

Standardized Chemical Pumps CPK



in accordance with DIN 24 256
Standard bearing assembly, mechanical seal

Works-Serial No.: _____

Type Series: _____

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0. General

Your centrifugal pump will only give you completely trouble-free and satisfactory service on condition that it is installed with due care and properly maintained. It is absolutely essential that the instructions contained in this manual be scrupulously observed, and that the pumps are not operated under conditions which differ from those specified under our "Operating Conditions". This operating instruction manual does not take any account of any safety regulations which may apply to the installation site, and the site manager or site operator is responsible for notifying our erection staff of any such regulations and seeing that they are complied with.

The type series, pump size, main operating data and Works serial number are all stamped on the rating plate affixed to the pump; please make sure to quote this information every time you write to us in respect of queries, repeat orders, and more particularly when ordering spare parts.

0.1 Transport

The pump set should be properly handled and slung for transport. Do not thread the ropes through the eye-bolt on the motor.

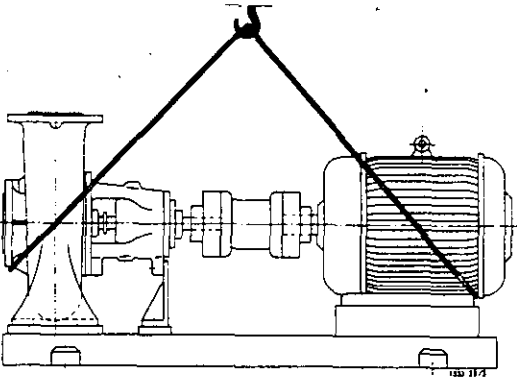


Fig. 1 Pump and driver mounted on a combined baseplate.

1. Erection (Installation on Site)

1.1 Foundation

Make sure that the concrete foundation has set firmly before placing the pumping set on it. The surface of the foundation should be truly horizontal and perfectly flat. The foundation bolts should be suspended in the baseplate.

1.2 Installation

After placing the pump on the foundation, level it up with the aid of a spirit level placed on the shaft/discharge nozzle. The correct gap between the two coupling halves specified on the installation drawing must be observed. Shims should always be inserted to the left and right of the foundation bolts in close proximity to the bolts themselves, between the baseplate or foundation frame and the foundation itself. If the spacing between adjoining anchor bolt holes exceeds 800mm, additional shims should be inserted half way between the adjoining holes. All shims must lie perfectly flush.

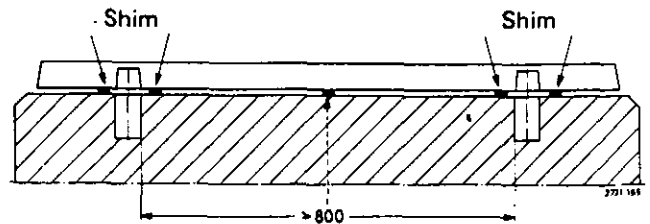


Fig. 2 Provision of necessary shims

To ensure silent running, the pumping set can be mounted on vibration dampers (please consult us first). Compensators can be arranged between the pump nozzles and the suction and discharge lines.

After insertion of the foundation bolts, the latter should be grouted in the foundation with mortar. When the mortar has set firm, the base plate should be levelled up in accordance with section 1.3. and the foundation bolts should be tightened uniformly and firmly. Thereafter the base plate should be grouted in with mortar (non-shrinking mortar if possible), making sure that no cavities remain unfilled.

1.3 Alignment of Pump and Driver

The pumping set can be considered to be correctly aligned if a straight edge placed axially on both coupling halves exhibits the same distance (a or b respectively) from each shaft at all points around the circumference. In addition, the gap between the two coupling halves must remain the same at all points around the circumference. The gap can be measured with the aid of a feeler gauge, a wedge gauge or a dial micrometer (see Figs. 3 and 4).

