



Centrifugal Pump

Serial No: _____

Type Series Elite: _____


Contents:	Page
0	General 3
0.1	Handling 3
1	Installation 3
1.1	Foundation 3
1.2	Mounting 3
1.3	Aligning Pump / Motor 3
1.4	Connecting the Piping 4
1.4.1	Auxiliary Connections 4
1.4.2	Vacuum Balance 4
1.5	Coupling Guard 4
1.6	Final Check 4
2	Startup / Commissioning Shut-down 4
2.1	Preparation 4
2.1.1	Lubricant 4
2.1.2	Shaft Seal 4
2.1.3	Priming the Pump and Associated Checks 4
2.1.4	Checking the Direction of Rotation 4
2.2	Startup 5
2.3	Shut-down 5
3	Maintenance and Lubrication 5
3.1	Supervision of Operation 5
3.2	Lubrication 5
3.2.1	Grease 5
4	Dismantling and Reassembly 6
4.1	General 6
4.2	Dismantling 6
4.2.1	Mechanical Seal 6
4.3	Deep groove Ball Bearing / Lubricant Fill 6
4.3.1	Grease Change 6
4.4	Reassembly 6
4.4.1	Pump 6
4.4.2	Shaft Seal 7
4.4.2.1	Stuffing Box Compartment 7
4.4.2.2	Packing Ring Cut to Size 7
4.4.2.3	Gland Leakage 7
4.4.2.4	Mechanical Seal 7
4.5	Spare Parts 7
4.5.1	Ordering Spare Parts 7
4.5.2	Parts List and Material Identification 8-9
4.5.3	Recommended List of Spare Parts for 2 years Continuous Operation 10
4.5.4	Recommended Torques 10
5	Trouble shooting 11-12

0 General

Centrifugal pumps will give trouble-free, satisfactory service if they are properly installed and maintained.

Follow the instructions in this manual carefully. Do not run the pumps under operating instruction which differ from those specified by us.

This manual does not take into account any on site safety regulations which may apply. The nameplate attached to the pump indicates the type series/size, identification number, impeller dimension and serial number. Please always indicate this data in case of inquiries, supplement orders and especially when ordering spare parts.

 For the standard pump arrangement operating conditions should never exceed the recommended working pressure and 95°C.

Ensure that operation is in accordance with the instructions contained in this manual (contract documentation). It is essential that the electrical connection values are as specified and that the instructions on installation and maintenance are followed.

Operation of this unit beyond the above conditions may result in excess load and subsequent failure. Failure to heed these warnings can result in personal injury and damage to equipment.

N.B.

This manual does not cover all details or eventualities which might occur during installation, operation or maintenance. The pumpset must only be handled by skilled, trained personnel. For any information and instructions not contained in this manual, please contact KSB Ajax Pumps. The manufacturer accepts no liability for the pumpset if the instructions in this manual are not complied with.

0.1 Handling

When handling the complete pumpset, attached ropes to the pump and motor as shown (not through the motor eyebolt) or onto the lifting lugs supplied.

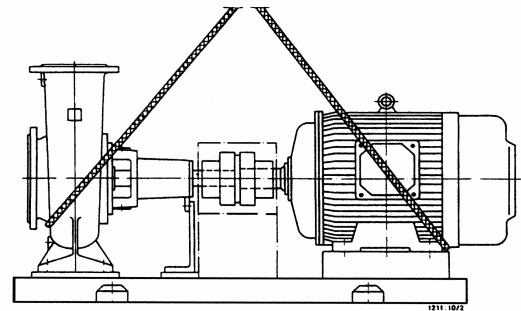


Fig. 1. Pump and motor and common baseplate.

1 Installation

1.1 Foundation

Make sure the concrete foundation has set before mounting the pumpset. The surface of the foundation must be completely horizontal and perfectly flat.

1.2 Mounting

Position the pumpset on the foundation and align using a precision spirit level (on the pump discharge nozzle).

Always fit shims to left and right of the anchor bolts near the bolts, between the baseplate/foundation frame and the foundation. If the shims are more than 800mm apart, position extra shims equal distant between them. All shims must be perfectly flush.

