ProMinent® Makro TZ METERING PUMPS

ProMinent®

Metering accuracy at high flow rates or high pressures
Three designs to solve any metering problem

ProMinent® Makro TZ motorized metering pumps are available in packed-plunger (HK), diaphragm (HM) and hydraulic diaphragm (HMH) versions.

ProMinent® Makro TZ versions available:

- 4 mechanically actuated diaphragm sizes
- 9 packed-plunger diameters
- 2 hydraulically actuated diaphragm sizes
- 4 stroking rates (gear ratios)
- 38 pressure ratings from 36 to 4640 psig (2.5 to 320 bar)
- manual or automatic stroke length adjustment

The design principle

The ProMinent® Makro TZ is a reciprocating, infinitely adjustable, positive-displacement metering pump. It is driven by a standard motor, the rotary motion of which is stepped down by means of a worm gear (1), converted into linear motion by an adjustable crank (2), and transmitted by a connecting rod (3) to a push rod (4). This provides an accurate forced suction and discharge cycle, which is advantageous when overcoming high suction lifts and when metering extremely viscous liquids. The stroke length can be finely adjusted by varying the eccentricity of the crank pin (5) producing the reciprocating motion. This design ensures a harmonic, sinusoidal stroking motion, which results in low noise levels.

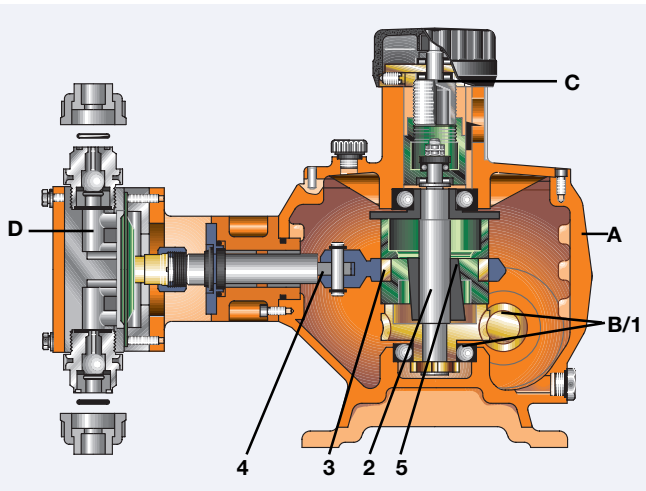
Makro TZ pump models

Type	Characteristic data (standard version)	Application
HM mechanically actuated diaphragm	• discharge pressure: up to 174 psig (12 bar) • metering capacity*: up to 658 GPH (2,490 L/h) (per liquid end) • repeatability better than ± 2% • material versions: PP, PVC, PTFE, 316 SS	General: low pressure metering or transfer of process chemicals, especially high viscosity materials. VOC's: metering or transfer of volatile organic chemicals.
HK packed-plunger	• discharge pressure: up to 4,640 psig (320 bar) • metering capacity*: up to 301 GPH (1,141 L/h) (per liquid end) • repeatability better than ± 0.5% • material version: 316 SS	General: metering of process chemicals into high pressure reactors, boilers or pipelines. Extreme Repeatability: metering of chemicals where extreme repeatability is required.
HMH hydraulically actuated diaphragm	• discharge pressure: up to 232 psig (16 bar) • metering capacity*: up to 318 GPH (1,204 L/h) (per liquid end) • repeatability better than ± 0.5% • material versions: PP, PVC, PTFE, 316 SS • integrated diaphragm rupture protection • integrated overpressure protection	General: medium pressure metering or transfer, or where high repeatability is required. Hazardous Materials: where zero emissions and/or diaphragm failure alarm are required.

*Above capacities are for “simplex” configurations. Pump models are available in "duplex" (two-head) or with add-on "multiplex" configuration for up to six liquid ends.

The liquid end is isolated from the gear housing, even on the hydraulically actuated HMH pumps. The physical separation prevents cross-contamination between process fluid and gear oil. This is an important feature for extended dependability.

