

ProMinent®

Makro metering pumps

Mechanically-actuated diaphragm (HM), packed-plunger (HK) and hydraulically-actuated diaphragm (HMH).

Precision pumps for large capacities

The Makro series pumps are designed to meter accurately at high flow rates or high pressures. The Makro is a motor-driven reciprocating pump with powered return straight crank drive, and is capable of multiplexing to increase capacity or to pump multiple fluids from a common drive motor.

Three liquid end options

The Makro mechanically-actuated diaphragm pumps feature a steel core DEVELOPAN® diaphragm threaded directly onto the reciprocating drive shaft for low pressure (less than 175 psig) metering. This design offers simplicity of operation and maintenance, while maintaining metering repeatability. Typical applications include metering of coagulants or slurries for municipal water and wastewater treatment.

The Makro packed-plunger pumps offer high pressure capabilities for feeding into high pressure boilers, reactors or pipelines. These offer exceptional repeatability, better than $\pm 0.5\%$.



The Makro hydraulically-actuated diaphragm pumps combine the accuracy of a packed-plunger pump with the advantages of a diaphragm pump, plus built-in pressure relief and integral diaphragm failure detection.

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.

Process control

The manual stroke-length adjusting mechanism may be replaced by a positioning motor for automatic

Pump selection guide

Pump series	Pump Type		Liquid End Design			No. of Liquid Ends		Max flow rate GPH
	Main pump accepting motor	Add-on module driven by main pump*	Mechanically actuated diaphragm	Packed plunger	Hydraulically actuated diaphragm	Simplex	Duplex	
Makro HM	X		X			X		658
Makro AM		X	X			X		658
Makro HMD	X		X				X	1316
Makro AMD		X	X				X	1316
Makro HK	X			X		X		302
Makro AK		X		X		X		302
Makro HKD	X			X			X	602
Makro AKD		X		X			X	602
Makro HMH	X				X	X		318
Makro AMH		X			X	X		318
Makro HMHD	X				X		X	636
Makro AMHD		X			X		X	636

*Note: Makro add-on modules must have the same gear ratio as the main (drive) pump. Liquid end designs may be intermixed with add-on pumps (i.e. Makro HM drive with Makro AK add-on).

Specifications: Makro

General:

<i>Housing construction:</i>	Acrylic resin coated cast aluminum
<i>Drive:</i>	Slide-ring adjustable crank (non-lost motion)
<i>Motor mounting flange:</i>	Available for NEMA 56C or 143/145 TC frame motors (motor not included with pump). Please specify with order. A 182/184 TC flange is available at extra cost (p.n. 7951144).
<i>Gear ratios and stroke frequencies (with 1725 RPM motor):</i>	10:1 = 172 SPM, 12:1 = 144 SPM, 15:1 = 115 SPM, 20:1 = 86 SPM
<i>Motor coupling:</i>	Flexible coupling included with pump
<i>Maximum motor RPM:</i>	1725
<i>Stroke frequency control:</i>	Remote or automatic frequency control optional with DC SCR drive or AC inverter
<i>Stroke length adjustment:</i>	Manual, in increments of $\pm 0.5\%$. Motorized stroke length control optional.
<i>Stroke counting:</i>	Available with optional stroke counter
<i>Lubrication:</i>	Oil lubricated
<i>Recommended oil:</i>	Mobil Gear Oil 629, ISO VG 150 or 220
<i>Oil quantity:</i>	Approximately 3.3 quarts (3.5 liters)
<i>Recommended oil change interval:</i>	5,000 hours
<i>Separation of drive from liquid end:</i>	An air gap separates the drive from the liquid end to prevent cross contamination of oil and process fluid in the event of diaphragm (HM/AM) or packing (HK/AK, HMH/AMH) failure.
<i>Maximum solids size in fluid:</i>	200 μ

Makro TZ 6 & 9 HM/AM; HMD/AMD:

<i>Pump type:</i>	Mechanically-actuated diaphragm (diaphragm threaded directly to reciprocating shaft)		
<i>Diaphragm:</i>	PTFE-faced EPDM with steel core		
<i>Max. stroke length:</i>	0.236" (6 mm) up to 1500 liquid end; for 2100 liquid end 0.354" (9 mm)		
<i>Diaphragm failure indication:</i>	Optional - see accessories		
<i>Wetted material of construction options and maximum fluid temperatures:</i>		<u>Continuous</u>	<u>Short Term</u>
	PP = polypropylene	176°F (80°C)	212°F (100°C)
	P = PVC	113°F (45°C)	140°F (60°C)
	T = carbon-filled PTFE	194°F (90°C)	248°F (120°C)
	SS = 316 stainless steel	194°F (90°C)	248°F (120°C)
<i>Check valves:</i>	Single ball (except disc-type valves on 1500 & 2100 P, PP and S liquid ends)		
<i>Repeatability:</i>	When installed and operated according to instructions, better than ±2% of rated capacity.		

Makro TZ 20 HK/AK; HKD/AKD:

<i>Pump type:</i>	Packed plunger (plunger threaded directly to reciprocating shaft)
<i>Max. stroke length:</i>	0.787" (20 mm)
<i>Plunger material:</i>	Aluminum oxide ceramic
<i>Packing seal method:</i>	Nut-tightened packing gland
<i>Seal flush port:</i>	Packing lubrication/flushing is possible for abrasive or hazardous fluids via the flush port. Hosebarbs fit 1/2" x 3/8" flexible tubing.
<i>Check valves:</i>	Double ball, models 12S, 17S, 23S and 30S; single ball models 40S, 50S, 60S, 79S and 85S
<i>Repeatability:</i>	When installed and operated according to instructions, better than $\pm 0.5\%$ of rated capacity.
<i>Maximum fluid temperature:</i>	Continuous: 392°F (200°C); Short term: 482°F (250°C)

Makro TZ 20 HMH/AMH; HMHD/AMHD:

<i>Pump type:</i>	Hydraulically-actuated diaphragm (packed plunger drives hydraulic fluid behind diaphragm)
<i>Max. stroke length:</i>	0.787" (20 mm)
<i>Diaphragm:</i>	PTFE faced EPDM with secondary PTFE faced EPDM backer
<i>Diaphragm failure indication:</i>	Integral to composite diaphragm, with micro-switch indicating separation of plies
<i>Pressure relief:</i>	Built-in hydraulic pressure relief valve. No external pressure relief valve required.
<i>Repeatability:</i>	When installed and operated according to instructions, better than $\pm 0.5\%$ of rated capacity.

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:

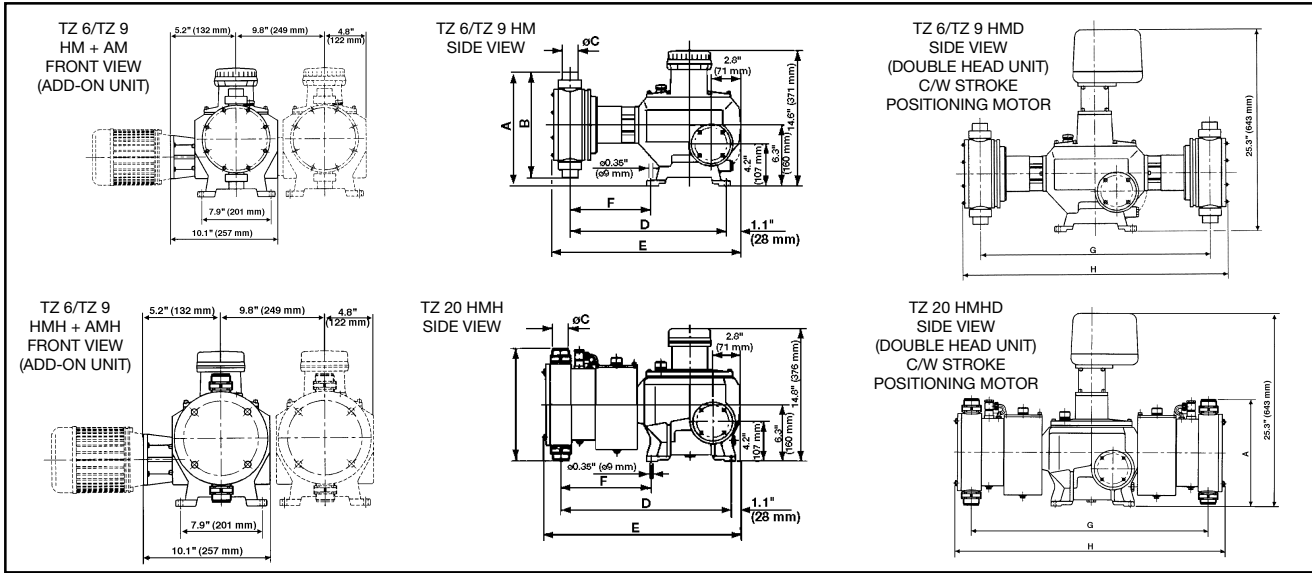
Suction lift min./max., or	ft. (m) _____
Positive suction head min./max., or	ft. (m) _____
Pressure in chemical tank	psig (bar) _____
Length of suction line	ft. (m) _____
Size (I.D.) of suction line	in. (mm) _____
Number of valves and fittings in suction line	_____

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

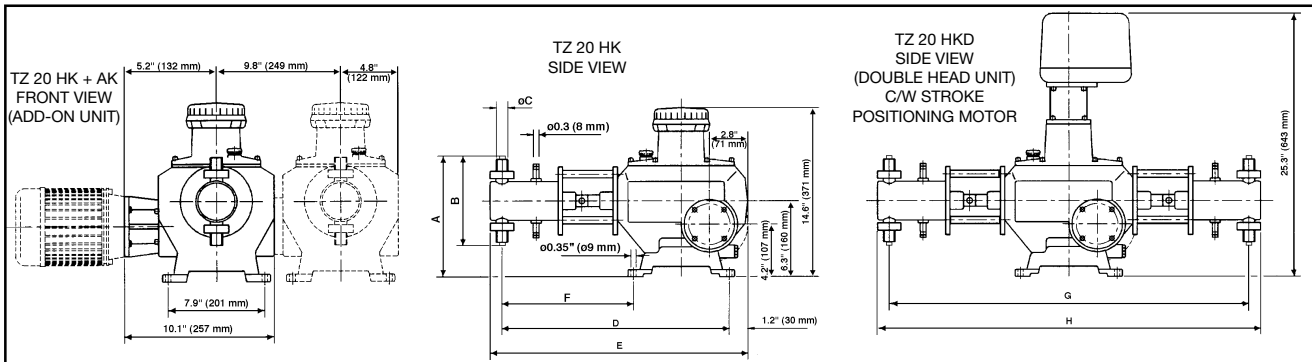
Dimensions: Makro



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					20.3 (515)**			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					22.0 (559)**			32.5 (826)**

* For PP, P and PTFE liquid end(s).

** For 316 Stainless Steel liquid end(s) only.

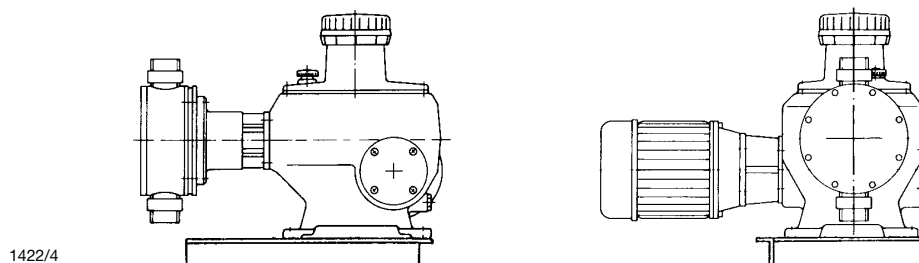


Pump Type	A	B	C*	D	E	F	G	H
12 S	11.1 (282)	9.6 (243)	1/4" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
17 S	11.1 (282)	9.6 (243)	1/4" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
23 S	11.1 (282)	9.6 (243)	3/8" FNPT	21.3 (540)	23.3 (592)	12.6 (320)	33.1 (840)	33.1 (842)
30 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.