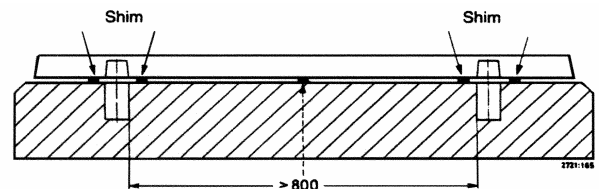


Fig. 2. Fitting shims

Uniformly tighten up securing means.

Baseplates have to be grouted with non-shrinking mortar up to the upper edge of the frame after having been fixed in position.

1.3 Aligning Pump/Motor

The coupling must be checked and the pumpset realigned even if the pump and motor are supplied ready mounted on a common baseplate.

1.4 Connecting the Piping

Never use the pump as an anchorage point for the piping.

Suction lift lines should be run with a rising slope towards the pump, positive suction lines with a downward slope towards the pump to avoid the formation of air locks.

The pipes should be supported very near the pump and connected without transmitting any stresses and strains to it. The pump must not bear the weight of the piping.

The nominal diameters of short pipelines should at least correspond to those of the pump connections. In case of long pipelines, the most economical nominal diameter is to be determined for the application.

Adaptors to larger nominal diameters should be designed with an extension angle of approx. 8° to avoid increased pressure losses.

The installation of non-return devices and suction and discharge valves is recommended according to the type of plant and pump.

Before commissioning a new installation, thoroughly check, flush and blow through all vessels, piping and connections.

Welding beads, scale and other impurities frequently only become dislodged after a certain period of time. It is necessary to fit a strainer in the suction line to prevent these entering the pump. The total cross-section of the holes in the strainer should be three times the cross-section of the piping in order to avoid excessive pressure loss across the strainer due to clogging.

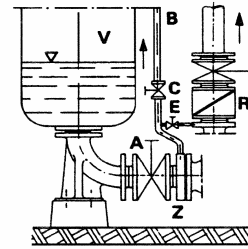
1.4.1 Auxiliary Connections

The size and locations of all auxiliary connections for sealing, flushing, and leakage liquid are shown in the general arrangement drawing or piping diagram.

1.4.2 Vacuum Balance

If the pump has to pump from a vessel under vacuum it is advisable to fit a vacuum balance line. This line should have a minimum diameter of 25mm and be arranged to lead into the vessel above the maximum advisable level.

An additional pipeline that can be shut off – a pump discharge nozzle vacuum balance line – facilitates the venting of the pump prior to start up.



- A Main isolating valve
- B Vacuum balance line
- C Isolating valve
- E Vacuum-tight isolating valve
- R Non-return flap valve
- V Vacuum vessel
- Z Intermediate flange

Fig. 3 Suction line and vacuum balance line

1.5 Coupling Guard

Safety regulations specify that the pump must be fitted with a coupling guard.

1.6 Final Check

Recheck alignment as described in 1.3. It must be possible to rotate the coupling easily by hand. Check the integrity of all connections.

2 Start Up/Commissioning, Shut-down

2.1 Preparation

2.1.1 Lubricant

Grease lubricated bearings. Bearings are already packed with grease.

2.1.2 Shaft Seal

For information on shaft seal please refer to 4.2.1 and 4.2.2.

2.1.3 Priming and Pump and Associated Checks

Vent and prime the pump and suction line before start up. The isolating valve in the suction line must be completely open.


Fully open the auxiliary lines (sealing, flushing liquid) and check they are functioning properly. Open the isolating valve in the vacuum line (if fitted) and close the vacuum-tight isolating valve E (fig. 3).

2.1.4 Checking the Direction of Rotation

The direction of rotation of the driver must match the arrow on the pump. Check this by switching the pump on and immediately switching it off again. Fit the coupling guard.

2.2 Startup

Start the set up against a closed discharge valve only. Once the pump has reached full speed slowly open the valve and set to the duty point.

 After the pump has reached its working temperature and/or if leakage occurs, (apart from a packed gland), tighten nuts with the set disconnected from the electric supply.

