Wittig

Operating Instructions and Spare Parts List

LPK 50-1 - LPK 100-1

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Gardner Denver Wittig GmbH
Johann-Sutter-Straße 6 + 8
D-79650 Schopfheim
Phone +497622/394-0
Fax +497622/394-200
E-mail: info@gdwittig.de
http://www.gdwittig.de

Gardner Denver

CONTENTS

Foreword

Please read this instruction manual carefully

This instruction manual contains essential informations for the proper installation and operation of your compressor. We recommend you to familiarize yourself with its contents before setting up and running of the machine.

The instructions and advices given in section 2, 3 an 4 must be followed exactly to ensure that the machine functions perfectly.

Please keep this manual within easy reach of the compressor.

1. Technical Data :

This instruction manual applies to :

Rotary compressors of the types LPK 50 - LPK 100

Technical data look rating plate

Operating speed 1450 r.p.m.

	LPK 50	LPK 75	LPK 100
Mass moment of inertia	0,1727 kg m^2	0,2178 kg m^2	0,2806 kg m^2
Flywheel effect	6,779 Nm^2	8,535 Nm^2	11,085 Nm^2

Effective capacity of oil tank 4 ltr.

Oil supply sufficient for ~ 33 hours' operation

	LPK 50	LPK 75	LPK 100
Weight of compressor ready for operation	125 kg	155 kg	195 kg

2. Installation

The room chosen as the site for the compressor must have an adequate fresh-air supply and should be as dust-free as possible.

2.1 Initial Check

All components listed in the delivery note should be checked to make sure that none is damaged or missing.

The compressor should be inspected for signs of damage sustained during transport.

Make certain that the rotor shaft can be turned by hand.

2.2 Anchoring of the Compressor

The compressor, which is mounted on a shaped base plate, and the drive motor to which it is coupled must be installed in such a way as to be free from vibration. No special concrete foundation is necessary. Before the base plate is bolted down a check should be made to ensure that it is perfectly level. If the compressor and motor are not bolted to the base plate until the unit is set up at the installation site, the base plate should first be anchored to the ground.

The motor and compressor are then fitted to the base plate and bolted down. The motor should subsequently be switched on briefly to check the direction of rotation.

There should be a clearance of 4-6 mm between the two shaft ends. With the coupling in the engaged position, a straight-edge should be laid across the outer edges of the two coupling flanges to check that the compressor shaft and motor shaft are correctly aligned (Fig.1).

The compressor and the motor should be lined up until the straight-edge shows that the coupling flanges are exactly flush at at least two points on their circumference 90° apart. If the coupling is not supplied by us, the type chosen should be one that does not transmit axial thrust. The coupling should be drawn on, not knocked on.

As with all freely rotating machine parts, the coupling should be provided with a guard to prevent any accidental contact. We have coupling guards on stock to fit all our machines.

To ensure that the motor and compressor shafts have been lined up exactly during the installation, or that the works alignment has not been disturbed during transport, it is essential that the alignment should be checked. If the compressor shaft and motor shaft are not perfectly in line, this will impose undue strain on the bearings and will shorten their life.

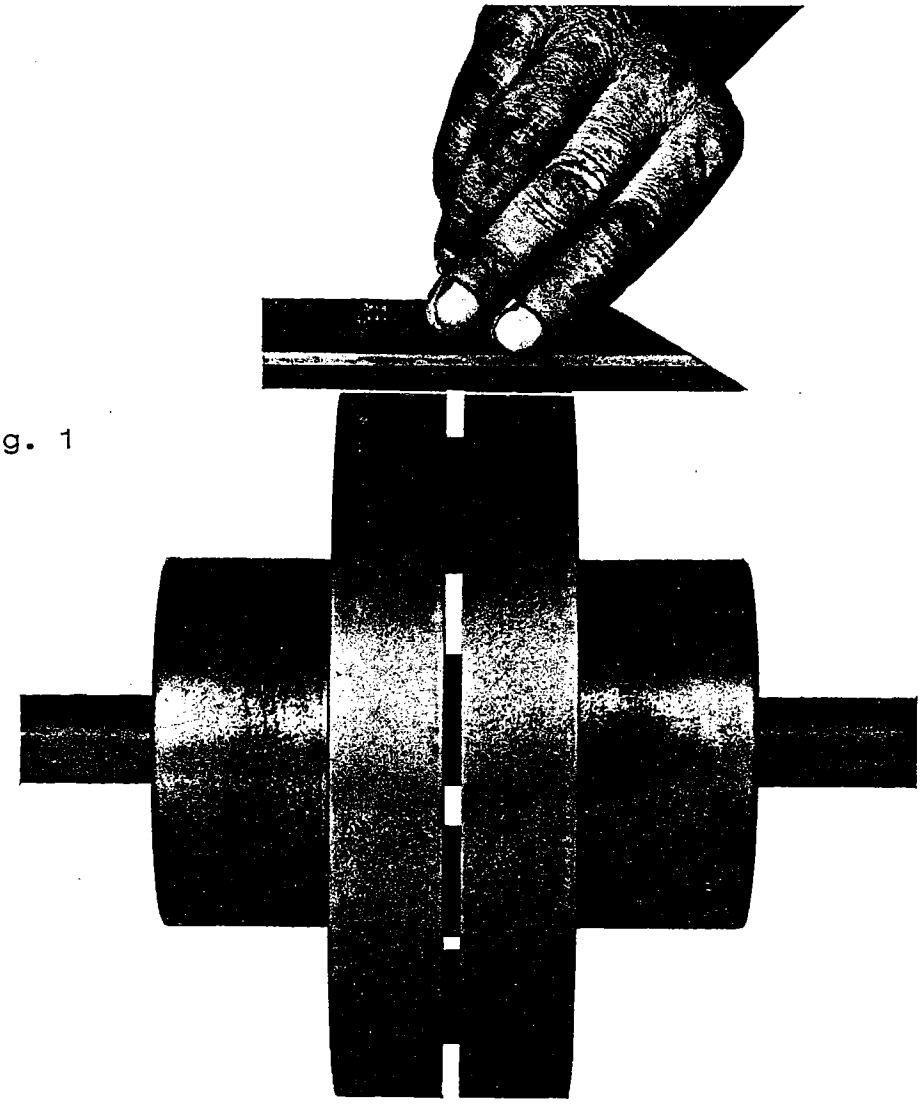


Fig. 1

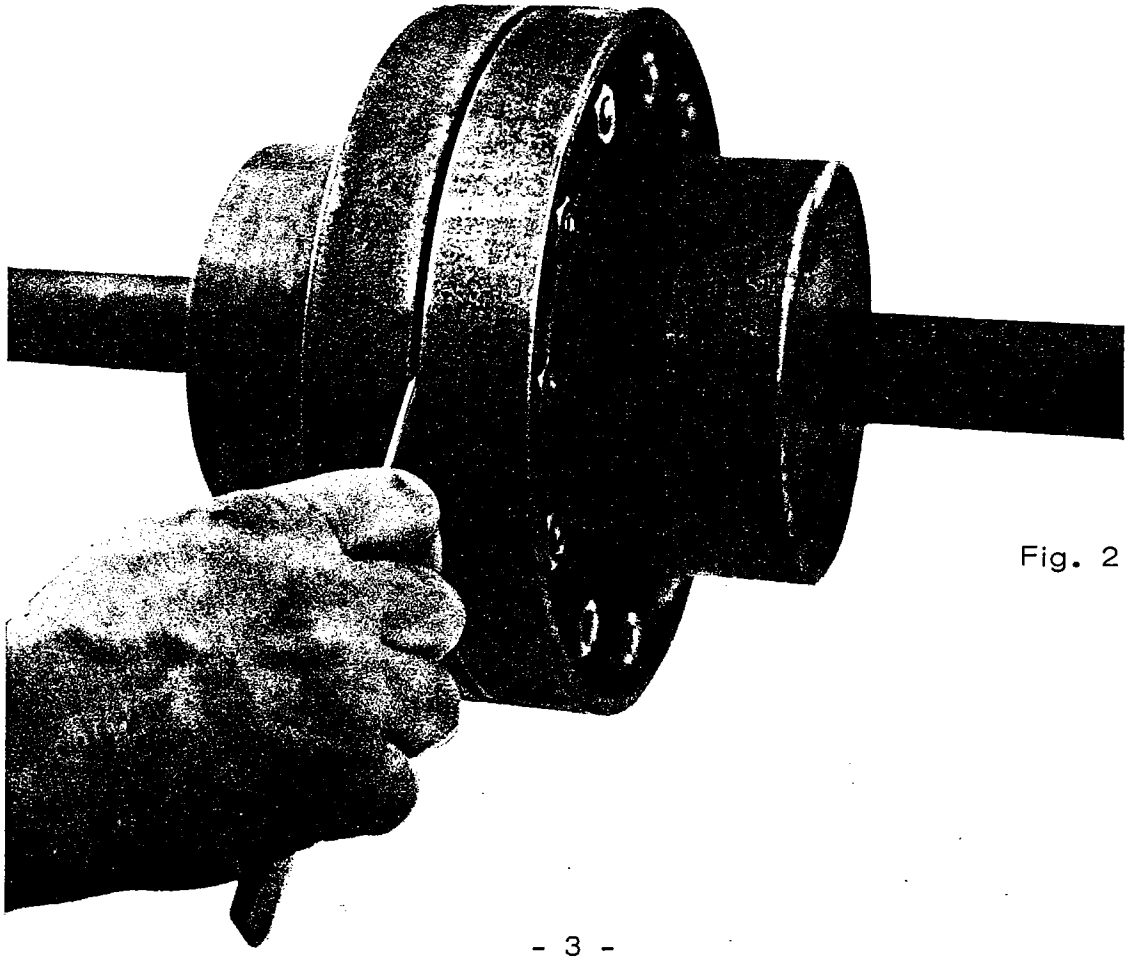


Fig. 2

Fig. 1 shows how mutual eccentricity of the shafts can be recognized.

Fig. 2 shows how any angular deviation in the alignment of the shaft can be detected.

With the coupling engaged and fixed in position with a set-screw, the width of the gap between the two flanges should be measured with a feeler gauge at at least four points 90° apart. The measurements should not differ from one another by more than 0.05 mm.

If the compressor is exactly aligned, the coupling flanges should allow a slight amount of movement when turned in opposite directions.

2.21 V-belt drive

At V-belt drive the V-belt pulley can be mounted directly on the free shaft-end of the compressor :

at types LPK 50 - 75	for all operating conditions (at vacuum - and pressure operation up to 2 bar overpressure)
at type LPK 100	at vacuum - and pressure operation up to 1 bar overpressure. At pressure operation over 1 to 2 overpressure a V-belt drive according Fig. 15 it to provide.

The V-belt tension normal must be so that at completely mounted and tensioned V-belts same allow to be pressed down by thumb-pressure for about 2 cm. Therefore the V-belt pulley must have a diameter minimum of 200 mm.

2.3 Accessories on the Suction Side

The arrangement of the components referred to in the following paragraphs can be seen in Figs. 4 and 5.

2.31 Intake Piping

The stud-bolts at the intake port are provided to fit a saddle flange in conformity with DIN 2673 (saddle flange with welded collar).

The pipe used should have a non-corrosive inner surface. Prior to fitting, the inside of the pipe should be cleaned out. Welding beads, scale or rust should be carefully removed.

Before the suction pipe is flanged to the intake port, it must be scrupulously cleaned. For the first few days of operation, a wire-mesh screen with a mesh size of about 1 mm should be inserted between the intake port and the suction pipe.

The suction pipe must rise towards the machine. At its lowest point, a condensation trap with a drain cock should be fitted. If no provision is made to allow condensation to drain off, the water will enter the compressor and cause a sudden surge when the machine is started, which can result in fracture of the rotor shaft or the vanes.

2.32 Prevention of Mechanical Contamination

To protect the compressor against mechanical contamination, a vacuum-tight filter should be built into the suction pipe for operation on vacuum (Fig. 3, item 38).

Our compressors should be equipped with an air filter (Fig. 4, item 37), which is fitted at the beginning of the suction pipe. The interval between oil changes can be considerably prolonged if a cyclone primary separator is installed. In lime works, brickyards, mines and glass works, the installation of this additional separator has proved well worth while.

