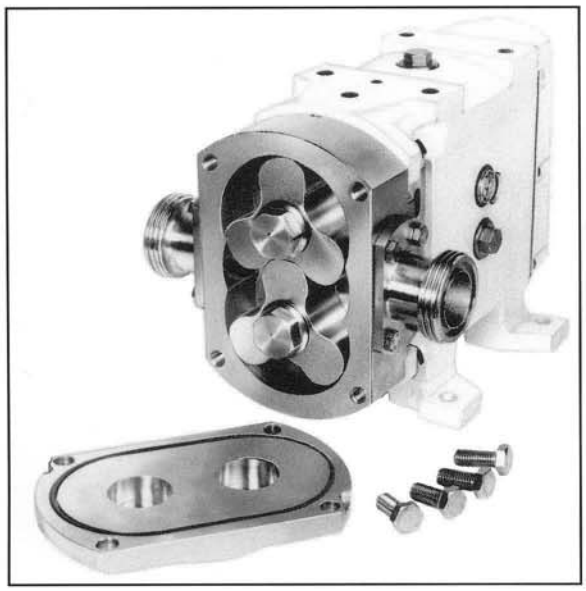
JABSCO®

24 Series
Rotary Lobe Pumps

INSTALLATION OPERATING AND MAINTENANCE MANUAL



Jabsco

ITT Industries

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INTRODUCTION

This manual contains information necessary for the installation, start-up, operation and maintenance of the ITT Jabsco Lobe pump range.

It is important that this manual is closely studied prior to installation or operation of the pump in order to avoid any practices which could cause damage.

If service or repair other than that mentioned in this manual should become necessary, contact your local ITT Jabsco distributor or factory for assistance.

Safety Checks

IT IS A REQUIREMENT OF COSHH (1988) REGULATIONS THAT THE MANUFACTURER'S INSTRUCTIONS IN THE HANDLING OF HAZARDOUS SUBSTANCES MUST BE OBSERVED AT ALL TIMES.

* All electrical wiring should be connected by a competent electrician.
* All equipment operating within a flameproof area must comply with the relevant standards applying to that area.
* The drive shaft and transmission must be guarded to B.S. 5304 "Code of practice for safeguarding of machinery". This applies if pump is driven via couplings or belt drives. Any guard fitted within a flameproof area must be constructed from non-spark material.
* All guards should be painted or coated to withstand the environments in which they are operating.
* All electrical equipment must be protected against environmental and overload conditions.
* Gland guards must be kept in place when the pump is operating.
* No closure of fastening should be loosened whilst the pump is operating.
* Leakage from mechanical seal or gland could be hazardous if liquids being pumped are toxic or corrosive.
* All pumps are equipped with lifting lugs which should be used as instructed within this manual.
* All joints on the pump head which are under pressure are potentially hazardous areas.
* All fasteners should be tightened to the correct torque figure (see this manual).
* If the relief valve is dismantled the correct spring rate should be reset on pump start up. Failure to do so could cause pump seizure.
* All gland flushing media must be compatible with the fluid being pumped.
* Jackets should not be over pressured. See limiting pressure in this manual.
* Pump should not be operated above its published rated performance.
* Labels should be attached to all surfaces over 60°C, indicating 'hot areas'.

Pump Inspection

All Lobe pumps are factory inspected and tested before packing and shipping to ensure safe delivery and satisfactory service. We would, however, recommend that you comply with the following actions on receipt of your Lobe pump:-

1. Remove packing material from container and check contents against packing list.
2. Check the pump for any physical damage sustained in shipping. If loss or damage is found notify your distributor immediately.

Pre-Installation Check

1. Remove protective shipping covers from inlet and outlet ports.
2. Remove end cover and inspect rotors and rotor case chamber for any foreign matter.
3. Replace end cover.
4. Assemble any integral part to the pump, i.e. relief valve, reduction unit, etc., following the assembly instructions given in later chapters.

PUMP INSTALLATION

To give optimum performance the installation of your Pureflo Lobe pump and its piping system should follow good hydraulic practice.

Baseplates

Various baseplate mounting of units can be used. These usually fall into three categories:-
Permanent Adjustable or Portable

Permanent baseplates should be installed with the following considerations:-

1. Baseplates should be grouted into concrete foundations.
2. Care should be taken to level the unit before grouting. Tightening down on an uneven surface could cause shaft misalignment with direct coupled units.

3. Where practicable fit anti-vibration pads between baseplate and floor.

Adjustable baseplates are used on sanitary applications where there is a need to clean under the unit.

1. The distance from baseplates to floor should be 100 mm (4") minimum to enable easy access of cleaning equipment.
2. Feet should be easily adjustable for height with four leg mountings as normal.
3. Baseplates to be of sufficient strength to resist any distortion which could be caused by the weight of the pump and drive unit.

Portable units are always fitted with wheels or castors for ease of movement.

1. Ensure wheels or castors have sufficient load carrying capability. On four wheel units place fixed castors at front with swivel at the rear.
2. Ensure unit is equipped with starter and cable reel.

Piping System

Suction and discharge pipe sizes are determined by calculation as described in the technical manual. It does not follow that the pump size will always determine the piping size.

On the suction side in particular or with a long pipe run on the discharge side, it is advantageous in reducing friction losses to use a larger pipe size than the pump standard ports. The ability to fit enlarged port adaptors gives further advantages in that the pump can be used with differing suction and discharge ports. This is necessary as the pump can accept high friction losses on the discharge side of the pump but not on the suction side where the NIPR could possibly be higher than the NIPA.

Simple guidelines to follow when installing piping systems are:-

1. Size of pipe should not be smaller than pump ports and in the majority of cases should be larger.
2. Easy bends should be used avoiding sharp elbows and tees.
3. Suction piping should be largest size and as short a run as possible.
4. Joints should be absolutely tight to avoid priming difficulty on the suction side and high pressure leakage of liquid on the discharge side.
5. All pipework should be supported independently. Failure to do so could cause distortion of pump cases. A table of acceptable forces on pump head is given on page 15.
6. Use expansion joints to minimise thermal expansion of piping.
7. Slope inlet piping up to pump on suction lift applications and down to pump on suction head applications to avoid air pockets developing which could become entrapped within pipe loops.
8. Use foot or check valves on suction side of pump to maintain priming capability.
9. Fit isolation valves on both suction and discharge sides of pump head to facilitate pump removal.
10. On vacuum service use large diameter pipe on suction side. It will be necessary to provide a high suction head.
11. Install vacuum and pressure gauges as close to the pump head as possible.
12. Where practical use suction strainers. Normal application is that the total area of the strainer holes should never be less than four times the cross sectional area of the suction pipe. If possible, fit vacuum gauges before and after the strainer to detect clogging which would result in pump starvation with ensuing cavitation.
13. Use full flow valves, i.e. ball or butterfly within the piping system to avoid friction losses.
14. Sufficient space should be allowed around the pump to facilitate removal of drive or replacement of parts.

