Liquid Feed System
Chemtube® 200 Diaphragm Metering Pump

The Chemtube® 200 Diaphragm Metering Pump is a hydraulically actuated tubular diaphragm type designed to provide long service under severe conditions. The Chemtube® 200 pump offers accurate metering of a wide range of chemicals for any process application. Together with other outstanding lines of metering pumps such as the Encore® 700, mechanical diaphragm pumps and Chemtube® 2000 high capacity hydraulic pump.

Key Benefits

- Economical installation through compact design
- Fast and easy service of suction and discharge valves
- Automatic adjustment of level and pressure of hydraulic fluid
- Long operational life in harsh conditions



Features

Cartridge Valves for a Wide Range of Applications
Suction and discharge valves are designed as cartridges which are compression sealed to the pump head and pipe connection by O-rings. These valves are easily removed for service or replacement by loosening the clampdown bolts. There is no need to remove or disturb the piping connections. Valve materials are available in PVC, Kynar®, or 316 SS in either a single or double ball configuration. A special arrangement is available for slurries utilizing a ceramic seat with a polyurethane ball for maximum abrasion resistance. A spring-loaded ball configuration is available for handling high viscosity liquids such as polymers.

Choice of Drive Arrangements
Two field convertible drive arrangements are available: direct drive or pulley drive. The unique pulley drive provides for an additional 4:1 range ability on stroke frequency with a standard induction motor offering greater application flexibility. When the pulley drive arrangement is combined with a DC or AC variable speed motor, total operating turndown can be as high as 800:1.

Automatic Hydraulic System and Internal Pressure Relief
The pump automatically adjusts the level and pressure of operating hydraulic fluid on every stroke, maintaining metering accuracy without the need for oil refill or vacuum compensator valves. Additional valving prevents excessive pump pressure and potential diaphragm damage in case of discharge blockage and purges air and oil vapors from the system.

Operation

The liquid end uses two diaphragms to isolate the process fluid from the hydraulic fluid in the gearbox. The tubular diaphragm, which handles the process fluid is surrounded by a 50/50 water/propylene glycol mixture. A flat disc diaphragm separates the intermediate fluid from the gearbox hydraulic oil. There are no mechanical connections between the two diaphragms and the pump drive. Both diaphragms are hydraulically balanced during the pump drive. Both diaphragms are hydraulically balanced during pump operation. The piston causes the liquid in the intermediate chamber to displace the tubular diaphragm and create pumping action with each piston stroke. Varying the stroke length or speed of the piston changes the capacity of the pump. An internal pressure relief valve protects the pump drive and piping components from an overpressure condition that could be caused by a blocked discharge line or closed valve. An integral air purge valve together with an oil refill valve maintain the integrity of the hydraulic system under all pumping conditions for

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consistent
accuracy and long, operator-free operation.

Manual and Automatic Stroke Length Control

The Chemtube® 200 Diaphragm Metering Pump can be controlled by varying the stroke length or stroke frequency. The following control schemes are available:
- Manual or Remote Manual Control
- Start-Stop Control where the motor is wired into the circuit of a transfer pump, switch, timer or controller
- Flow Proportional Control from a single process variable
- Residual, Compound Loop or Setpoint Control using one or two process variables

Manual Stroke Length Control
A 10 turn micrometer gives continuous feed rate adjustment over a 10:1 range. A percent scale and vernier indicate stroke length setting to 1 part in 400. Each revolution of the knob changes feed rate by 10%. Stroke length is infinitely adjustable from 0 to 100%.

Automatic Stroke Length Control
For automatic capacity control via stroke length, a NEMA® 4X actuator is used in conjunction with either of two process variable controllers. The compact, field retrofittable actuator easily installs on the pump and features local manual override and a window for clear indication of stroke length. Two microprocessor-based controllers are available:

SFC-SC, Signal Controller
The economical SC gives automatic process control in response to one process variable, typically flow rate

SFC-PC, Process Controller
The PC is a full featured setpoint controller, which provides more complex automatic control in response to two process variables, typically flow rate and chlorine residual. The PC can operate in any of four different control modes including residual feedback, compound loop, dual signal feed forward (for dechlorination) and flow proportional.

Direct mA Input
For remote or automatic control, typically from a SCADA or centralized control system, the optional stroke length controller accepts a direct 4-20 mA control signal. Stroke length position is linear and proportional to the mA input.

Variable Speed Control or Variable Frequency Control
For precise and accurate feed rate control via stroking speed an SCR for control of a DC motor or a variable frequency drive for inverter duty motor is available. Stroke frequency can be regulated manually by potentiometer setting, or automatically via 4-20 mA process variable input signal (optional). Closed loop speed regulation provides feed rate control accurate to 1% of full scale. Dosing or scaling of a process variable can be accomplished by means of an SC (Signal Control) used in conjunction with an SCR drive or VFD.