Makro TZ pumps are capable of multiplexing to increase capacity or to pump multiple fluids from a common drive motor.



A variety of mounting flanges available for:

- Standard NEMA 56C, 143/145 TC or 182/184TC constant speed four-pole motors of any voltage, phase or frequency
- Variable speed motors for local speed control or in proportion to external analog signal
- Explosion-proof motors for use in hazardous areas

Main Components:
A - Housing
B - Gears
C - Stroke length adjuster
D - Liquid end

ProMinent® Makro TZ HM/AM: Rugged, accurate and dependable diaphragm-type metering pumps for general chemical metering

Accurate metering of fluids:

- **Up to 20% solids content**
- **High viscosity**
- **Suction lifts up to 20 ft. (6 m) when primed**

A special liquid end and valve design for low flow loss produces accurate dosing of high viscosity Newtonian fluids and suction lifts up to 20 ft. (6 m) when primed.

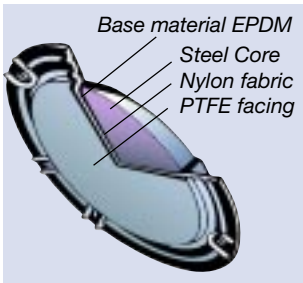
ProMinent® Makro TZ HM in a range of materials

ProMinent® Makro TZ HM

Offering all the benefits of a diaphragm-type metering pump!

The Makro mechanically-actuated diaphragm pumps feature a steel core DEVELOPAN® diaphragm. This core is vulcanized into chemical and temperature resistant, Nylon fabric reinforced EPDM. The diaphragm is PTFE-faced, with maximum stroke lengths of 0.236" (6 mm) or 0.354" (9 mm).

The DEVELOPAN® dosing diaphragm



The DEVELOPAN® pump diaphragm cutaway

The suction and discharge valves are equipped with precision ball checks or with disk checks for larger capacities.*

This design offers simplicity of operation and maintenance, while maintaining metering repeatability of ± 2% of rated capacity!

Typical applications include metering of coagulants or slurries for municipal water and wastewater treatment.

Liquid end materials

Material Code	Liquid end and fittings	Valve balls*	Seals
PP	Polypropylene	Borosilicate glass	EPDM
P	PVC	Borosilicate glass	Viton
T	PTFE (carbon-filled)	Ceramic	PTFE
S	316 SS	316 SS**	PTFE

*1-1/2" disk-type valves with disks made of aluminum oxide ceramic with a Hastelloy C spring, are standard on the HM 1500 and 2100 PP, P and S.

Pump Selection Guide
Mechanically Actuated Diaphragm-Type

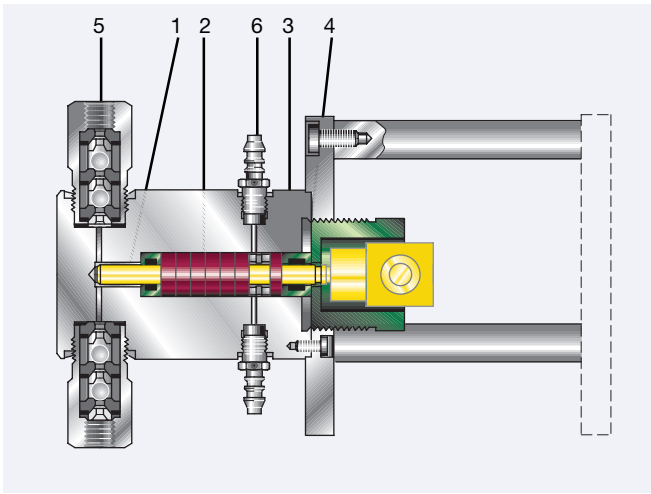
Makro Series	Pump type	Number of liquid Ends	Max. flow rate U.S.GPH	L/H
HM	Main Pump	Simplex	658	2490
AM	Add-on Module	Simplex	658	2490
HMD	Main Pump	Duplex	1316	4980
AMD	Add-on Module	Duplex	1316	4980

ProMinent® Makro TZ HK: Packed-plunger liquid end for high pressure injection and precision metering