Relief Valves

Lobe pumps are classified as positive displacement type and as such can generate medium to high pressures. To protect the pump against excessive pressures, a relief valve should be installed within the discharge piping system. The Pureflo Lobe integral relief valve which fits on to the end cover is designed to lift against pressure build-up and by-pass liquid from discharge to suction within the pump head.

There is one relief valve for each pump model, A, B, C and D. Each relief valve is capable of by-passing full flow from pump sizes 1 and 2 when pumping liquids of 1 cp or lower. *This type of relief valve should not be used on applications where the discharge is closed for more than 2-3 minutes.*

Extended running of the pump in this manner will cause rapid heating of liquid circulating through the relief valve. If such an operation is necessary, an in-line relief valve should be used where the liquid can be piped back to the suction vessel or as near to source as possible.

All relief valves have similar characteristics where the "cracking pressure", or pressure at which the

valve begins to lift and by-pass, is set by spring adjustment. The pressure then climbs to where full by-pass of fluid is taking place. This pressure build-up or "over pressure" is a function of each particular valve design.

The integral relief valve has one spring which can be adjusted over the pressure range of the pump. The over pressure is approximately 20% of the cracking pressure (see table below), this means that if the valve is set to crack at 5 bar, the over pressure would subject the pump to 6 bar before allowing full by-pass of liquid.

Certain conditions of viscosity and flow will take the pressure above the maximum loading of the pump, this will necessitate the fitment of a larger size relief valve in the discharge line in order to by-pass full flow.

Model	A1	A2	B1	B2	C1	C2	D1	D2
Max. diff. pressure - bar	10	6	9	6	8	6	7	5
Max. cracking pressure - bar	8.3	5	7.5	5	6.7	5	5.8	4.2

PUMP ALIGNMENT

Extreme care should be taken when mounting pump, drive unit and transmission on to the baseplate. Complete drive units which are supplied from distributor or factory will have been accurately aligned before despatch. A check on this alignment must be made before starting.

Integral Reduction Unit

The integral reduction unit will be supplied as a separate kit to the basic pump. The kit will include a fabricated baseplate on which pump and reduction unit will be bolted. *The rear feet of the bearing housing must be removed to avoid a six bolt fixing.*

Lifting Details

Pump only

A-size - by hand
B-size - lifting bolt provided
C-size - lifting bolt provided
D-size - lifting bolt provided

Pump and reduction gearbox

A-size - use lifting eye provided
B-size - use lifting bolt on pump and on motor
C-size - use lifting bolt on pump and on motor
D-size - use lifting bolt on pump and on motor

Detailed information is given for the reduction unit kit assembly in a later chapter.

A flange mounted IEC frame motor is spigot mounted to the reduction unit housing. Each pump model will accept the frame size of motor shown in the table below. The motor must be hose proof enclosure to IP55 to avoid entry of oil into the windings and water into the terminal box.

Pump Model	A	B	C	D
Frame Size	D90SD:D90LD	D100L:D112MD	D132SD:D132MD	D160MD:D160LD

Direct Coupled Units

These units whether fixed speed reduction units or variable speed units will be aligned to the pump by means of a coupling. Couplings can be various types such as bellows, pin, gear or torque slip. All couplings to a certain extent allow for shaft misalignment but it is important that the manufacturers limits are adhered to.

Alignment of pump and drive unit should be made in both parallel and angular planes by means of slips, gauges and straight edges. Shims can be used to adjust the height of the drive unit where necessary.

Belt Drive Units

Alignment of driving and driven pulleys can be made with a straight edge, ensuring that both pulleys are in line either horizontally or vertically mounted.

The pulley drive imposes more strain on bearings than direct coupled units. Bearing life is calculated at maximum conditions of load, bearing deflection, design and manufacturing tolerances. Limits are imposed on the minimum diameter of pulley when fitted to the driving shaft (see following table).
Both pulleys should be fitted as close to the pump and motor as possible.

B10 Bearing Life - Hours

Pump Model		A1	A2	B1	B2	C1	C2	D1	D2
Minimum Pulley		5"	5"	6"	6"	7"	7"	10"	10"
Bearing Life Pulleys	Front	43×10^3	31×10^3	15×10^3	13×10^3	14×10^3	8.9×10^3	12.8×10^3	15.7×10^3
	Rear	8600	6060	6330	5280	5480	3300	3168	3848
Bearing Life Direct Coupled	Front	14.8×10^4	10.2×10^4	5.9×10^4	4.9×10^4	9.9×10^4	5.7×10^4	7.7×10^4	8.4×10^4
	Rear	16.4×10^5	7.1×10^5	10.5×10^5	5.9×10^5	46×10^5	8.5×10^5	8.4×10^5	5.0×10^5

Pumps are equally suited to either direction of rotation.

Before connecting any drive units to the pump and after pumping system is complete, *turn over the pump shaft by hand to ensure that pump head rotating parts are not under stress.*

Complete the pump installation by connecting drive unit to pump.

Any drive unit fitted must not exceed the limiting shaft torque figures shown in the following table. For an explanation of how to use these figures see technical manual section 7, page 6.

Limited Shaft Torques

Pump Series	Nm	Kgf/m	ft-lbs
A	88	8.97	64.9
B	160	16.3	118
C	578	58.9	426
D	772	78.7	569

Examples are also given in the technical manual section 8, page 2, of calculating the overhung load on the driving shaft. These loading figures must be adhered to when applying belt drives. The table below gives the limiting figures of these loads.

Overhung Loads

Pump Series	Nm	Kg	lb
A	740	75.5	166.5
B	1260	128.5	283.5
C	2900	295.8	652.5
D	3600	367.2	810.0

ROUTINE PUMP CHECKS

Starting Checks

Before starting the pump unit certain checks must be observed. Failure to comply with these checks could endanger equipment and personnel.

1. Remove endcover and check that pump head is clean and does not contain any debris. CHECK TIGHTNESS OF ROTOR RETAINING BOLTS (key 7 on spare parts list). For reliable operation it is essential that these bolts are correctly tightened - lock pump using a soft wedge and tighten bolts to the correct torque (see back page of this manual) using a torque wrench. Refit endcover and check tightness of all other bolts and fastenings.

2. Check that the piping system conforms to the piping diagram of the installation.
3. Check for welding flash and other foreign matter in the piping system. All piping must be clean and free from installation debris.
4. See all piping connections and fittings are tight. If possible, flush through with clean water. *Do not use the pump for this operation.*
5. Fill pump with correct grade and amount of oil, see lubrication instructions. Ensure that the oil level window is always in the top position, i.e. furthest from base. Check drive lubrication instructions and comply.
6. Check that flush is connected to seal if required. This flush must be capable of providing adequate flow.
7. Check that all valves are open within the system and that pump protection devices are in operation, i.e. relief valve, expansion bellows, etc.
8. Check direction of pump rotation by jogging motor.
9. Start pump. If possible at slow speed, building up to operating speed whilst checking for leaks from piping system and pump seals. Packing gland must leak, see seal assembly instructions. If pump fails to produce expected flow within 2-3 minutes check pump and system problem items in the following problem solving section. Page 7.