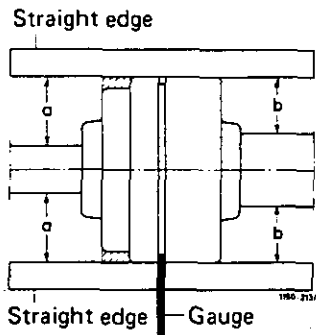


Fig. 3 Coupling alignment with the aid of a gauge and a straight edge

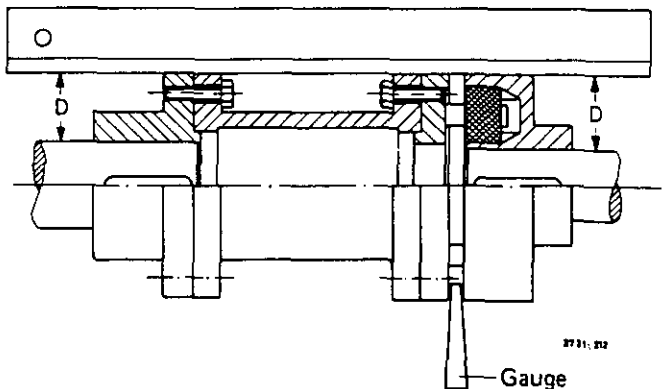


Fig. 4 Alignment of a spacer-type coupling
The deviation (tolerance) between the two coupling halves must not exceed 0.04mm both radially and axially.

1.4 Connecting

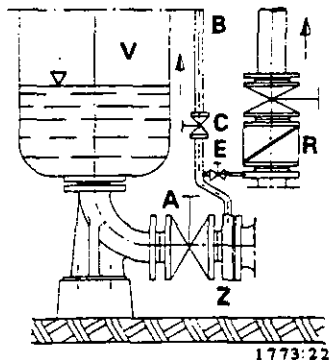
Never use the pump itself as an anchorage point for the piping. Suction lift lines should be laid with a rising slope towards the pump, and suction head lines with a downward slope towards the pump. The pipelines should be anchored in close proximity to the pump and should be connected to the latter without transmitting any stresses or strains, nor should the weight of the piping be loaded onto the pump. The nominal sizes of the pipelines should be at least equal to the nominal sizes of the pump nozzles. We recommend the incorporation of check valves or non-return valves and of isolating valves in the system, depending on the type of installation and pump. Any thermal expansion of the piping (due to high temperatures) must be compensated by suitable means, so as not to impose any additional load on the pump.

1.4.1 Auxiliary Connections

The auxiliary connections required for your pump (cooling, heating, sealing liquid, flushing liquid etc., as the case may be) are indicated on the installation drawing and on the piping diagram in respect of size and location.

1.4.2 Vacuum Balance Line

If the pump has to pump a liquid out of a vessel under vacuum, it is advisable to install a vacuum balance line. This line should have a nominal size of 25mm at least. It should be arranged to lead back into the vacuum vessel at a point above the highest permissible liquid level. An additional line starting at the pump discharge nozzle facilitates venting of the pump before start-up. The vacuum-tight isolating valve E in this connecting line should be closed after the venting procedure and should remain closed while the pump is running. The main isolating valve C in the vacuum balance line must remain open at all times when the pump is running, and should only be closed when the pump is shut down (Fig. 5).



- A Main isolating valve
- B Vacuum balance line
- C Isolating valve
- E Vacuum-tight isolating valve
- V Vessel under vacuum
- Z Intermediate flange
- R Check valve

Fig. 5 Suction line and vacuum balance line

1.5 Coupling Guard

In compliance with the accident prevention regulations, the pump may only be operated if it is fitted with a coupling guard. If the customer states specifically that this coupling guard is not to be supplied by us, it must be provided by the pump operator.

1.6 Final Check

Check the alignment once more, as described in section 1.3. It must be possible to rotate the pump rotor without effort by hand at the coupling.

2. Commissioning, Start-up and Shutdown

2.1 Preparations prior to Commissioning

2.1.1 Lubricants

Grease-lubricated bearings:

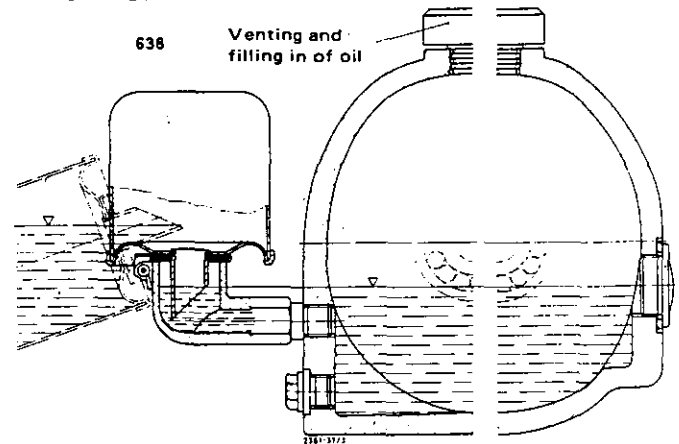
Grease-lubricated bearings are pre-packed with grease at our Works before despatch of the pump.