Technical Data: Makro TZ 6 HM

Diaphragm metering pumps



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Recommended motor for simplex pumps is 1.5 HP. Motor is not included with pump. A pressure relief valve is required on the discharge line. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

Liquid End	Suction lift	
	ft	(m)
130	19.5	(6)
260	16.0	(5)
530	13.0	(4)
1500	8.0	(2.5)

Makro TZ 6 main pumps HM

Pump version		Part no.	Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. MNPT		Shipping weight	
			Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/stroke	in.	lbs.	(kg)
TZ 6 HM 20-130	PP	920601	86	145	(10)	33	(125)	24.2	3/4	105	(47.5)
	P	920602	86	145	(10)	33	(125)	24.2	3/4	105	(47.5)
	T	920603	86	145	(10)	33	(125)	24.2	3/4	105	(47.5)
	S	920604	86	174	(12)	33	(125)	24.2	3/4	116	(52.5)
TZ 6 HM 15-130	PP	920606	115	145	(10)	44	(167)	24.2	3/4	105	(47.5)
	P	920607	115	145	(10)	44	(167)	24.2	3/4	105	(47.5)
	T	920608	115	145	(10)	44	(167)	24.2	3/4	105	(47.5)
	S	920609	115	174	(12)	44	(167)	24.2	3/4	116	(52.5)
TZ 6 HM 12-130	PP	920611	144	145	(10)	55	(209)	24.2	3/4	105	(47.5)
	P	920612	144	145	(10)	55	(209)	24.2	3/4	105	(47.5)
	T	920613	144	145	(10)	55	(209)	24.2	3/4	105	(47.5)
	S	920614	144	174	(12)	55	(209)	24.2	3/4	116	(52.5)
TZ 6 HM 10-130	PP	920616	172	145	(10)	66	(251)	24.2	3/4	105	(47.5)
	P	920617	172	145	(10)	66	(251)	24.2	3/4	105	(47.5)
	T	920618	172	145	(10)	66	(251)	24.2	3/4	105	(47.5)
	S	920619	172	174	(12)	66	(251)	24.2	3/4	116	(52.5)
TZ 6 HM 20-260	PP	920621	86	145	(10)	60	(228)	44.0	3/4	105	(47.5)
	P	920622	86	145	(10)	60	(228)	44.0	3/4	105	(47.5)
	T	920623	86	145	(10)	60	(228)	44.0	3/4	105	(47.5)
	S	920624	86	174	(12)	60	(228)	44.0	3/4	116	(52.5)
TZ 6 HM 15-260	PP	920626	115	145	(10)	80	(304)	44.0	3/4	105	(47.5)
	P	920627	115	145	(10)	80	(304)	44.0	3/4	105	(47.5)
	T	920628	115	145	(10)	80	(304)	44.0	3/4	105	(47.5)
	S	920629	115	174	(12)	80	(304)	44.0	3/4	116	(52.5)
TZ 6 HM 12-260	PP	920631	144	145	(10)	100	(381)	44.0	3/4	105	(47.5)
	P	920632	144	145	(10)	100	(381)	44.0	3/4	105	(47.5)
	T	920633	144	145	(10)	100	(381)	44.0	3/4	105	(47.5)
	S	920634	144	174	(12)	100	(381)	44.0	3/4	116	(52.5)
TZ 6 HM 10-260	PP	920636	172	145	(10)	120	(457)	44.0	3/4	105	(47.5)
	P	920637	172	145	(10)	120	(457)	44.0	3/4	105	(47.5)
	T	920638	172	145	(10)	120	(457)	44.0	3/4	105	(47.5)
	S	920639	172	174	(12)	120	(457)	44.0	3/4	116	(52.5)

Technical Data: Makro TZ 6 HM

Diaphragm metering pumps

Makro TZ 6 main pumps HM, continued

Pump version		Part no.	Stroking rate at 1725 RPM Strokes per min.	Maximum backpressure psig (bar)		Capacity at maximum backpressure U.S. (L/h) GPH		mL/ stroke	Suction and Discharge Conn. MNPT in.	Shipping weight lbs. (kg)	
TZ 6 HM 20-530	PP	920641	86	87	(6)	125	(476)	91.8	1	106	(48)
	P	920642	86	87	(6)	125	(476)	91.8	1	106	(48)
	T	920643	86	87	(6)	125	(476)	91.8	1	106	(48)
	S	920644	86	87	(6)	125	(476)	91.8	1	125	(56.5)
TZ 6 HM 15-530	PP	920646	115	87	(6)	167	(634)	91.8	1	106	(48)
	P	920647	115	87	(6)	167	(634)	91.8	1	106	(48)
	T	920648	115	87	(6)	167	(634)	91.8	1	106	(48)
	S	920649	115	87	(6)	167	(634)	91.8	1	125	(56.5)
TZ 6 HM 12-530	PP	920651	144	87	(6)	209	(793)	91.8	1	106	(48)
	P	920652	144	87	(6)	209	(793)	91.8	1	106	(48)
	T	920653	144	87	(6)	209	(793)	91.8	1	106	(48)
	S	920654	144	87	(6)	209	(793)	91.8	1	125	(56.5)
TZ 6 HM 10-530	PP	920656	172	87	(6)	251	(952)	91.8	1	106	(48)
	P	920657	172	87	(6)	251	(952)	91.8	1	106	(48)
	T	920658	172	87	(6)	251	(952)	91.8	1	106	(48)
	S	920659	172	87	(6)	251	(952)	91.8	1	125	(56.5)
TZ 6 HM 20-1500	PP	920661	86	44	(3)	237	(900)	174	1-1/2	136	(61)
	P	920662	86	44	(3)	237	(900)	174	1-1/2	136	(61)
	T	920663	86	44	(3)	237	(900)	174	1-1/2	136	(61)
	S	920664	86	44	(3)	237	(900)	174	1-1/2	191	(86.5)
TZ 6 HM 15-1500	PP	920666	115	44	(3)	317	(1200)	174	1-1/2	136	(61)
	P	920667	115	44	(3)	317	(1200)	174	1-1/2	136	(61)
	T	920668	115	44	(3)	317	(1200)	174	1-1/2	136	(61)
	S	920669	115	44	(3)	317	(1200)	174	1-1/2	191	(86.5)
TZ 6 HM 12-1500	PP	920671	144	44	(3)	396	(1500)	174	1-1/2	136	(61)
	P	920672	144	44	(3)	396	(1500)	174	1-1/2	136	(61)
	T	920673	144	44	(3)	396	(1500)	174	1-1/2	136	(61)
	S	920674	144	44	(3)	396	(1500)	174	1-1/2	191	(86.5)
TZ 6 HM 10-1500	PP	920676	172	44	(3)	475	(1800)	174	1-1/2	136	(61)
	P	920677	172	44	(3)	475	(1800)	174	1-1/2	136	(61)
	T	920678	172	44	(3)	475	(1800)	174	1-1/2	136	(61)
	S	920679	172	44	(3)	475	(1800)	174	1-1/2	191	(86.5)

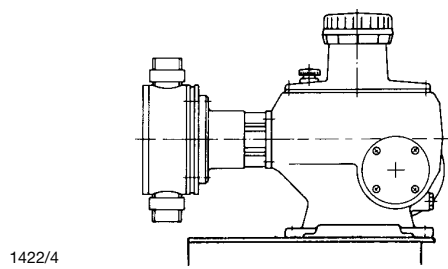
Media-contacted materials:

130, 260, 530 Liquid ends				1500 Liquid ends		
Liquid end and connectors	Valve balls	Seals	Valve Seat	Valve Springs	Seals	Valve Seat
PP = Polypropylene	Borosilicate glass	EPDM	EPDM	Hastelloy C	PTFE	PTFE
P = PVC (polyvinyl chloride)	Borosilicate glass	Viton®	Viton®	Hastelloy C	PTFE	PTFE
T = PTFE (polytetrafluoroethylene)	Ceramic	PTFE	PTFE	Hastelloy C	PTFE	PTFE
S = 316 Stainless steel	SS	PTFE	PTFE	Hastelloy C	PTFE	PTFE

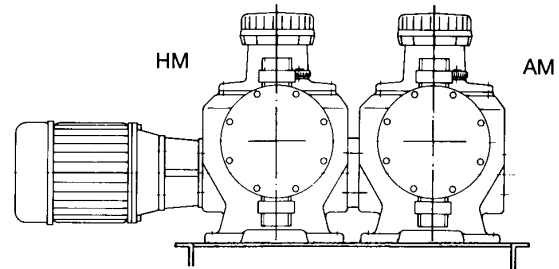
Viton® is a registered trademark of DuPont Dow Elastomers.

Technical Data: Makro TZ 6 AM

Diaphragm metering pump add-on modules



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The ProMinent Makro TZ AM add-on pump modules can be combined with any Makro TZ HM, HK or HMM main pump to form duplex or triplex pumps at rated pressure. Additional add-on pumps can be multiplexed at reduced pressure. If ordered as such, multiplex pumps will be provided completely assembled. Multiplex Makro pumps must be mounted on a baseplate. Makro TZ pumps can be multiplexed in the field; all the necessary components are supplied with the add-on pump.

The Makro TZ AM add-on modules may be driven by any Makro main pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure ratings of both must be reduced.

Duplex pump strokes are 180° out of phase, with no additional HP requirement. Contact ProMinent for brake HP requirements for two or more add-on pumps, and for reduced pressure ratings for three or more add-ons. Each add-on pump has its own independent stroke length control, and may be automatically controlled independent of the main pump using a stroke positioning system. A pressure relief valve is required on the discharge line.

Makro TZ 6 add-on pumps AM

Pump version	Part no.	Stroking rate at 1725 RPM		Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. MNPT		Shipping weight	
		Strokes per min.		psig	(bar)	U.S. GPH	(L/h)	mL/stroke	in.	lbs.	(kg)
TZ 6 AM 20-130	PP	920701	86	145	(10)	33	(125)	24.2	3/4	83	(37.5)
	P	920702	86	145	(10)	33	(125)	24.2	3/4	83	(37.5)
	T	920703	86	145	(10)	33	(125)	24.2	3/4	83	(37.5)
	S	920704	86	174	(12)	33	(125)	24.2	3/4	94	(42.5)
TZ 6 AM 15-130	PP	920706	115	145	(10)	44	(167)	24.2	3/4	83	(37.5)
	P	920707	115	145	(10)	44	(167)	24.2	3/4	83	(37.5)
	T	920708	115	145	(10)	44	(167)	24.2	3/4	83	(37.5)
	S	920709	115	174	(12)	44	(167)	24.2	3/4	94	(42.5)
TZ 6 AM 12-130	PP	920711	144	145	(10)	55	(209)	24.2	3/4	83	(37.5)
	P	920712	144	145	(10)	55	(209)	24.2	3/4	83	(37.5)
	T	920713	144	145	(10)	55	(209)	24.2	3/4	83	(37.5)
	S	920714	144	174	(12)	55	(209)	24.2	3/4	94	(42.5)
TZ 6 AM 10-130	PP	920716	172	145	(10)	66	(251)	24.2	3/4	83	(37.5)
	P	920717	172	145	(10)	66	(251)	24.2	3/4	83	(37.5)
	T	920718	172	145	(10)	66	(251)	24.2	3/4	83	(37.5)
	S	920719	172	174	(12)	66	(251)	24.2	3/4	94	(42.5)
TZ 6 AM 20-260	PP	920721	86	145	(10)	60	(228)	44.0	3/4	83	(37.5)
	P	920722	86	145	(10)	60	(228)	44.0	3/4	83	(37.5)
	T	920723	86	145	(10)	60	(228)	44.0	3/4	83	(37.5)
	S	920724	86	174	(12)	60	(228)	44.0	3/4	94	(42.5)
TZ 6 AM 15-260	PP	920726	115	145	(10)	80	(304)	44.0	3/4	83	(37.5)
	P	920727	115	145	(10)	80	(304)	44.0	3/4	83	(37.5)
	T	920728	115	145	(10)	80	(304)	44.0	3/4	83	(37.5)
	S	920729	115	174	(12)	80	(304)	44.0	3/4	94	(42.5)
TZ 6 AM 12-260	PP	920731	144	145	(10)	100	(381)	44.0	3/4	83	(37.5)
	P	920732	144	145	(10)	100	(381)	44.0	3/4	83	(37.5)
	T	920733	144	145	(10)	100	(381)	44.0	3/4	83	(37.5)
	S	920734	144	174	(12)	100	(381)	44.0	3/4	94	(42.5)
TZ 6 AM 10-260	PP	920736	172	145	(10)	120	(457)	44.0	3/4	83	(37.5)
	P	920737	172	145	(10)	120	(457)	44.0	3/4	83	(37.5)
	T	920738	172	145	(10)	120	(457)	44.0	3/4	83	(37.5)
	S	920739	172	174	(12)	120	(457)	44.0	3/4	94	(42.5)

