

MIDLAND PUMP MANUFACTURING COMPANY LIMITED



OPERATION AND MAINTENANCE MANUAL

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1. General information

This user manual relates Midland Pump Manufacturing Company Ltd positive displacement external gear pumps.

Midland Pump Manufacturing Company Ltd shall be referred to as "the manufacturer".

The person who will be installing and running the pump shall be referred to as "the end user"

The entire user manual must be read thoroughly before the pump is transported, lifted, installed, assembled or activity described in this user manual. Anyone who is to work with this pump must read this user manual before operation is started.

Upon receipt, check that the delivery is complete and undamaged. Any deficiencies or damage must be reported immediately to the transport company and the supplier, in order for a claim to be valid.

The user is responsible for compliance with the safety requirements described in this user manual. Please refer to and comply with prevailing local national laws and regulations.

The end user is responsible for ensuring that everyone who works with the pump has the necessary qualifications.

In the event that this user manual or other regulation recommends the use of personal protective equipment, such regulations must be observed.

Any modifications to the pump other than those specifically authorized by Midland Pump Manufacturing Company Ltd will invalidate all warranties.

The manufacturer assumes no liability for any personal injury or damage to the pump or other material damage resulting from:

- Any amendments to the pump not approved by the manufacturer.
- A failure to observe the safety regulations or other instructions in this user manual.
- The use of non-original spare parts that do not satisfy precisely the same, strict quality requirements as original the manufacturer spare parts.
- Any fault, blockage or breakdown in the pipework.

The end user is responsible for protecting the pipework against faults, blockages and explosions.

i) Storing the user manual

This user manual must be retained throughout the pump's full service life and must always accompany the pump.

The user manual must be available to operators, repair engineers and any maintenance staff or who may need to refer to it.

The user manual should be stored, in the immediate vicinity of the pump. If this is not possible, there must be a prominent sign by the pump stating where the user manual is kept.

It is recommended that an additional copy is stored elsewhere.



ii) Safety warnings – General

- Comply with the appropriate national manual handling regulations when lifting or moving the pump.
- Do not place fingers in the pump's ports when lifting or handling the pump or while the pump is running.
- Motors when fitted with lifting eyes they must not be used to lift the whole pump, but only to lift the motor separately.
- Lifting the pump should be performed at stable suspension points so that the pump is balanced and the lifting straps are not placed over sharp edges.
- Bolt the pump securely to the foundation.
- Clean out any impurities from the pipework before the pump is connected to it
- Remove the protective plugs from the pump ports before connecting the pipes.
- Flange couplings must always be undertaken by skilled professionals.
- All pipework must be correctly installed, aligned and sufficient tightening torque to prevent undue stress exerted on the pump.
- Threaded couplings must always be made by skilled professionals
- When connecting a pump to pipework if the coupling is over-tightened this can cause the pump casing to crack.
- Clean the pump of test oil before operation
- Use suitable safety equipment when aerating the pump such as gloves, protective goggles etc. depending on the pump liquid

- <u>Never</u> bleed the pump in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure.
- Check daily that the max allowed temperature of the pump has not been reached.
- Use appropriate hearing protection if necessary, if necessary, display a sign stating that hearing protection must be worn.
- The shaft seal must not be adjusted during operation
- Observe the safety instructions in the data sheet for the liquid in question and use the specified safety equipment in the form of protective clothing, a breathing mask or similar necessary safety equipment
- Use suitable safety equipment with pumps of liquids at temperatures of more than +60 ℃.
- When pumping hazardous liquids, circulate neutralising liquid before emptying the pump.
- The system must be depressurised before emptying the pump.
- Safety instructions in the data sheet for the liquid being pumped must be observed, and the safety equipment specified must be used.



iii) Safety warnings - Electrical

- Electrical couplings must always be established by authorised professionals, in accordance with the prevailing standards and directives.
- If you intend to use the pump in a potentially explosive environment, the pump must be connected to an explosion-proof motor.
- The pump and motor coupling should have sufficient clearance to prevent heat generation and the subsequent risk of explosion.

iv) Testing Certificates

Test certificates are not routinely issued but are available upon time of quotation.