When the filter is fitted, attention should be paid to the direction of flow. The filter should be so placed as to be easily accessible for cleaning.

2.33 Prevention of Fluid Intake

Precautions must be taken to ensure that vacuum pumps do not suck in liquids. They should consequently be provided with a reliable, automatically functioning float valve or a barometric column rising 10 metres above the water level.

In the case of compressors, there is seldom any danger of liquids being sucked in.

2.34 Vacuum relief Valve

The vacuum relief valve is the control element in a vacuum plant. When the presslected degree of vacuum has been reached it opens, allowing the vacuum pump to take in atmospheric air. The vacuum relief valve is built into the suction pipe (Fig. 3, item 88).

2.4 Accessories on the Discharge Side

2.41 Check Valve

A check valve (Fig. 4, item 49 and Fig.5, item 49) is supplied with all our compressors and vacuum pumps. The check valve is fitted close to the discharge port and serves to prevent any loss of the delivery pressure or vacuum.

When the check valve is installed, care should be taken to ensure that the direction of flow is correct ! (see arrow on the check valve-housing).

The check valve should be flanged together with the suction pipe.

2.42 Pressure Piping

The pressure piping must rise towards the machine; it must compensate for thermal stress without any direct strain being imposed upon the discharge flange. At the lowest point, a condensation trap with a drain cock should be fitted. With the compressor running, the condensate should be blown out with compressed air. If several compressors are supplying the one collective header pipe, the latter must be sufficiently large to ensure that the rate of flow in it is at most half that in the individual feeder pipes.

If an aftercooler is built into the pressure pipe of a compressor of type LPK 75 operating at overpressures above 1,5 bar or type LPK 100 operating from 1 bar a section of piping that can be removed to permit inspection of the inside of the discharge port and the pressure pipe, must be inserted between the discharge port on the compressor and the aftercooler (Regulations for the Prevention of Accidents, BVG 16).

2.43 Thermometer (applies only to compressors)

The regulations for the Prevention of accidents (VBG 16) stipulate that compressors with a power input greater than 24.6 HP must be provided with a reliable thermometer. This ruling applies to compressors of types LPK 75 for discharge overpressures from 1,5 bar and types LPK 100 for discharge overpressures from 1 bar.

The thermometer should be mounted in the pressure pipe immediately behind the discharge port (Fig. 4, item 114).

2.44 Safety Valve (applies only to compressors : Fig.4, item 84)

The Regulations for the Prevention of Accidents (VBG 16) stipulate that a non-closable safety valve must be installed in the pressure pipe of every compressor. The safety valve must be of appropriate size and so set as to prevent the maximum permissible operating pressure from being exceeded by more than 10%.

It must be capable of releasing the entire volume of compressed air delivered by the compressor. It must be provided with a means of manual ventilation.

The safety valve must precede all other fittings installed in the pressure pipe.

The compressed-air reservoir must also be equipped with a safety valve. If only one compressor is supplying the compressed-air reservoir, it is permissible to install a safety valve in the reservoir only and dispense with the safety valve in the pressure pipe. In this case, however, no shut-off valve may be fitted between the compressed-air reservoir and the compressor.

Once set, the safety valve must be secured in such a way as to prevent unauthorized or accidental alteration of the pressure setting.

The functioning of the safety valve should be tested once every week by manual ventilation with the compressor running.

If the safety valve is likely to discharge inflammable, noxius or otherwise dangerous (e.g.highly pressurized) gases or vapours, these must be led off safely.

2.45 Silencer (applies only to vacuum pumps : Fig. 3, item 108)

The vacuum pump expels air into the atmosphere with a loud whistling sound. A silencer effectively reduces the noise level. When the silencer is installed in the exit pipe, care should be taken to ensure that the direction of flow is correct.

The silencer should be fitted as near as possible to the exit port to avoid reverberations in the pipe-line.

The silencer should be installed in such a way that the condensation outlets can be easily reached.

2.46 Compressed-air Reservoir (Fig. 4, item 131)

Satisfactory pressure control can only be achieved if there is a minimum " cushion " of compressed air in the system behind the compressor. The necessary volume of compressed air depends upon the type of pressure control system used.

For idling operation, the minimum size of the pressure reservoir V_k (m^3) is :

$$V_k = 0.00275 \times \frac{Va}{\Delta p}$$

where Va is the delivery volume in cubic metres/hour and Δp the differential pressure in bar.

Example :

$$Va = 410\ m^3/hr.$$

$$\Delta p = 0.5\ bar$$

$$V_k = 0.00275 \times \frac{410}{0.5} = 2.26\ m^3$$

Hence, a minimum tank capacity of $2.5 m^3$ should be chosen.

For intermittent operation the minimum reservoir capacity is calculated according to the following formula :

$$V_k = 0.0235 \times \frac{Va}{\Delta p}$$

Example :

$$Va = 410\ m^3/hr.$$

$$\Delta p = 1.5\ bar$$

$$V_k = 0.0235 \times \frac{410}{1.5} = 6.43\ m^3$$

Hence, the tank must have a capacity of at least $6.5\ m^3$.

Please note : the greater the differential pressure may be, the smaller can be the capacity of the tank ; the larger the tank the smaller the differential pressures that can be handled.

Our pneumatic regulation system can only be used for discharge overpressures of more than 1 bar. At lower pressures another system must be adopted (e.g.blow-off via an overflow valve or backflow regulation).

The construction, equipment and testing of compressair-air tanks are subject to the Regulations for the Prevention of Accidents (VBG 17-19) and the Directions for Pressure Vessels.

At the lowest point of the pressure tank, a condensation outlet should be provided.

2.47 Cooler (Fig. 4, item 60)

If the discharge temperature of the compressed air is too high for the purpose intended, the compressed air must be recooled. In most cases a water-cooler is installed, but air-cooled compressed-air coolers can also be supplied. Provision must be made for draining off the condensate forming during the recooling process.

Compressors of types LPK 75 for overpressures greater than 1,5 bar and LPK 100 for overpressures greater than 1 bar, which feed a compressed-air reservoir (or an extensive compressed-air mains) must be equipped with a recooler, which should be fitted immediately after the discharge port. A separator (95) should be installed behind the aftercooler (see Fig. 4).

2.48 Separator (Fig. 4, item 95)

If the compressed air supplied to the consumers has to be as free from oil and as dry as possible, a separator must be built into the system. The separator should be installed near the consumer so that no temperature gradient occurs after the compressed air has passed through it.

Care should be taken to ensure that the direction of flow is correct.

Lay-out for Vacuum Generating Plants

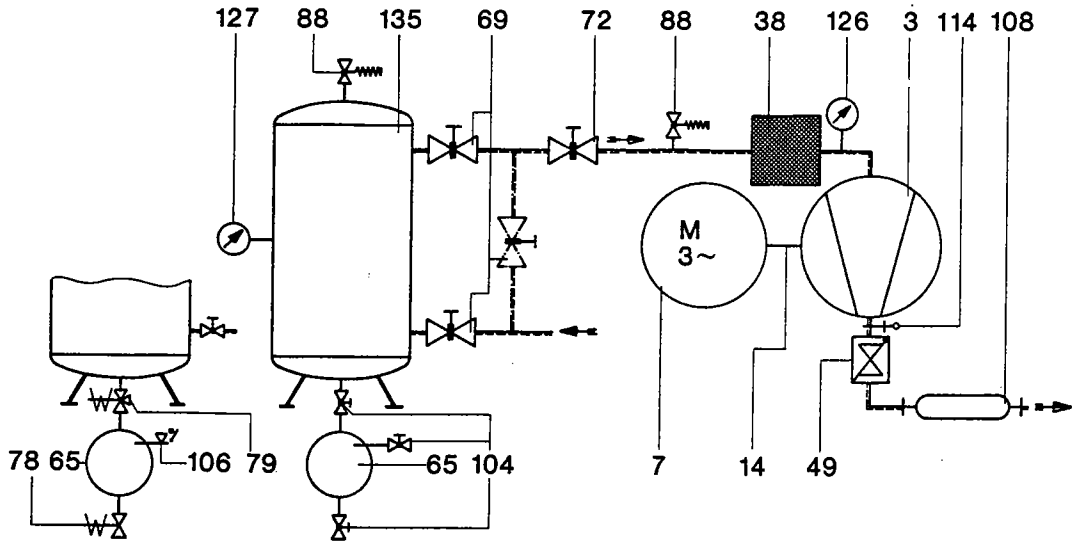


Fig. 3

3 Vacuum Pump
7 Three-phase motor
14 Elastic coupling
38 Vacuum filter
49 check-valve
65 Condensation reservoir
69 Shut-off valve to the tank
72 Shut-off valve in front of the vacuum pump (only necessary, if several vacuum pumps deliver into one collecting pipe)
78 Electrically operated two-way acting valve
79 Electrically operated three-way acting valve
88 Vacuum relief valve
104 Shut-off valve
106 Level control-switch
108 Exhaust-silencer
114 Thermometer
126 Vacuum gauge for end-vacuum
127 Vacuum gauge on the tank
135 Vacuum tank

Lay-out for Compressed-air Plants

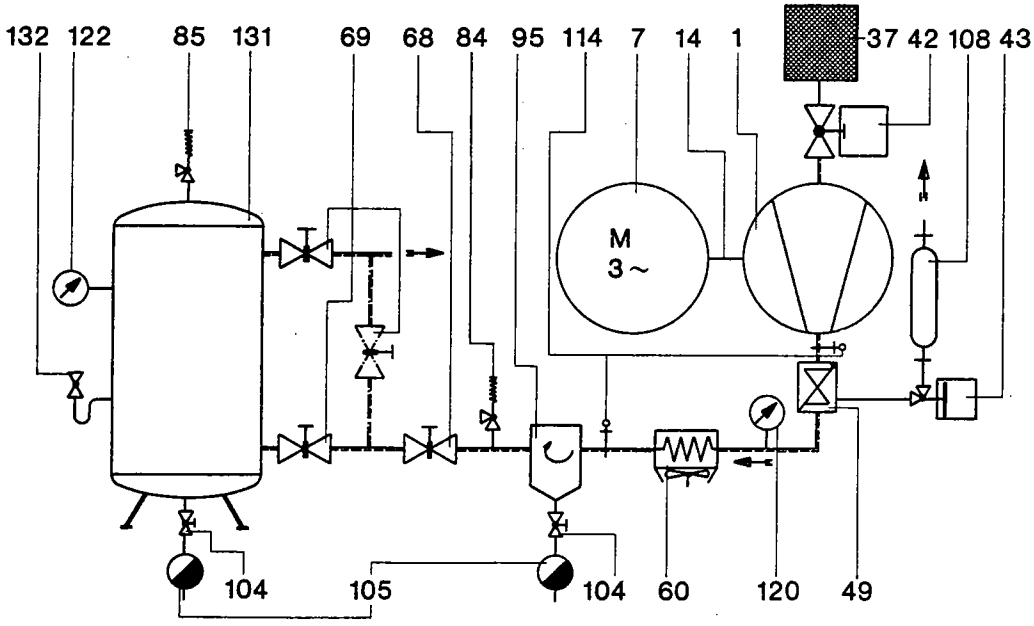


Fig. 4

1 Rotary-compressor
7 Three-phase motor
14 Elastic coupling
34 Air-filter
42 Pressure regulating valve
43 Pressure relief valve
49 Check valve
60 Air-cooled after-cooler
68 Shut-off valve (only necessary if several compressors deliver into one collecting pipe)
69 Shut-off valve to the tank
84 Safety valve for end-pressure
85 Safety valve at the tank
95 Cyclone-separator
104 Shut-off valve
105 Automatic condensation trap
108 Silencer
114 Thermometer
120 Pressure gauge for end-pressure
122 Pressure gauge at the tank
131 Pressure tank
132 Special equipment for TÜV-inspection control

3 First Operation of the Plant (Fig. 5)

3.1 Fill the oil tank (1) with oil up to approximately 3 cm below the winding of the filler cap (2) (for oil grade see Lubricant-Table, Section 11.1

3.2 Prime the lubricating system with the crank handle (3) until the ball in the oil-flow indicator (4) rises and falls ; then give another 80 complete turns.

The crank handle (3) is inserted into the opening visible when the oil filler plug (2) is removed, crank handle is to press down and to turn (see Fig. 24).

3.3 The first time the machine is operated, the motor should be run briefly to check the direction of rotation. (see arrow (7) on the air leading cap).