Technical Data: Makro TZ 6 AM

Diaphragm metering pump add-on modules

Makro TZ 6 add-on pumps AM, continued

Pump version		Part no.	Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. MNPT		Shipping weight	
			Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	(kg)
TZ 6 AM 20-530	PP	920741	86	87	(6)	125	(476)	91.8	1	84	(38)
	P	920742	86	87	(6)	125	(476)	91.8	1	84	(38)
	T	920743	86	87	(6)	125	(476)	91.8	1	84	(38)
	S	920744	86	87	(6)	125	(476)	91.8	1	103	(46.5)
TZ 6 AM 15-530	PP	920746	115	87	(6)	167	(634)	91.8	1	84	(38)
	P	920747	115	87	(6)	167	(634)	91.8	1	84	(38)
	T	920748	115	87	(6)	167	(634)	91.8	1	84	(38)
	S	920749	115	87	(6)	167	(634)	91.8	1	103	(46.5)
TZ 6 AM 12-530	PP	920751	144	87	(6)	209	(793)	91.8	1	84	(38)
	P	920752	144	87	(6)	209	(793)	91.8	1	84	(38)
	T	920753	144	87	(6)	209	(793)	91.8	1	84	(38)
	S	920754	144	87	(6)	209	(793)	91.8	1	103	(46.5)
TZ 6 AM 10-530	PP	920756	172	87	(6)	251	(952)	91.8	1	84	(38)
	P	920757	172	87	(6)	251	(952)	91.8	1	84	(38)
	T	920758	172	87	(6)	251	(952)	91.8	1	84	(38)
	S	920759	172	87	(6)	251	(952)	91.8	1	103	(46.5)
TZ 6 AM 20-1500	PP	920761	86	44	(3)	237	(900)	174	1-1/2	114	(51.1)
	P	920762	86	44	(3)	237	(900)	174	1-1/2	114	(51.1)
	T	920763	86	44	(3)	237	(900)	174	1-1/2	114	(51.1)
	S	920764	86	44	(3)	237	(900)	174	1-1/2	169	(76.5)
TZ 6 AM 15-1500	PP	920766	115	44	(3)	317	(1200)	174	1-1/2	114	(51.1)
	P	920767	115	44	(3)	317	(1200)	174	1-1/2	114	(51.1)
	T	920768	115	44	(3)	317	(1200)	174	1-1/2	114	(51.1)
	S	920769	115	44	(3)	317	(1200)	174	1-1/2	169	(76.5)
TZ 6 AM 12-1500	PP	920771	144	44	(3)	396	(1500)	174	1-1/2	114	(51.1)
	P	920772	144	44	(3)	396	(1500)	174	1-1/2	114	(51.1)
	T	920773	144	44	(3)	396	(1500)	174	1-1/2	114	(51.1)
	S	920774	144	44	(3)	396	(1500)	174	1-1/2	169	(76.5)
TZ 6 AM 10-1500	PP	920776	172	44	(3)	475	(1800)	174	1-1/2	114	(51.1)
	P	920777	172	44	(3)	475	(1800)	174	1-1/2	114	(51.1)
	T	920778	172	44	(3)	475	(1800)	174	1-1/2	114	(51.1)
	S	920779	172	44	(3)	475	(1800)	174	1-1/2	169	(76.5)

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	Part no.	Weight	
		lbs.	(kg)
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

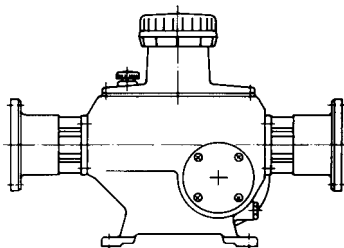
Technical Data: Makro TZ 6 HMD duplex diaphragm metering pumps and Makro TZ AMD duplex add-on modules

Recommended motor for duplex pumps is 1.5 HP. Motor is not included with pump. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

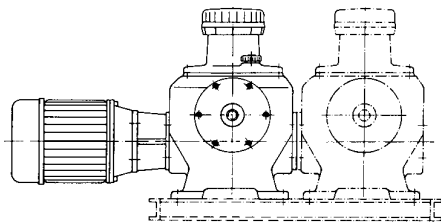
The HMD's two pump heads operate in a push-pull fashion, 180° out of phase. The stroke length knob controls both liquid ends; independent stroke length adjustment is not possible.

The AMD is a duplex add-on pump module which may be connected to any Makro main drive pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure rating of both must be reduced. For a complete HMD or AMD pump, select the main pump on this page to correspond to the liquid ends (e.g. FM-130 P) on the next page. Two liquid ends are required per pump. A pressure relief valve is required on the discharge line.

Makro TZ 6 HMD (main pump)



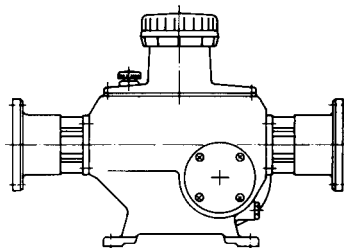
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Power end	Motor capacity HP	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
			lbs.	(kg)	
TZ 6 HMD 20	1-1/2	86	121	(55)	920685
TZ 6 HMD 15	1-1/2	115	121	(55)	920686
TZ 6 HMD 12	1-1/2	144	121	(55)	920687
TZ 6 HMD 10	1-1/2	172	121	(55)	920688

Makro TZ 6 AMD (add-on pump)



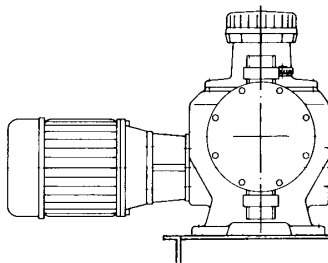
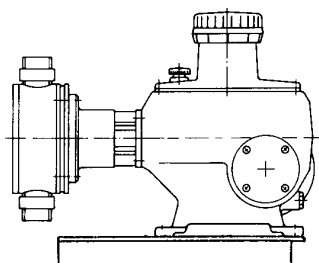
1167/3

Power end	Strokes per minute (at 1725 RPM)	Drive Unit Shipping weight		Part no.
		lbs.	(kg)	
TZ 6 AMD 20	86	90	(41)	806515
TZ 6 AMD 15	115	90	(41)	806516
TZ 6 AMD 12	144	90	(41)	806517
TZ 6 AMD 10	172	90	(41)	806518

Note: A base frame is required if Makro TZ main pumps are to be combined with add-on pumps (description follows liquid end section).

Technical Data: Makro TZ 9 HM

Diaphragm metering pumps



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Recommended motor for simplex pumps is 1.5 HP. Motor is not included with pump. A pressure relief valve is required on the discharge line. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

Liquid End	Suction lift	
	ft	(m)
2100	9.8	3

Makro TZ 9 main pumps HM

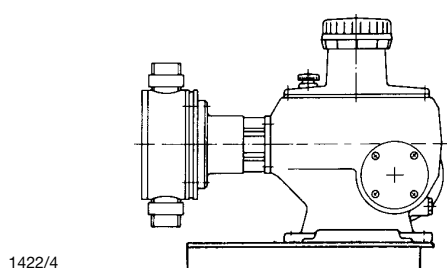
Pump version	Part no.	Stroking rate at 1725 RPM Strokes per min.	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. MNPT		Shipping weight	
			psig	(bar)	U.S. GPH	(L/h)	mL/stroke	in.	lbs.	(kg)
TZ 9 HM 20-2100	PP	1000763	87	44 (3)	330	(1250)	240	1-1/2	136	(61.5)
	P	1000766	87	44 (3)	330	(1250)	240	1-1/2	136	(61.5)
	T	1000768	87	44 (3)	330	(1250)	240	1-1/2	136	(61.5)
	S	1000769	87	44 (3)	330	(1250)	240	1-1/2	191	(86.5)
TZ 9 HM 15-2100	PP	1000771	117	44 (3)	445	(1685)	240	1-1/2	136	(61.5)
	P	1000772	117	44 (3)	445	(1685)	240	1-1/2	136	(61.5)
	T	1000773	117	44 (3)	445	(1685)	240	1-1/2	136	(61.5)
	S	1000774	117	44 (3)	445	(1685)	240	1-1/2	191	(86.5)
TZ 9 HM 12-2100	PP	1000776	146	44 (3)	555	(2100)	240	1-1/2	136	(61.5)
	P	1000777	146	44 (3)	555	(2100)	240	1-1/2	136	(61.5)
	T	1000778	146	44 (3)	555	(2100)	240	1-1/2	136	(61.5)
	S	1000779	146	44 (3)	555	(2100)	240	1-1/2	191	(86.5)
TZ 9 HM 10-2100	PP	1000780	172	44 (3)	658	(2490)	240	1-1/2	136	(61.5)
	P	1000781	172	44 (3)	658	(2490)	240	1-1/2	136	(61.5)
	T	1000782	172	44 (3)	658	(2490)	240	1-1/2	136	(61.5)
	S	1000783	172	44 (3)	658	(2490)	240	1-1/2	191	(86.5)

Media-contacted materials:

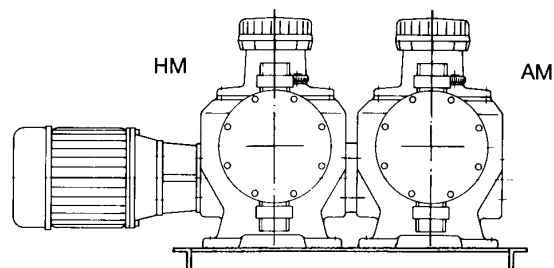
Liquid end and connectors	Valve Springs	Seals	Valve Seat
PP = Polypropylene	Hastelloy C	PTFE	PTFE
P = PVC (polyvinyl chloride)	Hastelloy C	PTFE	PTFE
T = PTFE (polytetrafluoroethylene)	Hastelloy C	PTFE	PTFE
S = 316 Stainless steel	Hastelloy C	PTFE	PTFE

Technical Data: Makro TZ 9 AM

Diaphragm metering pump add-on modules



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The ProMinent Makro TZ AM add-on pump modules can be combined with any Makro TZ HM, HK or HMM main pump to form duplex or triplex pumps at rated pressure. Additional add-on pumps can be multiplexed at reduced pressure. If ordered as such, multiplex pumps will be provided completely assembled. Multiplex Makro pumps must be mounted on a baseplate. Makro TZ pumps can be multiplexed in the field; all the necessary components are supplied with the add-on pump.

The Makro TZ AM add-on modules may be driven by any Makro main pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure ratings of both must be reduced.

Duplex pump strokes are 180° out of phase, with no additional HP requirement. Contact ProMinent for brake HP requirements for two or more add-on pumps, and for reduced pressure ratings for three or more add-ons. Each add-on pump has its own independent stroke length control, and may be automatically controlled independent of the main pump using a stroke positioning system. A pressure relief valve is required on the discharge line.