Technical Data

Accuracy
Repeatable metering accuracy is 1% of full scale, at constant hydraulic conditions, over a 10:1 range.
Stroke Length
28mm (1.100”)

Stroking Speeds
For 60 Hz operation, 3 stroking speeds are available; 36, 72, and 144 strokes/minute. For 50 Hz operation, 4 stroking speeds are available: 30, 60, 120, and 144 strokes/minute.

Feed Rate Adjustment
Feed rate is infinitely adjustable from 0 through 100%. A percent scale and vernier indicate stroke length setting in 0.25% increments. Each revolution of the knob changes stroke length by 10%.

Operating Range
Direct Drive Arrangement:
Stroke length is adjustable over a 10:1 range. Stroke frequency is adjustable over a 20:1 range [using an optional SCR (10:1 with VFD)]. Total combined maximum operating turndown can be as high as 200:1.
Pulley Drive Arrangement:
Stroke length is adjustable over a 10:1 range. Stroke frequency is adjustable over an 80:1 range [using an optional SCR (10:1 with VFD)]. Total combined maximum operating turn down can be as high as 800:1.

Speed of Response
Automatic stroke length control response time is 100 seconds from 0 to 100%. Variable speed control response time is under 3 seconds from 0 to 100%.

Suction Lift
Flooded suction is recommended. The pump will self-prime with a 1.5m (5ft) of water suction lift (wetted valves, zero backpressure, full stroke and speed, water like solutions). Once primed, the pump will operate with a 1.5m (5ft) of water suction lift.

Polymer and Slurry Handling Capabilities
Polymer solutions up to 10,000 centipoise (Brookfield Viscometer with No. 2 spindle @ 12 rpm) under any condition. Higher viscosities (up to 20,000 centipoise) with decreased capacity (10-15%). Hydrated lime slurries up to 0.45kgs (1lb) per gallon of water; activated carbon slurries up to 0.5kgs (1.1lbs) per gallon; diatomaceous earth slurries up to 0.20kgs (0.44lbs) per gallon of water.

Process Fluid Temperature Limits
82°C (180°F) for 316 SS Valves
65°C (150°F) for Kynar® Valves
52°C (125°F) for PVC Valves

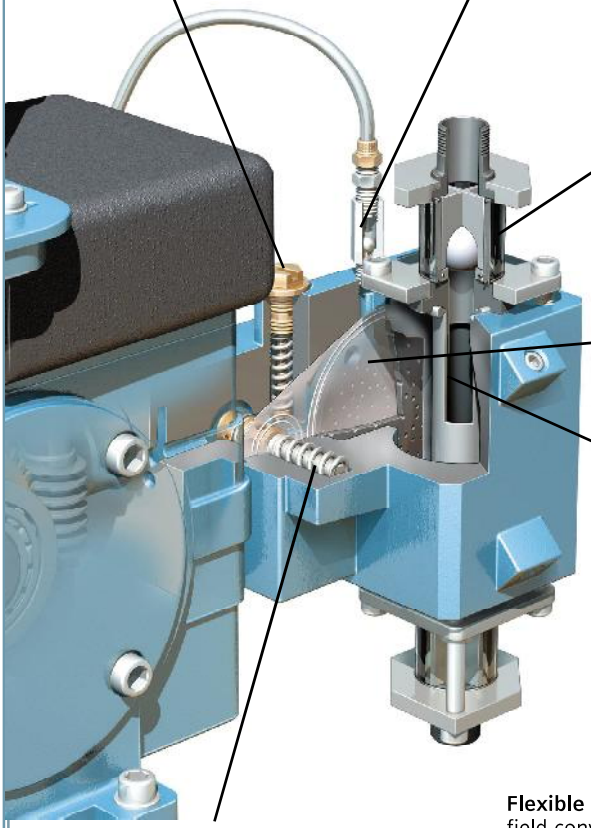
Ambient Temperature Limits
-12 to 49°C (10-120°F)

Materials of Construction
Gear Box and Liquid End Housing: epoxy painted, cast iron Automatic Actuator Enclosure: epoxy painted, aluminum Suction and Discharge Valve Housings: clear PVC, Kynar® or 316 stainless steel Valve Balls: 316 Stainless Steel, TFE, Ceramic, Glass, Polyurethane (for

Internal Pressure Relief Valve

Air Purge Valve - An air purge automatically removes any entrained air from the hydraulic fluid to maintain pumping accuracy.

Cartridge Valves - Cartridge-type suction and discharge valves are utilized for fast service without removing or disconnecting piping. The design includes wide flow paths and four-point guides to control ball rise and assure proper seating.