Daily Checks

1. Visual check of joints, oil, gland leakage and general running of the pump.
2. Any defect or malfunction should be corrected at the end of the shift if minor and at once if major.

Weekly Checks

1. Dismantle and clean rotor case and all internal parts of the pump head.
2. Inspect the gland packing and shaft sleeves for signs of wear and renew if necessary. Some liquids and service conditions will necessitate frequent packing changes. If the gland has been leaking excessively during operation, this is usually a sign that the packing should be renewed. This statement assumes correct tightening of the gland follower.
3. Inspect mechanical seal faces and joint rings for signs of wear and note for planned maintenance scheduling.
4. Check lubrication level and top up with correct grade when required.
5. Check lubrication on drive unit and follow manufacturer's instructions.

Monthly Checks

1. Change gland packing - intervals of change will vary according to the nature of the pump application.
2. Inspect as weekly checks.
3. Check relief valve function. If the relief valve is not operating on a regular basis, a tendency for the diaphragm to stick could become apparent.

Six-Monthly Checks

1. Change end cover 'O' ring and port joint rings.
2. Possible change mechanical seal complete.
3. Drain and change oil from pump and reduction unit if fitted.
4. Change front oil seals. Remove bearing retainers to replace oil seals. Change rear oil seal. Remove gear cover to replace the oil seal ensuring that the gear cover gasket is also replaced. *Ensure that oil had been drained from housing before changing oil seals.* Care should be taken when changing the front oil seal that bearing preload shims are not damaged or lost.
5. Check timing gears for excessive backlash by holding one shaft and rotating the other. If backlash is enough to allow rotors to engage they should be changed. See assembly instructions.
6. Check bearings for signs of wear and corrosion. If corroded to any extent, wear will be rapid. Bearings can be corroded by liquid passing over the slinger and entering through the dual lip oil seal. Any bearings showing wear should be replaced.

By ensuring a visual inspection daily and regular checks at planned intervals, pumps can be maintained to maximum performance for many years.

LUBRICATION INSTRUCTIONS

1. Lobe pumps are supplied without oil in the bearing housing. Before starting they must be filled with any of the following grades of oil:

   Duckhams - Galrex 8/9 Castrol - Magna 220
   Shell - Vitrea 220 B.P. - Energol CS220

Oil Capacities - Litres

Pump Size	Pump only	Pump and Reduction Unit only
A	0.6	1.1
B	1.3	2.3
C	2.6	3.9
D	4.4	6.6

2. The oil level indicator is on the side of the bearing housing and should always be in the top position i.e. furthest from the feet. Filler and drain plugs have identical thread size to the oil level indicator. When changing drive shaft position filler and drain plugs and oil level indicator should exchange positions. Side mounting units should have the oil level indicator in the filler position.
3. After the first 120 hours of service drain the lubricating oil from bearing housing and reduction unit. Flush with suitable oil and refill with correct grade of lubricant.
4. Check oil level daily and top up when necessary. Any substantial oil losses should be investigated immediately.
5. After 6 months running change oil completely as recommended in routine checks.
6. For pumps operating in extreme environments oil changes of differing grades may be necessary. Consult ITT Jabsco or local distributor for recommendation.
7. If the recommended grades of oil are not available any ISO grade gear oil of identical viscosity rating can be used.

MINOR DISASSEMBLY

Pump Head

1. Remove gland guard by unscrewing nut from stud.
2. Remove end cover bolts and end cover from the rotor case. If the end cover has become adhered to the rotor case with the liquid being pumped, use the two slots provided to prise the end cover away. *Do not use any other areas for this purpose.*
3. Unscrew the rotor bolts using a soft wedge between the rotors to prevent rotation.
4. Remove rotors taking care not to damage shaft splines.
5. Remove the rear nuts unscrewing each nut by increments whilst at the same time sliding the rotor case over the shafts away from the bearing housing.
6. Removal of rotor case will expose the gland seal (see separate instructions).

Integral Reduction Unit

1. Drain oil from bearing housing and reduction gear box using drain plug in reduction housing.
2. Unscrew motor fixing bolts and remove motor, taking care to support the motor's weight during removal.
3. Unscrew the socket cap screw on the motor gear and remove.
4. Unscrew bolts from base plate and remove.
5. Unscrew bolts from reduction gearbox and withdraw from gearbox housing dowels together with gasket.
6. Unscrew the socket cap screw on the pump gear and remove.
7. Unscrew the bolts from the gearbox housing and withdraw from the bearing housing together with gasket.

Relief Valve

1. Measure the distance that the adjusting screw protrudes from the relief valve housing. On assembly this distance must be maintained in order to provide an identical blow-off pressure.
2. Unscrew the adjusting screw and remove spring.

TROUBLE SHOOTING GUIDE

SYMPTOMS																					PROBLEMS	SOLUTION
Pump not Turning	Pump Turning No flow	Pump Turning Low Flow	Pump Turning Irregular Flow	Pump Turns then Loses Prime	Pump Starts then Stalls	Pump Overheating	Motor Overheating	Excessive Power Consumption	Pump Noisy and Vibrates	Rotor Chamber Wear	Gland Seal Wear Excessive	Gland Leakage	Pump Seizure									
•																					Driver not turning	Check wiring, fuses, etc.
•		•																			Belt drive broken or slipping	Replace belt or readjust
•																					Transmission sheared or slip torque coupling incorrect	Repair or readjust
	•																				Incorrect direction of rotation	Reverse drive
	•	•	•	•	•	•	•	•	•	•											Incorrect rotors fitted	Check normal or C.I.P. clearance rating
	•	•				•			•												End cover relief valve incorrectly set	Reset spring rating. Check diaphragm and spring for damage
	•																				Suction valves closed	Open valves
	•	•	•	•	•				•												Strainer or foot valve obstructed	Check strainer mesh size - remove obstruction
	•																				Pump not priming	Expel air from suction piping, introduce liquid to rotor surfaces
	•	•	•	•					•												Insufficient N.I.P.A.	Check suction system against N.I.P.R. by pump
	•	•	•	•					•												Air leaks on seals or pipe connections	Replace seals and tighten pipe connections
	•																				Pump speed too slow to prime	Prime suction pipe and fit foot valve
	•																				Liquid drains from suction pipe during shut-off periods	Fit foot valve
	•	•	•	•					•												Air inclusions in suction piping	Check piping for air locks, see 'Piping Installation' for correct slope of pipe. Bleed air pockets manually
		•	•	•					•												Vaporization taking place in the suction system. Cavitation noise apparent	Increase suction piping diameter. Increase suction head and reduce fittings and length of suction pipe. Decrease product temperature but check if viscosity varies, which could decrease N.I.P.A. See Technical Manual.
		•																			Viscosity of liquid below given value	Increase pump speed. Decrease product temperature
		•				•			•	•			•								Product temperature above rated figure	Cool the product - increase viscosity
					•		•	•													Product temperature below rated figure	Heat the product
		•			•	•	•	•	•	•			•								Discharge pressure above calculated figure	Check calculated discharge system pressure. Check for obstructions. Use large diameter piping or shorten line.
		•	•	•					•			•									Packing gland under tightened	Readjust - see assembly instructions
		•																			Pump speed below rated figure	Increase pump speed
		•	•	•																	Worn pump chamber and rotors	Fit new parts
				•	•	•	•	•	•												Viscosity of liquid above given value	Decrease pump speed. Increase product temperature
									•	•	•	•	•								Solids in liquid (not allowed for). Abrasive particles	Clean and flush system. Fit strainer to suction piping
						•	•	•			•		•								Packing gland over tightened	Readjust - see assembly instructions
											•	•									Gland flush not adequate	Increase flow rate - check for obstructions
			•	•			•	•	•												Pump speed above rated figure	Decrease pump speed
						•	•	•	•	•											Pump head under strain from piping	Support piping. Check alignment. Fit expansion joints where needed.
						•	•	•	•												Flexible coupling out of line	Adjust alignment - see instructions
									•												Loose pump or driver	Tighten and realign unit
					•	•	•	•	•	•		•	•								Bearings worn or failed	Replace parts as assembly instructions
					•	•	•	•	•	•											Timing gears worn or incorrectly timed	Replace or re-time gears as instructions
						•	•	•	•												Incorrect grade and amount of lubricating oil	Refer to manual for information
				•	•	•	•	•	•				•								Contact of rotating elements within pumping chamber	Check pump rated pressure. Consult maintenance manual for fitting instructions