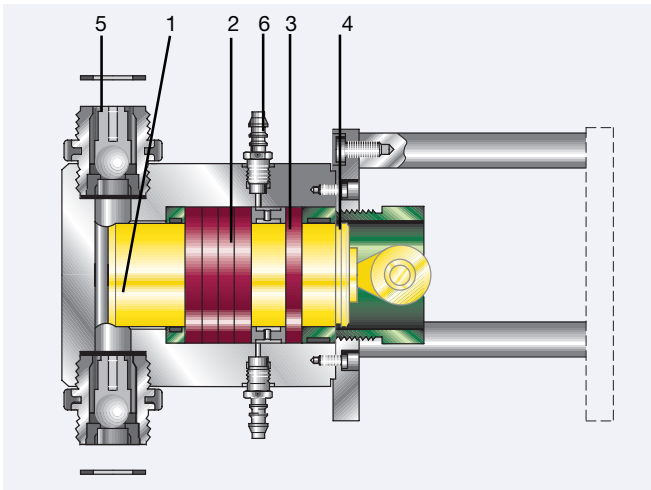
The plunger (1) is manufactured from polished aluminum oxide ceramic. This material exhibits extremely strong chemical and wear resistance. The precision plunger is sealed with spring loaded, self-adjusting PTFE composite packing (2) and is equipped with a lantern ring for seal flushing (3) and additional PTFE packing (4).

The dosing head and suction/discharge valves are 316 stainless steel, with precision ball valves (5) made of aluminum oxide ceramic and valve seals made of pure PTFE.

Makro TZ packed-plunger metering pump



Packed-plunger liquid end FK 12 ... FK 30



Packed-plunger liquid end FK 40... FK 85

Where high viscosity fluids are to be metered, the valves can be supplied with Hastelloy C valve springs.

Working pressures to 4,640 psig (320 bar) are possible. Repeatability is better than ±0.5%.

Liquid end materials	
Liquid end	316 SS
Fittings	316 SS
Plunger and valve balls	Aluminum oxide ceramic
Packing	PTFE and graphite (Special version: pure PTFE)
Seals	PTFE

Pump Selection Guide
Packed Plunger-Type

Makro Series	Pump type	Number of liquid Ends	Max. flow rate U.S.GPH	L/H
HK	Main Pump	Simplex	302	1141
AK	Add-on Module	Simplex	302	1141
HKD	Main Pump	Duplex	602	2282
AKD	Add-on Module	Duplex	602	2282

Design:
1. Plunger
2. Packing
3. Flushing ring
4. Piston shaft
5. Valves
6. Flushing connector

ProMinent® Makro TZ HMH: Hydraulically actuated diaphragm-type metering pump

Safe and accurate metering

Multi-layer diaphragm with built-in alarm

The Makro hydraulically actuated diaphragm-type metering pump sets new standards of safety and dependability.

The composite diaphragm is faced with a PTFE layer, bonded to an elastomer layer, which in conjunction with another PTFE layer and yet another elastomer layer – are formed under vacuum.

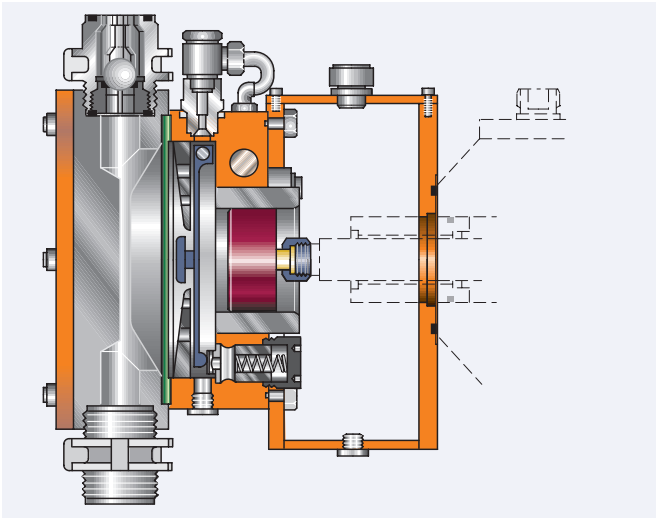
Should either of the external diaphragm faces incur damage and rupture, then, with the middle PTFE layer intact, cross contamination of process fluid with hydraulic fluid will be prevented.