3.5 On compressors : open all manually operated shut-off valves.

3.6 Switch on motor and check that pressure or vacuum develops.

COMPRESSOR

E X P L O S I O N H A Z A R D exists through pressure and temperature rise in the event of incorrect installation/arrangement or by manipulating the safety valve.

VACUUM PUMPS

E X P L O S I O N H A Z A R D exists through increasing vacuum and temperature rise in the event of incorrect installation/arrangement or by manipulating the vent valve.

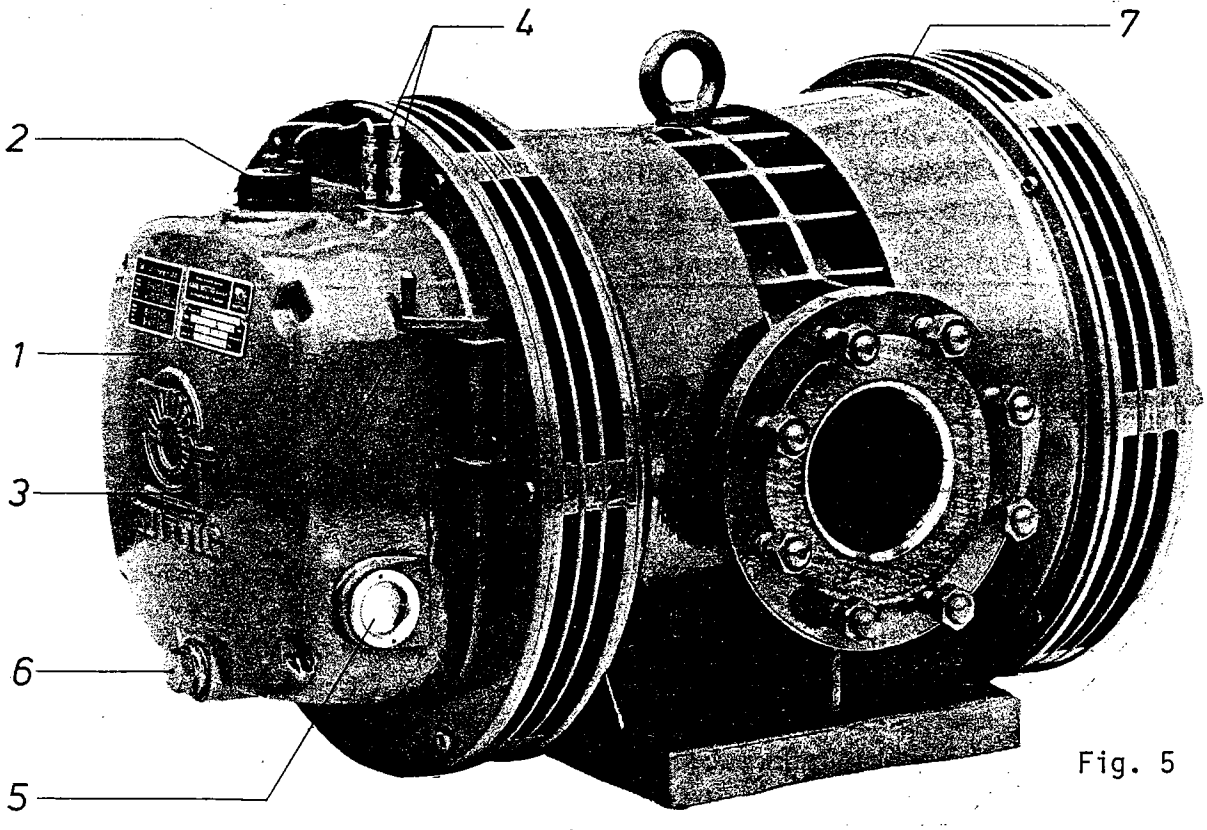


Fig. 5

4 Supervision and Maintenance of the Compressor

4.1 Oil-flow

If the oil pump is functioning properly, the balls in the oil-flow indicator (4) will rise and fall approx. 5 - 6 times per minute.

4.2 Checking of the performance data (see rating plate)

The operating pressure or vacuum should be checked daily.

The discharge temperature of the compressed air should be read off from the thermometer near the discharge port.

If the pressure or vacuum remain below the operating levels, this is generally the result of over-consumption. If the temperature exceeds the permissible maximum, or if, despite normal consumption, the set pressure or vacuum cannot be obtained, the compressor should be stopped and the procedure described in Section 8.1. followed.

4.3 Condensation

All condensation traps should be emptied twice to three times daily. Condensate in the pressure piping should be blown out with compressed air, with the cock slightly opened. Condensation in the suction piping should only be drained off when the machine is not running.

At ambient temperatures near or below freezing point, particular attention should be devoted to the removal of condensation

4.4 Oil tank (Fig. 5)

Whenever the oil level reaches the oil-Level sight glasses (5) (Fig.5, item 5) the oil-tank should be topped up through the oil-filler (2) (for normal oil sonsumption, see Section 1).

The oil-tank should be cleaned once every 12 months in the case of stationary compressors and once every3 months in the case of mobile units.

The machine should be stopped, the plugscrew (Fig.5,item 6) removed, the old oil drained off and the oil tank rinsed out with Flushing oil.

Do not forget to prime the lubrication system by hand before the machine is started again. (cf.Section 3.2).

4.5 Maintenance during Prolonged Disuse

If the compressor is out of operation for longer than one month, it should be run for half an hour every four weeks. All corrodable parts will then be supplied with fresh oil. If the compressor has not been in operation for more than 6 months, or if 6 months or more have elapsed between the date of delivery and the first operation of the machine, it must be rinsed through with fresh lubricating oil. This applies to the oil-pot, bearing and sealing spaces and compression chamber. The old oil should be drained off by removing the bottom plug-screws, the above mentioned spaces flushed out with fresh oil and the plug-screws replaced. Thereafter, the instructions given in Sections 3 to 3.2 should be carried out.

Do not forget to prime the lubrication system before starting the machine again.

4.6 V-belt Drive

Radial ball bearing should be lubricated once weekly through the lubrication nipple (13) with approx. 2 - 3 cm^3 grease according Lubricant-Table, Section 11.1 (see Fig. 15).

4.7 Fluid Intake

If at mud-sucking or fecal trucks, caused by wrong operation mud or fluid is sucted into the machine a flush cleaning with petroleum or Diesel fuel can be effected. To do so, a shutoff cock can be fitted into the line at the suction stud of the machine. At this cock a hose is to connect which is to put into a container filled with petroleum or Diesel fuel. At running machine the shutoff cock is to open and during 20 seconds flushing oil to suct into the vacuum pump. After the flush cleaning immediately one must pre-lubricate with the crank handle so that sufficient oil reaches the different greasing points.

4.8 Checking of the Rotor Vanes Wear (Fig. 6)

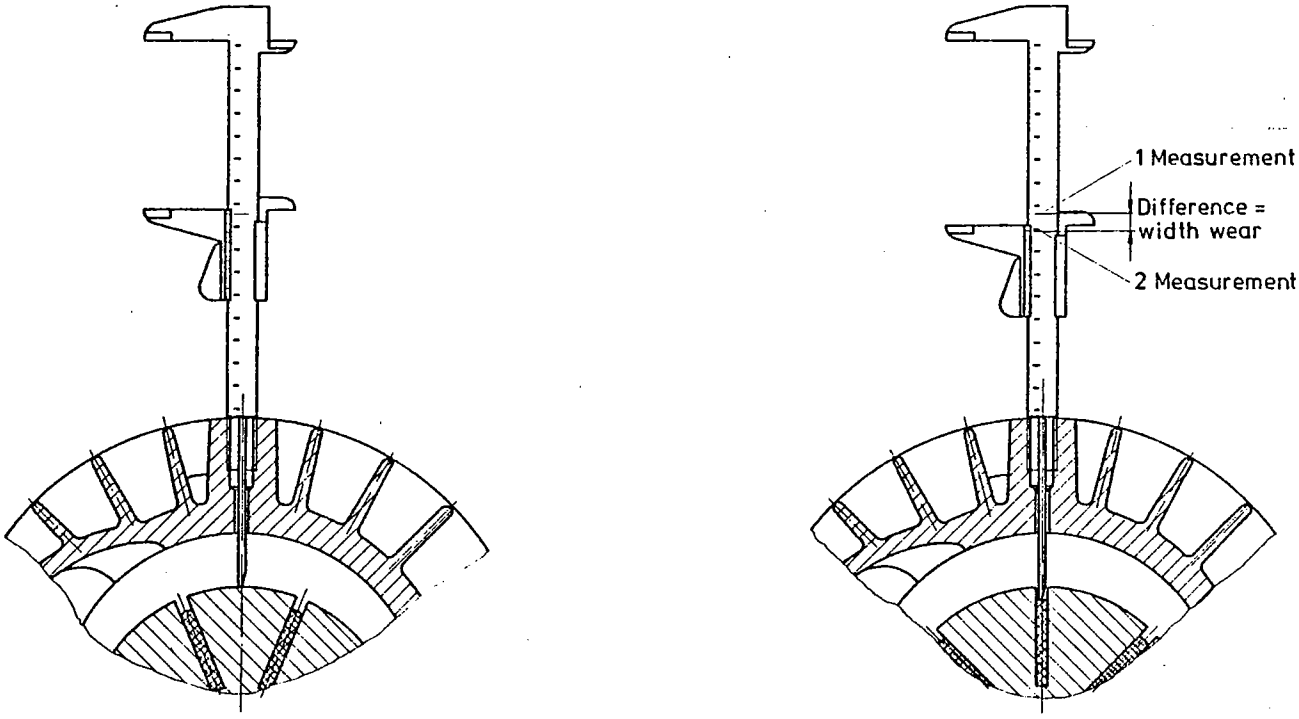
It is possible to check the wear of rotor vanes of the compressor without dismantling same. Remove the ring screw from the compressor housing.

Put into the open taphole a slide caliper rule. Turn the rotor of compressor carefully by hand until the slide caliper rule stands on the outer surface of the rotor. Read off the measure and continue turning the rotor by hand until measurement can be made of a rotor vane. The difference of both measurements may not exceed 3 mm (0,118 inches).

If the difference is greater than 3 mm, the rotor vanes must be replaced.

After the measuring, fit the ring screw with gasket and tighten it, otherwise loss in efficiency will occur.

The first control should be done after approx. 6 months or 2.500 service hours, and then every 3 months or 1.250 service hours, until the necessary replacement of the rotor vanes.



Measuring position 1 Measuring position 2

Fig. 6

4.9 Oil-bath Air Filter

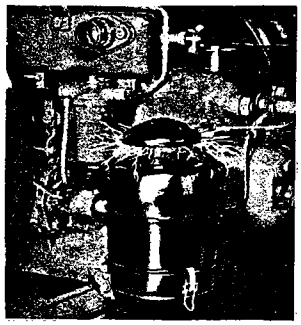


Fig.7

Inspect the air intake opening of the intake pipe and remove any adhering foliage, etc. Check that the filter connection is airtight.

Fig.8

Once or twice every three months, check the oil for sludge. Do not remove the oil-pan while the compressor is running

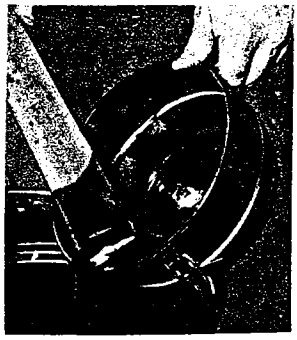


Fig. 9

If the oil level rises above the upper limit or if the oil is thick and sludgy, empty and clean the oil-pan.