Makro TZ 9 add-on pumps AM

Pump version	Part no.	Stroking rate at 1725 RPM		Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. MNPT		Shipping weight	
		Strokes per min.		psig	(bar)	U.S. GPH	(L/h)	mL/stroke	in.	lbs.	(kg)
TZ 9 AM 20-2100	PP	1000784	87	44	(3)	330	(1250)	240	1-1/2	114	(51.1)
	P	1000785	87	44	(3)	330	(1250)	240	1-1/2	114	(51.1)
	T	1000786	87	44	(3)	330	(1250)	240	1-1/2	114	(51.1)
	S	1000787	87	44	(3)	330	(1250)	240	1-1/2	169	(76.5)
TZ 9 AM 15-2100	PP	1000788	117	44	(3)	445	(1685)	240	1-1/2	114	(51.1)
	P	1000789	117	44	(3)	445	(1685)	240	1-1/2	114	(51.1)
	T	1000790	117	44	(3)	445	(1685)	240	1-1/2	114	(51.1)
	S	1000791	117	44	(3)	445	(1685)	240	1-1/2	169	(76.5)
TZ 9 AM 12-2100	PP	1000792	146	44	(3)	555	(2100)	240	1-1/2	114	(51.1)
	P	1000793	146	44	(3)	555	(2100)	240	1-1/2	114	(51.1)
	T	1000794	146	44	(3)	555	(2100)	240	1-1/2	114	(51.1)
	S	1000795	146	44	(3)	555	(2100)	240	1-1/2	169	(76.5)
TZ 9 AM 10-2100	PP	1000796	172	44	(3)	658	(2490)	240	1-1/2	114	(51.1)
	P	1000797	172	44	(3)	658	(2490)	240	1-1/2	114	(51.1)
	T	1000798	172	44	(3)	658	(2490)	240	1-1/2	114	(51.1)
	S	1000799	172	44	(3)	658	(2490)	240	1-1/2	169	(76.5)

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	Part no.	Weight	
		lbs.	(kg)
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

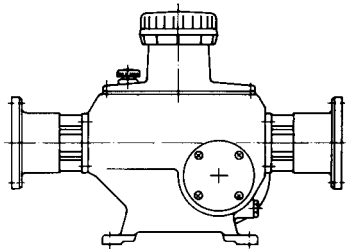
Technical Data: Makro TZ 9 HMD duplex diaphragm metering pumps and Makro TZ AMD duplex add-on modules

Recommended motor for duplex pumps is 1.5 HP. Motor is not included with pump. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

The HMD's two pump heads operate in a push-pull fashion, 180° out of phase. The stroke length knob controls both liquid ends; independent stroke length adjustment is not possible.

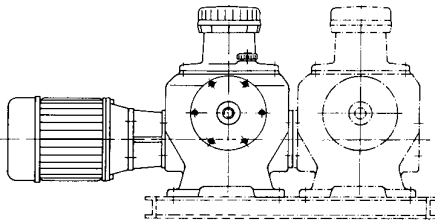
The AMD is a duplex add-on pump module which may be connected to any Makro main drive pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure rating of both must be reduced. For a complete HMD or AMD pump, select the main pump on this page to correspond to the liquid ends (e.g. FM-130 P) on the next page. Two liquid ends are required per pump. A pressure relief valve is required on the discharge line.

Makro TZ 9 HMD (main pump)



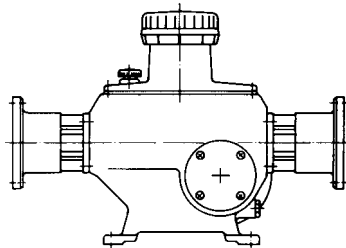
1167/3

Power end	Motor capacity HP	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
			lbs.	(kg)	
TZ 9 HMD 20	1-1/2	86	121	(55)	1000800
TZ 9 HMD 15	1-1/2	115	121	(55)	1000801
TZ 9 HMD 12	1-1/2	144	121	(55)	1000802
TZ 9 HMD 10	1-1/2	172	121	(55)	1000803



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Makro TZ 9 AMD (add-on pump)



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Power end	Strokes per minute (at 1725 RPM)	Drive Unit Shipping weight		Part no.
		lbs.	(kg)	
TZ 9 AMD 20	86	90	(41)	1000804
TZ 9 AMD 15	115	90	(41)	1000805
TZ 9 AMD 12	144	90	(41)	1000806
TZ 9 AMD 10	172	90	(41)	1000807

Note: A base frame is required if Makro TZ main pumps are to be combined with add-on pumps (description follows liquid end section).

Technical Data: Makro TZ

Diaphragm-type liquid ends for HMD/AMD pumps

ProMinent Makro TZ diaphragm-type liquid ends

Note: Two liquid ends are required for each duplex pump.

Note: Two liquid ends are required for each duplex pump.										Maximum capacity at different reduction ratios per liquid end: GPH (L/h)				Part no.
Liquid end			Materials			Weight lbs. (kg)		Maximum backpressure psig (bar)		Reduction ratio (match to power end)				
Type	Suction and Discharge Conn. NPT in.	Liquid end connector material	Valve balls**	Seals	20					15	12	10		
					Strokes per min.									
					86	115	144	172						
FM-130	PP	3/4	PP	Borosilicate Glass	EPDM	8	(3.5)	145	(10)	33 (125)	44 (167)	55 (209)	66 (251)	910401
	P		PVC	Borosilicate Glass	Viton® A	8	(3.5)	145	(10)					910402
	T		PTFE	Ceramic	PTFE	8	(3.5)	145	(10)					910403
	S		SS	SS	PTFE	19	(8.5)	174	(12)					910404
FM-260	PP	3/4	PP	Borosilicate Glass	EPDM	8	(3.5)	145	(10)	60 (228)	80 (304)	100 (381)	120 (457)	910407
	P		PVC	Borosilicate Glass	Viton® A	8	(3.5)	145	(10)					910408
	T		PTFE	Ceramic	PTFE	8	(3.5)	145	(10)					910409
	S		SS	SS	PTFE	19	(8.5)	174	(12)					910410
FM-530	PP	1	PP	Borosilicate Glass	EPDM	9	(4)	73*	(5)*	125 (476)	167 (634)	209 (793)	251 (952)	910413
	P		PVC	Borosilicate Glass	Viton® A	9	(4)	73*	(5)*					910414
	T		PTFE	Ceramic	PTFE	9	(4)	73*	(5)*					910415
	S		SS	SS	PTFE	28	(12.5)	73*	(5)*					910416
FM-1500	PP	1-1/2	PP	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*	237 (900)	317 (1200)	396 (1500)	475 (1800)	1001245
	P		PVC	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*					1001244
	T		PTFE	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*					1001246
	S		SS	Hastelloy C	PTFE	94	(42.5)	36*	(2.5)*					1001247
FM-2100	PP	1-1/2	PP	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*	330 (1250)	445 (1685)	555 (2100)	658 (2490)	1001245
	P		PVC	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*					1001244
	T		PTFE	Hastelloy C	PTFE	39	(17.5)	36*	(2.5)*					1001246
	S		SS	Hastelloy C	PTFE	94	(42.5)	36*	(2.5)*					1001247

* The admissible working pressure of 530 and 1500 twin-head pumps is reduced from 87 to 73 psig (6 to 5 bar), and 44 to 36 psig (3 to 2.5 bar), compared to simplex models.

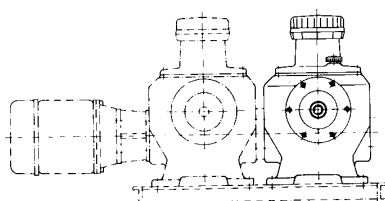
** The valves of liquid end types...1500/2100 PP, P, T and S are equipped with disc valves instead of ball valves. The valve disc and spring are made of Hastelloy C.

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	Part No.	Weight - lbs.	(kg)
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

Recommended motor capacities for Makro TZ multiplex pumps

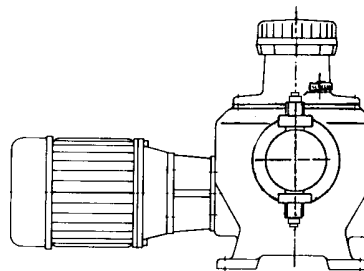
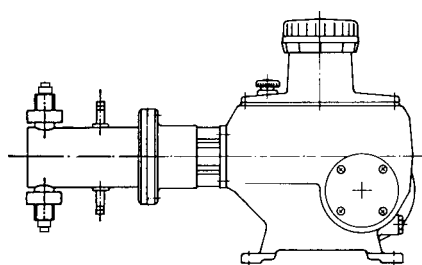


Type	Duplex pump	Triplex pump	Quadruplex pump	Duplex twin-head pump
TZ 6/9 HM 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 101...	3 HP	5 HP	5 HP	5 HP

Technical Data: Makro TZ 20 HK

Packed-plunger metering pumps

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See table of capacities for recommended motor HP. Motor is not included with pump. A pressure relief valve is required on the discharge line. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

ProMinent Makro TZ 20 main pumps HK

			Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. NPT		Shipping weight	
Pump version		Part no.	Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	(kg)
TZ 20 HK	20-12 S	920801	86	4640	(320)	2.6	(10)	2.0	1/4 F	110	(50)
	15-12 S	920803	115	4640	(320)	3.7	(14)	2.0	1/4 F	110	(50)
	12-12 S	920805	144	4640	(320)	4.5	(17)	2.0	1/4 F	110	(50)
	10-12 S	920807	172	4640	(320)	5.5	(21)	2.0	1/4 F	110	(50)
TZ 20 HK	20-17 S	920810	86	4640	(320)	5.5	(21)	4.1	1/4 F	110	(50)
	15-17 S	920812	115	3393	(234)	7.4	(28)	4.1	1/4 F	110	(50)
	*151-17 S	920813	115	4640	(320)	7.4	(28)	4.1	1/4 F	119	(54)
	12-17 S	920814	144	2711	(187)	9.2	(35)	4.1	1/4 F	110	(50)
	*121-17 S	920815	144	4640	(320)	9.2	(35)	4.1	1/4 F	119	(54)
	10-17 S	920816	172	2262	(156)	11	(42)	4.1	1/4 F	110	(50)
	*101-17 S	920817	172	4538	(313)	11	(42)	4.1	1/4 F	119	(54)
TZ 20 HK	20-23 S	920820	86	2436	(168)	10	(39)	7.6	3/8 F	112	(51)
	*201-23 S	920821	86	2784	(192)	10	(39)	7.6	3/8 F	121	(55)
	15-23 S	920822	115	1812	(125)	14	(53)	7.6	3/8 F	112	(51)
	*151-23 S	920823	115	2784	(192)	14	(53)	7.6	3/8 F	121	(55)
	12-23 S	920824	144	1450	(100)	17	(66)	7.6	3/8 F	112	(51)
	*121-23 S	920825	144	2784	(192)	17	(66)	7.6	3/8 F	121	(55)
	10-23 S	920826	172	1203	(83)	20	(79)	7.6	3/8 F	112	(51)
	*101-23 S	920827	172	2436	(168)	20	(79)	7.6	3/8 F	121	(55)
TZ 20 HK	20-30 S	920830	86	1392	(96)	18	(69)	13.3	3/8 F	115	(52)
	*201-30 S	920831	86	1638	(113)	18	(69)	13.3	3/8 F	123	(56)
	15-30 S	920832	115	1029	(71)	24	(92)	13.3	3/8 F	115	(52)
	*151-30 S	920833	115	1638	(113)	24	(92)	13.3	3/8 F	123	(56)
	12-30 S	920834	144	826	(57)	30	(115)	13.3	3/8 F	115	(52)
	*121-30 S	920835	144	1638	(113)	30	(115)	13.3	3/8 F	123	(56)
	10-30 S	920836	172	681	(47)	36	(138)	13.3	3/8 F	115	(52)
	*101-30 S	920837	172	1392	(96)	36	(138)	13.3	3/8 F	123	(56)
TZ 20 HK	20-40 S	920840	86	754	(52)	33	(125)	24.2	3/4 M	119	(54)
	*201-40 S	920841	86	913	(63)	33	(125)	24.2	3/4 M	128	(58)
	15-40 S	920842	115	565	(39)	44	(167)	24.2	3/4 M	119	(54)
	*151-40 S	920843	115	913	(63)	44	(167)	24.2	3/4 M	128	(58)
	12-40 S	920844	144	449	(31)	55	(209)	24.2	3/4 M	119	(54)
	*121-40 S	920845	144	913	(63)	55	(209)	24.2	3/4 M	128	(58)
	10-40 S	920846	172	377	(26)	66	(250)	24.2	3/4 M	119	(54)
	*101-40 S	920847	172	754	(52)	66	(250)	24.2	3/4 M	128	(58)

* REQUIRED: P.N. 7951144 Adapter mounting flange and motor shaft coupling.

