

2.1 ProMinent® Makro/ 5 Specifications

2.1.0 ProMinent® Makro/5 Specifications

General:

Housing Construction:	Acrylic resin coated cast xxxxxx
Drive:	Slide ring adjustable crank (non lost motion)
Configurations Available:	Main Drive Single Head Main Drive Dual Head (180 shifted) Add-on drive single head Add on Drive dual head
Max. Stroke Length:	2 in. (50 mm), Visible scale shows 0-100 %
Stroke Length Adjustment:	Manual Adjustment, automatic stroke length adjustment via 4 – 20 mA available as an option.
Gear Ratios And Stroke Frequencies: (with 1725 RPM Motor)	23:1 = 71 strokes per minute 19:1 = 89 strokes per minute 14:1 = 123 strokes per minute 11:1 = 159 strokes per minute
Sound Level:	70 dB
Stroke Frequency Control:	Remote or automatic frequency control optional with SCR Control & DC motor or AC motor and inverter
Stroke Sensor:	Available as an option.
Lubrication:	Oil Lubricated
Recommended Oil:	Mobil 634 VG 460, Part # 1006240, 5.2 gal (20 litre) drum
Oil Quantity:	4.4 gallons (16.5 litres)
Recommended Oil Change Frequency:	Every 5000 operating hours
Factory Testing:	Each pump is tested for capacity at maximum pressure.
Warranty:	2 years on drive, 1 year on liquid end.

Makro/ 5 Piston Liquid Ends:

Type:	Mechanically actuated packed plunger. Plunger is threaded directly to reciprocating shaft.
Liquid End / Valves:	316 SS
Piston:	Oxide ceramic or stainless steel with a wear resistant ceramic coating.
Packing Seal Method:	Nut tightened packing gland.
Flush Ports:	Standard feature on all liquid ends.
Maximum Fluid Temp:	Long term maximum pressure = 302° F (150° C) Short term at max 29 psi (2 Bar) for 15 min = 356° F (180° C)
Repeatability:	Better than + / - 0.5% In the stroke length range 10 – 100 % When installed and operated according to instructions
Max, Particle Size In Fluid:	0.3 mm (if larger than 0.3 mm, provisions have to be made to remove them before coming into the suction line).

2.1 ProMinent® Makro/ 5 Specifications

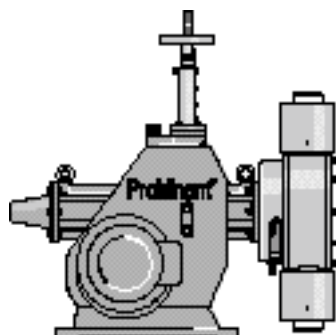
2.1.0 ProMinent® Makro/5 Specifications

Makro/5 Hydraulically Actuated Liquid Ends:

Type:	Hydraulically actuated diaphragm type liquid end. Piston drives hydraulic fluid behind diaphragm.	
Liquid End & Check Valves:	PP - Polypropylene Dosing head & valves, P - PVC Dosing head and valves T - PTFE with carbon. SS - Stainless steel	
Valve Seat & Seals:	All use materials use PTFE seats and seals.	
Valve Plate & Springs:	All materials use Hastelloy C plate and springs	
Diaphragm:	PTFE faced EPDM with secondary PTFE faced EPDM backer.	
Diaphragm Failure Indication:	Standard Feature on all Hydraulically Actuated Diaphragm Makro Pumps,	
Pressure Relief:	Internal hydraulic pressure relief valve recirculates hydraulic fluid in over pressure situations.	
Repeatability:	+ / - 1% In the stroke length range 10 – 100% When installed and operated according to instructions.	
Material	Continuous	Short term
Maximum Fluid Temperatures:	PP 176° F (80° C)	212° F (100° C)
	PVC 113° F (45° C)	140° F (60° C)
	PTFE 194° F (90° C)	248° F (120° C)
	SS 194° F (90° C)	248° F (120° C)
Max, Particle Size In Fluid:	0.3 mm (if larger than 0.3 mm, provisions have to be made to remove them before coming into the suction line).	

2.6 ProMinent® Makro/ 5 Diaphragm Dosing Pump

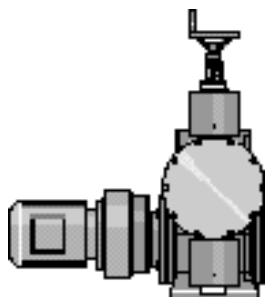
2.6.1 ProMinent® Makro/5 Diaphragm Dosing Pump



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ProMinent® Makro/ 5 main pump HM

The ProMinent® Makro/ 5 HM is supplied as standard. The stroke length can be adjusted between 0-20 mm. The gearbox is encased in a seawater resistant acrylic resin lacquered cast housing. The diaphragm liquid ends are available in different material combinations which are suited to different applications (see table). The metering reproducibility under defined conditions and if installed correctly is better than $\pm 2\%$ in the stroke length range between 30-100 %. The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For technical safety reasons, appropriate equipment must be installed to prevent current overload (instructions in the operating instruction manual must be followed).



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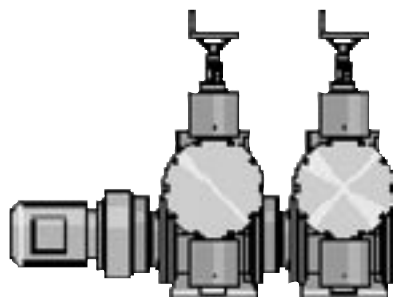
ProMinent® Makro/ 5 add on pump AM

The ProMinent® Makro/ 5 add on pump can be connected to the Makro/ 5 main power end to form a duplex or triplex pump. (At reduced back pressure, up to four add on power ends can be combined with a main power end.) Add on power ends can be fitted on site. If required, the main drive can be fitted with a 5 Hp and/or 5.5 Hp motor. You will require a base frame when connecting add on power ends.