Secondary Diaphragm - This flat diaphragm separates the hydraulic gearbox oil from the intermediate fluid that surrounds the tubular diaphragm. This provides an extra measure of isolation from the process fluid.

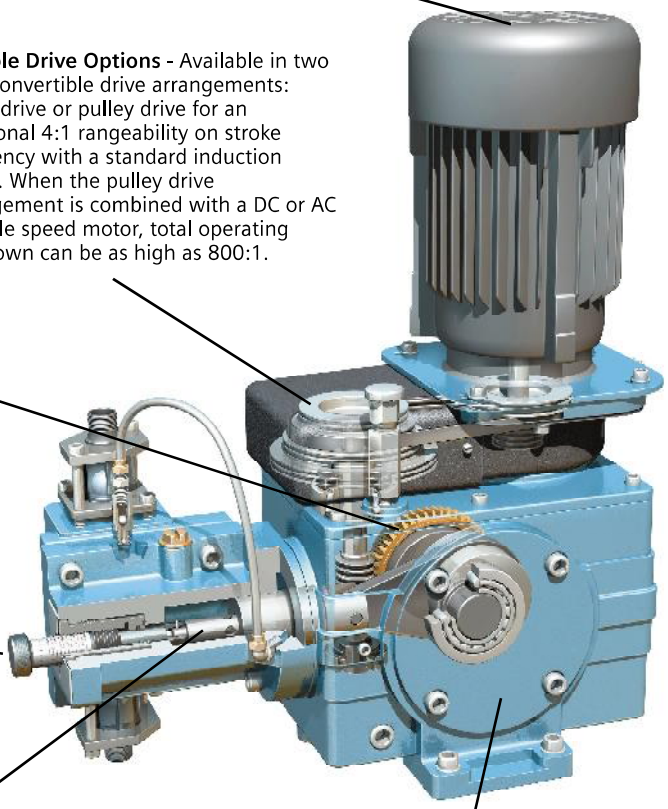
Tubular Diaphragm - The tubular diaphragm provides a straight-through flow path for the process chemical. It is available in Viton® or Hypalon® construction as standard.

Motor - Available with standard induction and variable speed motors (optional) for wider operating ranges and automatic process control.

Monitoring/By-Pass Valve - A monitoring/ by-pass valve compares and controls the relative pressure on both sides of the secondary pumping diaphragm preventing damaging imbalances.

Flexible Drive Options - Available in two field-convertible drive arrangements: direct drive or pulley drive for an additional 4:1 rangeability on stroke frequency with a standard induction motor. When the pulley drive arrangement is combined with a DC or AC variable speed motor, total operating turndown can be as high as 800:1.

Gear Sets - A variety of gear sets allows up to 144 strokes per minute.



Stroke Adjust Knob - A 10-turn micrometer-type stroke adjuster to obtain precise and highly repeatable feed rate settings. A percent scale and vernier indicate stroke length in 0.25% increments. Feed rate is infinitely adjustable from 0 to 100%. Automatic stroke length control is available with a motor operated positioner.

Stroke Adjust Mechanism - Stroke length is adjusted by the accurate positioning of a control rod. Piston travel stays constant while the point where the hydraulic chamber seals varies with the location of control ports in the control rod.

Robust Gearbox - The compact gearbox features liberal use of heavy duty parts including an epoxy painted cast iron housing, 316 SS fasteners, load absorbing tapered roller bearings, robust gears and steel and nodular iron drive components.

slurry service) Valve Seats: 316 Stainless Steel, PVC, PDFV, Ceramic, Polyurethane (for slurry service) Valve Seals: Hypalon® or Viton® Tubular Diaphragm: Hypalon® or Viton® Mounting Base: Plastic

Electrical Requirements
Standard induction motor arrangement is 1725 rpm (1450 rpm at 50 Hz), 115/230 Volts, 50/60 Hz, single phase, TEFC, UL® Listed, CSA® Approved. Motors with Other electrical characteristics are available as an option. The optional diaphragm leak detector requires 115 Volts, 50/60 Hz. Resistivity adjustable from 1,000 to 100,000 ohms. NC/NO relay rating 13 Amps @ 120 Volts. Optional automatic stroke length actuator has 3 alarm contacts (high, low, actuator disengaged) N.O. rated 5 Amps @ 250 Volts.

Chemical Metering Systems
Low cost packaged systems can be custom configured from standard stock components including tanks, mixers, instrumentation and a wide range of controls. All systems are shipped assembled, prewired and ready to install.

Accessories
Back Pressure Valves, Antisyphon Valves, Main Connections, Strainers, Pulsation Dampeners, Calibration Chambers, Solution Tanks, Mixers, Liquid Level Switches, Slurry Flushing Systems and numerous Mounting Accessories.