Oil-lubricated bearings:

The bearing bracket should be filled with oil of HD 20 quality.

Oil level in reservoir during filling procedure

Oil level indicator



Position of reservoir for topping-up of oil level in constant level oiler

Oil level in bearing bracket and in connection elbow

Fig. 6 Oil fill

Procedure:

Unscrew vent plug. Pour in oil through the vent plug aperture after having hinged down the reservoir of the constant level oiler until oil appears in the vertical portion of the connection elbow of the constant level oiler (see Fig. 6). Then fill the reservoir of the constant level oiler with oil and snap it back smartly into operating position. Screw vent plug in again. After a short time has elapsed, check whether the oil level in the reservoir has sunk. The reservoir should always remain filled. If the vent plug is inaccessible or difficult to reach, e.g. in cases where the motor is arranged above the pump (piggy-back arrangement), the oil can be filled into the bearing bracket through the connection elbow of the constant level oiler.

Caution:

The oil level should always be situated below the level of the vent slot arranged at the top edge of the connection elbow, and this slot should always be perfectly dry.

If no constant level oiler is provided on the bearing bracket, make sure that the oil level reaches the centreline of the oil level indicator arranged at the side of the bearing bracket.

2.1.2 Shaft Seal

Check the shaft seal, see section 4.

2.1.3 Priming the Pump and Checks to be carried out

The pump and suction lift line must be vented and primed with the fluid pumped before start-up. The isolating valve in the suction lift line must be fully open. All auxiliary connections provided on your pump (e.g. flushing liquid, sealing liquid, cooling liquid etc.) must be opened fully and the unimpeded flow of the fluid through these lines must be verified. Open the isolating valve in the vacuum balance line (if applicable to your installation) and close the vacuum-tight isolating valve "E" (Fig. 5).

2.1.4 Checking the Direction of Rotation

The direction of rotation must correspond to the arrow on the pump. This can be checked by switching on the pump for a short instant and switching it off again immediately.

Mount the coupling guard.

2.2 Switching On

Always make sure that the isolating valve in the discharge line is closed when the pump is switched on. Only after the pump has attained full operating speed should the discharge valve be opened gradually and the operating point conditions adjusted by means of this valve.

Caution:

After the operating temperature has been attained, and/ or in the event of leakage, tighten the lantern/casing connecting bolts after switching off the pumping set.

2.3 Switching Off

Close isolating valve in discharge line.

If a non-return valve or check valve has been incorporated in the discharge line, the isolating valve can remain open in so far as there is a back pressure present in the line.

Switch off driver. Observe the pumping set running down smoothly and quietly to a standstill.

In the event of a prolonged shutdown, the isolating valve in the suction lift line should be closed.

Close the auxiliary connections and turn off the cooling liquid supply (if applicable to your installation) after the pump has cooled down. The shaft seal of pumps which are connected to a supply vessel under vacuum must be fed with sealing liquid even when the pump is switched off. In the event of frost and/or of prolonged shutdown, the pump and the cooling compartments (if applicable) must be drained or otherwise protected against freezing.

3. Maintenance and Lubrication

3.1 Supervision of Operation

The pump should run quietly and free from vibration at all times. The pump must never be allowed to run dry. Avoid any prolonged running against a closed discharge valve. The bearing temperature may be allowed to attain up to 50° C above room temperature, but should not exceed +80° C.

Make sure the oil level is adequate (see section 2.1.1.). The isolating valves in the auxiliary feed lines must always remain open while the pump is running.

The soft-packed stuffing box (if your pump is fitted with one) should drip slightly during operation. The stuffing box gland should only be tightened lightly.

Any standby pumps in the pumping installation should be operated once a week for a short instant, by switching on and switching off again so as to maintain them in good condition for instant start-up in an emergency. The correct functioning of the auxiliary connections should be kept under observation. When signs of wear become apparent on the flexible coupling elements in the course of time, these elements should be replaced by new ones in good time.