ProMinent Makro/ 5 double-head pump

HMD (main pump)/AMD (add on pump)

Essentially the same instructions apply for the ProMinent® Makro/ 5 HMD and AMD pumps as for single pumps. They are, however, fitted with a second liquid end. The liquid ends operate in counter-cycle.



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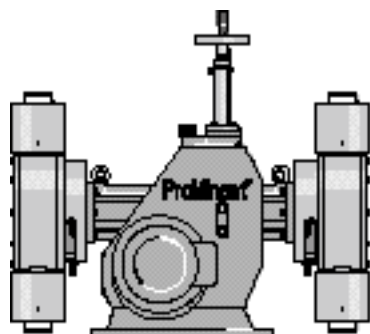
ProMinent® Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max. settings. Feedback potentiometer 1 k Ohm; enclosure rating: IP 54. Power supply 230 V ($\pm 10\%$), 50/60 Hz, approx. 40 W, mech. stroke rating display at Makro/ 5 power end. Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Makro/ 5 stroke length controller

Controller comprising actuator with servomotor and integrated microprocessor controller for stroke length adjustment via standard signal. Technical data, see actuator. Includes: Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in manual operating mode, actual value output 0/4-20 mA for remote display.

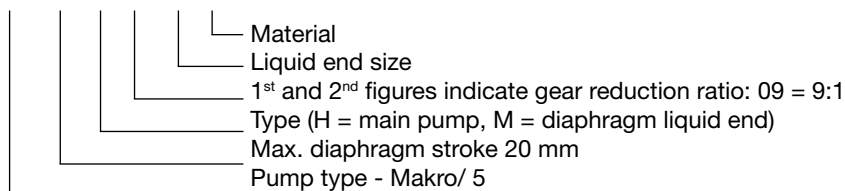


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2.6 ProMinent® Makro/ 5 Diaphragm Metering Pumps

2.6.2 Technical Data For Main Pump Diaphragm Liquid End

Pump type Makro/ 5	with 1800 rpm motor at 60 Hz Pump Capacity at Max. Back Pressure			Max. Stroke Freq.	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor	Part no.
	psi (bar)	l/h	gph					
Makro 5/20 HM 23-4000 P	43.5 (4)	1822	482	71	3	2" mnpt (32)	705 (320)	1007601
Makro 5/20 HM 23-4000 PP	43.5 (4)	1822	482	71	3	2" mnpt (32)	705 (320)	1007602
Makro 5/20 HM 23-4000 T	43.5 (4)	1822	482	71	3	2" mnpt (32)	705 (320)	1007603
Makro 5/20 HM 23-4000 S	43.5 (4)	1822	482	71	3	2" mnpt (32)	750 (340)	1007604
Makro 5/20 HM 19-4000 P	43.5 (4)	2254	597	89	3	2" mnpt (32)	705 (320)	1007597
Makro 5/20 HM 19-4000 PP	43.5 (4)	2254	597	89	3	2" mnpt (32)	705 (320)	1007598
Makro 5/20 HM 19-4000 T	43.5 (4)	2254	597	89	3	2" mnpt (32)	705 (320)	1007599
Makro 5/20 HM 19-4000 S	43.5 (4)	2254	597	89	3	2" mnpt (32)	750 (340)	1007600
Makro 5/20 HM 14-4000 P	43.5 (4)	3104	822	123	3	2" mnpt (32)	705 (320)	1007593
Makro 5/20 HM 14-4000 PP	43.5 (4)	3104	822	123	3	2" mnpt (32)	705 (320)	1007594
Makro 5/20 HM 14-4000 T	43.5 (4)	3104	822	123	3	2" mnpt (32)	705 (320)	1007595
Makro 5/20 HM 14-4000 S	43.5 (4)	3104	822	123	3	2" mnpt (32)	750 (340)	1007596
Makro 5/20 HM 11-4000 P	43.5 (4)	4064	1076	159	3	2" mnpt (32)	705 (320)	1007589
Makro 5/20 HM 11-4000 PP	43.5 (4)	4064	1076	159	3	2" mnpt (32)	705 (320)	1007590
Makro 5/20 HM 11-4000 T	43.5 (4)	4064	1076	159	3	2" mnpt (32)	705 (320)	1007591
Makro 5/20 HM 11-4000 S	43.5 (4)	4064	1076	159	3	2" mnpt (32)	750 (340)	1007592



The admissible priming pressure on the suction side is 50% of the maximum back pressure.

Materials In Contact With Chemicals

	Dosing Head	Suction/ Discharge Connector	DN 50 Plate Valves Seals	Valve plates/ Valve spring	Valve Seat
PP	Polypropylene	Polypropylene	PTFE	Hast. C	PTFE
P	PVC	PVC	PTFE	Hast. C	PTFE
T	PTFE with carbon	PTFE with carbon	PTFE	Hast. C	PTFE
S	316 stainless steel	316 stainless steel	PTFE	Hast. C	PTFE

DEVELOPAN® pump diaphragm with PTFE coating.

Custom designs available to order.

2.6 ProMinent® Makro/ 5 Diaphragm Metering Pumps

2.6.3 Spare Parts Kits

The spare parts kit generally contains consumable components required for the liquid ends.