Technical Data: Makro TZ 20 HK

Packed-plunger metering pumps

ProMinent Makro TZ 20 main pumps HK, continued

		Part no.	Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. NPT		Shipping weight	
Pump version			Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	(kg)
TZ 20 HK	20-50 S	920850	86	478	(33)	51	(195)	37.7	3/4 M	119	(54)
	*201-50 S	920851	86	580	(40)	51	(195)	37.7	3/4 M	128	(58)
	15-50 S	920852	115	362	(25)	68	(261)	37.7	3/4 M	119	(54)
	*151-50 S	920853	115	580	(40)	68	(261)	37.7	3/4 M	128	(58)
	12-50 S	920854	144	275	(19)	86	(326)	37.7	3/4 M	119	(54)
	*121-50 S	920855	144	580	(40)	86	(326)	37.7	3/4 M	128	(58)
	10-50 S	920856	172	232	(16)	103	(391)	37.7	3/4 M	119	(54)
	*101-50 S	920857	172	478	(33)	103	(391)	37.7	3/4 M	128	(58)
TZ 20 HK	20-60 S	920860	86	319	(22)	75	(284)	54.9	1 M	128	(58)
	*201-60 S	920861	86	406	(28)	75	(284)	54.9	1 M	137	(62)
	15-60 S	920862	115	246	(17)	100	(379)	54.9	1 M	128	(58)
	*151-60 S	920863	115	406	(28)	100	(379)	54.9	1 M	137	(62)
	12-60 S	920864	144	188	(13)	125	(474)	54.9	1 M	128	(58)
	*121-60 S	920865	144	391	(27)	125	(474)	54.9	1 M	137	(62)
	10-60 S	920866	172	159	(11)	150	(568)	54.9	1 M	128	(58)
	*101-60 S	920867	172	319	(22)	150	(568)	54.9	1 M	137	(62)
TZ 20 HK	20-70 S	920870	86	232	(16)	102	(387)	74.7	1 M	128	(58)
	*201-70 S	920871	86	290	(20)	102	(387)	74.7	1 M	137	(62)
	15-70 S	920872	115	174	(12)	136	(516)	74.7	1 M	128	(58)
	*151-70 S	920873	115	290	(20)	136	(516)	74.7	1 M	137	(62)
	12-70 S	920874	144	130	(9)	170	(645)	74.7	1 M	128	(58)
	*121-70 S	920875	144	290	(20)	170	(645)	74.7	1 M	137	(62)
	10-70 S	920876	172	116	(8)	204	(774)	74.7	1 M	128	(58)
	*101-70 S	920877	172	232	(16)	204	(774)	74.7	1 M	137	(62)
TZ 20 HK	20-85 S	920880	86	159	(11)	150	(568)	110	1-1/2 M	141	(64)
	*201-85 S	920881	86	203	(14)	150	(568)	110	1-1/2 M	150	(68)
	15-85 S	920882	115	116	(8)	201	(761)	110	1-1/2 M	141	(64)
	*151-85 S	920883	115	203	(14)	201	(761)	110	1-1/2 M	150	(68)
	12-85 S	920884	144	87	(6)	251	(951)	110	1-1/2 M	141	(64)
	*121-85 S	920885	144	188	(13)	251	(951)	110	1-1/2 M	150	(68)
	10-85 S	920886	172	72	(5)	301	(1141)	110	1-1/2 M	141	(64)
	*101-85 S	920887	172	159	(11)	301	(1141)	110	1-1/2 M	150	(68)

Media-contacted materials:

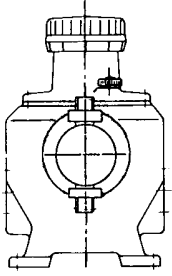
Liquid end and connectors	316 Stainless steel
Valve balls 12-70 S	Ceramic oxide; size 3/4" and 1" stainless steel
Seals	PTFE or PTFE with graphite
Plunger	316 SS/Ceramic
Ball seats	SS
12-30 S	PTFE
40-85 S	
Valve spring	85 S only

Note: The 1/4" and 3/8" suction and discharge connectors have female threads and are equipped with double-ball valves. Connectors from 3/4" and up have male threads and are equipped with single-ball valves.

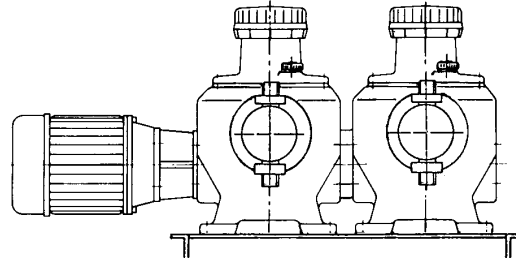
* REQUIRED: P.N. 7951144 Adapter mounting flange and motor shaft coupling.

ProMinent® Makro TZ 20 AK

Packed-plunger pump add-on modules



1421/4



1430/4

The ProMinent Makro TZ AK add-on pump modules can be combined with any Makro TZ main pump to form duplex or triplex pumps at rated pressure. Additional add-on pumps can be multiplexed at reduced pressure. If ordered as such, multiplex pumps will be provided completely assembled. Multiplex Makro pumps must be mounted on a baseplate. Makro TZ pumps can be multiplexed in the field; all the necessary components are supplied with the add-on pump.

The Makro TZ AK add-on modules may be driven by any Makro main pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure ratings of both must be reduced.

Duplex pump strokes are 180° out of phase, with no additional horsepower requirement. Contact ProMinent for brake horsepower requirements for two or more add-on pumps, and for reduced pressure ratings for three or more add-ons. Each add-on pump has its own independent stroke length control, and may be automatically controlled independent of the main pump using a stroke positioning system. A pressure relief valve is required on the discharge line.

ProMinent Makro TZ 20 add-on pumps AK

			Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. NPT		Shipping weight	
Pump version		Part no.	Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	(kg)
TZ 20 AK	20-12 S	920901	86	4640	(320)	2.6	(10)	2.0	1/4 F	88	(40)
	15-12 S	920902	115	4640	(320)	3.7	(14)	2.0	1/4 F	88	(40)
	12-12 S	920903	144	4640	(320)	4.5	(17)	2.0	1/4 F	88	(40)
	10-12 S	920904	172	4640	(320)	5.5	(21)	2.0	1/4 F	88	(40)
TZ 20 AK	20-17 S	920905	86	4640	(320)	5.6	(21)	4.1	1/4 F	88	(40)
	15-17 S	920906	115	4640	(320)	7.4	(28)	4.1	1/4 F	88	(40)
	12-17 S	920907	144	4640	(320)	9.2	(35)	4.1	1/4 F	88	(40)
	10-17 S	920908	172	4538	(313)	11	(42)	4.1	1/4 F	88	(40)
TZ 20 AK	20-23 S	920910	86	2784	(192)	10	(39)	7.6	3/8 F	90	(41)
	15-23 S	920911	115	2784	(192)	14	(53)	7.6	3/8 F	90	(41)
	12-23 S	920912	144	2784	(192)	17	(66)	7.6	3/8 F	90	(41)
	10-23 S	920913	172	2436	(168)	20	(79)	7.6	3/8 F	90	(41)
TZ 20 AK	20-30 S	920915	86	1638	(113)	18	(69)	13.3	3/8 F	93	(42)
	15-30 S	920916	115	1638	(113)	24	(92)	13.3	3/8 F	93	(42)
	12-30 S	920917	144	1638	(113)	30	(115)	13.3	3/8 F	93	(42)
	10-30 S	920918	172	1392	(96)	36	(138)	13.3	3/8 F	93	(42)
TZ 20 AK	20-40 S	920920	86	913	(63)	33	(125)	24.2	3/4 M	97	(44)
	15-40 S	920921	115	913	(63)	44	(167)	24.2	3/4 M	97	(44)
	12-40 S	920922	144	913	(63)	55	(209)	24.2	3/4 M	97	(44)
	10-40 S	920923	172	754	(52)	66	(250)	24.2	3/4 M	97	(44)
TZ 20 AK	20-50 S	920925	86	580	(40)	51	(195)	37.7	3/4 M	97	(44)
	15-50 S	920926	115	580	(40)	68	(261)	37.7	3/4 M	97	(44)
	12-50 S	920927	144	580	(40)	86	(326)	37.7	3/4 M	97	(44)
	10-50 S	920928	172	478	(33)	103	(391)	37.7	3/4 M	97	(44)
TZ 20 AK	20-60 S	920930	86	406	(28)	75	(284)	54.9	1 M	106	(48)
	15-60 S	920931	115	406	(28)	100	(379)	54.9	1 M	106	(48)
	12-60 S	920932	144	391	(27)	125	(474)	54.9	1 M	106	(48)
	10-60 S	920933	172	319	(22)	150	(568)	54.9	1 M	106	(48)
TZ 20 AK	20-70 S	920935	86	290	(20)	102	(387)	74.7	1 M	106	(48)
	15-70 S	920936	115	290	(20)	136	(516)	74.7	1 M	106	(48)
	12-70 S	920937	144	290	(20)	170	(645)	74.7	1 M	106	(48)
	10-70 S	920938	172	232	(16)	204	(774)	74.7	1 M	106	(48)

ProMinent® Makro TZ 20 AK

Packed-plunger pump add-on modules

ProMinent Makro TZ 20 add-on pumps AK, continued

		Stroking rate at 1725 RPM		Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge Conn. NPT		Shipping weight	
Pump version	Part no.	Strokes per min.		psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	(kg)
TZ 20 AK	20-85 S	920940	86	203	(14)	150	(568)	110	1-1/2 M	119	(54)
	15-85 S	920941	115	203	(14)	201	(761)	110	1-1/2 M	119	(54)
	12-85 S	920942	144	188	(13)	251	(951)	110	1-1/2 M	119	(54)
	10-85 S	920943	172	159	(11)	301	(1141)	110	1-1/2 M	119	(54)

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	<u>Part no.</u>	<u>Weight</u>	
		<u>lbs.</u>	<u>(kg)</u>
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

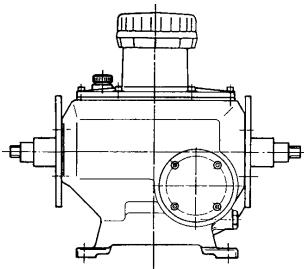
ProMinent® Makro TZ 20 HKD duplex packed-plunger metering pumps and Makro TZ AKD duplex packed-plunger add-on modules

The HKD's two pump heads operate in a push-pull fashion, 180° out of phase. The stroke length knob controls both liquid ends; independent stroke length adjustment is not possible.

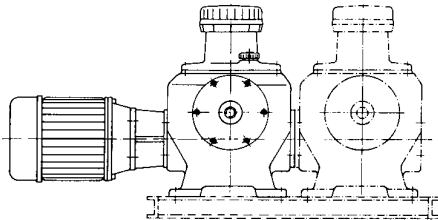
The AKD is a duplex add-on pump module which may be connected to any Makro main drive pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure rating of both must be reduced. For a complete HKD or AKD pump, select the main pump on this page to correspond to the liquid ends (e.g. FK-50/20S) on the next page. Two liquid ends are required per pump.

See table of capacities for recommended motor horsepower. Motor is not included with pump. A pressure relief valve is required on the discharge line. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

Makro TZ 20 HKD (main pump)



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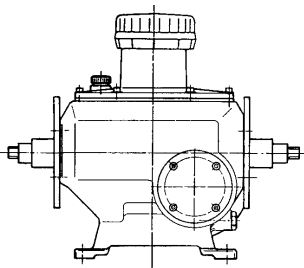


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Power end	Motor capacity HP	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
			lbs.	(kg)	
TZ 20 HKD 20	1-1/2	86	121	(55)	920890
TZ 20 HKD 201*	3	86	121	(55)	920891
TZ 20 HKD 15	1-1/2	115	121	(55)	920892
TZ 20 HKD 151*	3	115	121	(55)	920893
TZ 20 HKD 12	1-1/2	144	121	(55)	920894
TZ 20 HKD 121*	3	144	121	(55)	920895
TZ 20 HKD 10	1-1/2	172	121	(55)	920896
TZ 20 HKD 101*	3	172	121	(55)	920897

* REQUIRED: P.N. 7951144 Adapter mounting flange and motor shaft coupling.