3.2 Lubrication and Lubricant Changes

3.2.1 Lubrication

The antifriction bearings are grease or oil-lubricated; see section 4. for required lubricant fills.

3.2.2 Grease Changes

The initial fill (grease packing) of grease-lubricated anti-friction bearings should last for 3000 operating hours approx., but should be renewed at least once every 2 years or after every 3000 hours of operation (see section 4.).

Grease quality:

Use a good quality ball and roller bearing grease with a lithium soap base, free of resin and acid, not liable to crumble, and possessing good rust-preventive characteristics. The grease should have a penetration number situated between 2 and 3, corresponding to a worked penetration situated between 220 and 295mm/10. Its drop point should not be less than 175° C.

3.2.3 Oil Changes

The first oil change should be carried out after 300 hours of operation approx., and subsequent oil changes once every 3000 hours of operation approx.

Procedure:

Unscrew oil drain plug beneath the constant level oiler (or beneath the oil level indicator) and drain off the old oil. When the bearing bracket is empty, replace the oil drain plug and fill in fresh oil in accordance with section 2.1.1.

4. Special Instructions and Recommendations

4.1 Basic Instructions and Recommendations

Caution:

Before commencing dismantling, make sure that the pump cannot be accidentally switched on.

The isolating valves in the suction and discharge lines must be closed.

The volute casing must have cooled down to ambient temperature.

The volute casing must be drained and pressureless.

Always refer to the relevant sectional drawing when dismantling and reassembling the pump.

4.2 Dismantling

1. Drain the oil in accordance with section 3.2.3.
2. Remove the coupling guard.
3. Disconnect coupling spacer sleeve, or, if no spacer sleeve is fitted, remove the driver. If applicable, refer to the supplement sheet on couplings.
4. Disconnect and remove the auxiliary connections on your pump.
5. Loop a rope tightly around the top stay of the bearing bracket lantern.
6. Unscrew hex. head bolt 901.04 and the baseplate fixing bolts of support foot 183, and remove the support foot.
7. Unscrew hex. nuts 920.01 and pull the complete bearing bracket together with shaft, impeller and lantern out of the volute casing. Use forcing screws for assistance in doing this, having first cleaned the screw threads.
8. Unscrew impeller nut 922 with its Heli-Coil insert (right-handed screw thread), remove joint ring 411.31, pull off impeller 230, remove key 940.01.
9. Unscrew hex. nuts 920.02 and push back mechanical seal coverplate 471.01 until it abuts against thrower 507.01.
10. Dismantle casing cover 161 together with O-ring 412.01.
11. Pull the complete mechanical seal together with shaft protecting sleeve 524.01 mechanical seal coverplate 471.01 and thrower 507.01 off the shaft, See supplement sheet for dismantling of mechanical seal.
12. Unscrew hex. nuts 920.04 on the flange of bearing bracket lantern 344, and remove the bearing bracket lantern.
13. After having unscrewed the hexagon socket cap screw in the coupling hub, pull the coupling half off the pump shaft with the aid of an extractor device, and remove key 940.02.
14. Dismantle bearing covers 360.01 and 360.02 at pump and drive ends.
15. Carefully drive shaft 210 together with antifriction bearing 321.01 and 321.02 out of the bearing bracket.
16. Heat up the antifriction bearings and pull them off the shaft.
17. Clean all the components and examine them for signs of wear. Touch up the damaged components or replace them by new ones if necessary.

4.3 Reassembly

The pump should be reassembled in accordance with the rules of sound engineering practice. The fits of individual components should be coated with graphite or another suitable lubricant before assembly, and the same applies to screwed connections.

O-rings and radial shaft seal rings should be examined for signs of damage and replaced by new ones if necessary. Flat gaskets should in principle be replaced by new ones, and you should make sure that the thickness of the new gasket is exactly the same as that of the old one.

Caution:

Do not coat O-ring 412.01 with graphite or similar products. Use animal fats or silicone-base or PTFE-base lubricants for this ring.

Reassembly proceeds in reverse sequence to dismantling. The following points should be carefully observed.