In addition, due to the resulting increase of internal pressure, the diaphragm layers will separate at a predetermined location. This activates an internal micro switch which can be used to signal an alarm.

Pressure relief and air bleed valves protect against overpressure and evacuate hydraulic vapors and fumes. The discharge volume remains constant, even against varying back-pressures – with repeatability better than ± 0.5%.

ProMinent® Makro TZ 20 HMH

Patented composite diaphragm



Packed-plunger diaphragm metering pump with patented DEVELOPAN® safety diaphragm

Pump Selection Guide
Hydraulically Actuated Diaphragm-Type

Makro Series	Pump type	Number of liquid Ends	Max. flow rate U.S.GPH	L/H
HMH	Main Pump	Simplex	318	1204
AMH	Add-on Module	Simplex	318	1204
HMHD	Main Pump	Duplex	636	2408
AMHD	Add-on Module	Duplex	636	2408

Accessories and Control Options
Pre-engineered Packaged Systems

Electronic and mechanical accessories permit the Makro TZ to be controlled by process signals. The Makro TZ can easily be integrated into automatic process systems. Variable speed drives and/or stroke-positioning motors, controlled by ProMinent® Dulcometer® process controllers and Dulcotest® sensors lend dependability and versatility to automated systems.

Custom engineered chemical metering and control systems ensure plant specifications and industry standards are met.

Variable-speed drives

ProMinent offers a choice of variable-speed drives for manual speed adjustment or for proportioning flow in response to an external analog signal.

"DOS-Control" universal controller

The proportional flow controller acts as an external pulse controller for ProMinent® Makro TZ simplex, duplex or multiplex pumps. The preselected stroking rate can be reset at any time to between 1 and 29999 strokes at the keyboard and display panel.

"DOS-Control" flow controller

Standard features include:

- connector for the stroke feedback signal via stroke sensor
- connector for a float switch (monitors chemical levels)
- external analog input 0/4-20 mA and/or contact.

The "preselect stroking rate" function greatly facilitates the matching process.

ProMinent® Makro TZ with stroke length adjuster

Stroke-length adjustment

The manual stroke-length adjusting mechanism may be replaced by a positioning motor for automatic stroke length adjustment. The positioning time is approximately 1 second per 1% of stroke length adjustment. The “ServoControl” system can be used for remote-manual, or remote-automatic stroke-length adjustment in response to external analog or Dulcometer 3P output signals.

Pre-engineered Systems

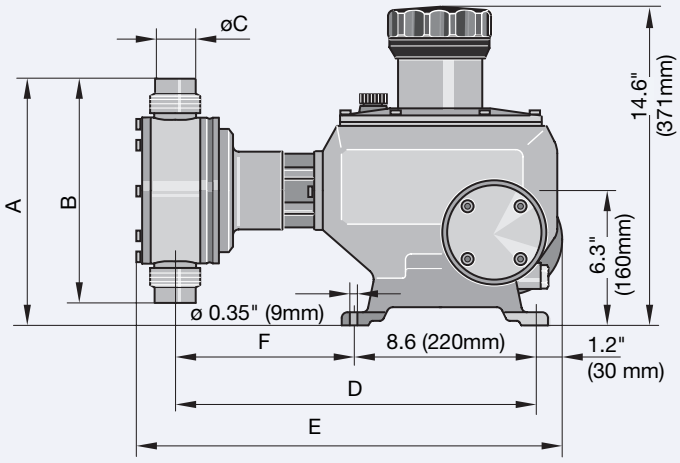
ProMinent also offers pre-engineered chemical metering packaged systems. Standard packages for capacities up to 208 gph (787 L/h) include the M1 (single pump) and M2 (dual pump) series dosing units.