2.3 Shut-down

Close the discharge gate valve. The discharge gate valve can remain open if the discharge line is fitted with a non-return device and pressure is maintained in the discharge pipe.

Switch off the motor, making sure the pumpset runs down smoothly and evenly to a stand-still.

If the pumpset is to remain out of service for long periods, close the shut-off valve in the suction line and close all auxiliary connections.

On pumps supplied with product under vacuum, there must be sealant supply to the shaft seal even at stand-still.

If there is a danger of freezer and/or if the pumps is to be out of service for a long period, then drain the pump or otherwise protect it against freezing.

3 Maintenance and Lubrication

3.1 Supervision of Operation

The pump must run quietly and evenly at all times. The pump must never run dry.

The bearing temperature may be 50°C above room temperature, but must not exceed 90°C (measured at the outside of the bearing housing).

Do not run the pump for more than three minutes against a closed discharge valve.

If the pump has gland packing, this must drip during operation. The gland nuts should only be lightly tightened up.

If the gland is leaking too heavily after a long period of operation, uniformly tighten the gland nuts up by 1/6 of a turn, then observe the leakage. If the nuts cannot be tightened up any further, install a new packing ring. It is usually not necessary to replace the complete packing.

Pumps with mechanical seals experience minor or invisible (vapour) leakage. The seal is maintenance free. Standby pumps should be started up and run for ten minutes once a week to keep them operational. Also check the integrity of the auxiliary connections. Flexible parts of the coupling which show signs of wear should be replaced in good time.

3.2 Lubrication

3.2.1 Grease

Once in service the bearings should be lubricated at regular intervals. The lubrication interval is dependent on a number of factors such as temperature, speed and the presence of foreign matter. Therefore it is impractical to give an exact recommendation, but generally the bearings should be greased every 1000 to 2000 hours depending on the severity of service. For pumps operating for 8 hours per day for 5 days of the week this would be every 6 to 12 months. For pumps used infrequently the bearings should have grease added at 12 month intervals. Refer to 4.3.1 for grease application.

Care must be taken to avoid over lubrication as excessive amounts of grease increase the friction in the bearings resulting in overheating and possible bearing failure. Under normal applications two strokes from an average grease gun should be adequate to ensure proper lubrication.

If the pump has been standing idle for a long period of time, has been flooded out, or if it has been operating for several months in a very dusty or very wet location, the bearings should be cleaned with gasoline or kerosene and new grease applied. To clean, wipe the bearing housing with a clean rag soaked in gasoline or kerosene, and flush all surfaces. Dry with compressed air if available. If not, allow the solvent to evaporate before relubricating the bearing.

When newly installed in a pump the bearings sometimes will run hot until they have properly seated and the excess lubricant has been expelled.

4 Dismantling and Reassembly

4.1 General

Before dismantling, make sure the pump is disconnected from the power supply and cannot be switched on accidentally.

The suction and discharge isolating valves must be closed.

The pump casing must have cooled down to ambient temperature.

The pump casing must be empty and not under pressure.

4.2 Dismantling

- 1 Detach all auxiliary supply lines.
- 2 Remove coupling guard.
- 3 For coupling without spacer.
 - 3.1 Dismantling of complete pump.
 - 3.1.2 Remove discharge and suction branch from pipeline.
 - 3.1.3 Loosen pump from baseplate.
 - 3.2 During dismantling the volute casing can remain on the baseplate and in the pipeline.
 - 3.2.1 Uncouple pump from motor.
 - 3.2.2 Confirm power supply disconnected.
 - 3.2.3 Disconnect power cables from motor.
 - 3.2.4 Loosen motor from baseplate.
 - 3.2.5 Remove supporting foot 73 from the baseplate and loosen nuts on backcover.
 - 3.2.6 Pull out bearing housing with backcover and complete rotor (assembled unit).

With larger pumps, suspend or support bearing housing to prevent the rotating assembly from falling over.

- 4 For coupling with spacer. During dismantling the volute casing can remain on the baseplate and in the pipeline.
 - 4.1 Remove spacer of the coupling.
 - 4.2 Remove supporting foot 73 from the baseplate and loosen nuts on the discharge cover.
 - 4.3 Pull out bearing housing with backcover and complete rotor (assembled unit).