2. Transportation

The pump must be adequately protected and secured before transport and shipment.

3. Lifting the pump

Do not lift or handle more than that can be easily managed or it must be lifted with a mechanical lifting aid.

Comply with the prevailing national manual handling regulations of the location when lifting or moving the pump.

4. Pump definition

i) Pump Serial Number

Each pump will have a unique serial number located on the flange or if applicable the foot of the pump.





ii) <u>Pump model</u>

A pump supplied by the manufacturer can come in various types and sizes,

There are four definitive pump groups:.

- Group 1
- Group 2
- Group 3
- LFP

To define each group the information on the indicator plate will have the following.

- For a group 1 pump it will have 2/3 letters followed by 3 numbers, e.g. (BA 150) or (MOD 125)
- For a group 2 pump it will have BA2 followed by hyphen and 2/3 numbers, e.g. (BA2-39) or (BA2-200)
- For a group 3 pump it will have 5 numbers, e.g. (32125)
- For the LFP group it will have the letters LFP followed by 3 numbers with a decimal point, e.g. (LFP 0.75)

iii) <u>Pump Sizes</u>

For groups 1, 2 and 3 the pump size is defined by the pump's body width 'A'.



Group 1

For Group 1 pumps the sizes are as follows,

Pump Size				
Dimension A mm (inch)	Pump Size			
6.35 (1/4")	250			
12.70 (1/2")	500			
19.05 (3/4")	750			
25.40 (1")	100			
31.75 (1 ¼")	125			
38.10 (1 ½")	150			

Group 2

For Group 2 pumps there are metric and imperial sizes which are as follows,

For group 2 metric sized pumps.

Pump Size					
Dimension A mm	Pump Size				
26.00	BA2-26				
31.70	BA2-125				
39.00	BA2-39				
41.20	BA2-162				
50.80	BA2-200				
52.00	BA2-52				
65.00	BA2-65				
78.00	BA2-78				

Group 3

For group 3 pumps the sizes are as follows,

Pump Size					
Dimension A mm	Pump Size				
48.00	31048				
50.00	32050				
64.00	31064				
75.00	32075				
80.00	31080				
100.00	32100				
125.00	32125				

LFP Group

For LFP group pumps the sizes are defined as the length of the pump.

By measuring dimension "A" you can find the size of an LFP pump.



Pump Size				
Dimension A mm	Pump Size			
53.00	0.25			
56.00	0.50			
58.00	2.00			
59.00	0.75			
62.00	1.00			
62.00	3.00			
66.00	4.00			
69.00	5.00			

5. Storage and Preservation

External, non-stainless surfaces are covered with protective paint – except the shaft. Pump ports and shafts are protected using plastic plugs.

i) Storage

If stored for periods in excess of 12 months the pump should have light oil sprayed in the cavity and the drive shaft rotated by hand before use to ensure free movement.

ii) <u>Preservation procedure</u>

Make sure that the pump does not corrode or dry out by using a light oil as prescribed above, because drying out between the sliding surfaces of the bearings can cause the bearings to become damaged when the pump is put into operation.

Preservation of the pump is necessary on untreated surfaces – both external and internal. Rustproof surfaces do not require any special protection.

- 1. If the pump has been in operation it must be emptied and neutralized if required. Clean oil or a neutral solution should be pumped through before storage.
- 2. Spray the light oil into the pump's ports.
- 3. Then rotate the pump shaft manually so that all internal surfaces are lubricated.
- 4. This process must be repeated every six months.
- 5. If the pump is to be stored outside the pipe system, pipe plugs should be fitted to the pump ports during the whole preservation period.