Preventive Maintenance Kit
Preventive Maintenance kits contain original replacements for those parts most susceptible to wear. They facilitate scheduled maintenance and help maintain equipment in good working order, eliminating equipment breakdowns and costly downtime.

Chemtube® 200 Series Capacity Chart

Piston Size	Direct Drive						* Pulley Step	Pulley Drive						Maximum Discharge Pressure				Connection Cartridge Valves
	60 Hz 1725 RPM			50 Hz 1450 RPM				60 Hz 1725 RPM			50 Hz 1450 RPM			psi		bar		
	Stroke Frequency	Capacity		Stroke Frequency	Capacity			Stroke Frequency	Capacity		Stroke Frequency	Capacity		Motor Horsepower @ 1725 RPM Induction (Variable Speed)		Motor Kilowatts /1450 RPM Induction (Variable Speed)		
inches	Strokes/min	US gph	lph	Strokes/min	US gph	lph		Strokes/min	US gph	lph	Strokes/min	US gph	lph	1/4 (1/2) Simplex	1/2 (3/4) Double Simplex	0.18 (0.37) Simplex	0.37 (0.55) Double Simplex	inches
7/8	36	2	7.6	30	1.7	6.3	4	9	0.5	1.9	8	0.4	1.7	Up to 125 psi with PVC seat and TFE ball		Up to 9 bar with PVC seat and TFE ball		1/2 NPT
							3	18	1	3.8	15	0.8	3.1					
							2	27	1.5	5.7	23	1.3	4.8					
							1	36	2	7.6	30	1.7	6.3					
	72	4	15.1	60	3.3	12.6	4	18	1	3.8	15	0.8	3.1					
							3	36	2	7.6	30	1.7	6.3					
							2	54	3	11.3	45	2.5	9.4					
							1	72	4	15.1	60	3.3	12.6					
	144	8	30.3	120	6.7	25.2	4	36	2	7.6	30	1.7	6.3					or
							3	72	4	15.1	60	3.3	12.6					
							2	108	6	22.7	90	5	18.9					
							1	144	8	30.3	120	6.7	25.2					
							4				36	2	7.6					
							3				72	4	15.1					
							2				108	6	22.7	Up to 300 psi with Kynar® seat and glass ball		Up to 20.5 bar with Kynar® seat and glass ball		
				144	8	30.3	1				144	8	30.3					1/2 SOC.
1 1/8	36	5	18.9	30	4.2	15.7	4	9	1.2	4.7	8	1.1	4.2					
							3	18	2.5	9.4	15	2.1	7.8					
							2	27	3.7	14	23	3.2	12.1					
							1	36	5	18.9	30	4.2	15.7					or
	72	10	37.9	60	8.3	31.6	4	18	2.5	9.4	15	2.1	7.8					
							3	36	5	18.9	30	4.2	15.7					
							2	54	7.5	28.3	45	6.2	23.6					
							1	72	10	37.9	60	8.3	31.6					
	144	20	75.7	120	16.7	63.1	4	36	5	18.9	30	4.2	15.7	Up to 390 psi with stainless steel sea and ball		Up to 26 bar with stainless steel sea and ball		R 1/2
							3	72	10	37.8	60	8.3	31.5					
							2	108	15	56.7	90	12.5	47.3					
							1	144	20	75.7	120	16.7	63.1					
							4				36	5	18.9					
							3				72	10	37.8					
							2				108	15	56.7					
				144	20	75.7	1				144	20	75.7					
1 5/8	36	15	56.8	30	12.5	47.3	4	9	3.7	14.2	8	3.3	12.6					
							3	18	7.5	28.4	15	6.2	23.6					
							2	27	11.2	42.5	23	9.6	36.2					
							1	36	15	56.8	30	12.5	47.3					1 NPT
	72	30	113.6	60	25	94.7	4	18	7.5	28.4	15	6.2	23.6					
							3	36	15	56.8	30	12.5	47.3					
							2	54	22.5	85.2	45	18.7	70.9					
							1	72	30	113.6	60	25	94.76					or
	144	60	227.1	120	50	189.2	4	36	15	56.7	30	12.5	47.3	125 psi		9 bar		1 SOC.
							3	72	30	113.5	60	25	94.6					
							2	108	45	169.9	90	37.5	141.9					
							1	144	60	277.1	120	50	189.2					or
							4				36	14.99	56.7					
							3				72	29.99	113.5					
							2				108	44.9	169.9					
				144	60	227.1	1				144	60	227.1					R 1

UGSI Chemical Feed, Inc.
1901 West Garden Road
Vineland, NJ 08360
Toll Free: 855-669-3845
Local: 856-896-2160
Fax: 856-457-5920
Email: info@ugsichemicalfeed.com
Website: www.ugsichemicalfeed.com

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