If the pump has been in operation for a long time some parts may be difficult to move. In this case use a brand name penetrating oil or suitable pull off device.

Under no circumstances use force.

4.2.1 Mechanical Seal

To replace the mechanical seal it is necessary to dismantle the pump.

After removing the impeller 2A draw the mechanical seal 35 from the shaft by hand. Remove the stationary seat from the backcover (or seal plate if fitted).

4.3 Deep Groove Ball Bearing / Lubricant Fill

4.3.1 Grease Change

Use a lithium soap based grease, resin and acid free, not liable to crumble, with good rust preventative properties. It should have a penetration number between 2 and 3, corresponding to a worked penetration between 220 and 295mm/10. Its drop point must be above 175°C. The hollow spaces around the bearings must not be more than half packed with grease. For example: Shell Alvania R2, Mobil Mobilux 2, B.P. Energrease LS2, Caltex Multifak 2.

Shaft Dia (Drive End)	Element Size	Imp End		Cplg End	
		Grams	Size	Grams	Size
24mm	#25	6	6305	6	6305
32mm	#35	9	6307	9	6307
42mm	#45	12	6309	12	6309
55mm	#55	17.5	6311	17.5	6311

(Note: 1 gram per shot of average grease gun).

4.4 Reassembly

4.4.1 Pump

Reassemble in accordance with standard engineering practice.

Coat the fittings and screw connections with graphite or similar before reassembly.

Check O-rings for wear and replace if necessary. All gaskets must be renewed; make sure the new ones are the same thickness as the old ones.

If the sealing area between impeller seal ring and casing wear ring is worn, replace the casing wear rings 42.1 and 42.2 where fitted.

Gap clearances:
New 0.3mm on diameter, maximum wear to 0.9mm on diameter.

Reassemble the pump in reverse order to dismantling. Make sure you reassemble in the right sequence.

Refer to section 2 for startup/recommissioning, shutdown.

4.4.2 General

Thoroughly clean the packing compartment and shaft sleeve before packing the gland.

4.4.2.1 Stuffing Box Compartment

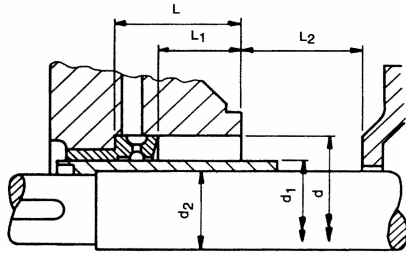


Fig. 4. Module 25 & 35

Note: Some models have combination lantern ring – restricter bush, check assembly drawing.

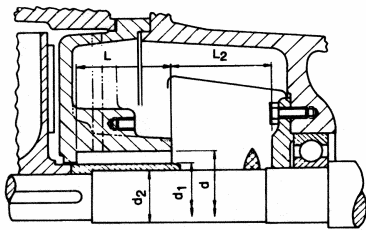


Fig. 5. Module 45 & 55

Dimensions of packing compartment / packing rings, number of rings.

MODULE	L	L1	L2	d	d1	d2	PACKING	
							Size	No. Rings
25	44	30	58	48	32	24	8 Sq	3
35	51	38	63	60	40	32	10 Sq	3
45	62	45	85	75	54	44	10 Sq	4
55	80	62	73	90	65	53	13 Sq	4

4.4.2.2 Packing Ring Cut to Size



Fig. 6 Packing ring cut to size.


Insert the first packing ring and push home.

Fit each subsequent ring separately with its joint staggered through 90° in relation to the previous one using the stuffing box ring.

Tighten the gland nuts lightly and evenly. It must be possible to rotate the rotor without difficulty.

4.4.2.3 Gland Leakage

Gland leakage must occur in any operating condition. A normal leakage rate would be between 10 to 20cm³/minute. This is approximately 100 to 150 drops per minute.

 Slacken off the gland nuts if there is insufficient leakage.

If leakage ceases entirely:

- Switch pump off immediately.
- Slacken gland nuts and repeat the startup procedure.