Makro TZ 20 AKD (add-on pump)



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Power end	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
		lbs.	(kg)	
TZ 20 AKD 20	86	90	(41)	806620
TZ 20 AKD 15	115	90	(41)	806621
TZ 20 AKD 12	144	90	(41)	806622
TZ 20 AKD 10	172	90	(41)	806623

Note: A base frame is required if Makro TZ main pumps are to be combined with add-on pumps (description follows liquid end section).

ProMinent® Makro TZ

Packed-plunger type liquid ends for HKD/AKD pumps

ProMinent Makro TZ packed-plunger type liquid ends

Note: Two liquid ends are required for each duplex pump.

Liquid end		Materials			Maximum capacity at different reduction ratios per liquid end: GPH (L/h)										
Type	Suction and Discharge Conn. NPT in.	Liquid end connector material	Valve balls	Seals	Weight lbs. (kg)	Reduction ratio								Part no.	
						20	201	15	151	12	121	10	101		
						Strokes per min. GPH (L/h) followed by psig (bar)									
FK 12/20 S..	1/4F	SS	Ceramic	PTFE	20 (9)	2.6 (10)	N/A (N/A)	3.7 (14)	N/A (N/A)	4.5 (17)	N/A (N/A)	5.5 (21)	N/A (N/A)	910430	
						4640 (320)	N/A (N/A)	4640 (320)	N/A (N/A)	4640 (320)	N/A (N/A)	4640 (320)	N/A (N/A)		
FK 17/20 S..	1/4F	SS	Ceramic	PTFE	20 (9)	5.5 (21)	N/A (N/A)	7.4 (28)	7.4 (28)	9.2 (35)	9.2 (35)	11 (42)	11 (42)	910431	
						4640 (320)	N/A (N/A)	3393 (234)	4640 (320)	2611 (187)	4640 (320)	2262 (156)	4538 (313)		
FK 23/20 S..	3/8F	SS	Ceramic	PTFE	22 (10)	10 (39)	10 (39)	14 (53)	14 (53)	17 (66)	17 (66)	20 (79)	20 (79)	910432	
						2436 (168)	2784 (192)	1812 (125)	2784 (192)	1450 (100)	2784 (192)	1203 (83)	2436 (168)		
FK 30/20 S..	3/8F	SS	Ceramic	PTFE	24 (11)	18 (69)	18 (69)	24 (92)	24 (92)	30 (115)	30 (115)	36 (138)	36 (138)	910433	
						1392 (96)	1638 (113)	1029 (71)	1638 (113)	826 (57)	1638 (113)	681 (47)	1392 (96)		
FK 40/20 S..	3/4M	SS	SS	PTFE	29 (13)	33 (125)	33 (125)	44 (167)	44 (167)	55 (209)	55 (209)	66 (250)	66 (250)	910434	
						754 (52)	913 (63)	565 (39)	913 (63)	449 (31)	913 (63)	377 (26)	754 (52)		
FK 50/20 S..	3/4M	SS	SS	PTFE	29 (13)	51 (195)	51 (195)	68 (261)	68 (261)	86 (326)	86 (326)	103 (391)	103 (391)	910435	
						478 (33)	580 (40)	362 (25)	580 (40)	275 (19)	580 (40)	232 (16)	478 (33)		
FK 60/20 S..	1M	SS	SS	PTFE	38 (17)	75 (284)	75 (284)	100 (379)	100 (379)	125 (474)	125 (474)	150 (568)	150 (568)	910436	
						319 (22)	406 (28)	246 (17)	406 (28)	188 (13)	391 (27)	159 (11)	319 (22)		
FK 70/20 S..	1M	SS	SS	PTFE	38 (17)	102 (387)	102 (387)	136 (516)	136 (516)	170 (645)	170 (645)	204 (774)	204 (774)	910437	
						232 (16)	290 (20)	174 (12)	290 (20)	130 (9)	290 (20)	116 (8)	232 (16)		
FK 85/20 S..	1-1/2M	SS	Ceramic	PTFE	51 (23)	150 (568)	150 (568)	201 (761)	201 (761)	251 (951)	251 (951)	301 (1141)	301 (1141)	910438	
						159 (11)	203 (14)	116 (8)	203 (14)	87 (6)	188 (13)	72 (5)	159 (11)		

ProMinent® Makro TZ

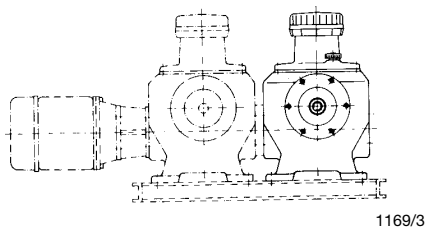
Packed-plunger type liquid ends for HKD/AKD pumps

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	<u>Part no.</u>	<u>Weight</u>	
		<u>lbs.</u>	<u>(kg)</u>
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

Recommended motor capacities for Makro TZ multiplex pumps



At max. pressure and max. stroking rate

Type	Duplex pump	Triplex pump	Quadruplex pump	Duplex twin-head pump
TZ 6/9 HM 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 101...	3 HP	5 HP	5 HP	5 HP

ProMinent® Makro TZ 20 HMM

Hydraulically-actuated diaphragm-type pump

New standards

With the hydraulically-actuated diaphragm-type of the TZ 20 series (TZ 20-HMM.../AMH...), ProMinent has developed metering pumps that set new standards with regard to accuracy and dependability. The simplex pump covers a capacity range from 94.6 gph (360 L/h) against 232 psig (16 bar) to 318 gph (1206 L/h) against 145 psig (10 bar).

Based on proven design principles

The proven gear mechanism of the Makro TZ 20 packed-plunger type metering pump with its variety of features (4 reducing ratios, speed control, stroke positioning motor, etc.) is used as the power end of this pump. All kinds of combinations, like duplex and multiplex pumps, and combinations with other metering pump types (TZ 6 HM TZ 9 HM, TZ 20 HK, Meta) are possible.

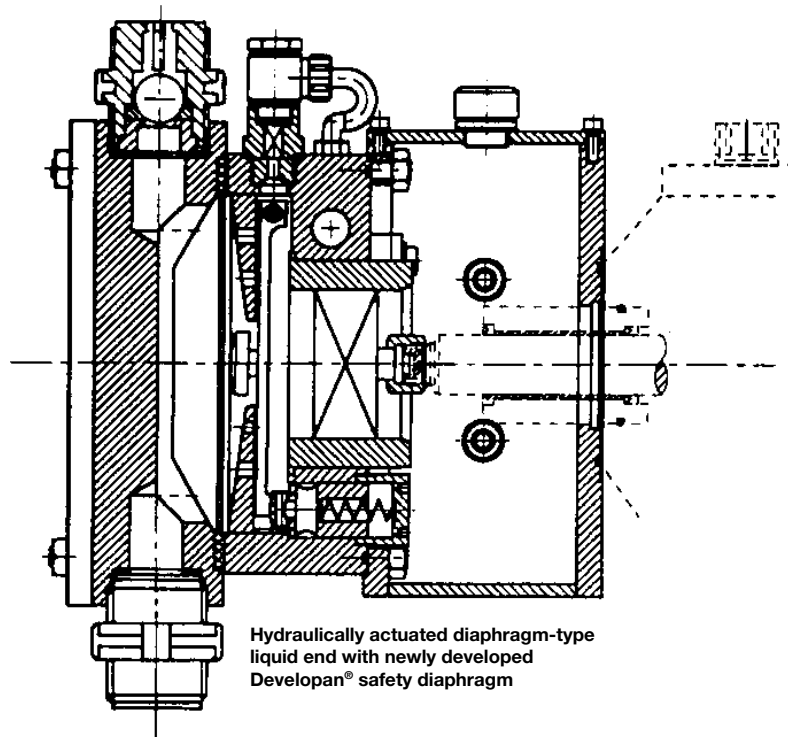
Low effect of pressure on flow rate

The concept of hydraulic actuation of the diaphragm results in a flow rate virtually insensitive to discharge pressure variation, similar to that of a packed-plunger type pump. By means of this technique it is now possible to achieve higher pressures and even better accuracy than mechanical diaphragm-type pumps.

High dependability

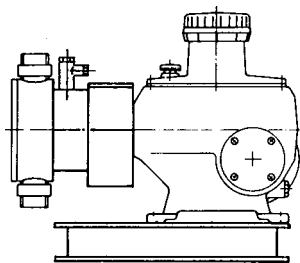
Long-term dependability is ensured by integrated diaphragm-failure and over-pressure monitors. Undetected failures are definitely avoided.

In particular the new diaphragm technology guarantees that in spite of a diaphragm failure the metering function is maintained and the contact of process fluid and hydraulic oil avoided.

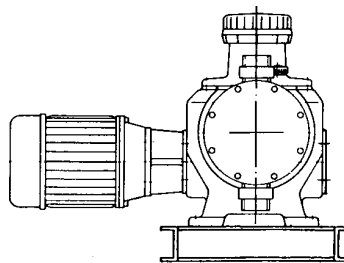


Technical Data: Makro TZ 20 HMH

Hydraulically-actuated metering pumps



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2408/4

Recommended motor for simplex pumps is 3 HP. Motor is not included with pump. Pressure relief valves are not required for pump protection, due to built-in hydraulic relief valves. (Relief valves may be required for process pipe protection.) Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

Makro TZ 20 main pumps HMH

			Stroking rate at 1725 RPM	Maximum backpressure		Capacity at maximum backpressure		Suction and Discharge onn. MNPT	Shipping Weight		
Pump version		Part no.	Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.	lbs.	kg.
TZ 20 HMH 20170-20	PP	921601	86	145	(10)	112	(424)	69.4	1	176	(80)
	P	921602	86	145	(10)	112	(424)	69.4	1	176	(80)
	T	921603	86	145	(10)	112	(424)	69.4	1	176	(80)
	S	921604	86	232	(16)	112	(424)	69.4	1	209	(95)
TZ 20 HMH 15170-20	PP	921605	115	145	(10)	126	(480)	69.4	1	176	(80)
	P	921606	115	145	(10)	126	(480)	69.4	1	176	(80)
	T	921607	115	145	(10)	126	(480)	69.4	1	176	(80)
	S	921608	115	232	(16)	126	(480)	69.4	1	209	(95)
TZ 20 HMH 12170-20	PP	921609	144	145	(10)	158	(600)	69.4	1	176	(80)
	P	921610	144	145	(10)	158	(600)	69.4	1	176	(80)
	T	921611	144	145	(10)	158	(600)	69.4	1	176	(80)
	S	921612	144	232	(16)	158	(600)	69.4	1	209	(95)
TZ 20 HMH 10170-20	PP	921613	172	145	(10)	190	(720)	69.4	1	176	(80)
	P	921614	172	145	(10)	190	(720)	69.4	1	176	(80)
	T	921615	172	145	(10)	190	(720)	69.4	1	176	(80)
	S	921616	172	232	(16)	190	(720)	69.4	1	209	(95)
TZ 20 HMH 20190-20	PP	921617	86	145	(10)	159	(602)	116.2	1-1/2	179	(81)
	P	921618	86	145	(10)	159	(602)	116.2	1-1/2	179	(81)
	T	921619	86	145	(10)	159	(602)	116.2	1-1/2	179	(81)
	S	921620	86	145	(10)	159	(602)	116.2	1-1/2	220	(100)
TZ 20 HMH 15190-20	PP	921621	115	145	(10)	211	(802)	116.2	1-1/2	179	(81)
	P	921622	115	145	(10)	211	(802)	116.2	1-1/2	179	(81)
	T	921623	115	145	(10)	211	(802)	116.2	1-1/2	179	(81)
	S	921624	115	145	(10)	211	(802)	116.2	1-1/2	220	(100)
TZ 20 HMH 12190-20	PP	921625	144	145	(10)	264	(1003)	116.2	1-1/2	179	(81)
	P	921626	144	145	(10)	264	(1003)	116.2	1-1/2	179	(81)
	T	921627	144	145	(10)	264	(1003)	116.2	1-1/2	179	(81)
	S	921628	144	145	(10)	264	(1003)	116.2	1-1/2	220	(100)
TZ 20 HMH 10190-20	PP	921629	172	145	(10)	318	(1204)	116.2	1-1/2	179	(81)
	P	921630	172	145	(10)	318	(1204)	116.2	1-1/2	179	(81)
	T	921631	172	145	(10)	318	(1204)	116.2	1-1/2	179	(81)
	S	921632	172	145	(10)	318	(1204)	116.2	1-1/2	220	(100)