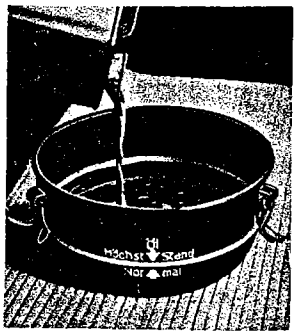
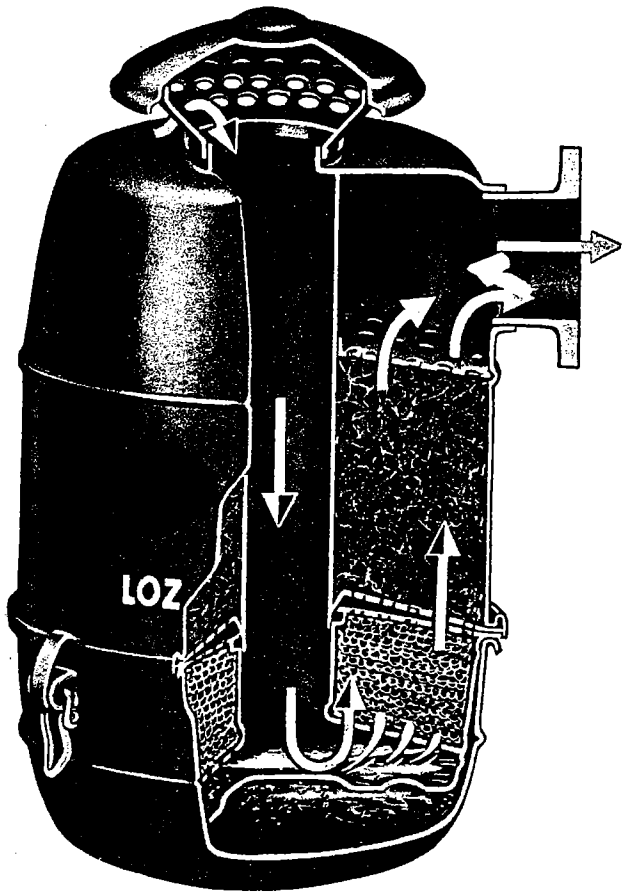


Fig.10

Fill the oil-pan up to the "normal" mark with fresh compressor oil (see lubricant table).



Section through an LOZ oil-bath air filter.

4.91 INTAKE AIR FILTER

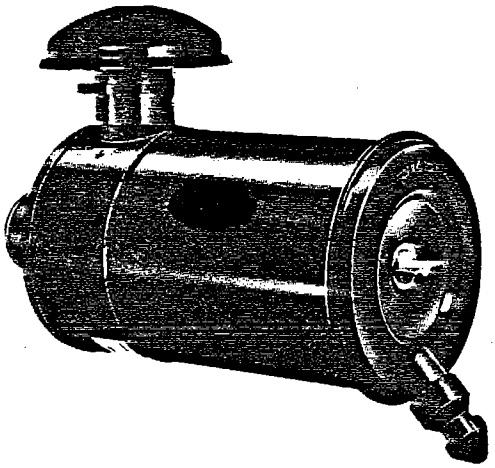
4.92 Mounting

The air filter must be mounted vertically. However, it must not be installed with the clean air nozzles pointed downwards since dirt will fall into the clean air line when removing the cartridge and can thus get into the filter, or the dust discharge of the preseparator will be impaired.
The air filter is also fitted with a safety cartridge.

Take care that the direction sign on the marking "OBEN-TOP" on the dust container is in upward direction.

4.93 Maintenance

Filter maintenance is in the rule limited to servicing the cartridge.
The maintenance intervals are dependent on the respective dust conditions.



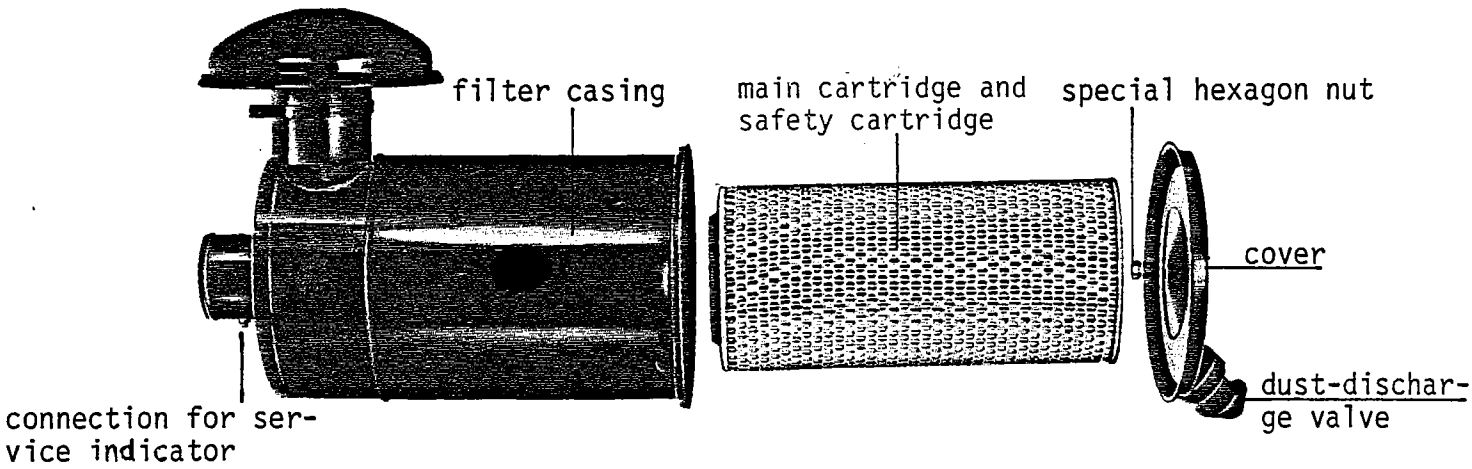
Maintenance of the filter cartridge is then to be undertaken when a red field appears in the maintenance indicator.

The air filter cartridge should not be used for more than 2 years.

Cartridge maintenance should only be carried out with the compressor shut down.

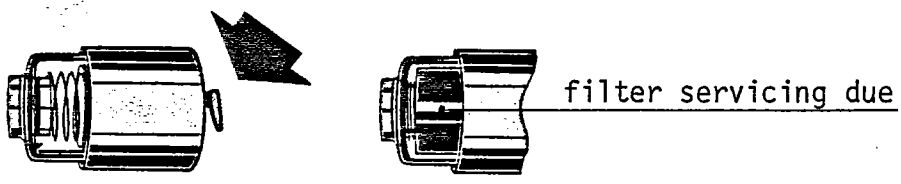
The **safety cartridge** is **not** to be cleaned or reused.

The compressor is **not** to be **operated without main cartridge.**

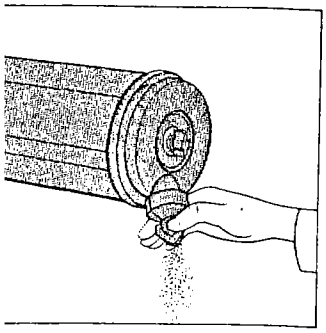


4.94 Maintenance indicator

After filter maintenance, the red field is to be cleared by pressing the reset button. The maintenance indicator is then once again ready for operation.



The maintenance indicator must not be installed with the reset button to the top.



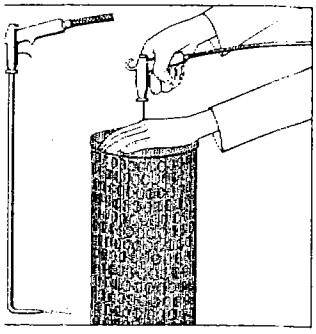
4.95 Dust discharge valve

Remove any dust cakes by pressing the valve together. If the filter is installed horizontally, the valve must point downward.

4.96 Cartridge change

Shut the compressor down.
Remove cover including dust discharge valve.
Undo hexagon nut and take contaminated cartridge out.
Clean filter housing with a moist cloth, in particular the sealing surface of the filter cartridge. Dust must not enter the clean air piping.

Undo hexagon nut (size 24) on the centre rod, pull out the safety cartridge and throw it away.
Place new cartridge into filter casing and screw down tightly with hexagon nut. Fit cover with dust discharge valve pointing downward.



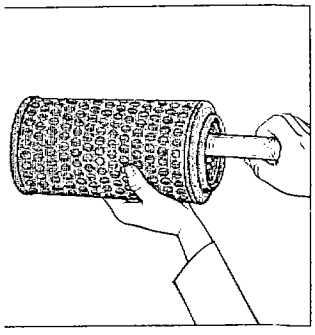
4.97 Cleaning

If no replacement is at hand, the used cartridge may be cleaned provisionally as follows:

By blowing out
Blow out the cartridge surface with dry compressed air of not more than 5 bar at an angle from outside towards the folgs. Then blow the interior out carefully.

Knocking as a last resort
To be done only if cleaning by blowing out is not possible.
Knock the cartridge with its face on a soft surface (e.g. hand palm) several times so that the dust falls out. Do not use force, do not damage the cartridge.

4.98 Checking the cartridge



Before reinsertion, the cleaned cartridge should be checked for damage, e.g. on the paper bellows, rubber gaskets, and dents or damage to the sheet jacket etc.

Cracks and holes in the paper bellows can be detected by examination of the cartridge against the light or with an electric torch.

Under no circumstances may damaged cartridges by re-used. In case of doubt, replace the cartridge.

4.99 Cartridge storage

Protect spare cartridges against dust, moisture and damage.
They should preferably be stored in their original packing.

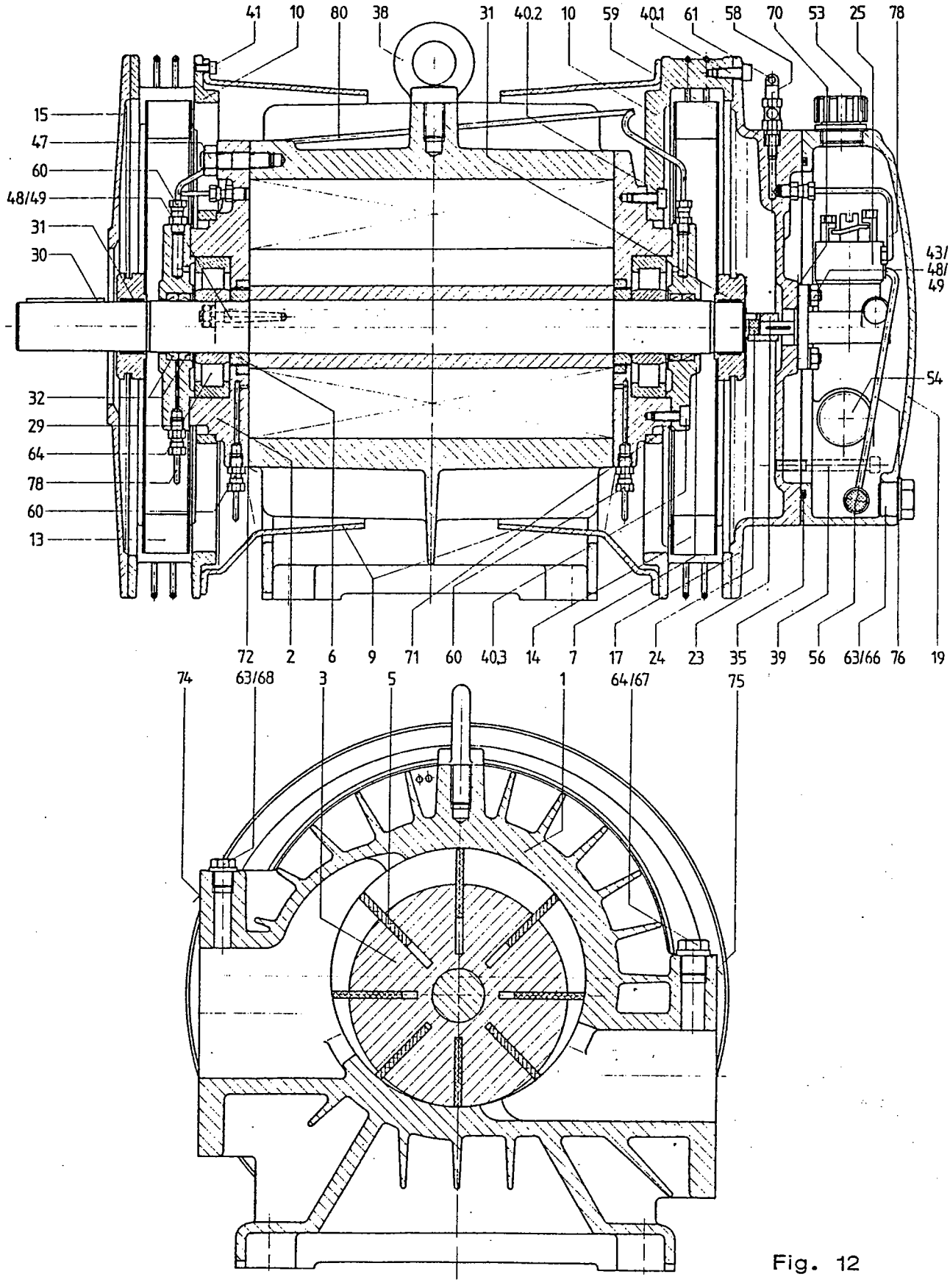
4.100 Routine Maintenance

Operating hours are calculated on the basis of approx, 14 hours'running daily

	Daily	Every 3 months or 1,250 operating hours	Every 6 months or 2,500 operating hours	Every 12 months or 5,000 operating hours
Drain off condensate	twice/ thrice			
Check oil level in oil tank	twice			
Check oil feed (oil-flow indicators)	twice/ thrice			
Check pressure or vacuum	X			
Vent safety valve manually	weekly once			
Check discharge-air temperature	X			
Separator		X *		
Clean air filter or intake air filter		once/* twice		
Clean filter inserts in vacuum filter			once/* twice	
Clean oil tank		mobile units X		X
After - cooler				X
Inspect rotor - vanes			X	
Renew rotor vanes				X
Renew rotary shaft seals in cover-plate A+B-side and oil-tank				X **