6. Installation

All items in this section must be read and observed when installing the pump supplied by the manufacturer.

i) Connecting the Pump and motor



Carefully shield the coupling between the pump and motor.

- 1. Before connecting the motor and the pump, check that the pump shaft can revolve easily and regularly.
- 2. When connecting the motor with the pump, make sure that the pump shaft and the motor shaft are on precisely the same center line and that there is sufficient axial clearance (see section axial clearance)
- 3. For advice on motor sizes please consult the manufacturer's technical dept. **prior** to placing an order.

ii) Aligning the pump and motor

Couplings are aligned in accordance with the coupling supplier's instructions with regard to the maximum permitted tolerances.

- 1. Check the axial alignment between the pump shaft and the motor shaft by means of a straightedge. Place the straightedge over the two coupling pieces at 4 places on the circumference – 90° apart. Any misalignment will become evident in the form of a gap of light between the straightedge and the coupling hub.
- 2. Axial alignment may deviate by a maximum of 0.05 mm when both halves of the coupling rotate.
- 3. Check the parallelism/gap between the halves of the coupling, using an air gap gauge. The gap may be a maximum of 0.5° – or when both halves rotate the gap deviation may not exceed 0.05 mm on the same point.
- 4. Alignment is corrected by inserting suitable shim between the pump's or the motor's base and base frame.

Incorrect alignment between pump and motor may cause increased wear on the coupling elements.

iii) Axial clearance

After coupling and alignment between motor and pump has been completed, the pump's axial clearance must be set correctly,

The axial clearance does not have to be set for pumps purchased with a motor, as this is set in the factory.

There should be sufficient axial clearance between the two couplings to prevent any loads on the pump as this will reduce performance and the life of the pump.

iv) Before connecting pipes



Clean out any impurities from the pipe system before connecting the pump.



Remove the protective plugs from the pump ports before connecting any pipework.

The pump must be installed so that there is no tension between the pipe and the pump casing.

We recommend that you connect pumps with an internal thread to pipes with a cylindrical thread.

v) <u>Dry running</u>

The pump should be secured against dry running as otherwise it will result in unnecessary wear or destruction. Dry running results in heat development at the pump casing, bearings, shafts and seals.

Pump supplied for potentially explosive environments **<u>must</u>** therefore always be secured against dry running on account of overheating.

vi) Threaded coupling



Threaded couplings must always be made by skilled professionals.



Connecting a pump with an internal thread to a pipe with a conical thread can cause the pump casing to burst if the coupling is over-tightened.

vii) Electrical coupling



Electrical couplings must always be established by qualified professionals, in accordance with the prevailing standards and directives

When installing the pump, check;

•	That the local mains voltage is the same as stated on the motor's name plate.
•	That the motor's direction of rotation corresponds with the desired pump direction. When the pump unit is viewed from the motor end, and you require the pump direction to the clockwise, the motor's rotation must be clockwise.

viii) Monitoring



Connect any monitoring and safety systems that are necessary for safe operation



Connect and adjust any monitoring and safety systems - according to the operating condition.

ix) Before starting the pump



The pump must be cleaned of test oil before starting up the pump if the test oil is not compatible with the pump liquid. In each individual case it is to be estimated the degree of cleaning which is deemed necessary.

Before starting the pump, check;

- That the pump shaft can be turned around freely.
- That the pump and motor are aligned precisely see section entitled: "Alignment between motor and pump"
- That all isolating valves in the suction and pressure pipe are fully open, to avoid the pressure being too high and the pump running dry
- That any by-pass valve is fitted correctly see section entitled: "Positioning of valve"
- That any Relief valve is adjusted to the correct opening pressure see section entitled: "Setting of Relief valve"
- That there is no coagulated liquid in the pump or the pipe system after the last operation that may cause blockage or breakdown
- That the necessary monitoring and safety systems are connected and adjusted according to the operating conditions/instructions in this manual

x) Before starting after preservation

If the pump has been in storage for a long period of time, you must also check the following:

Before starting the pump after preservation check;

• That the pump is not corroded or dried out – see section entitled – see section entitled: "Storage and protection of pump". Check that the pump shaft rotates freely

xi) After starting the pump

After starting the pump, check;

- That the pump is drawing the liquid.
- That there is no cavitation in the pump casing.
- That the speed is correct.
- That the direction of rotation is correct. Viewed from the motor side, liquid is pumped to the right when the shaft rotates clockwise.
- That the pump is not vibrating or emitting a knocking sound.
- That there are no leaks.
- If applicable, that the mechanical shaft seal is fully sealed
- Screw gland pumps however are permitted a low level of leakage.
- That the operating pressure is correct
- That the relief valve opens at the correct pressure
- That the magnetic clutch (type ED) is not slipping and thus causing an inadequate flow, and that the temperature in the magnetic clutch does not exceed the permissible value.
- That the power consumption is correct.
- That all monitoring equipment is in full working order.
- That any pressurised water pipes, heating/cooling systems and lubricating systems, etc. are operating.

7. Cavitation

There must be no cavitation in the pump casing as this results in extensive damage to the pump. The cause of cavitation should be found and the problem solved.

Cavitation is defined as formation and deflation of small liquid free bubbles. This process may exist in areas within the pump where the pressure falls to a level below the vapour pressure of the liquid. Always ensure that there is adequate pressure at the pump inlet to avoid cavitation so that the liquid does not boil or evaporate. Always check that the pump suction pressure is greater than the liquid's steam pressure irrespective of the temperature.

Cavitation can be ascertained in the form of vibrations and jarring sound from the pump. It may sound as if gravel was running through the pump. Cavitation arises when the vacuum in the pipe on the suction side is too high.

The increased vacuum may be caused by the following:

- That any filters in front of the pump are blocked or too narrow
- That the liquid viscosity is too high
- That the suction pipe is too long
- That the suction pipe is too narrow

Check if any filters fitted in front of the pump are blocked. If so, clean the filter thoroughly. If there is feed flow to the pump, you should bleed the pump before starting again. If there is no feed flow to the pump, the pump should be filled with liquid before start-up to avoid dry running as no dry running is allowed – see section 11.8 - Dry running..

If cavitation is due to too high viscosity, the problem may be remedied by fitting a suction pipe with a larger diameter or by heating the pump liquid so to increase the fluidity of the liquid and in turn a lower viscosity.

If cavitation is due to the suction pipe being too long, this may be remedied by moving the pump closer to the tank from which the pump is drawing or by fitting a suction pipe with a larger diameter.

8. Screw Gland

i) Running in the Screw Gland seal

When starting a new pump, the shaft seal must be run in as described below:

- 1. Once the pump has started, the shaft seal must leak.
- 2. When the shaft seal is saturated after approx. 30 minutes' operation the packing gland screws must be tightened gradually, so that the leakage is reduced.
- Check that the screw gland does not become hot. If the screw gland becomes hot, loosen the packing rings slightly, after which you must check that the temperature is falling.
- 4. The soft shaft seal must not be tightened so much that there is no leakage.
- 5. The soft shaft seal must leak continuously.
- 6. The leakage rate must be checked at regular intervals, If necessary, see section entitled:

"Adjusting the Screw Gland seal"

ii) Adjusting the Screw Gland seal



The shaft seal must not be adjusted during operation

It is important that the soft shaft seal leaks during operation, as this provides lubrication and also releases the frictional heat that is generated.

The shaft seal with packing coil requires continuous adjustment, to make sure that the volume of leakage by the screw gland is correct.

Depending on the speed, pressure, pump size and viscosity the screw gland must leak to remove the frictional heat that is generated between the shaft and the packing rings. If there is insufficient leakage, the heat generated can cause the gasket rings to harden and create increased wear on the shaft.