These self-contained packages provide easy pump hookup and are ideal for chemical trials, permanent or emergency chemical injection and backup. Systems are mounted on either a SS or UV protected PP stand and include the metering pump(s), piping, and selected accessories: calibration column, backpressure valve(s), pressure relief valve(s), pulsation dampener(s), sediment strainer(s). All system packages are fully assembled and tested prior to shipment.

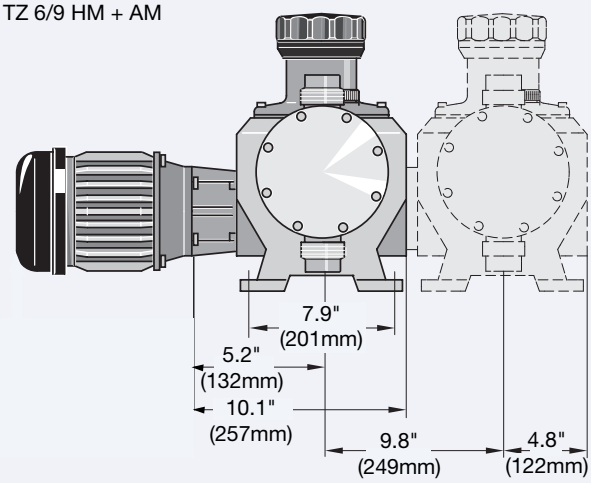
Custom engineered chemical metering and control packages or systems can also be designed and built to meet special application needs and plant specifications.

ProMinent® Makro TZ HM/AM Diaphragm Metering Pumps
ProMinent® Makro TZ HMH/AMH Hydraulic Diaphragm Metering Pumps

TZ 6/9 HM



TZ 6/9 HM + AM



ProMinent Makro TZ 6 HM, TZ 9 HM and TZ 20 HMH

Pump Type	A	B	C	D	E	F	G*	H*
TZ 6 & 9 HM (HMD)								
130	10.6 (269)	8.6 (218)	3/4" MNPT	16.7 (424)**	19.6 (497)**	8.0 (204)**	24.0 (609)**	27.3 (693)*
260	10.6 (269)	8.6 (218)	3/4" MNPT	16.7 (424)**	19.6 (497)**	8.0 (204)**	24.0 (609)**	27.3 (693)*
530	11.5 (292)	10.4 (264)	1" MNPT	16.9 (428)**	19.8 (504)**	8.2 (208)**	24.3 (617)**	27.8 (707)*
1500	13.7 (347)	14.8 (375)	1-1/2" MNPT	17.8 (451)**	21.3 (542)**	9.1 (231)**	26.1 (663)**	30.8 (783)*
2100	13.7 (347)	14.8 (375)	1-1/2" MNPT	17.8 (451)**	21.3 (542)**	9.1 (231)**	26.1 (663)**	30.8 (783)*
Without reinforcement plate				17.5 (446)***	20.3 (515)***	8.9 (226)**	25.7 (653)***	28.7 (729)***
TZ 20 HMH (HMHD)								
70-20	12.6 (319)	12.5 (318)	1" MNPT	18.5 (471)	21.6 (548)**	9.9 (251)	26.7 (703)	31.7 (804)**
90-20	13.3 (339)	14.1 (358)	1-1/2" MNPT	18.9 (481)	22.5 (571)**	10.3 (261)	31.0 (788)	33.5 (850)**
Without reinforcement plate								
70-20						21.1 (536)***		30.7 (780)***
90-20						22.0 (559)***		32.5 (826)***

* For twin-head pumps, side view (not shown). Dim G = From midpoints of valves. Dim H = Overall head to head.
** For PP, P and PTFE liquid end(s).
*** For 316 Stainless Steel liquid end(s) only.