- 1 pump diaphragm
- 1 suction connector set
- 1 discharge connector set
- 2 valve plate and Hast. C spring
- 1 set of seals (O-rings, ball seat discs, ball seat housings)

Spare parts kit Makro/ 5 HM

Description	Part No.
Liquid end FM 4000 PP	1008171
Liquid end FM 4000 P	1008172
Liquid end FM 4000 T	1008173
Liquid end FM 4000 S (without valve set)	1008174

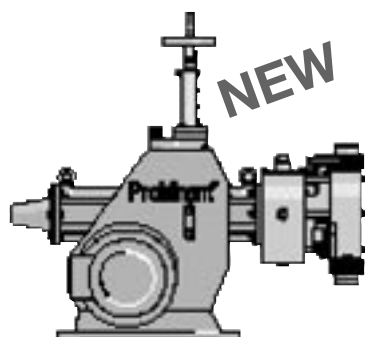
PTFE dosing diaphragm

ProMinent® DEVELOPAN® composite diaphragm consists of EPDM with a woven inner layer, large surface area, integrally vulcanised aluminium core and PTFE Teflon coating on the side in contact with the feed chemical.

Description	Part No.
Makro/ 5 FM 4000	1006509

2.9 ProMinent® Makro/ 5 Hydraulic Diaphragm Dosing Pumps

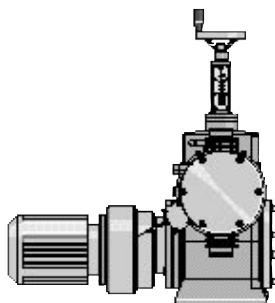
2.9.1 ProMinent® Makro/ 5 Hydraulic Diaphragm Dosing Pumps



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ProMinent® Makro/ 5 main pump HMH

The ProMinent® Makro/ 5 HMH is driven as standard by a 3 kW spur wheel geared motor, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F. The stroke length can be adjusted between 0...50 mm. The gearbox is encased in a seawater resistant acrylic resin lacquered cast housing. The diaphragm liquid ends are available in different material combinations which are suited to different applications (see table). The metering reproducibility under defined conditions and if installed correctly is better than $\pm 1\%$ in the stroke length range between 10-100 % (you must read notes in the operating instructions). The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For technical safety reasons, appropriate equipment must be installed to prevent current overload (you must read the notes in the operating instructions).



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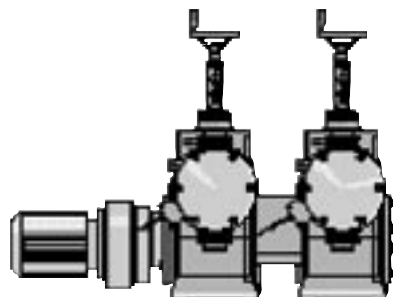
ProMinent® Makro/ 5 add on pump AMH

The ProMinent® Makro/ 5 add on pump can be connected to the Makro/ 5 main power end to form a duplex or triplex pump. (At reduced back pressure, up to four add on power ends can be combined with a main power end). Add on power ends can be fitted on site. If required, the main drive can be fitted with a 5 Hp and/or 7.5 Hp motor. You will require a base frame when connecting add on power ends.

ProMinent® Makro/ 5 twin head pump

HMHD (main pump)/AMHD (add on pump)

Essentially the same instructions apply for the ProMinent® Makro/ 5 HMHD and AMHD pumps as for single pumps. They are, however, fitted with a second liquid end. The liquid ends operate in counter-cycle.



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ProMinent® Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

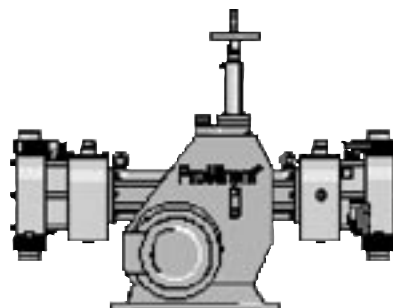
Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max. settings. Feedback potentiometer 1 k Ohm; enclosure rating: IP 54. Power supply 230 V ($\pm 10\%$), 50/60 Hz, approx. 40 W, mech. stroke rating display on Makro/ 5 power end. Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Makro/ 5 stroke length controller

Controller comprising actuator with servomotor and integrated microprocessor controller for stroke length adjustment via standard signal. Technical data, see actuator.

Includes:

Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in manual operating mode, actual value output 0/4-20 mA for remote display.

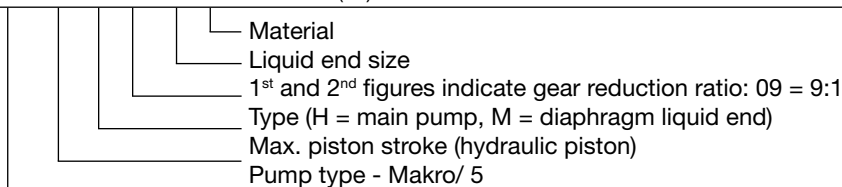


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2.9 ProMinent® Makro/ 5 Hydraulic Diaphragm Dosing Pumps