Technical Data: Makro TZ 20 HMH

Hydraulically-actuated metering pumps

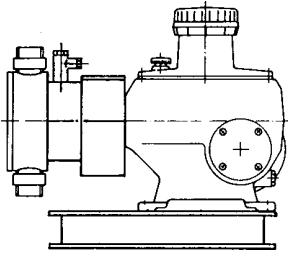
Makro TZ 20 main pumps HMH, continued

Media-contacted materials:

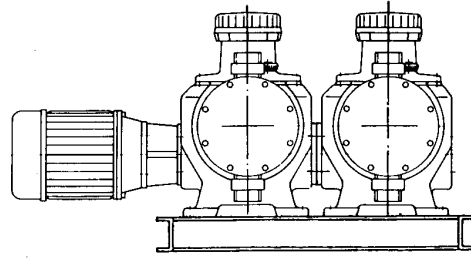
	Suction/ Discharge connector	DN 20/25 Ball Valves			DN 40 Spring Valves		
		Seals	Valve Balls	Valve Seat	Seals	Valve Spring	Valve Seat
PP = Polypropylene	PP	EPDM	Borosilicate Glass	EPDM	PTFE	Hastelloy C	PTFE
P = PVC (polyvinyl chloride)	PVC	Viton®	Borosilicate Glass	Viton®	PTFE	Hastelloy C	PTFE
T = PTFE (polytetrafluoroethylene)	PTFE	PTFE	Ceramic	PTFE	PTFE	Hastelloy C	PTFE
S = 316 Stainless steel	SS	PTFE	SS	PTFE	PTFE	Hastelloy C	PTFE

ProMinent® Makro TZ 20 AMH

Hydraulically-actuated diaphragm metering pump add-on modules



2391/4



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The ProMinent Makro TZ AMH add-on pump modules can be combined with any Makro TZ main pump to form duplex or triplex pumps at rated pressure. Additional add-on pumps can be multiplexed at reduced pressure. If ordered as such, multiplex pumps will be provided completely assembled. Multiplex Makro pumps must be mounted on a baseplate. Makro TZ pumps can be multiplexed in the field; all the necessary components are supplied with the add-on pump.

The Makro TZ AMH add-on modules may be driven by any Makro main pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure ratings of both must be reduced.

Duplex pump strokes are 180° out of phase, with no additional HP requirement. Contact ProMinent for brake horsepower requirements for two or more add-on pumps, and for reduced pressure ratings for three or more add-ons. Each add-on pump has its own independent stroke length control, and may be automatically controlled independent of the main pump using a stroke positioning system. Pressure relief valves are not required for pump protection, due to a built-in hydraulic relief valve. (Relief valves may be required for process pipe protection.)

Makro TZ 20 add-on pumps AMH

Pump version	Part no.	Stroking rate at 1725 RPM		Maximum backpressure		Capacity at Maximum backpressure			Suction and Discharge Conn. MNPT
		Strokes per min.		psig	(bar)	U.S. GPH	(L/h)	mL/stroke	
TZ 20 AMH 20 70-20	PP	921637	86	145	(10)	112	(424)	69.4	1
	P	921638	86	145	(10)	112	(424)	69.4	1
	T	921639	86	145	(10)	112	(424)	69.4	1
	S	921640	86	232	(16)	112	(424)	69.4	1
TZ 20 AMH 15 70-20	PP	921641	115	145	(10)	126	(480)	69.4	1
	P	921642	115	145	(10)	126	(480)	69.4	1
	T	921643	115	145	(10)	126	(480)	69.4	1
	S	921644	115	232	(16)	126	(480)	69.4	1
TZ 20 AMH 12 70-20	PP	921645	144	145	(10)	158	(600)	69.4	1
	P	921646	144	145	(10)	158	(600)	69.4	1
	T	921647	144	145	(10)	158	(600)	69.4	1
	S	921648	144	232	(16)	158	(600)	69.4	1
TZ 20 AMH 10 70-20	PP	921649	172	145	(10)	190	(720)	69.4	1
	P	921650	172	145	(10)	190	(720)	69.4	1
	T	921651	172	145	(10)	190	(720)	69.4	1
	S	921652	172	232	(16)	190	(720)	69.4	1
TZ 20 AMH 20 90-20	PP	921653	86	145	(10)	159	(602)	116	1-1/2
	P	921654	86	145	(10)	159	(602)	116	1-1/2
	T	921655	86	145	(10)	159	(602)	116	1-1/2
	S	921656	86	145	(10)	159	(602)	116	1-1/2
TZ 20 AMH 15 90-20	PP	921657	115	145	(10)	211	(802)	116	1-1/2
	P	921658	115	145	(10)	211	(802)	116	1-1/2
	T	921659	115	145	(10)	211	(802)	116	1-1/2
	S	921660	115	145	(10)	211	(802)	116	1-1/2
TZ 20 AMH 12 90-20	PP	921661	144	145	(10)	264	(1003)	116	1-1/2
	P	921662	144	145	(10)	264	(1003)	116	1-1/2
	T	921663	144	145	(10)	264	(1003)	116	1-1/2
	S	921664	144	145	(10)	264	(1003)	116	1-1/2

ProMinent® Makro TZ 20 AMH

Hydraulically-actuated diaphragm metering pump

add-on modules

Makro TZ 20 add-on pumps AMH, continued

			Stroking rate at 1725 RPM	Maximum backpressure		Capacity at Maximum backpressure		Suction and Discharge Conn. MNPT	
Pump version	Part no.		Strokes per min.	psig	(bar)	U.S. GPH	(L/h)	mL/ stroke	in.
TZ 20 AMH 10 90-20	PP	921665	172	145	(10)	318	(1204)	116	1-1/2
	P	921666	172	145	(10)	318	(1204)	116	1-1/2
	T	921667	172	145	(10)	318	(1204)	116	1-1/2
	S	921668	172	145	(10)	318	(1204)	116	1-1/2

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	<u>Part no.</u>	<u>Weight</u>	
		<u>lbs.</u>	<u>(kg)</u>
Base frame for one main pump and one add-on pump	804538	19	(8.7)
Base frame for one main pump and two add-on pumps	804539	26	(12)
Base frame for one main pump and three add-on pumps	804540	32	(14.7)

ProMinent® Makro TZ 20 HMHD duplex hydraulically-actuated diaphragm metering pumps and Makro TZ 20 AMHD duplex hydraulically-actuated diaphragm add-on modules

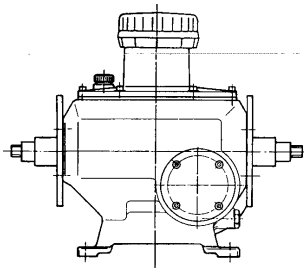
ProMinent Makro TZ, hydraulically-actuated diaphragm-type twin-head metering pump

Recommended motor for duplex pumps is 3 HP. Motor is not included with pump. Capacities are given for standard 4-pole AC motor at 60 Hz (nominal 1725 RPM). For performance at 50 Hz, multiply rated capacity by 5/6.

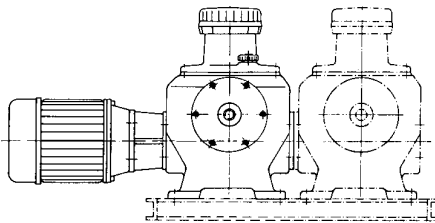
The HMHD's two pump heads operate in a push-pull fashion, 180° out of phase. The stroke length knob controls both liquid ends, and independent stroke length adjustment is not possible.

The AMHD is a duplex add-on pump module which may be connected to any Makro main drive pump; **however, to obtain the rated pressure, the frequency of the add-on pump must be selected to match the frequency of the main pump.** If pumps with different stroking rates are coupled, the pressure rating of both must be reduced. For a complete HMHD or AMHD pump, select the main pump on this page to correspond to the liquid ends (e.g. FMH-70-20 P) on the next page. Two liquid ends are required per pump. Pressure relief valves are not required for pump protection, due to built-in hydraulic relief valve. (Relief valves may be required for process pipe protection.)

Makro TZ 20 HMHD (main pump)



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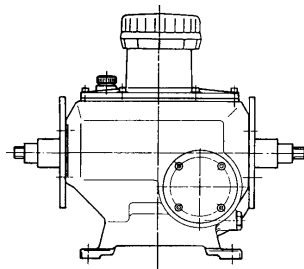


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Power end	Motor capacity HP	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
			lbs.	(kg)	
TZ 20 HMHD 201*	3	86	121	(55)	921636
TZ 20 HMHD 151*	3	115	121	(55)	921635
TZ 20 HMHD 121*	3	144	121	(55)	921634
TZ 20 HMHD 101*	3	172	121	(55)	921633

* REQUIRED: P.N. 7951144 Adapter mounting flange and motor shaft coupling.

Makro TZ 20 AMHD (add-on pump)



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Power end	Strokes per minute (at 1725 RPM)	Drive unit Shipping weight		Part no.
		lbs.	(kg)	
TZ 20 AMHD 20	86	90	(41)	806808
TZ 20 AMHD 15	115	90	(41)	806807
TZ 20 AMHD 12	144	90	(41)	806806
TZ 20 AMHD 10	172	90	(41)	806805

Note: A base frame is required if Makro TZ main pumps are to be combined with add-on pumps (description follows liquid end section).

ProMinent® Makro TZ 20

Hydraulically actuated diaphragm-type liquid ends for HMHD/AMHD pumps

ProMinent Makro TZ hydraulically-actuated diaphragm-type liquid ends

Note: Two liquid ends are required for each duplex pump.

Note: Two liquid ends are required for each duplex pump.							Maximum capacity at different reduction ratio per liquid end: GPH (L/h)				Part no.
Liquid end		Materials			Max. pressure psig (bar)						
Type	Suction and Discharge Conn. MNPT in.	Liquid end connector material	Valve balls*	Seals			Reduction ratio				
							20	15	12	10	
							Strokes per min.				
						86	115	144	172		
FMH 70-20	PP	PP	Borosilicate Glass	EPDM	145	(10)					910550
	P	PVC	Borosilicate Glass	Viton® A	145	(10)	112	126	158	190	910552
	T	PTFE	Ceramic	PTFE	145	(10)	(424)	(480)	(600)	(720)	910554
	S	SS	SS	PTFE	232	(16)					910556
FMH 90-20	PP	PP	Ceram/Hast. C	EPDM	145	(10)					910553
	P	PVC	Ceram/Hast. C	Viton® A	145	(10)	159	211	264	318	910551
	T	PTFE	Ceramic	PTFE	145	(10)	(602)	(802)	(1003)	(1204)	910555
	S	SS	Ceram/Hast. C	PTFE	145	(10)					910557

* Size 1-1/2" PP, P and S are equipped with a disc valve with 1.45 psig (0.1 bar) Hastelloy C spring. The valve disc is made of ceramic.