The leakage described above is achieved by tightening the packing rings axially, so that they apply a pressure against the shaft. This pressure restricts the flow of the liquid, once the screw gland has reached its maximum adjustment where the screw gland cannot be tightened anymore contact the manufacturer.

9. Relief valve

The section below uses both the designations relief valve and the safety valve.

Safety valve is defined as a valve fitted on the pressure pipe in the pipe system and which secures the **whole** pipework in the event of constant pressure increase. The safety valve has return flow to the liquid tank.

Relief valve is defined as the valve supplied by the manufacturer which is fitted to the pump. The relief valve secures only pump and motor. The relief valve does not secure the whole pipe system. The relief valve protects pumps in the event of brief pulsating excess pressures and not in the event of constant pressure increase. The function of the valve is described in detail under the section: Operating principle - relief valve.

Midland pumps are supplied both with and without a relief valve.



The relief valve is \underline{not} approved for protection of the pipe system, and therefore it must \underline{not} be used for this purpose



The pipe system **<u>must</u>** be protected against excess pressure in other ways than by use of the Midland pump relief valve

If a pipe system contains a facility to block the pump's pressure line, the pressure line <u>must</u> be fitted with a relief valve to take the <u>full</u> liquid volume - as pumping up against a blocked outlet line causes rapid pressure increase and results in heat accumulation inside the pump. This heat accumulation inside the pump is transferred to the pump surface and therefore constitutes a risk of explosion as for pumps functioning in a potentially explosive environment.



If the possibility exists to block the pump's pressure line, the pressure line $\underline{\text{must}}$ be fitted with a relief value to take the $\underline{\text{full}}$ liquid volume - as otherwise there is a risk of explosion

The Midland pump release valve must <u>**not**</u> be used for constant pressure control – such as "keeppressure valve".

If a need for constant pressure control exists, another solution should be found leading to the same result - such as frequency converter or gear.



Do <u>not</u> use the relief valve for constant pressure control.



The liquid volume may <u>not</u> circulate through the relief valve for long periods of time. Circulation over long periods of time through the release valve causes a significant heating up of the pump and pump liquid, and this may result in destruction of the pump

i) Operating the relief valve

When the pressure increases in the pump, the pump liquid is forced into the valve's pressure side. If the valve's preset pressure is exceeded, the internal spring is depressed, after which the pump liquid is forced out of the outlet side of the valve and down into the pump again. In this way recirculation of the pump liquid is created.



The pump must not pump with the valve open for long periods of time.



Recirculation through the release valve over a long period of time causes the liquid and the pump to heat up significantly

ii) Setting the release valve

If you have received the pump and the release valve has not been set at Midland Pump Manufacturing Company Ltd you should not set the release valve to a greater pressure than that was quoted.

To adjust the release valve you have to remove the cap and slacken the locking nut, adjust accordingly and taking care not to exceed the operating pressure at the time of quotation.

10. <u>Noise</u>

We refer to the prevailing local national laws and regulations on noise limits at the workplace.

Appropriate noise reduction measures must be implemented in accordance with the aforementioned local national laws and regulations, if so required.



Use appropriate hearing protection if necessary! If necessary, display a sign stating that hearing protection must be worn!

11. Hot liquids

When pumping hot liquids at high temperatures, suitable procedures must be drawn up to prevent any danger of injury caused by touching or standing close to the pump.



Check daily that the max allowed temperature is observed.



The pump must be shielded when pumping hot liquids that create a surface temperature on the pump of more than $+80 \,^{\circ}$ C A warning sign must be displayed in a clearly visible location.



When pumping hot liquids, the pipes should be fitted with compensators to prevent tensions in the pump casing.



Midland pumps may not be used to pump liquids at a temperature that is higher than the liquid's ignition temperature, and with reference to the maximum temperatures specified in the table in the table below depending on the type of seal used.