2.9.2 Technical Data for Main Pump

	with 1800 rpm motor at 60 Hz							
	Feed Rate at at Max. Back Pressure				Max. Stroke Rate	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor
Pump type Makro/ 5	psi (bar)	l/h	gph	strokes/ min.	mWG ft.	inches (DN)	lbs. (kg)	Part no.
Makro 5/50 HMH 23 60-50 S	363 (25)	532	140	71	3	1.5" mnpt (32)	705 (320)	1006218
Makro 5/50 HMH 19 60-50 S	363 (25)	666	176	89	3	1.5" mnpt (32)	705 (320)	1006214
Makro 5/50 HMH 14 60-50 S	363 (25)	921	244	123	3	1.5" mnpt (32)	705 (320)	1006210
Makro 5/50 HMH 11 60-50 S	363 (25)	1191	315	159	3	1.5" mnpt (32)	705 (320)	1006206
Makro 5/50 HMH 09 60-50 S					3	1.5" mnpt (32)	705 (320)	1006202
Makro 5/50 HMH 23 70-50 PP	145 (10)	728	192	71	3	1.5" mnpt (32)	705 (320)	1008127
Makro 5/50 HMH 23 70-50 P	145 (10)	728	192	71	3	1.5" mnpt (32)	705 (320)	1008128
Makro 5/50 HMH 23 70-50 T	145 (10)	728	192	71	3	1.5" mnpt (32)	705 (320)	1008129
Makro 5/50 HMH 23 70-50 S	232 (16)	728	192	71	3	1.5" mnpt (32)	705 (320)	1008130
Makro 5/50 HMH 19 70-50 PP	145 (10)	913	241	89	3	1.5" mnpt (32)	705 (320)	1008073
Makro 5/50 HMH 19 70-50 P	145 (10)	913	241	89	3	1.5" mnpt (32)	705 (320)	1008124
Makro 5/50 HMH 19 70-50 T	145 (10)	913	241	89	3	1.5" mnpt (32)	705 (320)	1008125
Makro 5/50 HMH 19 70-50 S	232 (16)	913	241	89	3	1.5" mnpt (32)	705 (320)	1008126
Makro 5/50 HMH 14 70-50 PP	145 (10)	1263	334	123	3	1.5" mnpt (32)	705 (320)	1008069
Makro 5/50 HMH 14 70-50 P	145 (10)	1263	334	123	3	1.5" mnpt (32)	705 (320)	1008575
Makro 5/50 HMH 14 70-50 T	145 (10)	1263	334	123	3	1.5" mnpt (32)	705 (320)	1008071
Makro 5/50 HMH 14 70-50 S	232 (16)	1263	334	123	3	1.5" mnpt (32)	705 (320)	1008072
Makro 5/50 HMH 11 70-50 PP	145 (10)	1633	432	159	3	1.5" mnpt (32)	705 (320)	1006231
Makro 5/50 HMH 11 70-50 P	145 (10)	1633	432	159	3	1.5" mnpt (32)	705 (320)	1006232
Makro 5/50 HMH 11 70-50 T	145 (10)	1633	432	159	3	1.5" mnpt (32)	705 (320)	1006233
Makro 5/50 HMH 11 70-50 S	232 (16)	1633	432	159	3	1.5" mnpt (32)	705 (320)	1008068
Makro 5/50 HMH 23 75-50 PP	145 (10)	847	224	71	3	1.5" mnpt (32)	705 (320)	1008147
Makro 5/50 HMH 23 75-50 P	145 (10)	847	224	71	3	1.5" mnpt (32)	705 (320)	1008148
Makro 5/50 HMH 23 75-50 T	145 (10)	847	224	71	3	1.5" mnpt (32)	705 (320)	1008149
Makro 5/50 HMH 23 75-50 S	174 (12)	847	224	71	3	1.5" mnpt (32)	705 (320)	1008150
Makro 5/50 HMH 19 75-50 PP	145 (10)	1062	281	89	3	1.5" mnpt (32)	705 (320)	1008143
Makro 5/50 HMH 19 75-50 P	145 (10)	1062	281	89	3	1.5" mnpt (32)	705 (320)	1008144
Makro 5/50 HMH 19 75-50 T	145 (10)	1062	281	89	3	1.5" mnpt (32)	705 (320)	1008145
Makro 5/50 HMH 19 75-50 S	174 (12)	1062	281	89	3	1.5" mnpt (32)	705 (320)	1008146
Makro 5/50 HMH 14 75-50 PP	145 (10)	1467	388	123	3	1.5" mnpt (32)	705 (320)	1008139
Makro 5/50 HMH 14 75-50 P	145 (10)	1467	388	123	3	1.5" mnpt (32)	705 (320)	1008140
Makro 5/50 HMH 14 75-50 T	145 (10)	1467	388	123	3	1.5" mnpt (32)	705 (320)	1008141
Makro 5/50 HMH 14 75-50 S	174 (12)	1467	388	123	3	1.5" mnpt (32)	705 (320)	1008142
Makro 5/50 HMH 11 75-50 PP	145 (10)	1898	502	159	3	1.5" mnpt (32)	705 (320)	1008135
Makro 5/50 HMH 11 75-50 P	145 (10)	1898	502	159	3	1.5" mnpt (32)	705 (320)	1008136
Makro 5/50 HMH 11 75-50 T	145 (10)	1898	502	159	3	1.5" mnpt (32)	705 (320)	1008137
Makro 5/50 HMH 11 75-50 S	174 (12)	1898	502	159	3	1.5" mnpt (32)	705 (320)	1008138