* Depending upon amount of condensation or dirt

** times apply for European conditions ; considerably more frequently in tropies.


41
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40.3
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7
17
24
23
35
39
56
63/66
76
19
74
63/68
3
5
1
64/67
75

Fig. 12

5. Dismantling (position-numbers see Fig. 12)

Detach the machine from the base plate. Drain off the Lubricating oil at the plug-screw (63) of the oil tank (19). Disconnect the Lubricating oil pipes at connection of the oil-flow indicators (58). After unscrewing the hexagon socket screws (39) remove the oil tank (19) and after unscrewing the hexagon socket screws (40.1) the oil tank cover (17) with oil pump (25) can be removed.

5.1 Fan and fan cowling (see Fig. 13)

Remove hexagon socket screws (40.1) at A-side and take off fan cover (15).

Lift adjusting spring (30) out of the groove.

For withdrawal of the fans (13 and 14), loosen the 6 hexagonal socket screws (40) each at both sides of compressor, so that the claws of a two-armed extractor can grip between fan hub and clamping disk (50). A previous blow given with the hammer in axial direction to the fan hub loosens the slotted tensioning elements (31).

Withdraw the fans by means of the extracting device from the rotor shaft (Fig. 13).

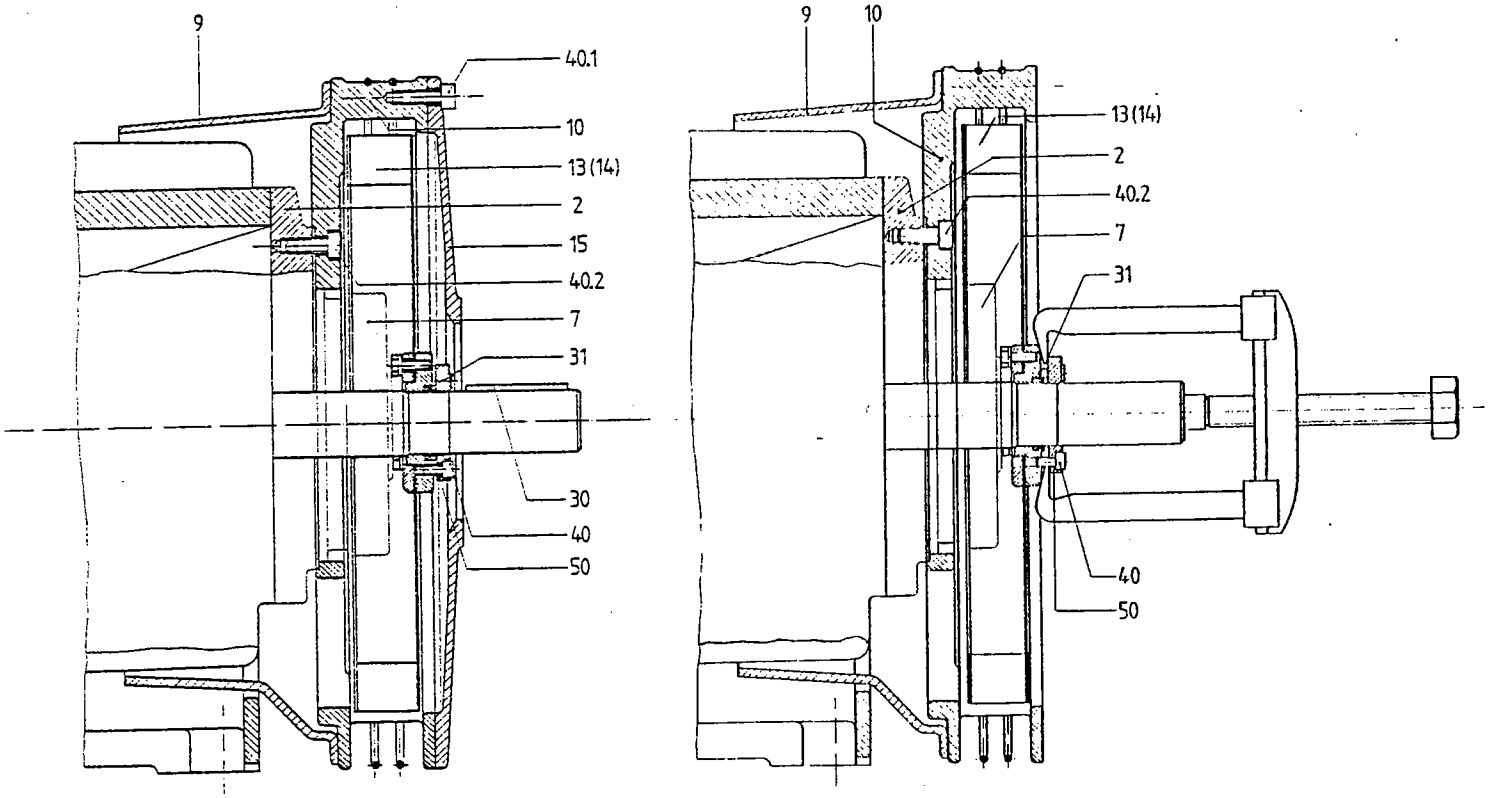


Fig. 13

5.2 End cover, housing cover, rotor vanes (Fig. 12 and 14)

After removing of the hexagon socket screws (40) draw off the end cover (7) over the rotor shaft. Take care that the packing washers of the rotary seals (32) not become damaged. Remove the hexagonal nuts (47) on the housing covers (2) loosen the tapered pins (37) by tightening the hexagonal nuts (48) and withdraw them. Draw off the housing covers (2) over the shaft ends (remove carefully, so that the gaskets (72) not get damaged. Withdraw the vanes (5) from their slots in the rotor (3) and lift the rotor (3) out of the housing (1).

5.3 V-belt drive (only for type LPK 100 above a overpressure of 1 bar (Fig. 15)

Demounting:

Slacken off the V-belts. Remove the six hexagonal socket screws (11), the hexagon cap screw (9) with spring ring (10) and disc.

Draw off the complete V-belt drive with bearing plate (1) by detaching device from the rotor shaft.

Draw out the V-belt disc(2) with bearings (4) from the bearing plate 1.

Take off the guard-ring (7) and Nilos-spacer rings (5), Nilos-rings (6), radial ball bearing (4) and demount the spacer ring (3).

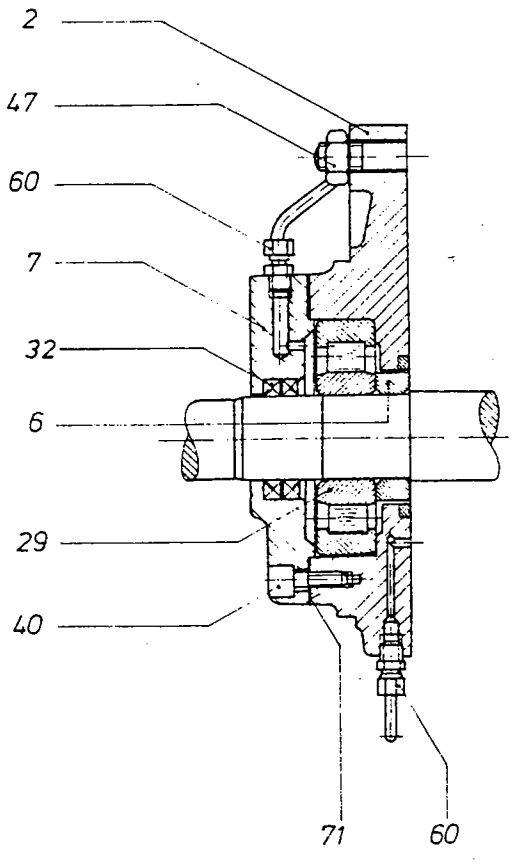


Fig. 14

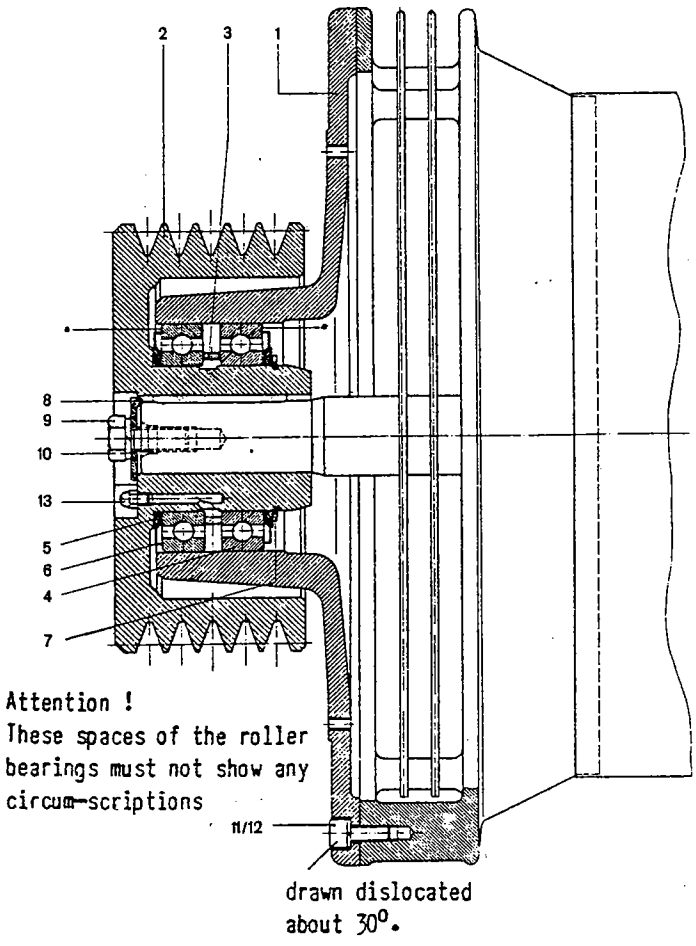


Fig. 15

6. Inspection of Wearing Parts

When the compressor has been dismantled, the wearing parts should be inspected.

6.1 Rotor-vanes (5)

The dimensions of the rotor vanes in new condition are given in the Table in Section 10.1. The width should not be less than the wear dimension ; if it is, the vanes must be renewed.