1. Use only the bearing types and sizes specified in the section 4.3.2. The antifriction bearings should be pre-heated in an oil bath to 80° C approx. before being slipped onto the shaft until they abut against the shaft shoulder.
2. Take care not to damage the radial seal rings 421.01/02 when mounting bearing covers 360.01/02.
3. Mount the mechanical seal as described in the supplement sheet. Observe the recommendations of section 4.3.1. Check the sliding fit of the shaft protecting sleeve on the shaft.
4. The impeller nut should be tightened firmly. The tightening torque to be applied to this nut is greater than that applicable to a conventional screw thread, because of the Heli-Coil insert incorporated in the nut as a locking device. The impeller nut should be tightened again some 20 to 30 minutes after the initial tightening.
5. After assembly into the volute casing which has remained in situ in the piping, the coupling alignment should be checked (see section 1.3.).
6. Fill in oil in accordance with section 2.1.

4.3.1 Mechanical seal

The following points should be observed when mounting the mechanical seal:

Extreme care and cleanliness during assembly are the essential pre-requisites for the trouble-free operation of the mechanical seal.

The guard protecting the rubbing faces should only be removed immediately before assembly takes place.

When the stationary seal ring has been inserted, check its plane parallelism in relation to the casing component. The surface of the shaft protecting sleeve must be absolutely clean and smooth, and the mounting edge of the sleeve must be chamfered.

When slipping the rotating assembly of the seal onto the shaft protecting sleeve, take suitable steps to protect the surface of the shaft protecting sleeve against damage.

Before final mounting in the pump, the rubbing faces of the mechanical seal should be wetted with a drop or two of oil. In the case of pumps equipped with a double acting mechanical seal, the mechanical seal compartment must be properly vented and pressurized to the correct pressure specified in the installation drawing (it should remain under pressure even when the pump is stopped).

The supply of quench liquid must remain turned on even when the pump is stopped.

4.3.2 Bearings

Bearing bracket	Radial ball bearings 321.01/02 DIN 625/C3 bearing clearance	Oil fill in litres
P 25/ 62	6305	0,2
P 35/ 80	6307	0,5
P 45/ 120	6409	0,5
P 55/ 140	6411	1,5

Fig 7 Table of bearings to be fitted and required oil fills

See section 4.4.2 for correlation between pump sizes and bearing bracket sizes.

4.4 Stock of Spare Parts/Interchangeability

Always please quote the following details when ordering spare parts:

Pump type: CPK in this case

E-No.

No.

The above data are stamped on the rating plate.

4.4.1 Recommended Stock of Spare Parts for 2 Years of Operation, in accordance with VDMA and with DIN 24 296

Part No.	Designation	Number of pumps (including standby pumps)						
		2	3	4	5	6	8	10 and more
		Quantity of spare parts required						
210	Shaft	1	1	2	2	2	3	30%
230	Impeller	1	1	2	2	2	3	30%
321.01/02	Radial ball bearing	1	1	2	2	3	4	50%
330	Bearing bracket	-	-	-	-	-	1	2 off
433	Rotating seal ring	2	3	4	4	4	6	90%
	Stationary seal ring	2	3	4	4	4	6	90%
	O-rings	2	3	6	8	8	10	150%
	Gaskets on stationary seal ring	2	3	6	8	8	10	150%
	Spring	1	1	1	1	2	2	20%
502.01 ¹⁾	Casing wear ring	2	2	2	3	3	4	50%
524.01	Shaft protecting sleeve	1	1	1	2	2	2	20%
	Gaskets for pump casing (set)	4	6	8	8	9	12	150%