2.9

ProMinent® Makro/ 5 Hydraulic Diaphragm Dosing Pumps

2.9.2 Technical Data for Main Pump (Cont.)

Pump type Makro/ 5	with 1800 rpm motor at 60 Hz			Max. Stroke Rate	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor	Part no.
	Feed Rate at at Max. Back Pressure							
	psi (bar)	l/h	gph	strokes/ min.	mWG ft.	inches (DN)	lbs. (kg)	
Makro 5/50 HMH 23 85-50 PP	145 (10)	1087	288	71	3	1.5" mnpt (32)	705 (320)	1010419
Makro 5/50 HMH 23 85-50 P	145 (10)	1087	288	71	3	1.5" mnpt (32)	705 (320)	1010420
Makro 5/50 HMH 23 85-50 T	145 (10)	2435	645	159	3	1.5" mnpt (32)	705 (320)	1010422
Makro 5/50 HMH 23 85-50 S	174 (12)	1087	288	71	3	1.5" mnpt (32)	705 (320)	1010423
Makro 5/50 HMH 19 85-50 PP	145 (10)	1362	360	89	3	1.5" mnpt (32)	705 (320)	1010424
Makro 5/50 HMH 19 85-50 P	145 (10)	1882	498	123	3	1.5" mnpt (32)	705 (320)	1010425
Makro 5/50 HMH 19 85-50 T	145 (10)	1362	360	89	3	1.5" mnpt (32)	705 (320)	1010426
Makro 5/50 HMH 19 85-50 S	174 (12)	1362	360	89	3	1.5" mnpt (32)	705 (320)	1010427
Makro 5/50 HMH 14 85-50 PP	145 (10)	1883	498	123	3	1.5" mnpt (32)	705 (320)	1010428
Makro 5/50 HMH 14 85-50 P	145 (10)	1883	498	123	3	1.5" mnpt (32)	705 (320)	1010429
Makro 5/50 HMH 14 85-50 T	145 (10)	2434	645	159	3	1.5" mnpt (32)	705 (320)	1010430
Makro 5/50 HMH 14 85-50 S	174 (12)	1883	498	123	3	1.5" mnpt (32)	705 (320)	1010431
Makro 5/50 HMH 11 85-50 PP	145 (10)	2435	645	159	3	1.5" mnpt (32)	705 (320)	1010432
Makro 5/50 HMH 11 85-50 P	145 (10)	1883	498	123	3	1.5" mnpt (32)	705 (320)	1010433
Makro 5/50 HMH 11 85-50 T	145 (10)	2435	645	159	3	1.5" mnpt (32)	705 (320)	1010434
Makro 5/50 HMH 11 85-50 S	174 (12)	2435	645	159	3	1.5" mnpt (32)	705 (320)	1010435
Makro 5/50 HMH 23 100-50 P	145 (10)	1590	420	71	3	2" mnpt (32)	728 (330)	1006199
Makro 5/50 HMH 23 100-50 PP	145 (10)	1590	420	71	3	2" mnpt (32)	728 (330)	1006200
Makro 5/50 HMH 23 100-50 T	145 (10)	1590	420	71	3	2" mnpt (32)	728 (330)	1006201
Makro 5/50 HMH 23 100-50 S	145 (10)	1590	420	71	3	2" mnpt (32)	750 (340)	1006203
Makro 5/50 HMH 19 100-50 P	145 (10)	1995	525	89	3	2" mnpt (32)	728 (330)	1006204
Makro 5/50 HMH 19 100-50 PP	145 (10)	1995	525	89	3	2" mnpt (32)	728 (330)	1006205
Makro 5/50 HMH 19 100-50 T	145 (10)	1995	525	89	3	2" mnpt (32)	728 (330)	1006207
Makro 5/50 HMH 19 100-50 S	145 (10)	1995	525	89	3	2" mnpt (32)	750 (340)	1006208
Makro 5/50 HMH 14 100-50 P	145 (10)	2760	730	123	3	2" mnpt (32)	728 (330)	1006209
Makro 5/50 HMH 14 100-50 PP	145 (10)	2760	730	123	3	2" mnpt (32)	728 (330)	1006211
Makro 5/50 HMH 14 100-50 T	145 (10)	2760	730	123	3	2" mnpt (32)	728 (330)	1006212
Makro 5/50 HMH 14 100-50 S	145 (10)	2760	730	123	3	2" mnpt (32)	750 (340)	1006213
Makro 5/50 HMH 11 100-50 P	145 (10)	3565	940	159	3	2" mnpt (32)	728 (330)	1006215
Makro 5/50 HMH 11 100-50 PP	145 (10)	3565	940	159	3	2" mnpt (32)	728 (330)	1006216
Makro 5/50 HMH 11 100-50 T	145 (10)	3565	940	159	3	2" mnpt (32)	728 (330)	1006217
Makro 5/50 HMH 11 100-50 S	145 (10)	3565	940	159	3	2" mnpt (32)	750 (340)	1008184

Material

Liquid end size

1st and 2nd figures indicate gear reduction ratio: 09 = 9:1

Type (H = main pump, M = diaphragm liquid end)

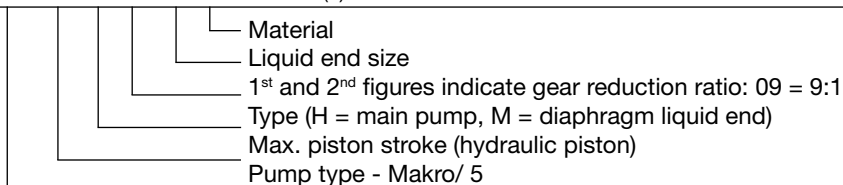
Max. piston stroke (hydraulic piston)