<u>Min/Max seal Temperature</u>				
Seal Type	Temperature			
Nitrile	About -20℃/+100℃			
Neoprene	About -40℃/+95℃			
Viton	About -20℃/+205℃			
PTFE	About -20℃/+100℃			
Silicone	About -60 ℃/+205 ℃			
EPDM	About -40 ℃/+130 ℃			

The pump liquid's minimum/maximum temperature limits for the various seals used in Midland pumps.

11. Maintenance and Spares

The pump must be inspected and maintained on an ongoing basis in accordance with the schedule below.

Maintenance					
During daily inspection checks;	Solution				
That the pump does not vibrate or emit jarring sounds.					
That there is no cavitation inside the pump casing.					
That any circulation pipes – cooling, heating or pressurised pipes are in working order.					
That power output and power consumption are correct.					
That flow and operational pressure is correct.					
That the max allowed temperature is observed.					
During monthly inspection, check:					
That any filters and drainage holes are clean.					
That mechanical shaft seals are not leaking.					
Whether the connecting elements are worn.	Replace if worn				
During inspection every 6 months, check;					
That the bearings do not have too much play					
That the relief valve, if any, functions correctly and opens at the right pressure.					
That the screw gland is intact.	To be repacked				
In connection with service work, check;					
All parts for wear and tear.	Replace worn parts				
That all parts are located correctly in connection with assembly.					

i) Disposal of liquid

The safety data sheet for the liquid used must be obtained, and the liquid must be disposed of in accordance with the safety data sheet's instructions.

Please refer to the relevant liquid's safety data sheet!



The safety instructions in the data sheet for the liquid in question must be observed, and the safety equipment specified must be used.

ii) Emptying and cleaning the pump

If the liquid being pumped is inflammable, toxic, corrosive or hazardous in any other way, or if the liquid has a temperature of more than 60 °C, special safety measures must be implemented before the pump is emptied.

The liquid's safety data sheet must be obtained and read before emptying the pump.

Please refer to the relevant liquid's safety data sheet.



Observe the safety instructions in the data sheet for the liquid in question and use the specified safety equipment.



Use suitable safety equipment with pump liquids at temperatures of more than +60 ℃.



When pumping hazardous liquids, circulate neutralising liquid before emptying the pump by spraying a light oil into the ports of the pump.

The system must be depressurised before emptying the pump.

- When pumping hazardous liquids, circulate a liquid that has a neutralising effect in relation to the pump liquid. We recommend the use of thin neutralising liquids to facilitate drainage.
- 2. Empty the pipe system.

Note that there is still liquid in the bottom of the pump casing and in the shaft seal housing, even if the pipe system is empty.

- 3. Stop the unit.
- 4. Close the valves on the suction side and the pressure side, if the system is equipped with these, so that the system is depressurised.
- 5. Place a collecting tank under the pump to take the volume of liquid contained in the part of the system to be emptied.
- 6. Remove the pump and place it with the ports pointing up/down, and then rotate the shaft manually to empty.

Please note that the drainage time is longer for highly-viscous liquids.

iii) <u>Repairs</u>

Pumps that are sent to Midland Pump for repair must have been emptied and cleaned before our factory can accept them, and the pumps must be accompanied by information about the pump liquid used.

Cleaning and emptying of the pump must be undertaken with due regard to the safety of our repair engineers.

We would point out that certain liquids coagulate and harden before arrival at our factory, which makes any repairs fully or partly impossible if the pump has not been emptied and cleaned before shipment. In such cases, inadequate emptying and cleaning will generate increased repair costs, or in the worst case mean that the pump has to be scrapped.

iv) Spare parts

We recommend that you use original spare parts.