6.2 Cylindrical Roller Bearing (29)

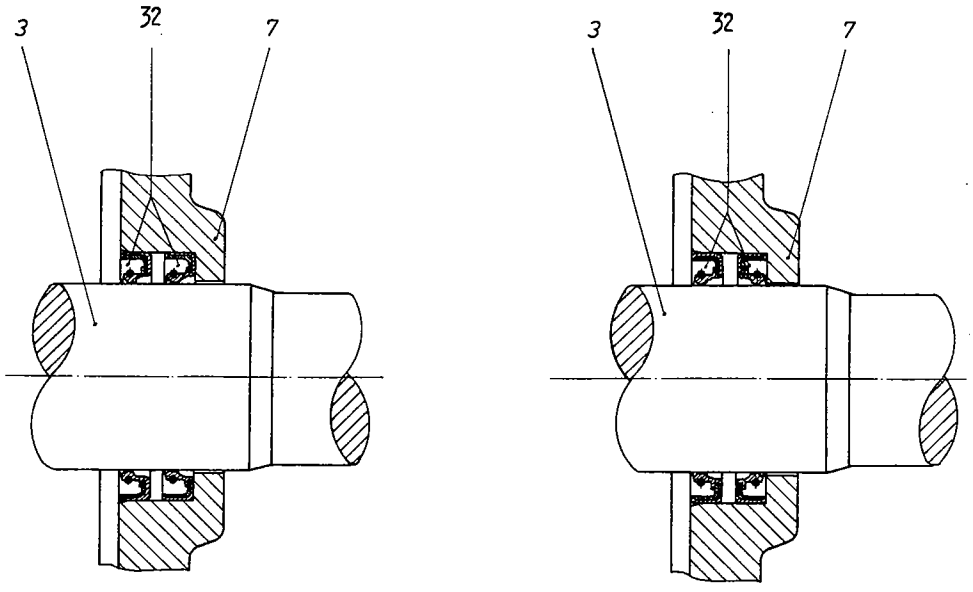
The running surfaces of the bearings should be inspected. If any heavy scoring or signs of drift are visible, the bearing should be renewed. To do so, heat the inner races on the rotor shaft and draw them off ; withdraw the outer races from the housing end-plate with a bearing extractor.

6.3 Gaskets (71 + 72) O-ring (35) and rotary seals (32+34)

Defective gaskets (71+72) should be replaced by new gaskets of exactly the same thickness (measure with micrometer).

The O-ring and the rotary shaft seals (32+34) should as a rule be renewed every time the compressor is dismantled, since they become hard and less efficient after prolonged operation of the machine.

At installation new rotary seals (32) take care of the direction of the packing washers according Fig. 16.

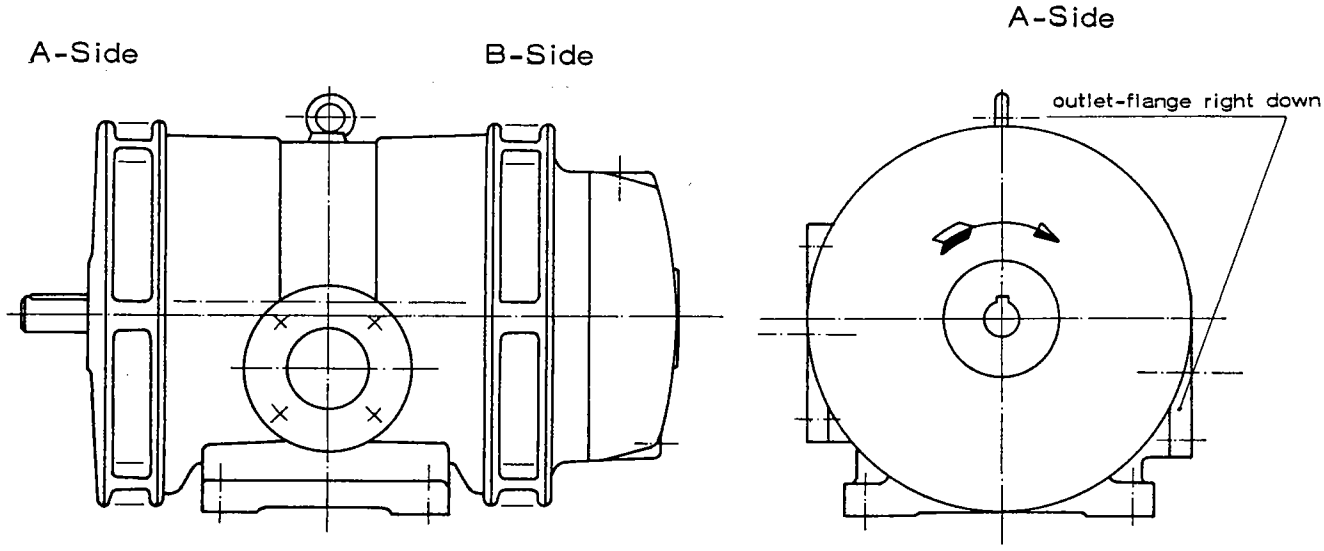


At pressure operation

At vacuum-and alternatively pressure-vacuum operation

Fig. 16 Mounting of rotary shaft seals

Clockwise rotation



Anticlockwise rotation

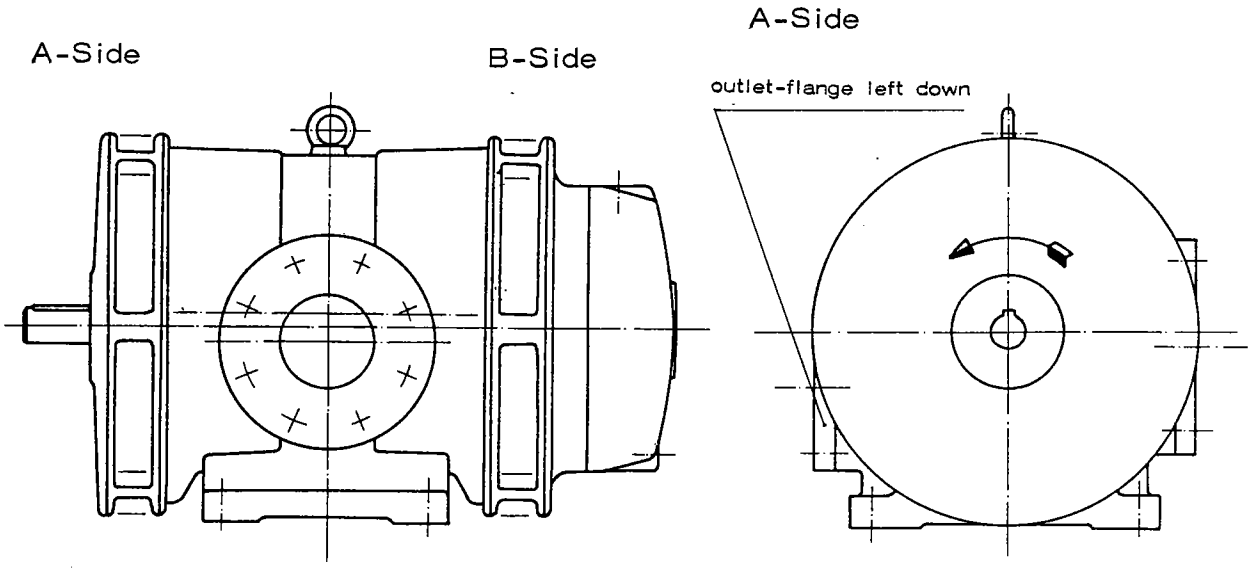


Fig. 17 Arrangement of the suction - and pressure flanges at clockwise or anticlockwise rotation.

6.4 Housing (1)

The condition of the inner surfaces of the housing should be examined. The inside diameter in new condition can be seen from the Table in Section 10.1

If the housing is badly scored or worn, it must be turned and subsequent honed. Slight scores may be removed with emery cloth or a fine grindstone.

6.5 Housing End-plate (2)

The inner face of the housing end-plates should be examined for marks due to drifting of the rotor (3). Slight scores may be removed with emery cloth or a fine grindstone. If deeper scores are present, the inner face should be turned or ground lightly.

Thereby also the butting ring must be redressed about the respective dimension. At ready grinded housing cover the butting ring must be projecting about 0,03 - 0,04 mm over the plane surface of the housing end-plate.

6.6 Oil Lines and Oil Tank(19)

The oil lines between the oil tank (19), the oil-flow indicators (58) and the pipe connections (60), likewise the oil pipes inside of the oil tank should be cleaned in petrol and blown trough with compressed air, care being taken to ensure that the bores are all clear.The sieve (56) at the end of the oil suction pipe should also be cleaned thoroughly and the oil tank (19) should be rinsed out with petrol.

7. Assembly of the compressor (position numbers see Fig. 12)

The compressor should be assembled in the reverse order of that described in Section 5. Any gaskets between the individual parts of the machine that have been damaged during dismantling must be replaced by new gaskets of exactly the same thickness (measure with micrometer). When the rotor (3) has been placed in the housing (1), the rotor vanes (5) should be inserted into the slots in the rotor so that their working surfaces (recognizable from friction profile, sligth scores etc.) face outwards towards the housing. The vanes must move freely in the slots and should be smeared with lubricating oil before being fitted. Possible bended rotor vanes are to straighten by hand. At assembling of the housing covers first the pressboard gaskets (72) should be placed over the stud-bolts of the housing (1). Thereafter, the housing covers with installed outer ring of the cylindrical bearing (29) are to push carefully over the shaft ends, and the hexagonal nuts tightened slightly by hand. The tapered pins (37) are then hamm ered home and the hexagonal nuts (47) tightened diagonally with a spanner.

The axial clearance of the rotor should first be measured with a dial gauge. To do so, the rotor must be pulley by hand against the housing cover (2) at the drive end. The dial gauge is then set to zero and the rotor pushed against the housing cover at the oil-tank end. The total axial clearance can be read off on the dial gauge. The correct axial clearance Z can be seen from the table in Section 10.1 (see also 10.3 / Adjustment of axial clearance).

The sealing surfaces on the shaft should be smeared with lubricating oil.

End cover (7) with rotary shaft seals (32) to slide carefully on the rotor shaft. Hereby it is to take care that the packing washers of the rotary shaft seals not get damaged at the slot of the adjusting spring. Screw on the oil pipes to the housing covers (2) and end covers (7) tighten well the nuts of the pipe-unions.

7.1 Fan and fan cowling (Fig. 12 and 13)

Fit fan cowling (10) with fan protection (9) at housing cover (2) with each 4 hexagon socket screws (40.2).

Degrease the rotor shaft end and put on the fans (13 and 14) up to impact of the inclined collar. Insert the degreased tensioning elements (31) in the bore of the fan hub.

Sequence: first conical part outside,
then cylindrical part outside.

Fix clamping disk (50) with 6 hexagonal socket screws (40) at fan hub and tighten them equally crosswise by a tightening torque of 10 Nm (1 kpm).

Put in adjusting spring (30) in to the groove. At the drive end screw on the fan cover (15).

7.2 Oil tank cover and oil tank (Fig. 12)

Slip the toothed rim for coupling (24) in to the drive pins of the rotor shaft (3).

Fit oil tank cover (17) with oil pump at the fan cowling (take care that the coupling of the oil pump (23) engage the toothed rim (24).

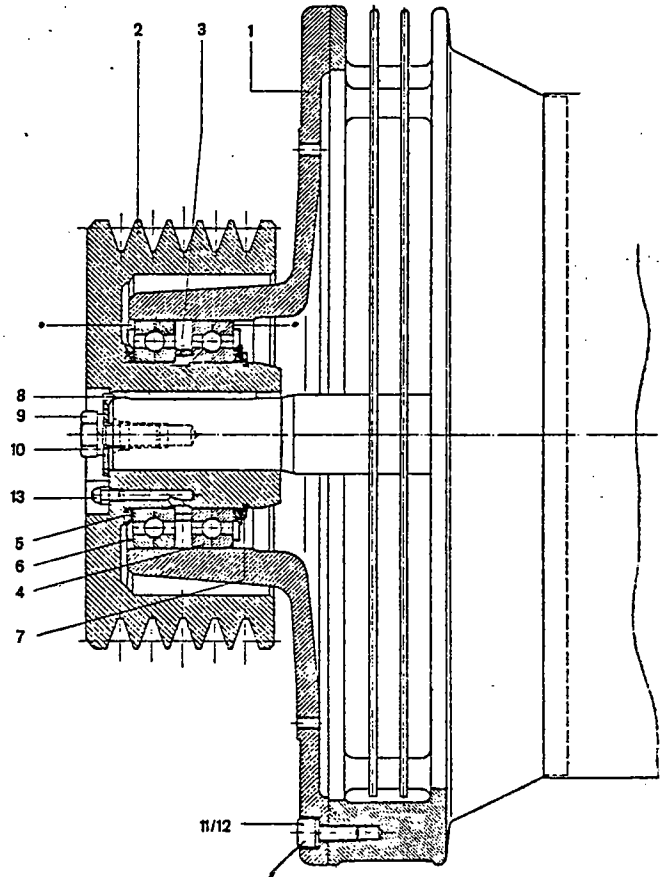
Screw on the oil tank (19) with O-ring (35) on the oil tank cover (17). Attach oil pipings on the oil flow-indicators (58) and the pipe-unions (59).