Pump type - Makro/ 5

2.9 ProMinent® Makro/ 5 Hydraulic Diaphragm Dosing Pumps

2.9.2 Technical Data for Main Pump (Cont.)

Pump type Makro/ 5	with 1800 rpm motor at 60 Hz Feed Rate at at Max. Back Pressure			Max. Stroke Rate	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor	Part no.
	psi (bar)	l/h	gph	strokes/ min.	mWG ft.	inches (DN)	lbs. (kg)	
Makro 5/50 HMH 23 130-50 P	87 (6)	2730	720	71	3	Flansch-DN65*	728 (330)	1008189
Makro 5/50 HMH 23 130-50 PP	87 (6)	2730	720	71	3	Flansch-DN65*	728 (330)	1008190
Makro 5/50 HMH 23 130-50 T	87 (6)	2730	720	71	3	Flansch-DN65*	728 (330)	1008191
Makro 5/50 HMH 23 130-50 S	87 (6)	2730	720	71	3	G2 1/2-DN65	750 (340)	1008192
Makro 5/50 HMH 19 130-50 P	87 (6)	3420	905	89	3	Flansch-DN65*	728 (330)	1008193
Makro 5/50 HMH 19 130-50 PP	87 (6)	3420	905	89	3	Flansch-DN65*	728 (330)	1008194
Makro 5/50 HMH 19 130-50 T	87 (6)	3420	905	89	3	Flansch-DN65*	728 (330)	1008195
Makro 5/50 HMH 19 130-50 S	87 (6)	3420	905	89	3	G2 1/2-DN65	750 (340)	1008196
Makro 5/50 HMH 14 130-50 P	87 (6)	4730	1250	123	3	Flansch-DN65*	728 (330)	1008197
Makro 5/50 HMH 14 130-50 PP	87 (6)	4730	1250	123	3	Flansch-DN65*	728 (330)	1008198
Makro 5/50 HMH 14 130-50 T	87 (6)	4730	1250	123	3	Flansch-DN65*	728 (330)	1008199
Makro 5/50 HMH 14 130-50 S	87 (6)	4730	1250	123	3	G2 1/2-DN65	750 (340)	1008200
Makro 5/50 HMH 11 130-50 P	87 (6)	6115	1620	159	3	Flansch-DN65*	728 (330)	1008201
Makro 5/50 HMH 11 130-50 PP	87 (6)	6115	1620	159	3	Flansch-DN65*	728 (330)	1008202
Makro 5/50 HMH 11 130-50 T	87 (6)	6115	1620	159	3	Flansch-DN65*	728 (330)	1008203
Makro 5/50 HMH 11 130-50 S	87 (6)	6115	1620	159	3	G2 1/2-DN65	750 (340)	1008204



The admissible priming pressure on the suction side is 50 % of the maximum back pressure.

Materials In Contact With Chemicals

Dosing Head		Suction/ Discharge Connector	Plate Valves: DN 32, 40, 50, 65		Valve Seat
			Seals	Valve plates/ Valve spring	
PP	Polypropylene	Polypropylene	PTFE/EPDM®	Hast. C	PTFE
P	PVC	PVC	PTFE/VITO®	Hast. C	PTFE
T	PTFE with carbon	PTFE with carbon	PTFE	Hast. C	PTFE
S	316 stainless steel	316 stainless steel	PTFE	Hast. C	PTFE

* Only plate valves DN 65

2.9 ProMinent® Makro/ 5 Diaphragm Dosing Pump

2.9.3 Spare Parts Kits

Spare parts kits Makro/ 5 HMH

The spare parts kits generally contain the consumable components for the liquid ends.

- 1 dosing diaphragm
- 1 suction valve set
- 1 discharge valve set
- 1 seal set (O-rings, ball seat discs, ball seat housings)

Description	Part No.
Liquid end FMH 60/70/75/85-50 PP	911903
Liquid end FMH 60/70/75/85-50 P	911901
Liquid end FMH 60/70/75/85-50 T	911905
Liquid end FMH 60/70/75/85-50 S	911907
Liquid end FMH 60/70/75/85-50 S (with 2 valve sets)	911908

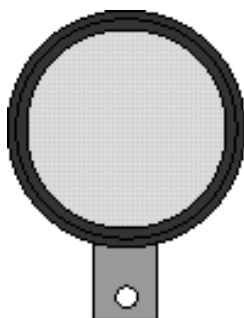
Description	Part No.
Liquid end FMH 100-50 PP	1008246
Liquid end FMH 100-50 P	1008247
Liquid end FMH 100-50 T	1008248
Liquid end FMH 100-50 S	1008249
Liquid end FMH 100-50 S (with 2 valve sets)	1008250

Description	Part No.
Liquid end FMH 130-50 PP	1008251
Liquid end FMH 130-50 P	1008252
Liquid end FMH 130-50 T	1008253
Liquid end FMH 130-50 S	1008264
Liquid end FMH 130-50 S (with 2 valve sets)	1008265

Makro/ 5 HMH metering diaphragms

1 metering diaphragm (composite diaphragm, vacuum packed)

Description	Part No.
FMH 60/70/75/85-50	1007298
FMH 100/130-50	1007852



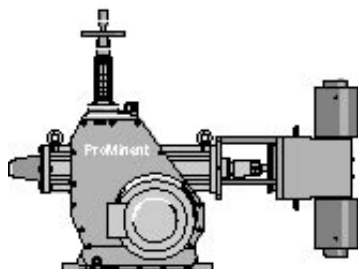
pk_2_024

2.6 ProMinent® Makro/ 5 Piston Dosing Pump

2.13.1 ProMinent® Makro/ 5 Piston Dosing Pumps

ProMinent® Makro/ 5 HK piston dosing pump

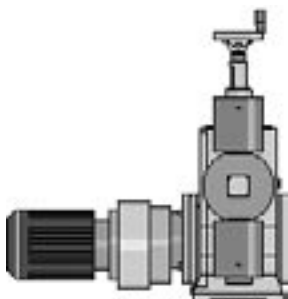
The stroke length is adjustable between 0...50 mm. The gearbox is housed in a sea water-resistant acrylic resin lacquered cast housing. The piston liquid end is made of stainless steel 1.4571 and pistons are made of oxide ceramic or stainless steel with a ceramic wear-resistant coating. Dosing reproducibility under defined conditions and when installed correctly, is better than $\pm 0.5\%$ in a stroke length range of between 10 and 100 % (instructions in the operating instructions manual must be followed). The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For all motor-driven dosing pumps, for safety reasons, suitable overload protection must be provided during installation. A tensioning key is supplied as standard for re-tensioning packing rings.



pk_2_075

ProMinent® Makro/ 5 AK add-on pumps

The ProMinent® Makro/ 5 AK add-on piston dosing pump can be used with the ProMinent® Makro/ 5 HK piston main power end to expand to a duplex or triplex system. (At reduced backpressures up to four add-on power ends can be combined with a single main power end). The customer can retrofit the add-on power ends on site. If required, the main power end can be fitted with a 5 Hp or a 7.5 Hp motor. You will require a base frame when connecting add on power ends.