Midland Pump Manufacturing Company Ltd accepts no liability for any personal injury or damage to the pump as a consequence of the use of non-original spare parts that do not satisfy precisely the same strict quality requirements as original Midland Pump Manufacturing Company Ltd spare parts.

v) Ordering spare parts

When ordering spare parts, the following information must be provided:

The pump's serial number:	AB999
Build number:	PE999/PES999
The model of pump:	BA150

The above information may be found on the pump's name plate. The serial number is also embossed on the pump's flange/foot.

Spare parts drawings and list can be issued upon request with the specific build number.

13. Technical Specifications

The technical specifications of the pump such as:

- Operational pressure
- Viscosity of pumped fluid
- Temperature
- Suction height

Will be advised at the time of quotation and should not be exceeded.

Pump	00/101	Litres/minute						
Madal	CC/Tev	50 Hz				60 Hz		
woder	(ml/rev)	4 pole	6 pole	8 pole		4 pole	6 pole	8 pole
(Rpm for no	load speed!>)	1480rpm	970rpm	720rpm		1760rpm	1160rpm	860rpm
LFP 0.25	0.167	0.24	0.16	0.12		0.29	0.19	0.14
LFP 0.5	0.333	0.49	0.32	0.24		0.58	0.39	0.29
LFP 0.75	0.50	0.73	0.49	0.36		0.88	0.58	0.43
LFP 1.0	0.667	0.97	0.65	0.48		1.17	0.78	0.58
LFP2.0	1.33	1.94	1.29	0.96		2.33	1.55	1.15
LFP 3.0	2.00	2.92	1.94	1.44		3.50	2.33	1.73
LFP 4.0	2.67	3.90	2.59	1.92		4.68	3.11	2.31
LFP 5.0	3.33	4.86	3.23	2.40		5.83	3.88	2.88
TC 250	2.3	3.36	2.23	1.66		4.03	2.68	1.99
TC 500	4.8	7.01	4.66	3.46		8.41	5.59	4.15
TC 750	7.1	10.37	6.89	5.11		12.44	8.26	6.13
TC 100	9.5	13.87	9.22	6.84		16.64	11.06	8.21
TC 125	11.8	17.2	11.4	8.5		20.7	13.7	10.2
TC 150	14.2	20.7	13.8	10.2		24.9	16.5	12.3
MOD 100	16.1	23.5	15.6	11.6		28.2	18.7	13.9
BA 100	19.6	28.6	19.0	14.1		34.3	22.8	16.9
MOD 125	20.2	29.5	19.6	14.5		35.4	23.5	17.5
MOD 150	24.2	35.3	23.5	17.4		42.4	28.2	20.9
BA 125	24.5	35.8	23.8	17.6		42.9	28.5	21.2
BA2-26	24.9	36.4	24.2	17.9		43.6	29.0	21.5
BA 150	29.4	42.9	28.5	21.2		51.5	34.2	25.4
BA2-125	30.4	44.4	29.5	21.9		53.3	35.4	26.3
BA2-39	37.4	54.6	36.3	26.9		65.5	43.5	32.3
BA2-162	39.5	57.7	38.3	28.4		69.2	46.0	34.1
BA2-200	48.6	71.0	47.1	35.0		85.1	56.6	42.0
BA2-52	49.8	72.7	48.3	35.9		87.2	58.0	43.0
BA2-65	62.2	90.8	60.3	44.8		109.0	72.4	53.7
BA2-78	74.7	109.1	72.5	53.8		130.9	87.0	64.5
31048	75.2		72.9	54.1			87.5	65.0
31064	100		97.0	72.0			116.4	86.4
32050	118.7		115.1	85.5			138.2	102.6
31080	125		121.3	90.0			145.5	108.0
32075	178		172.7	128.2			207.2	153.8
32100	237.4		230.3	170.9			276.3	205.1
32125	296.7		287.8	213.6			345.4	256.3
Standard		4 pole	up to 600 cS	t				
6 pole up to 1400 cSt			St		8 pc	le up to 2000	cSt	

The table below shows the maximum flow rates and Rpm of each pump model.