3. Remove bolts and slide complete assembly from end cover.
4. Relief valve seat, diaphragm, plunger and valve guide can all be dismantled with ease, being spigot mounted and sliding fits.

Packed Gland

1. Follow instructions as in pump head disassembly.
2. The sleeve is a slide fit on to the shaft and is held in place by the sleeve dowel pin.
3. Removal of the sleeve will expose the sleeve 'O' ring.
4. Ensure that all shims remain on the shaft, behind the sleeve dowel pin, and that none have adhered to the sleeve.

Hygienic Mechanical Seal

1. Follow instructions as in pump head disassembly.
2. The mechanical stationary seat is located in the base of the rotor case gland bore.
3. When removing the mechanical seal release the two socket cap screws and slide the seal assembly off the shaft.

Hygienic Mechanical Seal Flushed

1. Remove flushing connectors from seal housing.
2. Follow instructions as in pump disassembly. (It will be necessary to loosen the flush seal housing retaining bolts in the same manner as when loosening the rotor case dome nuts.)
3. Unscrew the mechanical seal socket cap screws from the shaft sleeve and slide seal off.
4. Remove shaft sleeves and seal housing, ensuring all shims remain on the shaft.

MINOR ASSEMBLY

Relief Valve

1. Screw adjusting screw a few turns into the relief valve housing.
2. Slide spring over plunger and fit plunger into relief valve housing so that it passes through adjusting screw.
3. Fit diaphragm into recess in relief valve housing. If PTFE coated, ensure that PTFE side is 'face up', i.e. facing liquid.
4. Fit relief valve seat into recess in relief valve housing and 'O' ring into groove.
5. Pass bolts through relief valve housing, diaphragm and relief valve seat and fit complete assembly on to end cover. Tighten bolts to correct torque.
6. If reassembling relief valve ensure that the adjusting screw protrudes from the relief valve housing the correct distance measured on disassembly. If fitting a new part the spring must be adjusted when pump is operating to ensure the required blow-off pressure.

Packed Gland - Sleeved

1. Replace 'O' rings on shafts - never attempt to use old or cut 'O' rings.
2. Assemble sleeves to pump shafts to ensure sliding fit.
3. Remove sleeves and place within the rotor case gland bores ensuring that the sleeves stand above the bore. (Use packing pieces within the rotor case chamber to achieve this).
4. Lobe pump packings are supplied as pre-cut rings and when installed should be spaced at 120° intervals.
5. Fit each ring individually and ensure that the first ring and each successive ring is firmly seated with a tamping tool. (See section on gland packing procedure).
6. Assemble gland followers to the rotor case and hand tighten only the gland stud nuts.
7. Fit rotor case to bearing housing ensuring that sleeves are in line with shaft pins.
8. Tighten gland followers only as instructed in gland packing procedures.

Gland Packing Procedure

Unlike mechanical seals, soft gland packing must leak to perform correctly. The function of packing is to control leakage to an acceptable level, not to prevent it entirely.

Pump packings contain a lubricant which acts as a primary sealant during the start-up and breaking in phases.

Once the pump is on stream, however, external lubricant must be supplied to maintain an acceptable gland life.

This lubricant is normally the fluid which is being pumped.

Packing Installation

The importance of packing the pump correctly cannot be over-emphasised. There is only one way to pack a pump and it is as follows:-

1. Remove *all* old packing from the stuffing box. Clean box and shaft thoroughly and examine sleeve for wear or scoring.
2. Replace sleeve if wear is excessive, do not attempt to seal a pump with worn sleeves. Check pump bearings by lifting shaft up and down. Do not expect the packing to act as a bearing.
3. Lobe pumps are supplied with preformed rings of packing which are cut to size to fit within the gland cavity. If, however, coil packing is being used the following table will give correct sizes and sections for the pump range.

Gland Dimensions

			3-rings of Packing	Housing Depth
Size	Shaft ø	Housing ø	Packing Section	O/A Length
A	30	44	7 x 7	25
B	38	54	8 x 8	28
C	55	75	10 x 10	35
D	63	83	10 x 10	43

4. Always cut packing into separate rings. Never wind a coil of packing into a stuffing box. Cut the packing on a mandrel the same diameter as the shaft in the pump.
5. Hold the packing coil tightly and firmly on the mandrel. Cut the first ring and try it in the stuffing box to make certain it fills the packing space properly.
6. Each successive ring can be cut in the same manner or the first ring can be used as a master from which other rings can be cut.
7. Install one ring at a time making sure that each ring seats firmly. Joints of successive rings should be kept 120° apart. Each ring should be firmly seated with a tamping tool with the shaft sleeve in position in the stuffing box.
8. When the third ring has been seated tamping should be carried out with the gland follower. Do not rely on the gland follower to tamp the first or second rings.
9. After the last ring has been installed, take up the gland nuts finger-tight. Do not jam the packing tight using spanners at this stage.
10. Assemble rotor case to bearing housing (see separate instructions).