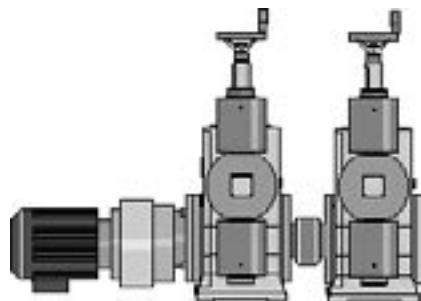


pk_2_076

ProMinent® Makro/ 5 double-head version

HDK (main pump)/AKD (add-on pump)

For the ProMinent® Makro/ 5 HKD and AKD the same basic instructions as for the simplex pumps apply. It is also fitted, however, with a second liquid end. The liquid ends operate in push-pull mode.



pk_2_077

ProMinent® Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max.-settings. Feedback potentiometer

1 k Ohm; enclosure rating: IP 54. Power supply 230 V ($\pm 10\%$), 50/60 Hz, approx. 40 W, mechanical stroke rating display on Makro/ 5 power end.

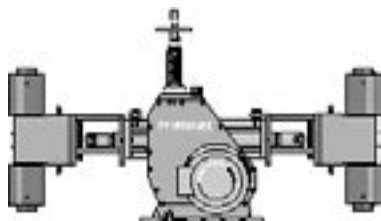
Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Makro/ 5 stroke length controller

Controller comprising actuator with servomotor and integrated microprocessor controller for stroke length adjustment via standard signal. Technical data, see actuator.

Includes:

Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in



pk_2_078

2.13 ProMinent® Makro/ 5 Diaphragm Dosing Pump

2.13.2 Technical Data Main Pump HK

Pump type Makro/ 5	with 1800 rpm motor at 60 Hz			Max. Stroke Rate	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor	Part no.
	Feed Rate at at Max. Back Pressure							
	psi (bar)	l/h	gph	strokes/ min.	mWG ft.	inches (DN)	lbs. (kg)	
Makro 5/50 HK 23-17 S	4640 (320)	44	11	71	3	1/4" mnpt (8)	658 (298.5)	1005418
Makro 5/50 HK 19-17 S	4640 (320)	56	14	89	3	1/4" mnpt (8)	658 (298.5)	1005417
Makro 5/50 HK 14-17 S	4640 (320)	78	20	123	3	1/4" mnpt (8)	658 (298.5)	1005416
Makro 5/50 HK 11-17 S	4640 (320)	101	26	159	3	3/8" mnpt (10)	658 (298.5)	1005415
Makro 5/50 HK 23-23 S	3480 (240)	82	21	71	3	3/8" mnpt (10)	660 (299.5)	1005423
Makro 5/50 HK 19-23 S	3480 (240)	104	27	89	3	3/8" mnpt (10)	660 (299.5)	1005422
Makro 5/50 HK 14-23 S	3480 (240)	144	38	123	3	3/8" mnpt (10)	660 (299.5)	1005421
Makro 5/50 HK 11-23 S	3132 (216)	187	49	159	3	3/8" mnpt (10)	660 (299.5)	1005420
Makro 5/50 HK 23-30 S	2030 (140)	142	37	71	3	3/4" mnpt (15)	666 (302)	1005428
Makro 5/50 HK 19-30 S	2030 (140)	179	47	89	3	3/4" mnpt (15)	666 (302)	1005427
Makro 5/50 HK 14-30 S	2030 (140)	247	65	123	3	3/4" mnpt (15)	666 (302)	1005426
Makro 5/50 HK 11-30 S	1841.5 (127)	319	84	159	3	3/4" mnpt (15)	666 (302)	1005425
Makro 5/50 HK 23-40 S	1160 (80)	253	67	71	3	3/4" mnpt (15)	669 (303.5)	1005433
Makro 5/50 HK 19-40 S	1160 (80)	318	84	89	3	3/4" mnpt (15)	669 (303.5)	1005432
Makro 5/50 HK 14-40 S	1160 (80)	439	116	123	3	3/4" mnpt (15)	669 (303.5)	1005431
Makro 5/50 HK 11-40 S	1015 (70)	569	150	159	3	1" mnpt (25)	669 (303.5)	1005430
Makro 5/50 HK 23-50 S	725 (50)	396	104	71	3	1" mnpt (25)	669 (303.5)	1005438
Makro 5/50 HK 19-50 S	725 (50)	497	131	89	3	1" mnpt (25)	669 (303.5)	1005437
Makro 5/50 HK 14-50 S	725 (50)	687	182	123	3	1" mnpt (25)	669 (303.5)	1005436
Makro 5/50 HK 11-50 S	652.5 (45)	889	235	159	3	1" mnpt (25)	669 (303.5)	1005435
Makro 5/50 HK 23-60 S	507.5 (35)	571	151	71	3	1" mnpt (25)	686 (311)	1005443
Makro 5/50 HK 19-60 S	507.5 (35)	716	189	89	3	1" mnpt (25)	686 (311)	1005442
Makro 5/50 HK 14-60 S	507.5 (35)	989	262	123	3	1" mnpt (25)	686 (311)	1005441
Makro 5/50 HK 11-60 S	435 (30)	1280	339	159	3	1.25" mnpt (25)	686 (311)	1005440
Makro 5/50 HK 23-70 S	362.5 (25)	778	206	71	3	1.25" mnpt (25)	686 (311)	1005448
Makro 5/50 HK 19-70 S	362.5 (25)	975	258	89	3	1.25" mnpt (25)	686 (311)	1005447
Makro 5/50 HK 14-70 S	362.5 (25)	1348	357	123	3	1.25" mnpt (25)	686 (311)	1005446
Makro 5/50 HK 11-70 S	333.5 (23)	1743	461	159	3	1.25" mnpt (25)	686 (311)	1005445
Makro 5/50 HK 23-85 S	232 (16)	1147	303	71	3	1.25" mnpt (25)	700 (317.5)	1005453
Makro 5/50 HK 19-85 S	232 (16)	1438	381	89	3	1.25" mnpt (25)	700 (317.5)	1005452
Makro 5/50 HK 14-85 S	232 (16)	1988	526	123	3	1.25" mnpt (25)	700 (317.5)	1005451
Makro 5/50 HK 11-85 S	232 (16)	2570	681	159	3	1.25" mnpt (25)	700 (317.5)	1005450