Fig. 8

¹⁾ Only on CPK-G and CPK-S pumps

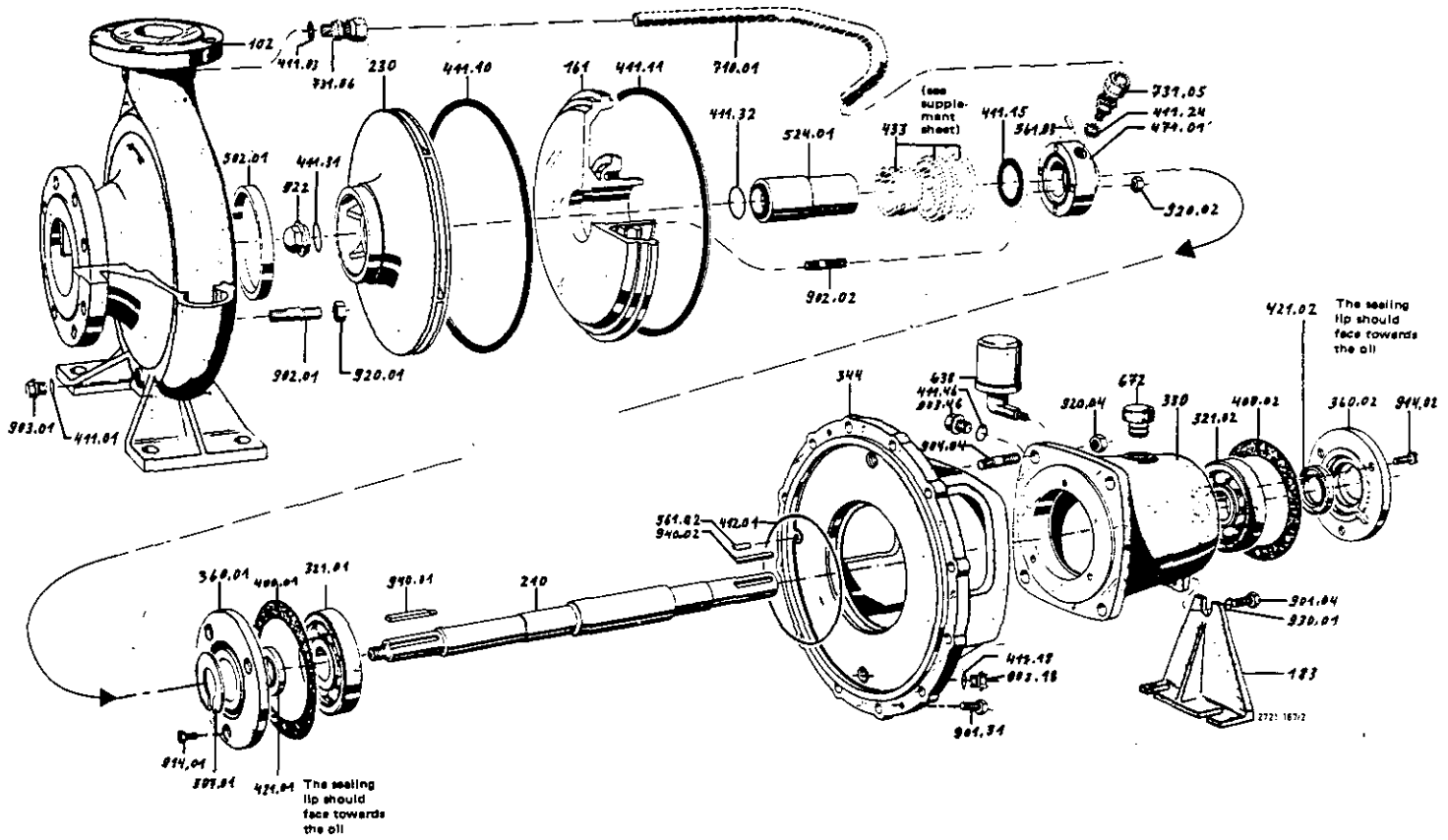
4.2.2 Interchangeability of Spare Parts

Bearing Bracket	Pump Size	Designation	Volute casing ¹⁾	Casing cover	Support foot	Shaft	Impeller ¹⁾	Radial ball bearing	Bearing bracket	Bearing bracket lantern	Mechanical seal	Seal coverplate	Casing wear ring ²⁾	Thrower	Shaft protecting sleeve	Impeller nut
		Part No.	102	161	183	210	230	321.01/02	330	344	433	471.01	502.01	507.01	524.01	922
P 25/62	32-125			1	1	1		1	1	1	1	1	1	1	1	1
	32-160			2	2	1		1	1	2	1	1	1	1	1	1
	40-160			2	2	1		1	1	2	1	1	2	1	1	1
	50-160			2	3	1		1	1	2	1	1	1	1	1	1
	32-200			3	3	1		1	1	3	1	1	3	1	1	1
	40-200			3	3	1		1	1	3	1	1	2	1	1	1
	50-200			3	3	1		1	1	3	1	1	3	1	1	1
P 35/80	65-160			4	4	2		2	2	4	2	2	7	2	2	2
	80-160			4	5	2		2	2	4	2	2	10	2	2	2
	65-200			5	5	2		2	2	5	2	2	8	2	2	2
	80-200			5	5	2		2	2	5	2	2	10	2	2	2
	100-200			5	6	2		2	2	5	2	2	12	2	2	2
	32-250			6	5	2		2	2	6	2	2	6	2	2	2
	40-250			6	5	2		2	2	6	2	2	5	2	2	2
	50-250			6	5	2		2	2	6	2	2	4	2	2	2
	65-250			6	6	2		2	2	6	2	2	8	2	2	2
	80-250			6	7	2		2	2	6	2	2	11	2	2	2
	40-315			7	6	2		2	2	7	2	2	5	2	2	2
	50-315			7	7	2		2	2	7	2	2	7	2	2	2
P 45/120	100-250			8	8	3		3	3	6	3	3	13	3	3	2
	125-250			8	9	3		3	3	6	3	3	15	3	3	2
	150-250			8	10	3		3	3	6	3	3	16	3	3	2
	65-315			9	8	3		3	3	7	3	3	9	3	3	2
	80-315			9	9	3		3	3	7	3	3	12	3	3	2
	100-315			9	9	3		3	3	7	3	3	14	3	3	2
	125-315			9	10	3		3	3	7	3	3	16	3	3	2
	80-400			10	10	3		3	3	8	3	3	12	3	3	2
	100-400			10	10	3		3	3	8	3	3	14	3	3	2
125-400			10	11	3		3	3	8	3	3	15	3	3	2	
P 55/140	200-250			11	13	4		4	4	9	4	4	17	4	4	3
	150-315			12	12	4		4	4	10	4	4	18	4	4	3
	200-315			12	13	4		4	4	10	4	4	19	4	4	3
	250-315			12	16	5		4	4	10	4	4	21	4	4	3
	150-400			13	12	4		4	4	11	4	4	18	4	4	3
	200-400			13	13	4		4	4	11	4	4	20	4	4	3
	150-500			14	14	4		4	4	12	4	4	18	4	4	3