Adjustment of Gland

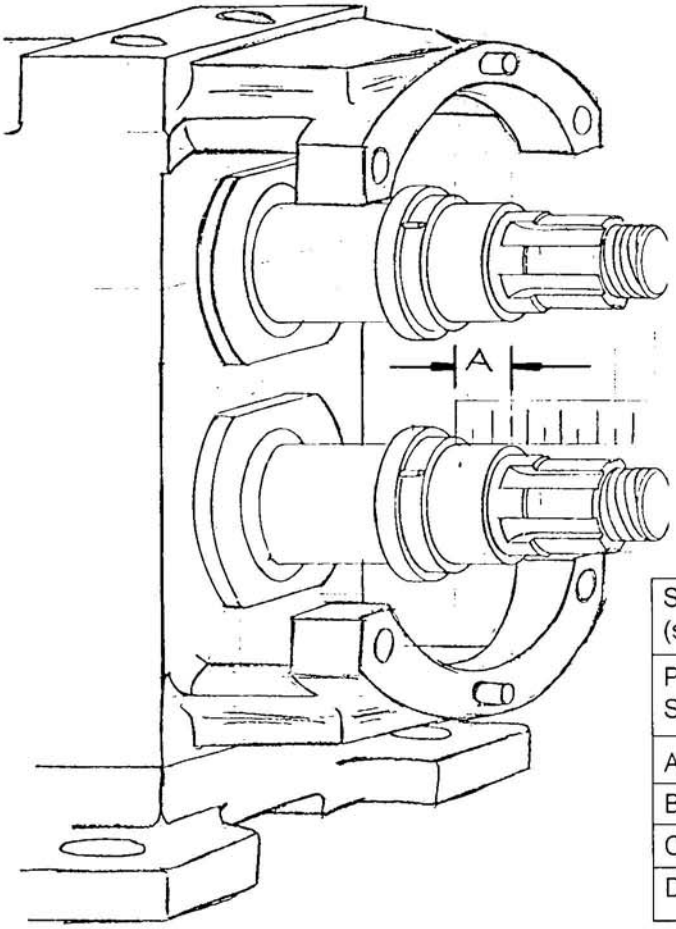
1. Start pump, and take up gland nuts until leakage is decreased to a tolerable amount. Stopping leakage entirely at this point will cause the packing to burn up.
2. Excessive leakage during the initial running of a pump will result in a better packing result over a longer period of time.
3. Gland nuts should be tightened by degree approximately half a turn at a time until leakage is minimal.

Hygienic Mechanical Seal - Standard

These seals are precision products. Any damage to the lapped faces, no matter how slight, will impair the seal performance and result in early failure. Do not fit with soiled hands, ensure absolute cleanliness of pump shafts and housings, do not place seal faces in contact with bench tops, retain in package until moment of fitment.

1. Lightly lubricate larger 'O' rings and fit over steps on carbon mating rings. Examine bores of pump rotorcase for burrs, sharp edges, dirt, etc. and remove. Ensure a lead-in is present on leading edges of bores. (A chamfer 15° by 1/16 in. (1.5 mm) long is ideal). Press carbon ring down bore 'O' ring first, hand pressure only is allowed.
2. Slide stainless steel spring adaptors over shaft sleeves. Set to dimension 'A' and tighten screws in order to mark sleeve. Remove spring adaptor and centre punch the shaft sleeve in the position marked by the screw. Dimple the sleeve with the appropriate size drill for a depth of 1.5 mm (1/16"). Debur dimples and refit spring adaptor and tighten screws.

   Note: Care should be taken during the operation to centre punch and drill with the sleeve on a mandrel. This will avoid distortion.
3. Slide wave springs over shafts.
4. Fit small 'O' rings into counterbores of stainless steel seal rings and lightly lubricate. Check that no sharp corners or burrs are present on sleeves. Slide seal rings, 'O' ring first over shafts until pins locate with grooves in spring adaptors.
5. Offer rotorcase up to shafts and carefully align bores with shafts. Locate fixing studs and tighten evenly. The shafts must not contact carbon mating-rings during this operation.



STANDARD DIMENSIONS (stated in mm)			
PUMP SIZE	SHAFT SIZE	LENGTH "A"	DIMPLE SIZE
A1, A2	30	18.2 ± 0.25	4.0
B1, B2	38	18.2 ± 0.25	4.0
C1, C2	55	21.8 ± 0.25	5.2
D1, D2	63	21.8 ± 0.25	5.2

Hygienic Mechanical Seal - Flushed

1. Replace 'O' rings on shafts.
2. Assemble shaft sleeves to pump shafts ensuring a 'sliding fit'.
3. Fit oil seals and 'O' rings to seal housing and slide on to shafts.
4. Fit mechanical seals to sleeves and tighten screws.
5. Offer rotor case up to shafts and slide into position tightening bolts and seal housing bolts by increments to prevent misalignment.
6. Fit flushing connectors to seal housing or rotor case on A series.
7. Ensure all joints are tight and flushing fluid is reaching the seal before starting pump.

Pump Head - Existing Parts.

1. Position the rotor case so that the shaft sleeves are in line with the pins in the shaft. Slide the rotor case along the shafts until the studs engage through the bearing housing lugs. Fit the bolts and tighten each one in turn evenly until all are in position. Tighten to correct torque figure.
2. Ensure shaft splines, bore and back face of rotors are clean. Ensure 'O' rings (key 64) are in place.
3. Slide rotors onto shafts and lock pump using a soft wedge.
4. Ensure 'O' rings (key 63) are in place then fit rotor bolts and tighten. IMPORTANT:- For reliable operation it is essential that these bolts are tightened to the correct torque (see inside back page of this manual) using a torque wrench.
5. Fit 'O' ring to end cover and assemble to rotor case.
6. Tighten end cover bolts to correct torque figure.
7. Fit gland guard only after any seal adjustments have been made.

Pump Head - Complete New Parts

1. Fit shaft sleeve shims of approx. 1 mm total thickness to each shaft.
2. Fit rotor case to bearing housing and assemble rotors on to splines tightening rotor bolts. Measure the gap between the rear face of the rotor and the rear face of the rotor bore in a number of places noting the minimum gap of the readings.
   Feeler gauges can be used through the port bore to obtain these measurements.
3. Using the clearance chart provided subtract the clearance required by model/rotor clearance type from the minimum gap shown by feelers. This shows the amount of shims to be removed from each 1 mm shim pack.

4. Remove rotor case and shaft sleeves and remove the required amount of shim. It is advisable to rotate the shims slightly so that the cut-out is not in line with the dowel pin.
5. After fitment of the gland seal (see separate instructions), fit the rotor case to the bearing housing tightening the nuts to the required torque figure.
6. Fit rotors and rotor bolts to correct torque - see previous section.
7. Fit end cover joint ring and assemble to the rotor case, tightening bolts to required figure.
8. Fit joint rings to port adaptors and assemble on to rotor case with set screws.