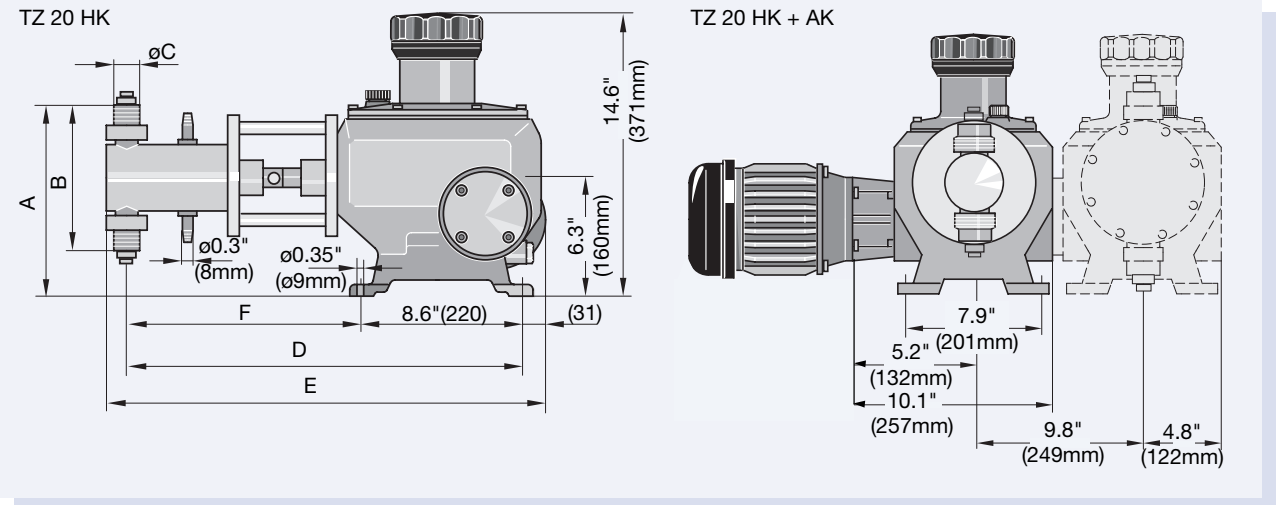
Table of Capacities and Pressures for 1 liquid end with 1725 rpm motor

				Capacity GPH (L/h) and Motor HP											
Liquid end	Working pressure psig (bar)			Volume mL/stroke	Stroking rate 172 spm Type HM 10 GPH	(L/h)	HP	Stroking rate 144 spm Type HM 12 GPH	(L/h)	HP	Stroking rate 115 spm Type HM 15 GPH	(L/h)	HP	Stroking rate 86 spm Type HM 20 GPH	(L/h)	HP
HM 130	174 (12)	*		24.2	66	(251)	1.5	55	(209)	1.5	44	(167)	1.5	33	(125)	1.5
HM 260	174 (12)	*		44.0	120	(457)	1.5	100	(381)	1.5	80	(304)	1.5	60	(228)	1.5
HM 530	87 (6)	**		91.8	251	(952)	1.5	209	(793)	1.5	167	(634)	1.5	125	(476)	1.5
HM 1500	44 (3)	**		174	475	(1800)	1.5	396	(1500)	1.5	317	(1200)	1.5	237	(900)	1.5
HM 2100	44 (3)	**		240	658	(2490)	1.5	555	(2100)	1.5	445	(1685)	1.5	330	(1250)	1.5
					Type HMH 101			Type HMH 121			Type HMH 151			Type HMH 201		
HMH 70-20	232 (16)	*		69.4	190	(720)	3	158	(600)	3	126	(480)	3	112	(424)	3
HMH 90-20	145 (10)			116.2	318	(1204)	3	264	(1003)	3	211	(802)	3	159	(602)	3

GPH refers to U.S. gallons per hour.

* PP, PVC and PTFE versions have a reduced maximum working pressure of 145 psig (10 bar).
** Twin-head pumps have a reduced maximum working pressure of 73 and 36 psig (5 and 2.5 bar), respectively.