Thereafter proced according the instructions given in Section 3.

7.3 V-belt drive (Fig. 19)

In the following succession : Nilos-spacer ring (5),Nilos-ring(6) radial ball bearing (4), spacer ring (3), radial ball bearing (4), Nilos-ring (6), Nilos-spacer ring (5) and guard-ring (7), items to mount on the inner hub of the V-belt pulley (2).
The spaces of the radial ball bearings (4) to which seal the Nilos-rings (6) must not show any circumscriptions.
Fill bearing with lubricating grease according lubrication table 10.2.
Complete mounted V-belt pulley (2) with the bearings to introduce carefully into the neck of the bearing plate (1).
Complete V-belt drive to fit on the rotor shaft (without using a hammer), until hub of the V-belt pulley strickes at the sloping chamfer of shaft.
Bearing plate (1) to fit with hexagonal socket screws (11) at the ventilator-head of the compressor. It is to examine, if the V-belt pulley (2) can be turned easely without opposition.

Fig.19



* Attention !

These spaces of the roller bearings must not show any circumscriptions

drawn dislocated about 30°

8. Operational Faults and their Correction

Possible Causes	Remedy
8.1 The Delivery Volume of the Compressor falls off	
Air filter or vacuum-tight filter clogged	Clean filter; see Maintenance Instructions, Section 4.100
On vacuum pumps, air leak in suction piping or accessories	Trace leak (test piping with steam or brush over with soap solution) and repair
On old compressors, normal wear of rotating parts	Replace wearing parts according to Routine Maintenance Table (Section 4.100 and Assembly Instructions (Section 7)or return compressor to our works
Excessive radial clearance or axial clearance allowed on reassembly after dismantling	Readjust clearances exactly; see Section 10
8.2 The Drive Motor is Overloaded	
Operating pressure too high	Check pressure gauge (may give incorrect reading), replace if necessary. Vent safety valve by hand and test function.
Lubrication-oil starvation Oil-tank empty or oil pump defective	Fill oil-tank Return oil pump to our works
Unsuitable lubricating oil	See Lubricant Table (Section 11.1) for suitable oil grades
Axial-clearance incorrect	Adjust axial-clearance according to Section 10.31 and 10.32 .

Possible Causes	Remedy

8.3 Fractures of Vanes or Shaft

Sudden surge of condensation in compressor	Check that condensation traps are located in pressure and suction piping as prescribed in Sections 2.31 and 2.42
Penetration of foreign bodies into compressor	Increase filtering capacity of filters (Maintenance as described in Section 4). Install additional separators. Prevent formation of rust in intake piping by using pipes with non-corrosive inner surface. During first hours of operation cover intake port with fine-meshed screen.

8.4 Oil Contamination of Delivery Air

Piston stroke in oil pump at individual lubrication points too large	Reduce oil feed at oil pump (see Section 11.0)

8.5 Lubrication Oil Starvation despite Functioning Oil Pump

Piston stroke in oil pump too small	Increase stroke (see Section 11.0)
Oil-line between oil-tank and oil-pump blocked. Oil-tank or sieve clogged	Dismantle oil-line and blow through. Clean oil-tank (see Section 4.4). Check oil-flow at oil-flow indicator

8.6 Uneven Rotation of Rotor Shaft ; Bearings knocking

Compressor not correctly aligned ; bearings worn	Align according to instructions in Section 2.2. Replace bearings (see Section 6.2).

8.7 Temperature of Delivery Air too High

See Section 8.2	
Cooling fins on housing clogged with dirt	Partial-dismantling see Section 5 and 5.1 Clean cooling fins with wire brush

Possible Causes	Remedy

8.8 Oil escaping around Rotor-shaft

Rotary shaft seals are damaged	Replace rotary shaft seals (32 and 34)

8.9 Abnormal Noises

Lubricating-oil starvation or unsuitable lubricating oil	Adjust piston stroke according to instructions for lubrication. Select a lubrication oil listed in the Lubricant Table (see Section 11.0 and 11.1)
Rotor vanes are weared off in the width and have in the rotor-slots unsufficient guidance	Replace rotor vanes (see permissible wear dimensions, Section 10.1

9. Mode of Operation of the Compressor

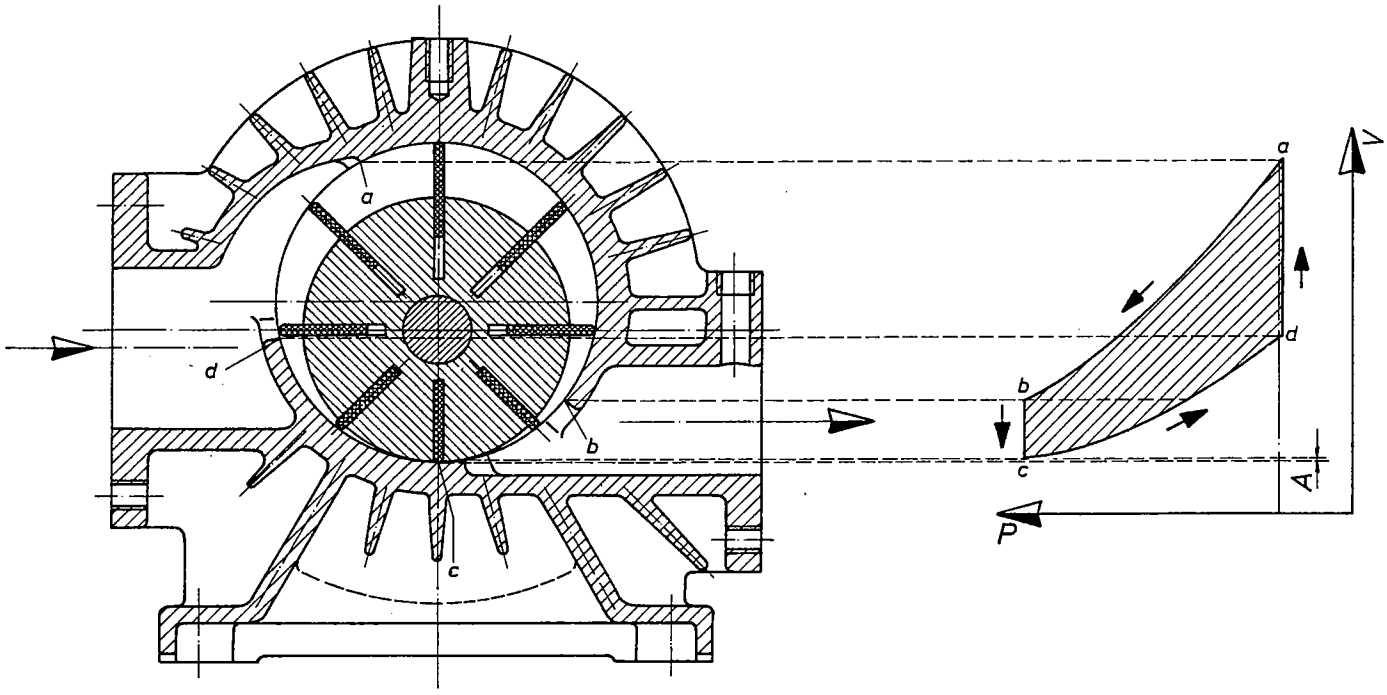


Fig. 18

9.1 Working Diagram

The mode of operation of rotary compressors is similar to that of piston compressors. The same process takes place in the individual cells of a rotary compressors as in the cylinder of a piston compressor. In comparison with the workin diagram of a piston compressor, the slight noxious space of the rotary compressor is striking.

The rotation of one cell of the rotary compressor corresponds to one cycle of the piston compressor.

	Rotary Compressor	Piston Compressor
a - b	Compression of the air trapped in the cell	Compression of the air trapped in the cylinder
b - c	Expulsion of the compressed air into the Discharge duct	Expulsion of the compressed air trough the exhaust valve
c - d	Expansion of the compressed air remaining in the noxious space at A	Expansion of the compressed air remaining in the dead space A of the cylinder
d - a	Intake of air	Intake of air

9.2 Mode of Operation

The compression chamber is formed by the rotor and the inner wall of the housing. It is crescent-shaped, since the rotor is eccentrically mounted in the housing.

The rotor is fitted with radially sliding vanes. When the rotor revolves, the vanes are flung outwards and divide the crescent-shaped compression chamber into cells each of which is thus bounded by two vanes, the inner surface of the housing and the rotor.

The largest cell is situated on the intake side in the horizontal axis of the rotor, at point 'a' in Fig. 18. When the rotor turns in the direction indicated (clockwise), the capacity of the cell diminishes continously and the air trapped in it is compressed.

When the leading vane of the cell passed the inner edge of the discharge duct (at point 'b'), the cell is " opened " and the compressed air, at the desired delivery pressure, is expelled trough the exit slot into the discharge port.

At the point where the rotor and the inner surface of the housing almost touch (point 'c'), the capacity of the cell is at its smallest, and the cell is then sealed of again. The residual air in the cell expands to intake pressure as the capacity of the cell increases in its passage towards the intake duct.

As the leading vane of the cell passes point 'd', the inner edge of the intake duct, the cell opens again. Air is sucked in as the capacity of the cell increases. When the cell reaches its maximum size, it is sealed off again as it passes the outer edge of the intake duct, and the compression cycle starts anew.

9.3 Function of the Compressor Components

Axial Bearings

The rotor is arranged floating between 2 distance rings forced in axial alignement. The distance rings are overhanging to the surface of the housing end-plate approx. 0.03 - 0.05mm. Therefore a lateral touch and seizing of the housing end-plate is prevented.

Sealing Parts

The compression chamber is sealed off from the atmosphere by two tandem joined rotary shaft seals.

Lubrication

The lubrication of the sliding parts is effected by an automatic oil-pump, driven by the rotor shaft. The oil pump is located in the oil-tank and only the priming crank handle is accessible from the outside. The regulation of the lubricating oil-feed is described in Section 11.0.

Cooling

The compressor is cooled by two radial fans mounted on the rotor shaft which suck in air at the machine centre and pass it axially over the cooling fins.

10. Adjustment of working clearances (see Fig. 19)

The efficiency, smooth operation and working life of the compressor depend upon the accurate adjustment of the radial an axial clearances Therefore care should be taken, when the compressor is dismantled, not to alter the clearances or damage components that play a part in determining these clearances.

10.1 Clearances, Dimensions Determining Clearances and Wear Dimensions

Abbreviation	Designation	Dimensions (mm)					
$\ddot{O}$	Oil clearance: minimum distance of rotor from end-plate when compressor is cold (spacer overlap at rotor front surface)	Type LPK 50		LPK 75		LPK 100	
		0,05-0,08		0,05-0,08		0,05-0,08	
Z	Axial clearance, axial clearance of the rotor between the thrustrings in the housing end-plates	0,37-0,40		0,42-0,46		0,55-0,60	
$L_R - L_S$	Rotor-vane shorter than rotor	0,40 - 0,50		0,60 - 0,71		0,90 - 1,01	
P_1 and P_2	Gaskets between housing and housing end-plates, measure the thickness of the gaskets with a micrometer or calculate according to sections 10.3 and 10.5						
	Dimensions determining clearance	Nominal	Allowance	Nominal	Allowance	Nominal	Allowance
D_G	Housing inside Diameter	200	+ 0,046	200	+ 0,046	200	+ 0,046
L_G	Housing lenght	200	- 0,046	282	- 0,052	400	- 0,057
L_R	Rotor lenght	200,2	- 0,046	282,2	- 0,052	400,2	- 0,063
L_S	Rotor-vane length	199,8	- 0,072	281,6	- 0,081	399,3	- 0,097
b	Rotor - vane width	54	- 0,3	54	-0,3	54	- 0,3
S	Clearance between rotor and housing at the lowest point (see Section 10.2)	0,06		0,06		0,10	
E	Thickness of spacer strips for A-and B-side (see Section 10.2)	0,12		0,12		0,17	
A	Bearing radial clearance (29)	0,05 - 0,06		0,05 - 0,06		0,05 - 0,06	
	Permissible wear dimensions						
D_G	Housing inside diameter	*		*		*	
b	Rotor-vane width	51,5		51,5		51,5	

The internal diameter of the housing can be redressed up to max. 201,0 mm. At further wear the housing is to drill out and a bushing must be pressed in.