Pump Head Clearances (mm)

Pump Size	Rotors	Code	Front Minimum	Rear Nominal	Radial Minimum	Mesh Minimum
A1	- Normal	0,2	.11	.14	.11	0
	- CIP	1,3	.16	.21	.19	0
	Extra	4,5	.25	.30	.29	0
A2	- Normal	0,2	.19	.19	.20	0
	- CIP	1,3	.22	.24	.24	0
	Extra	4,5	.37	.37	.40	0
B1	- Normal	0,2	.14	.17	.17	0
	- CIP	1,3	.20	.25	.26	0
	Extra	4,5	.23	.28	.28	0
B2	- Normal	0,2	.21	.20	.26	0
	- CIP	1,3	.24	.26	.31	0
	Extra	4,5	.40	.41	.52	0
C1	- Normal	0,2	.16	.19	.20	0
	- CIP	1,3	.20	.29	.26	0
	Extra	4,5	.25	.34	.29	0
C2	- Normal	0,2	.27	.26	.30	0
	- CIP	1,3	.32	.36	.36	0
	Extra	4,5	.53	.55	.60	0
D1	- Normal	0,2	.23	.24	.28	0
	- CIP	1,3	.23	.29	.28	0
	Extra	4,5	.33	.39	.48	0
D2	- Normal	0,2	.24	.23	.30	0
	- CIP	1,3	.24	.28	.30	0
	Extra	4,5	.39	.43	.48	0

Mesh to be on mid position of backlash.

If rear clearance is adjusted with the use of shims to within ±0.04 mm then front clearance should come automatically.

Equivalents:- 0.1 mm = 0.00394 inches
0.001 inches = 0.0254 mm

Lobe Pump Shims

Shaft Sleeve

Pump	O.D.	I.D.	
A	33	24.1	Thickness (mm)
B	41	33.9	0.02, 0.05, 0.10,
C	58	47.1	0.15, 0.20
D	66	53.7	

Gear

Pump	O.D.	I.D.	Width of split	
A	34	25.2	7.3	Thickness (mm)
B	40	30.2	9.3	0.03, 0.05, 0.10,
C	62	50.2	15.3	0.15, 0.20, 0.30
D	70	55.2	15.3	

Bearing - thicknesses as gear

Pump	O.D.	I.D.
A	51.8	44
B	61.8	53
C	89.8	79
D	99.8	88

Equivalents:- 0.1 mm = 0.00394 inches
0.001 inch = 0.0254 mm

Integral Reduction Unit

1. Lay baseplate on flat surface and position packing piece over bolt holes in base plate. For positioning refer to parts list sectional drawing.

   Note adequate lifting facilities and space will be needed around the assembly area.
2. Position the driving shaft in the bottom position. If the feet have to be changed over to achieve this, remember to reverse filler, drain plugs and sight level gauge. If an existing pump is being converted, first drain the oil, then remove the gear cover.
3. Remove the bolts attaching the rear feet to the bearing housing. Position bearing housing on packing piece supporting the bearing housing during assembly.
4. Press dowels into the gearbox and reduction gearbox housings leaving approx. 1/3 of the dowel length proud of housing faces.
5. Fit baseplate bolts through the front feet and packing piece, screw on nuts hand-tight. Offer up the gearbox housing to the bearing housing ensuring that the gasket is in position between the two parts. Slide the dowel pins into position on the rear face of the bearing housing.
6. Screw in gearbox housing bolts and tighten to the appropriate torque figure, first fitting each bolt with a spring washer.
7. Fit key to driving shaft (supplied with pump). Position the gear so that the boss on the gear is facing away from the pump and is flush with the end of the shaft. Lock into place with socket screw.
8. Position the reduction gearbox housing to the gearbox housing using the dowel pins and ensuring that the gasket is between the two faces.
9. Slide dowel pins into their holes and bolt into position using correct torque figures.
10. Screw rear baseplate bolts through reduction gearbox feet. Tighten both front and rear baseplate bolts.
11. Fit key to motor shaft using key provided with the reduction unit kit. Position the gear on A, B and C models so that the boss on the gear is facing towards the motor and the back face of the gear is flush with the end of the shaft. On the D size pump fit the gear so the boss is facing away from the motor and the face of the boss is 3 mm from the end of the shaft. Lock into place with the socket screw.
12. The motor to be fitted must be to the correct frame size and conform to IP55 enclosure (see pump alignment).
13. Scew studs into the lower two holes of the reduction gearbox flange and fit gasket. Using motor eyebolt with a hoist or suitable load carrying appliance, guide the motor into position ensuring that both gears mesh. Fit the top two bolts, four spring washers with nuts and tighten to correct torque figure.
14. Fit drain plug to reduction gearbox and refill to oil level window with correct grade of oil.

DO NOT ASSEMBLE AS SHOWN IN THE SPARE PARTS LIST (SD561)

MAJOR DISASSEMBLY

(It is recommended that major disassemblies are undertaken by factory trained personnel).

Bearing Housing

1. Drain oil from bearing housing by removing drain plug.
2. Remove drive key from shaft.
3. Unscrew socket cap screws and remove gear cover and gasket.
4. Unscrew lock and shaft nuts. Use the rotors to lock shafts by fitting them 180° out of positional mesh (i.e. rotor dwells toward each other). Do not remove rotor case as bent shafts will result.
5. Remove pump head (see minor disassemblies).
6. Remove left and right hand helical timing gears, together with gear spacer, timing shims and gear keys. If the pump is to be assembled using the existing components, the shims must be labelled and replaced on correct shaft.
7. Remove shaft sleeve shims and label to ensure fitment to the same shaft on reassembly.
8. Unscrew bolts and remove bearing retainers. The preload shims must be labelled for assembly.
9. Remove shafts, tapered roller bearings, bearing spacers and needle roller inners from bearing housings. Care should be taken when the tapered roller bearings clear the housing bores that the shaft is not damaged on thread or ground faces.
10. Slide off the shafts the needle bearing inners and bearing spacers, press off the tapered roller inners taking care to label each one.
11. Slide out the rear tapered roller bearing outers.
12. Press out the needle bearing outer cage from the bearing housing. Both shafts should now be laid out together with their respective bearings, nuts, spacers and shims.

MAJOR ASSEMBLY

(It is recommended that major assemblies are undertaken by factory trained personnel).

Bearing Housing

Existing Parts

1. Slide outer rings of rear taper roller bearings into bearing housing.
2. Press outer rings of needle bearings into their correct bearing housing bore, flush with the rear face.
3. Press on to their shafts the inner rings of the tapered rollers.
4. Slide on bearing spacers and inner rings of needle bearings.
5. Assemble both shafts into the bearing housing, slide on gear spacer and correctly labelled shims.
6. Fit gear keys and gears ensuring correct alignment of timing (i.e. one dot driving shaft, two dots driven shaft). Driven gear has an annular groove for identification.
7. Slide into bearing housing the front outer rings of the tapered roller bearing taking care not to misalign.
8. Fit pre-load shims to correct bearing and bolt bearing retainer to housing.
9. Screw on shaft and lock nuts tightening to the correct torque figure. Use the rotors for this purpose.
10. Assemble gasket and gear cover to bearing housing.