Material version S = stainless steel 1.4571/1.4404

Piston diameter in mm

1 and 2 gear reduction ratio; 09 = 9:1

Type (H = main pump; K = piston liquid end)

Maximum piston stroke 50 mm

Gearbox type - Makro/ 5

Motor must be ordered separately.

2.13 ProMinent® Makro/ 5 Piston Dosing Pump

2.13.2 Technical Data Main Pump HK (cont.)

Pump type Makro/ 5	with 1800 rpm motor at 60 Hz Feed Rate at at Max. Back Pressure			Max. Stroke Rate	Suc- tion Lift	Connection Suction/ Discharge Side	Shipping Weight w/ motor	Part no.
	psi (bar)	l/h	gph					
Makro 5/50 HK 23-100 S	174	1589	421	71	3	2" mnpt (50)	331.5	1005458
Makro 5/50 HK 19-100 S	174	1991	527	89	3	2" mnpt (50)	331.5	1005457
Makro 5/50 HK 14-100 S	174	2752	729	123	3	2" mnpt (50)	331.5	1005456
Makro 5/50 HK 11-100 S	174	3558	942	159	3	2" mnpt (50)	331.5	1005455
Makro 5/50 HK 23-130 S	87	2684	711	71	3	2" mnpt (50)	350	1005463
Makro 5/50 HK 19-130 S	87	3366	891	89	3	2" mnpt (50)	350	1005462
Makro 5/50 HK 14-130 S	87	4652	1232	123	3	2" mnpt (50)	350	1005461
Makro 5/50 HK 11-130 S	87	6014	1593	159	3	2" mnpt (50)	350	1005460

- Material version S = stainless steel 1.4571/1.4404
- Piston diameter in mm
- 1 and 2 gear reduction ratio; 09 = 9:1
- Type (H = main pump; K = piston liquid end)
- Maximum piston stroke 50 mm
- Gearbox type - Makro/ 5

Motor must be ordered separately.

Materials In Contact With Chemicals

	Liquid End	Suction/Discharge Connection	Ball Seat/ Seals	Valve Balls	Pistons
Makro 5/50 HK DN 8-DN 10	316 Stainless Steel	316 Stainless Steel	SS/PTFE	Oxide Ceramic	Stainless Steel/Ceramic
Makro 5/50 HK DN 15-DN 25	316 Stainless Steel	316 Stainless Steel	PTFE/PTFE	316 S. Steel	Stainless Steel/Ceramic
Makro 5/50 HK DN 32-DN 65	316 Stainless Steel	316 Stainless Steel	PTFE/PTFE	Hast. C (plate)	Stainless Steel/Ceramic

2.13 ProMinent® Makro/ 5 Piston Dosing Pump

2.13.3 Spare Parts Kits

Spare parts kits Piston Dosing Pumps

The spare parts kits generally contain the consumable components for the liquid ends.

- valve balls or valve plate with spring
- ball seat discs
- PTFE/graphite piston packing rings
- piston rings
- flat seals/ O-rings

Description	Part No.
Makro/ 5 FK 17/50 S DN 8	1005899
Makro/ 5 FK 17/50 S DN 10	1005536
Makro/ 5 FK 23/50 S DN 10	1005004
Makro/ 5 FK 23/50 S DN 15	1005900
Makro/ 5 FK 30/50 S DN 15	1005901
Makro/ 5 FK 30/50 S DN 20	1005537
Makro/ 5 FK 40/50 S DN 20	1005902
Makro/ 5 FK 40/50 S DN 25	1005538
Makro/ 5 FK 50/50 S DN 25	1005539
Makro/ 5 FK 60/50 S DN 25	1005903
Makro/ 5 FK 60/50 S DN 32	1005540
Makro/ 5 FK 70/50 S DN 32	1005541
Makro/ 5 FK 70/50 S DN 40	1005904
Makro/ 5 FK 85/50 S DN 40	1005542
Makro/ 5 FK 85/50 S DN 50	1005905
Makro/ 5 FK 100/50 S DN 50	1005543
Makro/ 5 FK 100/50 S DN 65	1005544