After adjustment, observe the leakage for around 2 hours with the temperature of the product at its maximum.

Then with the pressure of the product at its minimum check whether there is sufficient leakage.

4.4.2.4 Mechanical Seal

Reassemble in reverse order to dismantling.

When fitting a mechanical seal bear the following points in mind:

Maximum care and maximum cleanliness are mandatory. Do not remove the guard on the seal faces until just before fitting.

The seal faces, o-rings and rubber seals must not be damaged.

Clean or carefully remove any deposits from the shaft and stationary ring seat in the bearing housing. The shaft 20 may be lubricated with liquid detergent to reduce friction when mounting the seal. Do not use grease.

Push the stationary seal with rubber boot seal into the backcover or seal plate, applying pressure evenly to all sides.

4.5 Spare Parts

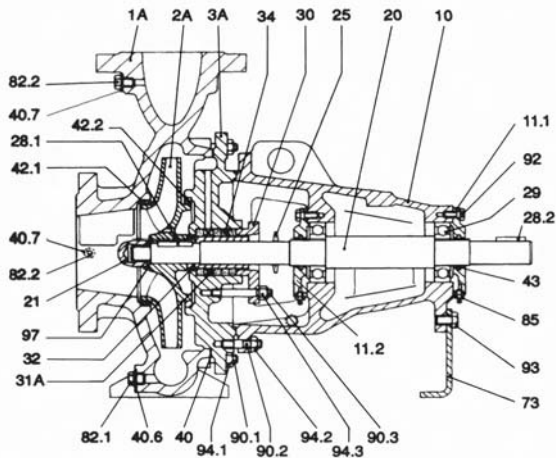
4.5.1 Ordering Spare Parts

When ordering spare parts please always indicate the following information which may be taken from the nameplate of the pump.

e.g.

- Pump Type: Elite pump
- Pump Size: E80-20
- ID No: 210428
- Ser. No: 9401234
- Impeller Dia: 196

Parts List and Material Identification
Packed Gland Arrangement

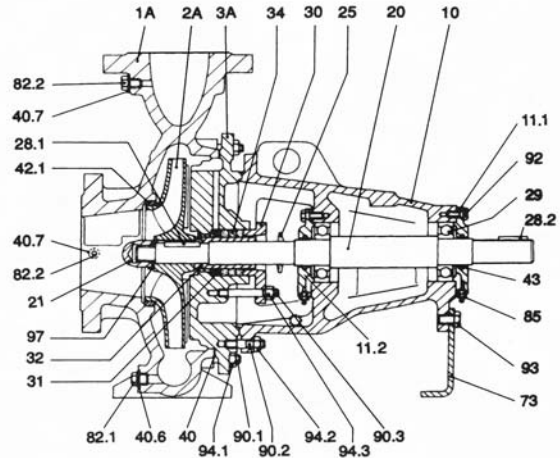
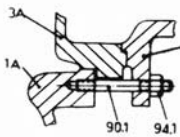


Pump Model:

E40-32, E50-32, E65-32, E80-32, E80-40, E100-32,
E100-40, E125-32, E125-40, E150-20, E150-26, E150-32,
E150-40, E200-26, E200-32, E200-40, E250-32, E250-40

Pump Models with clamped back cover:

E32-13, E32-16, E40-13, E40-16,
E50-13, E50-16, E65-13, E65-16,
E80-16, E80-20, E100-16, E100-20,
E125-20, E150-26, E200-26

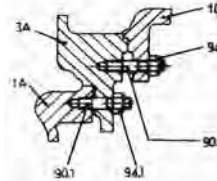


Pump Model:

E32-13*, E32-16, E32-20, E32-26, E40-13*, E40-16, E40-20,
E40-26, E50-13, E50-16, E50-20, E50-26, E65-13, E65-16,
E65-20, E65-26, E80-16, E80-20, E80-26, E100-16,
E100-20, E100-26, E125-20, E125-26

Pump Models with bolted back cover:

E32-20, E32-26, E40-20, E40-26, E40-32,
E50-20, E50-26, E50-32, E65-20, E65-26,
E65-32, E80-26, E80-32, E80-40, E100-26,
E100-32, E100-40, E125-26, E125-32,
E125-40, E150-20, E150-32, E150-40,
E200-32, E200-40, E250-32, E250-40



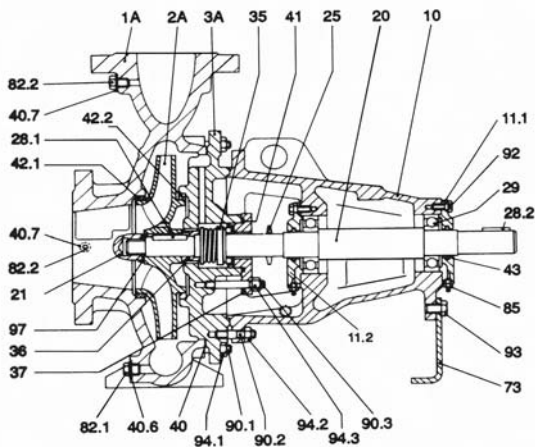
* no Expeller Vanes

ITEM	DESCRIPTION	MATERIAL	ITEM	DESCRIPTION	MATERIAL
1A	Casing	Cast Iron	40.7	Gasket, Flange Plug	Bonded Fibre
2A	Impeller	Zinc Free Bronze	42.1	Wear Ring, Casing	Zinc Free Bronze
3A	Backcover	Cast Iron	42.2	Wear Ring, Backcover	Zinc Free Bronze
10	Bearing Housing	Cast Iron	43	Seal, Bearing Cover	Felt*
11.1/2	Bearing Cover	Cast Iron	73	Support Foot	Steel
20	Shaft	Stainless Steel	82.1	Plug, Casing Drain	Malleable Iron
21	Impeller Nut	Bronze	82.2	Plug, Flange	Malleable Iron
25	Slinger	Rubber	85	Grease Nipple	Steel
28.1	Key, Impeller	Key Steel	90.1	Stud, Casing	Steel
28.2	Key, Coupling	Key Steel	90.2	Stud, Backcover	Steel
29	Bearing	Steel	90.3	Stud, Gland	Steel
30	Gland	Cast Iron	92	Setscrew, Bearing Cover	Steel
31	Lantern Ring Bush	Bronze	93	Setscrew, Support Foot	Steel
31A	Lantern Ring	Cast Iron	94.1	Nut, Casing Stud	Steel
32	Shaft Sleeve	Stainless Steel	94.2	Nut, Backcover Stud	Steel
34	Gland Packing	Graphited Fibre	94.3	Nut, Gland Stud	Steel
40**	Gasket, Casing	Bonded Fibre/NBR	97	Washer, Impeller Nut	Brass
40.6	Gasket, Drain Plug	Bonded Fibre			

*Note: Lip Seals fitted to pump models E80-40, E100-40, E125-32, E125-40, E150-32, E150-40, E200-26, E200-32, E200-40, E250-32, E250-40

**From 1997 O Ring used instead of gasket.

**Parts List and Material Identification
Mechanical Seal Arrangement**

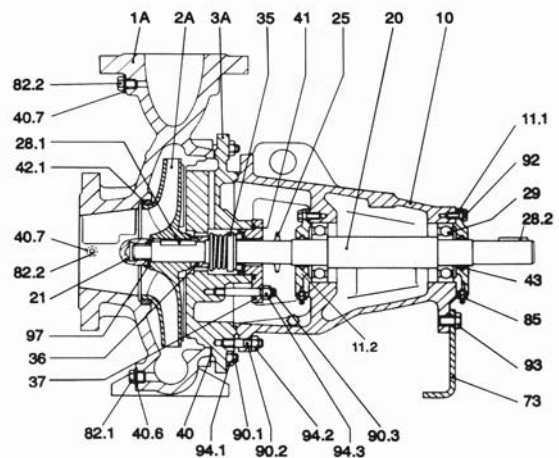
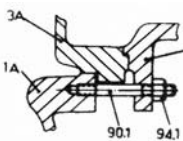


Pump Model:

E40-32, E50-32, E65-32, E80-32, E80-40, E100-32,
E100-40, E125-32, E125-40, E150-20, E150-26, E150-32,
E150-40, E200-26, E200-32, E200-40, E250-32, E250-40

Pump Models with clamped back cover:

E32-13, E32-16, E40-13, E40-16,
E50-13, E50-16, E65-13, E65-16,
E80-16, E80-20, E100-16, E100-20,
E125-20, E150-26, E200-26

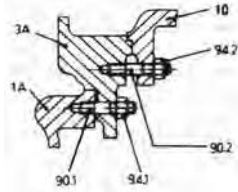


Pump Model:

E32-13*, E32-16, E32-20, E32-26, E40-13*, E40-16, E40-20,
E40-26, E50-13, E50-16, E50-20, E50-26, E65-13, E65-16,
E65-20, E65-26, E80-16, E80-20, E80-26, E100-16,
E100-20, E100-26, E125-20, E125-26

Pump Models with bolted back cover:

E32-20, E32-26, E40-20, E40-26, E40-32,
E50-20, E50-26, E50-32, E65-20, E65-26,
E65-32, E80-26, E80-32, E80-40, E100-26,
E100-32, E100-40, E125-26, E125-32,
E125-40, E150-20, E150-32, E150-40,
E200-32, E200-40, E250-32, E250-40



* no Expeller Vanes

ITEM	DESCRIPTION	MATERIAL	ITEM	DESCRIPTION	MATERIAL
1A	Casing	Cast Iron	41	O Ring Seal Plate	Nitrile
2A	Impeller	Zinc Free Bronze	42.1	Wear Ring, Casing	Zinc Free Bronze
3A	Backcover	Cast Iron	42.2	Wear Ring, Backcover	Zinc Free Bronze
10	Bearing Housing	Cast Iron	43	Seal, Bearing Cover	Felt*
11.1/2	Bearing Cover	Cast Iron	73	Support Foot	Steel
20	Shaft	Stainless Steel	82.1	Plug, Casing Drain	Malleable Iron
21	Impeller Nut	Bronze	82.2	Plug, Flange	Malleable Iron
25	Slinger	Rubber	85	Grease Nipple	Steel
28.1	Key, Impeller	Key Steel	90.1	Stud, Casing	Steel
28.2	Key, Coupling	Key Steel	90.2	Stud, Backcover	Steel
29	Bearing	Steel	90.3	Stud, Gland	Steel
35	Mechanical Seal	Carbon/Ceramic	92	Setscrew, Bearing Cover	Steel
36	Spring Sleeve	Stainless Steel	93	Setscrew, Support Foot	Steel
37	Seal Plate	Cast Iron	94.1	Nut, Casing Stud	Steel
40**	Gasket, Casing	Bonded Fibre/NBR	94.2	Nut, Backcover Stud	Steel
40.6	Gasket, Drain Plug	Bonded Fibre	94.3	Nut, Gland Stud	Steel
40.7	Gasket, Flange Plug	Bonded Fibre	97	Washer, Impeller Nut	Brass

*Note: Lip Seals fitted to pump models E80-40, E100-40, E125-32, E125-40, E150-32, E150-40, E200-26, E200-32, E200-40, E250-32, E250-40

**From 1997 O Ring used instead of gasket.

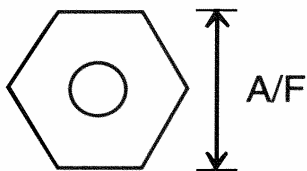
4.5.3 Recommended List of Spare Parts for 2 Years Continuous Operation

Part No.	Part Description	Number of pumps (including standby pumps)						
		2	3	4	5	6 & 7	8 & 9	10 & more
Pumps with gland packing		Quantity of spare parts						
20	Shaft	1	1	2	2	2	3	30%
2A	Impeller (including wear ring)	1	1	1	2	2	3	30%
29	Deep groove ball bearing	2	2	2	4	6	8	100%
10	Bearing bracket	-	-	-	-	-	1	2 off
34	Gland packing (set)	4	6	8	8	9	12	150%
42	Casing wear ring	2	2	2	3	3	4	50%
32	Shaft protecting sleeve	2	2	2	3	3	4	50%
40	Gaskets (set)	4	6	8	8	9	12	150%
Pumps with mechanical seal								
36	Spring sleeve	2	2	2	3	3	4	50%
35	Mechanical seal (complete)	2	3	4	5	6	7	90%

4.5.4 Recommended Torques

For casing and impeller nut.