Bearing Housing

Complete New Parts

**Note: position of bearing housing prior to assembly is as follows:-*

Looking on rear end with driving shaft in top position oil sight glass and plug are to be on the L.H. side.

1. Press on to shafts the inner rings of the tapered rollers. These bearings are not matched pairs but attention should be given to correct pairing of inner and outer components.
2. Slide on bearing spacer and press inner ring of the rear needle bearing into position.
3. Press the outer rings of the needle bearings into the bearing housing flush with the rear face.
4. Press dowel pins into place on the front face of the bearing housing.
5. Slide outer rings of the rear taper roller bearings into the bearing housing.
6. Assemble both shafts into the bearing housing.

To Ensure Correct Preload on Tapered Roller Bearings

1. Stand pump on to the rear face of the bearing housing. Tap both shafts on the rotor end using a hide faced hammer. Note: This is to ensure that the tapered roller bearings are fully seated.
2. Fit the outer rings of the front taper roller bearing.
3. Measure the depth from the bearing face to the bearing housing face and note. Measure the depth of spigot projection on the bearing retainer being fitted and note. Subtract the spigot depth from the bearing housing depth and add 0.025 mm (0.001") to give a bearing pre-load. This calculation is the amount of shims which must be placed between bearing and bearing retainer. The bearing pre-load can be checked by measuring the torque required to rotate the shaft (see table).
4. Fit bearing retainer 'O' rings and oil seals before final assembly to the bearing housing.

Timing Shafts to Ensure Rotor Interchangeability

5. Fit gear spacer and gear key to shaft.
6. Slide both gears into position and screw on shaft nuts hand-tight ensuring that the right-hand helix is assembled to the driving shaft. The driven shaft gear has an annular groove for identification.
7. Slacken off the shaft nut on the relevant shaft (see table) until the master jig fits over both splines.
8. The shaft nut which is not to be adjusted can be tightened to the correct torque figure and the locknut assembled.
9. With the timing jig in place push the gear fully foward and measure the gap, using feeler gauge, between spacer and gear. Note this measurement and, pushing the gear fully back, take a similar measurement.
10. Add both measurements together and divide the result by 2. Add shims of equivalent thickness to this figure between gear spacer and gear.
11. When a master jig is not available the rotors can be used to time the shafts by measuring the gap between the rotors at opposite points and adding shims to rotate the shaft until the gap is equal at all points.
12. Tighten shaft and lock nuts to the required torque. Recheck gaps between rotors and readjust until equal.
13. Fit rear oil seal into the gear cover and assemble gasket and cover to the bearing housing with socket cap screws.

Spline Rotation/Gear Shim

Fit right-hand gear to drive shaft.
Fit left-hand gear to driven shaft (with indent ring).
Looking on driver and driven shaft end.
Shimming driving shaft rotates spline clockwise.
Shimming driven shaft rotates spline anti-clockwise.

	Shim (mm)	Movement at rotor pcd (mm)
A	0.1	0.046
B	0.1	0.035
C	0.1	0.034
D	0.1	0.031
A	0.22	0.1
B	0.28	0.1
C	0.29	0.1
D	0.32	0.1

Preload Torque - min

Pump Type	Bearing Reference	Preload	Torque per pair of brgs
A	30205 A	10 microns	3.5 lbf ins
B	30206 A	12 microns	4.4 lbf ins
C	30210 C	15 microns	5.3 lbf ins
D	30211 C	20 microns	7.1 lbf ins

Equivalents:- 0.1 mm = 0.00394 inches
0.001 inch = 0.0254 mm

14. Fit all drain and filler plugs. Bolt feet for required mounting position and screw in the oil sight glass to the top position, i.e. furthest position from the feet.

    Note:- Whilst fitting all shims care should be taken to ensure that all faces are clean and free from grease. Grease between shims during assembly may cause excessive preloading of taper roller bearings.

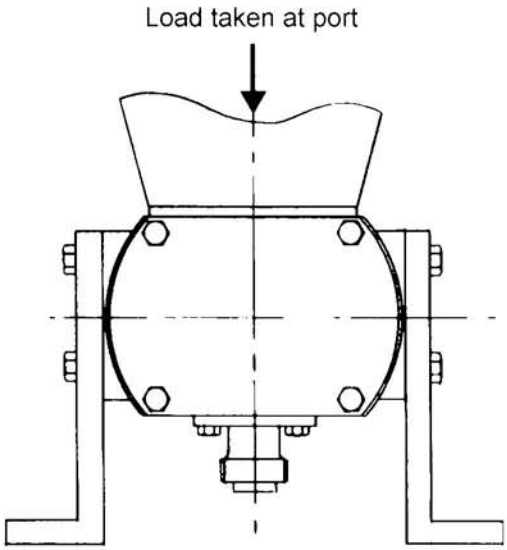
Max. Pressure on Pump Casings

All pumps are 25 Bar (363 lbf/in^2).

Some port connections have maximum pressure ratings which are less than this value, e.g. B.S. 3581 (3A) is 150 lbf/in^2 (10.34 bar).

Max. Load on Foot Bolts

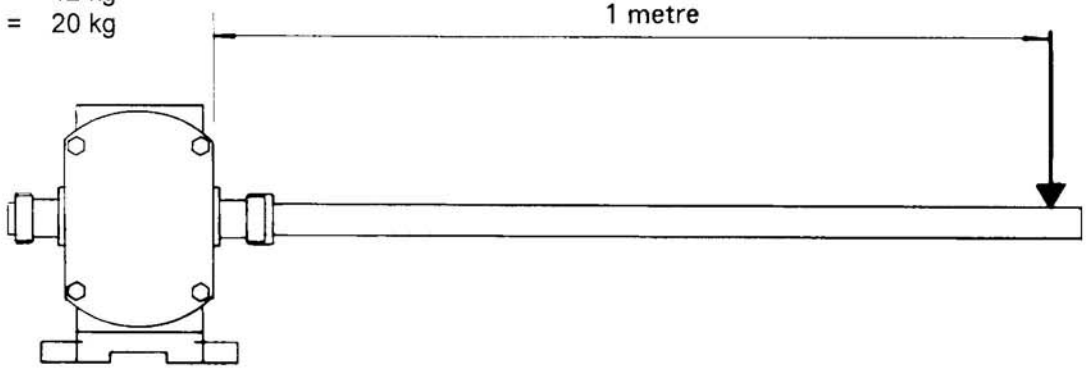
A-size = 25 kg
B-size = 40 kg
C-size = 70 kg
D-size = 75 kg



Max. Load on Ports

Load at 1 metre from pump casing.