Materials of construction:

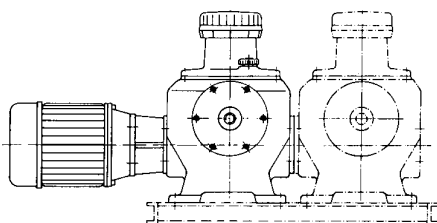
PP = Polypropylene
P = PVC (polyvinyl chloride)
T = PTFE (polytetrafluoroethylene)
S = 316 Stainless steel

Base frame for Makro TZ

A base frame **is required** if Makro TZ main pumps are to be combined with add-on pumps:

	Part no.	Weight	
		lbs.	(kg)
Base frame for one main pump and one add-on pump	804535	19	(8.7)
Base frame for one main pump and two add-on pumps	804536	26	(12)
Base frame for one main pump and three add-on pumps	804537	32	(14.7)

Recommended motor capacities for Makro TZ multiplex pumps



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At max. back pressure and max. stroking rate

Type	Duplex pump	Triplex pump	Quadruplex pump	Duplex twin-head pump
TZ 6 HM 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 10...	1-1/2 HP	1-1/2 HP	3 HP	3 HP
TZ 20 HK 101...	3 HP	5 HP	5 HP	5 HP
TZ 20 HMH 101...	3 HP	5 HP	5 HP	5 HP

Makro HM/AM

Spare parts kits

Spare parts kits

Spare parts kits for ProMinent Makro series metering pumps include pump diaphragm, valve balls, valve components and all required seals.

Standard kit for PP, NP-Acrylic and PVC material versions:

- 1 Pump diaphragm
- 1 Suction valve, complete
- 1 Discharge valve, complete
- 2 Valve balls
- 1 Set of seals, complete

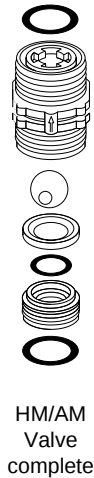
Standard kit for TT-PTFE material version:

- 1 Pump diaphragm
- 1 Suction valve, complete
- 1 Discharge valve, complete
- 2 Valve balls
- 2 Ball-seat discs or valve assembly
- 1 Set of seals, complete

Standard kit for SS (stainless steel) version:

- 1 Pump diaphragm
- 2 Valve balls
- 1 Set of seals, complete

Note: Union nut and NPT inserts are not included in the spare parts kit.

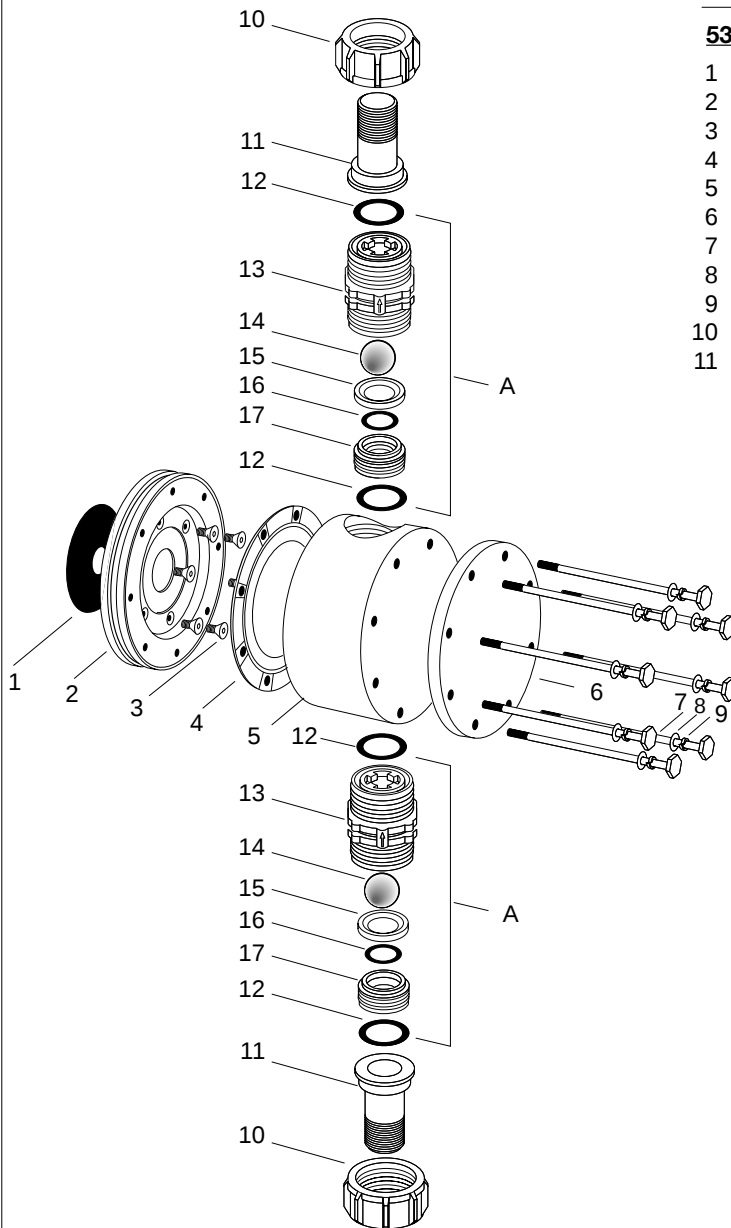


Liquid end Type	Material Code	Complete Liquid end	Spare Parts Kit	Valve Complete	Diaphragm
FM-130 DN 20	PP	910401	910451	803701	811470
	P	910402	910454	803703	811470
	T	910403	910457	803705	811470
	SS	910404	910474 910460*	803707	811470
FM-260 DN 20	PP	910407	910452	803701	811471
	P	910408	910455	803703	811471
	T	910409	910458	803705	811471
	SS	910410	910475 910461*	803708	811471
FM-530 DN 25	PP	910413	910453	803702	811472
	P	910414	910456	803704	811472
	T	910415	910459	803706	811472
	SS	910416	910476 910462*	803708	811472
FM-1500 & 2100 DN 40	PP	1001245	1001573	741174	811473
	P	1001244	1001574	741173	811473
	T	1001246	1001575	1000580	811473
	SS	1001247	1001577 1001576*	741175	811473
FMH-70-20	PP		911903	741174	806938
	P		911901	741173	806938
	T		911905	1000580	806938
	SS		911907 911908*	741175	806938
FMH-90-20	PP		911904	741174	806938
	P		911902	741173	806938
	T		911906	1000580	806938
	SS		911909 911910*	741175	806938

*SS with 2 valves, complete

Meta & Makro HM-530 P Liquid End Complete

EXPLODED VIEW



Description

Qty. Part No.

530 P liquid end complete

1 910414

1	safety diaphragm	1	485149
2	back plate	1	810221
3	countersunk screw M6 x 20	6	465236
4	DEVELOPAN diaphragm	1	811472
5	dosing head body only FM-530 PVC	1	810842
6	reinforcement plate 180	1	810160
7	bolt M6 x 90 (316 SS)	8	468167
8	washer	8	462219
9	washer (lock)	8	462456
10	clamping nut DN25 PVC	2	356565
11	NPT insert 1" Male PVC	2	7358602

A valve complete DN25 PVC

***2 803704**

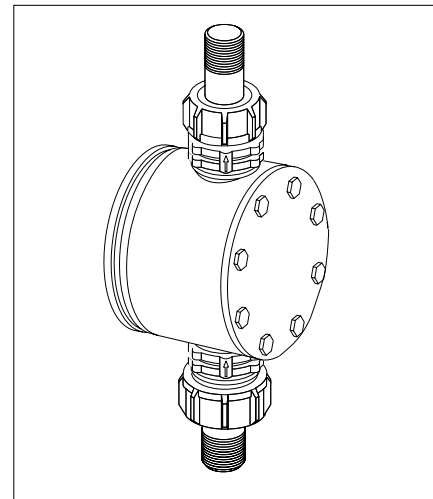
12	valve seal o-ring 32 x 3.5 Viton®	2	481041
13	valve body DN25 PVC	1	140544
14	valve ball 25mm Duran®	1	404217
15	ball seat disc DN25 PVC	1	804832
16	ball seat o-ring 20 x 3 Viton®	1	481021
17	ball seat bushing DN25 PVC	1	804826

* Meta valves complete are used *as both* suction and discharge valves. Quantities reflect # of components in *each* valve.

Spare Parts Kit

1 910456

A	valve complete DN25 PVC	2	803704
3	DEVELOPAN diaphragm	1	811472
12	valve seal o-ring 32 x 3.5 Viton®	4	481041
14	valve ball 25mm Duran®	2	404217
15	ball seat disc DN25 PVC	2	804832
16	ball seat o-ring 20 x 3 Viton®	2	481021
17	ball seat bushing DN25 PVC	2	804826



#MET3PVC

((THIS IS A MASTER, EDIT FOR SPECIFIC APPLICATION))

PROMINENT FLUID CONTROLS, INC.

- Makro HM (for flow rates from 10 to 658 gph per head)

SECTION _____ - CHEMICAL METERING PUMPS

1.1 APPLICATION

- A. Quantity: _____
- B. Chemical Service: _____
- C. Tag. Nos.: _____
- D. Capacity (US gallons per hour per head) _____
- E. No. of heads per pump: _____
- F. Backpressure (psig): _____

1.2 DESCRIPTION

- A. The chemical metering pump(s) shall be a ((CHOOSE ONE: simplex / duplex / triplex / quadruplex)) motor-driven, reciprocating, mechanically-actuated diaphragm type whose drive rotation is reduced by a worm gear and converted into a reciprocating motion by means of an eccentric sleeve and transmitted by a connecting rod to the thrust rod creating a reciprocating motion on the diaphragm. The stroke length is adjusted limiting the amount of the eccentric (stroke amplitude modulation) via a stroke length adjustment. The pump shall be of a modular design to accommodate duplex heads on a single drive or add-on pumps powered by a single electric motor. The drive shall be mounted in an aluminum housing, coated with a chemical resistant two-part epoxy finish.
- B. The chemical metering pump manufacturer shall provide a two year warranty on the pump drive and one year warranty on the pump liquid end, including diaphragm and O-rings.
- C. The pump shall be fully tested to meet rated flow and pressure by the manufacturer.
- D. The power supply shall be ____ VAC, ____ Hz, ____ phase.
- E. The liquid end shall be physically separated from the drive unit by back plate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the sole-noid if the primary diaphragm fails. The diaphragm shall be nylon-reinforced EPDM with PTFE-faced fluid contact surface.

1.3 LIQUID END ((SELECT ONE))

- The liquid end shall be glass-filled polypropylene. The suction and discharge valves shall be polypropylene with EPDM seals and ceramic valve balls.
- The liquid end shall be PVC. The suction and discharge valve shall be constructed of PVC with Viton® seals and ceramic valve balls.
- The liquid end shall be carbon-filled PTFE. The suction and discharge valve shall be constructed of carbon-loaded PTFE with PTFE seals and ceramic valve balls.
- The liquid end shall be 316 stainless steel. The suction and discharge valve shall be constructed of 316 stainless steel with PTFE seals and ceramic valve balls.

1.4 CONTROL

- A. Stroke length control for each pump ((SELECT ONE))
 - shall be adjustable manually by means of a stroke length knob, in increments of 0.5%, from 0% to 100% of stroke length.

- 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 ((SELECT ONE))
 - shall be fixed at the pump's maximum stroke rate. Pump shall include a ((1.5 / 3.0)) HP, TEFC, four-pole AC motor.
 - 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 ((1.5 / 3.0)) HP, TENV, 1725 RPM brushless DC motor.
 - 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 membrane keypad and digital display spannable to show RPM, percent output or flow rate. The actual motor speed, as measured by motor-mounted tachometer, shall be proportional to the rate setting in manual mode, or proportional to an external 4-20 mA signal in external mode. Pump shall include a ((1.5 / 3.0)) HP, TENV, 1725 RPM brushless DC motor with flange-mounted tach.

1.5 ACCEPTABLE MANUFACTURER

- A. ProMinent Fluid Controls, model _____
- B. Or pre-approved equal.

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

- A. A foot valve and strainer shall be provided with each pump.
- B. An injection check valve shall be provided with each pump.
- C. A diaphragm failure detector shall be provided to ((open/close)) a contact in the event of diaphragm failure.
- D. An adjustable-pressure, diaphragm-type back pressure/antisiphon valve shall be provided with each metering pump.
- E. An in-line, adjustable-pressure, diaphragm-type pressure relief valve shall be provided with each metering pump.
- F. An air-charged, bladder-type pulsation dampener shall be provided with each metering pump.
- G. A clear PVC calibration column with FNPT fittings top and bottom shall be provided with each pump.

END OF SECTION