	200-500			14	17	4		4	4	12	4	4	20	4	4	3

The components featuring the same number in a vertical column are interchangeable.
Fig. 9

¹⁾ These components cannot be used in other pump sizes
²⁾ Only on CPK-G and CPK-S pumps

4.5 Exploded View and List of Components



When ordering spare parts always please specify the pump type (stamped on the rating plate and on the suction flange), year of manufacture, quantity required, item number, designation, material of construction, nature of fluid pumped, exploded view number, and mode of despatch.

Part No.	Designation	Extent of Supply
102	Volute casing	with joint rings 411.01/10. casing wear ring 502.01 ¹⁾ , stud bolts 902.01, threaded plug 903.01, nuts 920.01
161	Casing cover	with joint ring 411.11, O-ring 412.01, studs 902.02, nuts 920.02
210	Shaft	with joint ring 411.31, impeller nut 922, keys 940.01/02
230	Impeller	with joint ring 411.32
321.1/2	Radial ball bearing	
330	Bearing bracket	with flat gaskets 400.01/02 joint ring 411.46, vent plug 672, threaded plug 903.46
330	Bearing bracket (complete)	as above, but including also support foot 183, bearing covers 360.01/02, radial shaft seal rings 421.01/2, constant level oiler 638, hex. head bolt 901.04 hexagon socket cap screws 914.01/02, spring disc 930.01
344	Bearing bracket lantern	with O-ring 412.01, cylindrical pin 561.02, studs 902.04, forcing screws 901.31, nuts 920.04, threaded plug 903.18, joint rings 411.18
360.01/02	Bearing covers	with flat gaskets 400.1/400.2, hexagon socket cap screws 914.1/914.2
421.01/02	Radial shaft sealing ring	
433	Mechanical seal (complete)	
471.01	Seal coverplate	with joint ring 411.15, grooved pin 561.03
502.01 ¹⁾	Casing wear ring	
507.01	Thrower	
524.01	Shaft protecting sleeve	with joint ring 411.32
638	Constant level oiler	