A1 = 5 kg
A2, B1 = 6 kg
B2, C1 = 7 kg
C2, D1 = 12 kg
D2 = 20 kg



Torque Figures in Nm				
Equivalents:- 1 Nm = 0.102 kgf/m = 0.7376 lbf/ft		1 kgf/m = 9.8067 Nm = 7.233 lbf/ft	1 lbf/ft = 1.3558 Nm = 0.1383 kgf/m	
Basic Pump	*A-size*	*B-size*	*C-size*	*D-size*
End cover to rotor case	19	62	35	62
Rotor case to brg. hsg.	19	62	62	62
Bearing retainer	8	14	30	30
Shaft nut	120	250	600	750
Shaft lock nut	60	100	250	300
Gear cover	9	21	19	37
Foot	25	72	72	72
Port	19	19	C1 19 C2 35	35
Rotor Bolt	55	120	170	170
Reduction Gearbox				
Motor thro-bolt	54	94	94	232
Motor stud/nut	25	54	54	131
Gearbox	11	27	27	54
Relief/Bypass Valve				
Housing to end cover	25	25	25	25

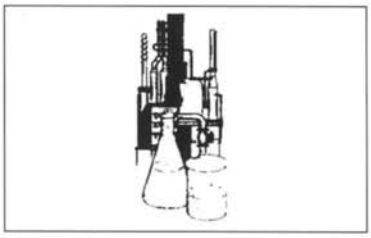
Spanner Sizes - mm					
Equivalents: 1 mm = 0.0394 inches 1 inch = 25.4 mm Type:- S = Spanner, i.e. hex. head A = Allen key, i.e. socket head X = Special					
Basic Pump	*A-size*	*B-size*	*C-size*	*D-size*	*Type*
Endcover	13	19	17	19	S
Rotor case	13	19	19	19	S
Rotor bolt	24	30	36	46	S
Bearing retainer	10	13	17	17	S
Shaft nut	36	46	65	75	S
Shaft lock nut	36	46	65	75	S
Gear cover	5	6	6	8	A
Foot	8	10	10	10	A
Port	13	13	C1 13 C2 17	17	S
Reduction Gearbox					
Gear lock screw	3	3	4	4	A
Motor thro'-bolt	17	19	19	24	S
Motor stud/nut	17	19	19	24	S
Gearbox	5	6	6	8	A
Relief/bypass Valve					
Housing screw	13	13	13	13	S
Internal Support Brg.					
Housing screw	8	8	10	13	S
Mechanical Seal					
Seal grub screw					A
Flush hsg. screw	10	13	17	17	S

Markets

Other Jabsco pumps available are used in many diverse markets, the major served markets are described on this page.

CHEMICAL/INDUSTRIAL

This wide and diverse market covers a multitude of market sectors and applications. Typical sectors include metal finishing industry, platers, chemical producers, chemical users, photographic/reprographic, petroleum, paper and pulp, paint, clays and ceramics, adhesives and electronics. The list of products handled includes most acids, alkalines, sludges, slurries, diesel fuel, water, oils and greases, solvents and paints.

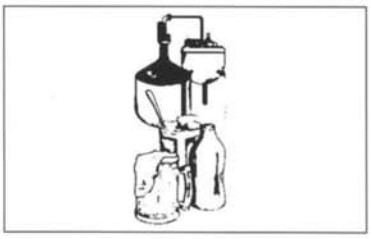


PHARMACEUTICAL

All the pump needs of this demanding industry including pharmaceutical, cosmetic and biotechnology sectors, can be met from our range. Typical products handled include vaccines, enzymes, fermenter feedstocks, drugs, hormones, syrups, pill pastes, toothpaste, creams, lotions, shampoos, blood products and cough syrups. Pump designs and materials exceed current U.S. F.D.A., 3A and

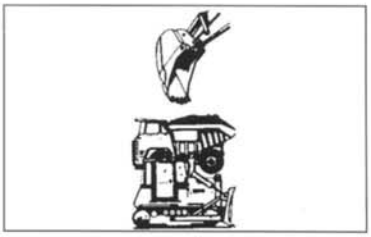
FOOD/BEVERAGE

The range of market sectors served by the Pureflo range of hygienic pumps is very wide and includes bakery, dairy, brewing, soft drinks, canning, winery, confectionery, meat and food processing. Products handled include sugars, jams, dairy creams, milk, wine, bakery dough, yeast, brine, pickles, soups, tomato paste, yoghurt, fats and oils, fruit pulps and chocolate. Pump designs and materials exceed current U.S. F.D.A., 3A and European standards.



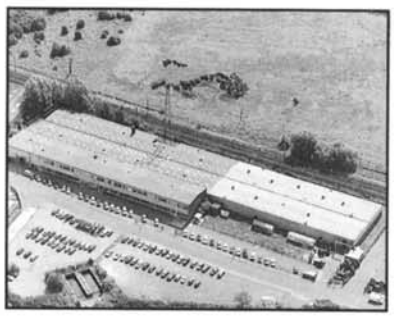
VEHICLE

We have for many years produced DC motor powered pumps for the marine industry. These products and the engineering experience gained have been successfully applied to the vehicle market. This market includes both on-road and off-road vehicles such as buses, trucks, excavators, road rollers, military equipment, railway vehicles, forestry equipment and agricultural machinery. The major applications are for water and diesel fuel handling - vehicle fitted refuelling pumps are supplied to most major OEM's worldwide.



If you would like details of our products for these markets write, fax or phone us at the address overleaf.

About ITT Jabsco...



ITT Jabsco is a unit of the ITT Fluid Technology Corporation - a world leader in the manufacture of pumps, valves and controls.

... It's Quality ...

ITT Jabsco operates exacting internal quality control and product qualification procedures.

Every production employee takes personal responsibility using established statistical process techniques, sopisticated measuring equipment and computer controlled machine tools. Virtually every item is inspected and performance tested before shipment.

ITT Jabsco is a quality assured manufacturer approved by BSI to ISO/EN/BS9001.

... and Worldwide Service

Our products are supported through a worldwide network of distributors and service agents in over 60 countries.

Most distributors are able to provide technical support and adapt or engineer special packages to meet your needs.

Distributor

Jabsco

ITT Industries

Jabsco, 20 Icon, Foothill Ranch, CA 92610 — **USA**
Tel : +1 949 609 5106 Fax : +1 949 859 1254

Jabsco, Bingley Road, Hoddesdon, Hertfordshire, EN11 0BU — **UK**
Tel : +44 (0) 1992 450 145 Fax : +44 (0) 1992 467 132

Fluid Products Canada, 55 Royal Road, Guelph, Ontario N1H 1T1 — **CANADA**
Tel : +1 519 821 1900 Fax : +1 519 821 5316

NHK Jabsco Co Ltd, 3-21-10, Shin - Yokohama, Kohoku-ku, Yokohama 222 — **JAPAN**
Tel : +81 (0) 45 475 8906 Fax : +81 (0) 45 475 8908

Jabsco GmbH, Oststraße 28, 22844 Norderstedt — **GERMANY**
Tel : +49 (0) 40 53 53 73 0 Fax : +49 (0) 40 53 53 73 11