ACROSS FLAT	mm	17	19	24	30	36	46
	lb-ft	12	20	32	50	65	80
TORQUE	N-m	16	27	43	68	88	108



5 Trouble-shooting

Pump delivers insufficient liquid.	Motor overloaded.	Excessively high pump discharge pressure.	Bearing overheated.	Pump leaks.	Excessive shaft seal leakage.	Rough pump running.	Excessive temperature rise inside the pump.	Cause	Remedy ¹⁾
•								The pump generates an excessively high differential pressure	Reset duty point
•								Excessively high back pressure	Check plant for dirt Fit larger impeller(s) ²⁾ Increase speed (applies to turbine driven or I.C. engine driven pumps)
•						•	•	The pump and/or piping are incompletely vented or primed	Vent or prime the pump and piping completely
•								Suction line or impeller(s) are clogged	Remove deposits in the pump and/or piping
•								Formation of airpockets in the piping	Alter piping layout If necessary, fit a vent valve
•						•	•	NPSH available is too low (on positive suction head installations)	Check liquid level Mount pump at lower level Open isolating valve in suction line fully Check suction line strainers Make sure that the permissible rate of pressure decrease is not exceeded
•								Ingress of air on shaft seal	Sealing liquid passage is clogged; clean it out. If necessary, arrange a sealing liquid supply from an outside source, or increase sealing liquid pressure Fit a new shaft seal
•								Reverse rotation	Change over two phases of the power supply cable
•								Rotational speed is too low ²⁾	Increase speed
•						•		Excessive wear of the pump internals	Replace worn components with new ones
	•					•		Pump back pressure is lower than specified in the purchase order	Adjust duty point accurately in case of persistent overloading, trim the impeller(s) if necessary ²⁾
	•							Specific gravity or viscosity of the fluid pumped is higher than that specified in the purchase order ²⁾	²⁾
	•				•			Gland cover too tight or tightened askew	Correct
	•	•						Excessive rotational speed	Reduce speed ²⁾
				•				Defective gasket	Renew gasket between volute casing and discharge cover
					•			Worn shaft seal	Renew shaft seal Check flushing liquid or sealing liquid pressure

1) The pump should be made pressureless before attempting to remedy faults in parts under pressure.

2) Please refer to KSB Ajax Pumps.

Pump delivers insufficient liquid.	Motor overloaded.	Excessively high pump discharge pressure.	Bearing overheated.	Pump leaks.	Excessive shaft seal leakage.	Rough pump running.	Excessive temperature rise inside the pump.	Cause	Remedy ¹⁾
●					●			Grooving, score marks or roughness on shaft protecting sleeve	Renew shaft sleeve / shaft protecting sleeve
					●			The pump runs noisily	Correct the suction conditions Align pump Rebalance motor Increase suction pressure at pump suction nozzle
			●		●	●		Pump misaligned	Rectify
			●		●	●		The pump is distorted or resonance vibrations in the piping	Check piping connections and pump fixing bolts, reduce gap between pipe supports, if necessary Support piping using anti-vibration material
			●					Excessive axial thrust ²⁾	Clean out balance holes in impeller Fit new casing wear rings
			●			●		Too much, too little or unsuitable lubricant quality	Reduce quantity of or top up lubricant, or change lubricant quality
			●					The specific coupling gap has not been maintained	Restore correct coupling gap in accordance with the data on the installation plan
●	●							The motor is running on two phases only	Replace the defective fuse Check electrical connections
						●		The rotor is out of balance	Clean the rotor Rebalance the rotor dynamically
						●		Defective bearings	Fit new bearings
						●	●	Insufficient rate of flow	Increase the minimum rate of flow
					●			Faults in the circulation liquid supply	Increase the cross-section of the circulation liquid line

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