¹⁾ Only on CPK-G and CPK-S pumps

5. Operating Troubles

Trouble	Code number Cause - Remedy
Pump delivers insufficient liquid	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 18, 28
Driver is overloaded	12, 13, 15, 23, 27, 28
Excessively high pump discharge pressure	15
Excessively high bearing temperature	22, 23, 24, 25, 26
Leakage at the pump	29
Excessive leakage at shaft seal	17, 18, 19, 20, 21, 22, 23, 33
The pump runs rough	3, 6, 11, 12, 22, 23, 30, 31, 32
Excessive temperature rise inside the pump	3, 6, 32

Numbers not mentioned do not apply to this pump type

Cause - Remedy 1)

1. The pump delivers against an excessively high discharge pressure
 - Open discharge valve further until the duty point conditions have been attained (adjusted)
2. Excessively high back pressure
 - Fit an oversize impeller²⁾
 - Increase rotational speed (applies to turbine or I.C. engine driven pumps)
3. The pump and/or piping are incompletely vented or primed
 - Vent or prime the pump and system completely
4. Suction line or impeller clogged
 - Remove deposits in the pump and/or piping
5. Formation of air pockets in the piping
 - Alter piping layout
 - If necessary, fit a vent valve
6. NPSH available is too low (on positive suction head installations)
 - Check liquid level in suction vessel
 - Open isolating valve in suction line fully
 - Install a different suction line if necessary, if the friction losses in the suction line are excessive
 - Check suction line strainer
7. Excessively high suction lift
 - Clean out suction strainer basket and suction piping
 - Check liquid level in the pit
 - Alter the suction line
9. Reverse rotation
 - Change over two of the phase leads of the power supply cable
10. Rotational speed is too low ^{2) 3)}
 - Increase rotational speed
 - Increase voltage of power supply
11. Excessive wear of the pump internals
 - Replace worn components by new ones
12. Pump back pressure is lower than specified in the purchase order
 - Adjust point accurately by means of the isolating valve in the discharge line
 - In case of persistent overloading, trim the impeller if necessary ²⁾

Cause - Remedy 1)

13. Specific gravity or viscosity of the fluid pumped is higher than that specified in the purchase order
 - ²⁾
15. Excessive rotational speed
 - Reduce speed (applies to turbine or I.C. engine driven pump)
 - ^{2) 3)}
17. Worn shaft seal
 - Check condition of shaft seal and renew it if necessary
 - Check flushing liquid or sealing liquid pressure
18. Grooving, score marks or roughness on shaft protecting sleeve surface
 - Fit a new shaft protecting sleeve
19. Lack of cooling liquid or fouled and clogged cooling liquid compartment
 - Increase the flow of cooling liquid
 - Clean out the cooling compartment
 - Clean the cooling liquid itself
20. Stuffing box gland, end cover or seal coverplate incorrectly tightened, wrong type of packing material used
 - Remedy the fault
21. The pump runs rough
 - Correct the suction conditions
 - Check alignment of pumping set and realign if necessary
 - Re-balance the pump rotor dynamically
 - Increase the suction pressure at pump suction nozzle
22. Pumping set misaligned
 - Check alignment at coupling and realign the set if necessary
23. The pump is warped
 - Check piping connections and pump fixing bolts
24. Excessive axial thrust ²⁾
 - Clean out balance holes in impeller
 - Fit new casing wear rings
25. Too much or too little lubricant, or unsuitable lubricant quality
 - Top up lubricant, reduce quantity of lubricant, or change lubricant quality
26. The prescribed coupling gap has not been maintained
 - Restore correct coupling gap in accordance with the data on the foundation drawing
27. Operating voltage is too low
28. The motor is running on two phases only
 - Replace the defective fuses
 - Check the cable connections
29. The connecting bolts are slack
 - Tighten the bolts
 - Fit new gaskets
30. The rotor is out of balance
 - Clean the rotor
 - Re-balance the rotor dynamically
31. Defective bearings
 - Fit new bearings
32. Insufficient rate of flow
 - Increase the minimum rate of flow
33. Faults in the circulation liquid supply
 - Increase the cross-section of the circulation liquid line

1) The pump should be made pressureless before attempting to remedy faults concerning parts exposed to pressure

2) Please refer to KSB

3) This fault can also be remedied by altering the impeller diameter



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