ProMinent® Makro TZ HK/AK/HKD Packed-Plunger Metering Pumps



ProMinent® Makro TZ 20 HK

Pump Type	A	B	C*	D	E	F	G**	H**
12 S	11.1 (282)	9.6 (243)	1/4" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
17 S	11.1 (282)	9.6 (243)	1/4" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
23 S	11.1 (282)	9.6 (243)	3/8" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
30 S	11.1 (282)	9.6 (243)	3/8" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
40 S	10.7 (272)	8.8 (223)	3/4" MNPT	21.6 (548)	23.9 (606)	12.9 (328)	33.7 (856)	35.8 (910)
50 S	10.7 (272)	8.8 (223)	3/4" MNPT	21.6 (548)	23.9 (606)	12.9 (328)	33.7 (856)	35.8 (910)
60 S	11.1 (282)	9.6 (243)	3/4" MNPT	21.5 (546)	23.9 (607)	12.8 (326)	33.6 (853)	35.9 (913)
70 S	11.1 (282)	9.6 (243)	1" MNPT	24.2 (553)	24.2 (614)	13.1 (333)	34.1 (867)	36.5 (926)
85 S	12.5 (318)	12.4 (315)	1-1/2" MNPT	24.9 (563)	24.9 (632)	13.5 (343)	34.9 (886)	37.9 (962)

* 1/4" and 3/8" sizes – FNPT and double ball check valves; 3/4" and 1" sizes – MNPT and single ball check valves; 1-1/2" size – MNPT and single disk check valves.

** For Twin head pumps, side view (not shown): Dim G = from midpoints of valves. Dim H = overall head to head.

Table of Capacities and Pressures for 1 liquid end with 1725 rpm motor

Liquid end	Volume mL/ stroke	Stroking rate 172 spm				Stroking rate 144 spm				Stroking rate 115 spm				Stroking rate 86 spm			
				Type HK10 1.5 HP	Type HK101 3 HP			Type HK12 1.5 HP	Type HK121 3 HP			Type HK15 1.5 HP	Type HK151 3 HP			Type HK20 1.5 HP	Type HK201 2 HP
		GPH	(L/h)	PSIG (bar)	PSIG (bar)	GPH	(L/h)	PSIG (bar)	PSIG (bar)	GPH	(L/h)	PSIG (bar)	PSIG (bar)	GPH	(L/h)	PSIG (bar)	PSIG (bar)
HK 12 S	2.0	5.5	(21)	4640 (320)		4.5	(17)	4640 (320)		3.7	(14)	4640 (320)		2.6	(10)	4640 (320)	
HK 17 S	4.1	11	(42)	2262 (156)	4538 (313)	9.2	(35)	2711 (187)	4640 (320)	9	(28)	3393 (234)	4640 (320)	5.5	(21)	4640 (320)	
HK 23 S	7.6	20	(79)	1203 (83)	2436 (168)	17	(66)	1450 (100)	2784 (192)	17	(53)	1812 (125)	2784 (192)	10	(39)	2436 (168)	2784 (192)
HK 30 S	13.3	36	(138)	681 (47)	1392 (96)	30	(115)	826 (57)	1638 (113)	29	(92)	1029 (71)	1638 (113)	18	(69)	1392 (96)	1638 (113)
HK 40 S	24.2	66	(250)	377 (26)	754 (52)	55	(209)	449 (31)	913 (63)	52	(167)	565 (39)	913 (63)	33	(125)	754 (52)	913 (63)
HK 50 S	37.7	103	(391)	232 (16)	478 (33)	86	(326)	275 (19)	580 (40)	82	(261)	362 (25)	580 (40)	51	(195)	478 (33)	580 (40)
HK 60 S	54.9	150	(569)	159 (11)	319 (22)	125	(274)	188 (13)	391 (27)	119	(379)	246 (17)	406 (28)	75	(284)	319 (22)	406 (28)
HK 70 S	74.7	204	(774)	116 (8)	232 (16)	170	(645)	130 (9)	290 (20)	162	(516)	174 (12)	290 (20)	102	(387)	232 (16)	290 (20)
HK 85 S	110.0	301	(1141)	72 (5)	159 (11)	251	(951)	87 (6)	188 (13)	239	(761)	116 (8)	203 (14)	150	(568)	159 (11)	203 (14)

GPH refers to U.S. gallons per hour.

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