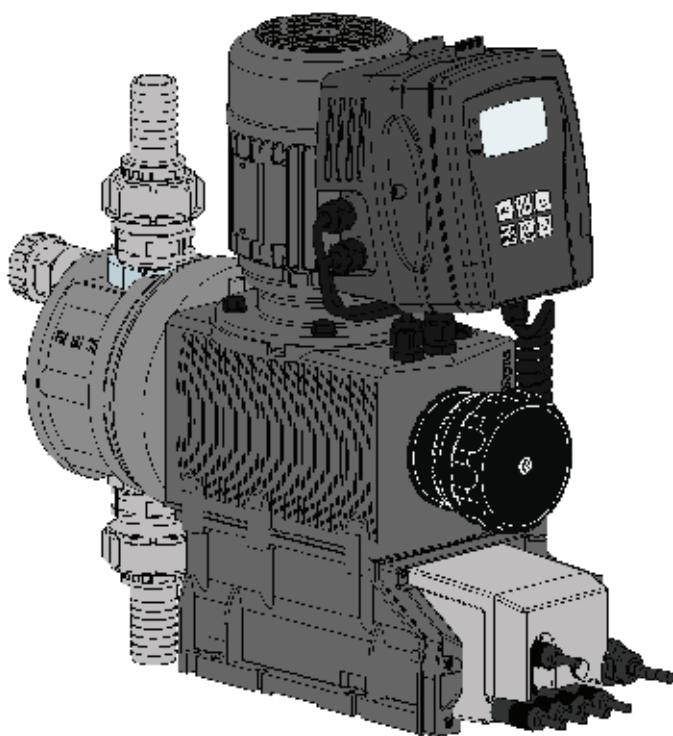
ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Overview: Sigma/ 2 control type (S2Cb)

The Sigma/2 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 16.1 to 93.0 gph at a maximum backpressure of 232 to 58 psig. Stroke length is 0.20 in

Under defined conditions and when installed correctly, the reproducibility of the metering is better than $\pm 2\%$ 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.

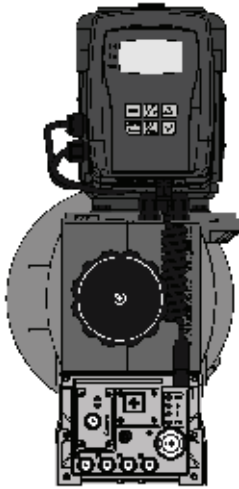


Sigma/ 2 Basic Type (S2Ba)

The Sigma/ 2 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 2 Basic pump is also suitable for use with inverter duty and DC motors for varying flow requirements.

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Sigma/ 2 control type (S2Cb)

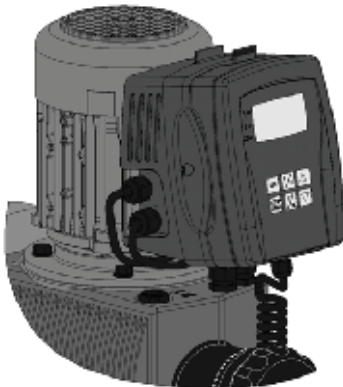


For optional control via contact or analog signals (e.g. 0/4 - 20 mA) the Sigma control type results in good adaptability, even in fluctuating metering requirements.

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.

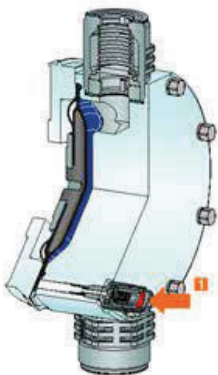
Detachable operating unit (HMI)



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 individual functions of the metering pump can be easily selected and adjusted with five program keys. 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.

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Sigma/ 2 control type (S2Cb)

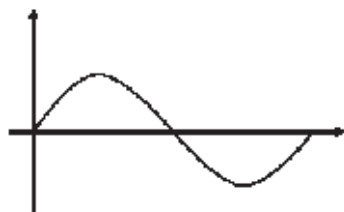


Diagram 1: Discharge stroke, suction stroke equal

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.

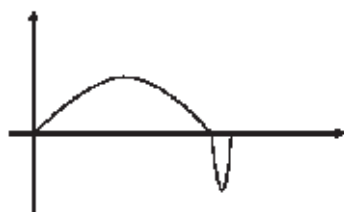


Diagram 2: long discharge stroke, short suction stroke

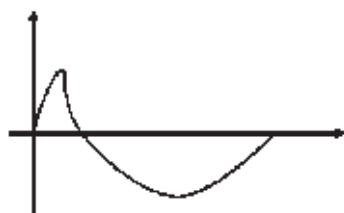


Diagram 3: short discharge stroke, long suction stroke

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Specifications (S2Ba and S2Cb)

General:

<i>Maximum stroke length:</i>	0.196" (5.0 mm) HM; 0.6" (15 mm) HK		
<i>Power cord:</i>	6 feet (2 m) 2 wire + ground (supplied on control versions)		
<i>Stroke frequency control:</i>	S2Ba: Constant speed or optional DC/SCR drive or AC inverter S2Cb: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.		
<i>Stroke counting:</i>	Standard on S2Cb		
<i>Materials of construction</i>			
<i>Inner casing:</i>	Cast aluminum		
<i>Housing:</i>	Glass-filled Luranyl™ (PPE)		
<i>Wetted materials of construction:</i>			
	Liquid End:	PVDF	316 SS
	Suct./Dis. Connectors:	PVDF	316 SS
	Seals:	PTFE	PTFE
	Check Balls:	Ceramic	SS
<i>Viscosity ranges:</i>	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		
<i>Sound pressure level:</i>	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)		
<i>Drive:</i>	Cam and spring-follower (lost motion)		
<i>Lubrication:</i>	Oil lubricated		
<i>Recommended oil:</i>	ISO VG 460, such as Mobil Gear Oil 634		
<i>Oil quantity:</i>	Approximately 0.6 quart (550 mL)		
<i>Recommended oil change interval:</i>	5,000 hours		
<i>Warranty:</i>	Two years on drive, one year on liquid end		
<i>Factory testing:</i>	Each pump is tested for rated flow at maximum pressure.		
<i>Industry Standard:</i>	CE approved, CSA available (standard in Canada), NSF/ANSI 61		



Sigma 2 Diaphragm:

<i>Diaphragm materials:</i>	PTFE faced EPDM with Nylon reinforcement and steel core		
<i>Liquid end options:</i>	Polyvinylidene Fluoride (PVDF) or 316 SS, with PTFE seals		
<i>Check valves:</i>	Single ball check, PVDF and SS versions. Optional springs available in Hastelloy C		
<i>Repeatability:</i>	When used according to the operating instructions, better than ±2%		
<i>Max. fluid operating temperatures:</i>	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)
<i>Diaphragm failure indication:</i>	Visual indicator is mandatory. The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.		
<i>Separation of drive from liquid end:</i>	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 diaphragm failure indication).		
<i>Max. solids size in fluid:</i>	0.3 mm		
<i>Stroke length adjustment:</i>	Manual, in increments of 0.5%. Motorized stroke length adjustment is available.		

Sigma 2 Packed Plunger:

<i>Piston materials:</i>	Ceramic oxide; packing rings of PTFE, packing spring of 316 SS.		
<i>Liquid end options:</i>	316 SS with PTFE seals		
<i>Check valves:</i>	Double ball, stainless steel; optional springs (Hastelloy C4).		
<i>Repeatability:</i>	When used according to the operating instructions, better than ±0.5%		
<i>Max. fluid operating temperatures:</i>	Material	Constant	Short Term
	316 SS	392°F (200°C)	428°F (220°C)
<i>Stroke length adjustment:</i>	Manual, in increments of 0.2%. Motorized stroke length control is optional.		

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Specifications (S2Ba and S2Cb) Cont.

Sigma 2 Basic Version

<i>Motor mounting flange:</i>	Fits all NEMA 56C frame motors (motor not included with pump)
<i>Gear ratios and stroke frequencies (with 1725 RPM motor):</i>	20:1 = 87 SPM, 11:1 = 158 SPM, 7.25:1 = 238 SPM
<i>Motor coupling:</i>	Flexible coupling included with pump
<i>Required Motor HP:</i>	1/3 HP (0.25 kW)
<i>Full load RPM:</i>	1750 RPM (60 Hz)
<i>Stroke sensor (optional):</i>	Hall effect - requires 5 VDC

Sigma 2 Control Version

<i>Control Function:</i>	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.
<i>Enclosure rating:</i>	IP 65
<i>Pump power requirements:</i>	1ph, 115V-230V, 50/60 Hz (internally converted to drive below motor)
<i>Motor data:</i>	Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.25 kW (0.33 HP) 230 3 phase (1.2 A, 1690 rpm)
<i>Relay load</i>	
<i>Fault relay only (Option 1):</i>	Contact load: 250 VAC, 8 A, 50/60 Hz Operating life: > 200,000 switch functions
<i>Fault relay with pacing relay (Option 3):</i>	Fault Relay Contact load: 24 V, 8 A, 50/60 Hz Operating life: > 200,000 switch functions Pacing relay Residual impedance in ON-position ($R_{DS(on)}$): < 8 Ω Residual current in OFF-position: < 1 μ A Maximum voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: 750x10 ⁶ Contact closure: 100 ms (for pacing relay)
<i>Air Humidity</i>	Max. air humidity*: 95% rel. humidity * non-condensing
<i>Fuse:</i>	Internal, 6.3 AT - (1.5 kA)
<i>Analog output signal:</i>	Max. impedance 300 Ω Isolated 4-20 mA output signal
<i>Bus interface options available:</i>	CANopen, PROFIBUS DP
<i>Relay cable (optional):</i>	6 feet (2 m) 3 wire (SPDT) 250 VAC, 2 A
<i>Pulse contact/remote pause contact:</i>	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.)
<i>Contact input max. pulse frequency:</i>	25 pulses/sec
<i>Contact input impedance:</i>	10 kOhm
<i>Max. pulse memory:</i>	65,535 pulses
<i>Necessary contact duration:</i>	20ms
<i>Analog - current input burden:</i>	Approximately 120 Ohm
<i>Max. allowable input current:</i>	50 mA
<i>Input power requirements:</i>	single phase, 115-230 VAC