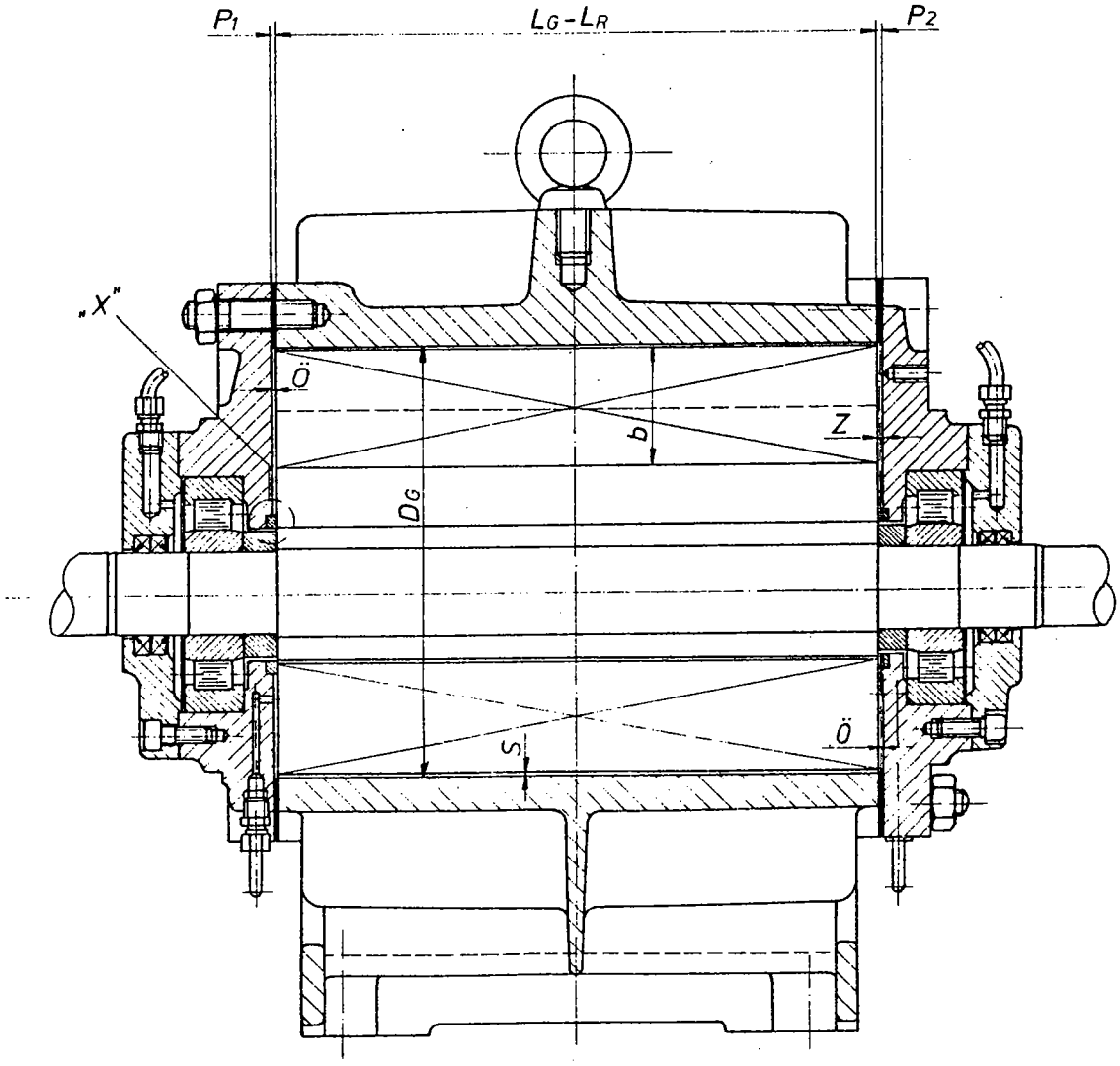
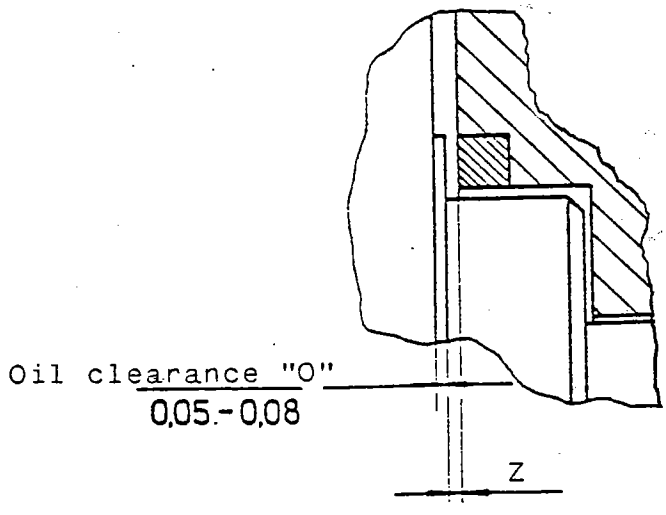


Fig. 19 Indication of the clearances



Blow up of "X"

10.2 Adjustment of Clearance "S" and Fitting of Housing End-plates

(Letters see Fig. 19, numbers Fig. 12)

The radial clearance "S" of the compressor must be readjusted when the rotor, housing or housing end-plates are replaced, the circumference of the rotor is ground or the inner surface of the housing turned.

First, measure the bearing clearance "A" of the roller bearings (29) any oil or grease adhering to the bearings should be removed by washing them in paraffin or petrol. The bearing clearances "A" should correspond to the values indicated in Table 10.1.

To the clearance "S" indicated in Table 10.1 is added half the bearing clearance of the roller bearings. Under the rotor (3) has been placed in the housing (1), a steel strip equivalent in thickness to the specified clearance plus the bearing clearance is inserted between the rotor and the housing (1) at both ends (Fig. 20). Lift the housing end-plate at the drive end, together with the gasket P_1 and the fitted outer race and rollers of the cylindrical roller bearing (29), over the rotor shaft on to the inner race of the roller bearing. Place a steel disk in front of the housing end-plate and push a steel tube over the rotor shaft. A hexagonal screw fitted with a washer should then be inserted into the thread on the end of the rotor shaft and tightened until the rotor (3) is firmly held against the housing end-plate (2) (Fig. 21). Fix the end-plate (2) to the housing (1) by screwing hexagonal nuts on to the stud-bolts.

At the opposite, open end of the compressor, measure the distance between the rotor (3) and the housing (1) at the level of the rotor shaft axis with a caliper square and check whether the rotor is correctly centred in the housing (Fig. 22). Any slight adjustment needed can be made by slacking off the nuts on the end-plate at the drive end and shifting the end-plate so as to bring the rotor into centre. Afterwards, tighten the nuts on the end-plate. Lift the opposite end-plate, with gasket P_2, on to the inner race of the roller bearing (29) and secure it with hexagonal nuts. Fit a C-spanner to the free end of the shaft and turn the rotor until the steel strips slip out from under it. Continue turning to test whether the rotor revolves freely. Thereafter, drill trough the housing end-plates and housing at the points marked.

The drill holes should be reamed outh with a tapered reamer until the tapered pins fit well. After the holes have been blown out, the tapered pins are then hammered home firmly and fitted with the appropriate washers and extractor nuts (the latter should only be tightened lightly, so as not to loosen the tapered pins). The rotor now has correct radial clearance "S" and is accurately centred, and the end-plates are correctly adjusted. Remove both end-plates and withdraw the steel spacer strips.

Example of adjustment of clearance "S":

Prescribed clearance between rotor and lowest point of housing	S =	0,06 mm

Measured bearing clearance of cylindrical roller bearing (29):

"A" end bearing	0,05 mm
"B" end bearing	0,06 mm

Required thickness of spacer strips:

Drive end	0,06 + 0,05 =	0,11 mm
Opposite end	0,06 + 0,06 =	0,12 mm

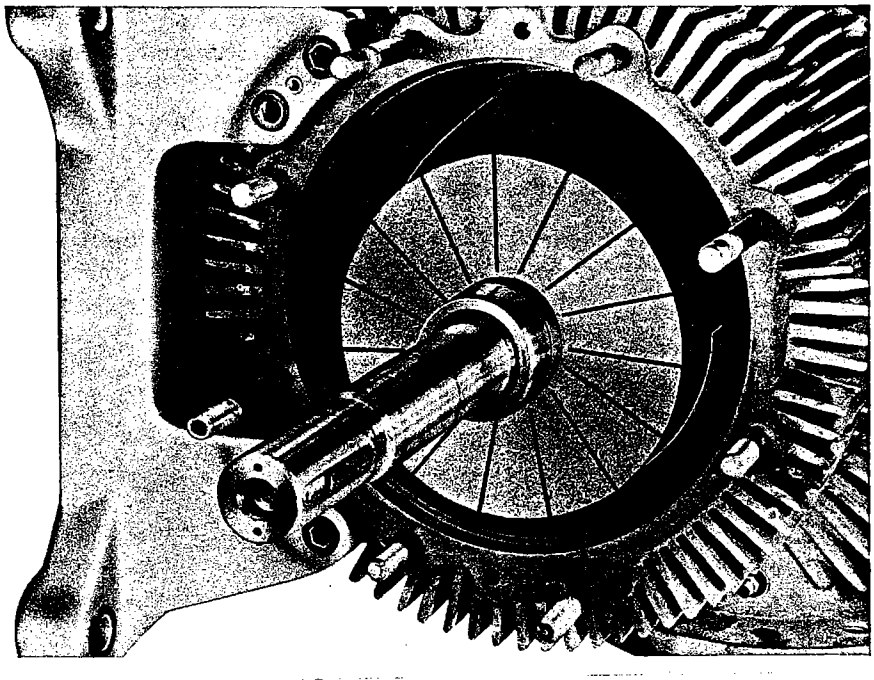


Fig. 20

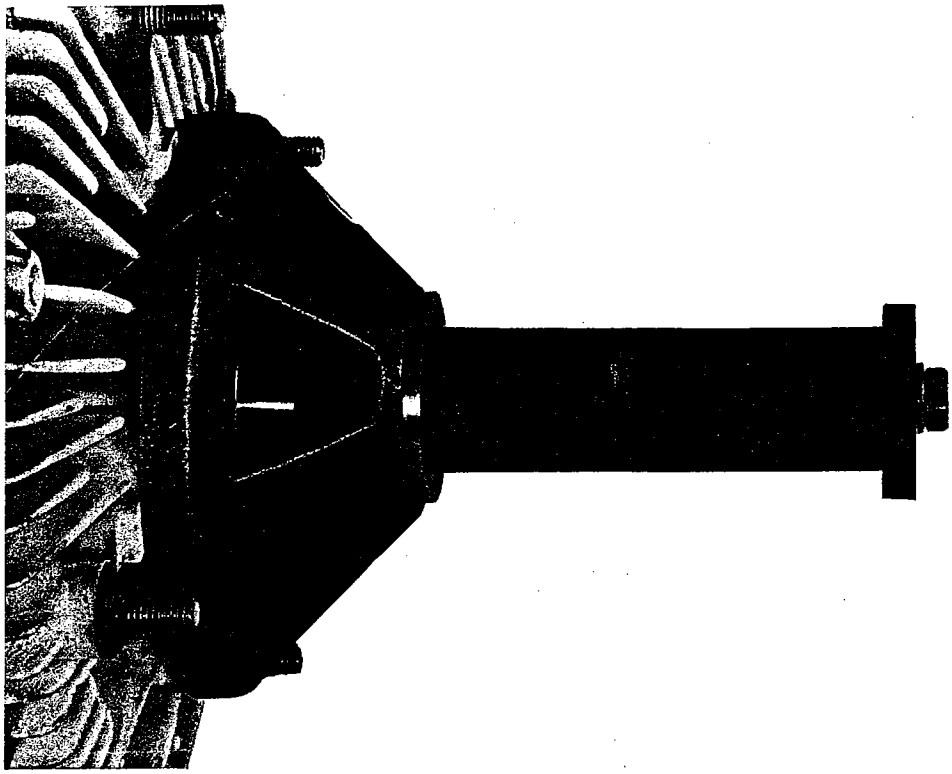


Fig. 21

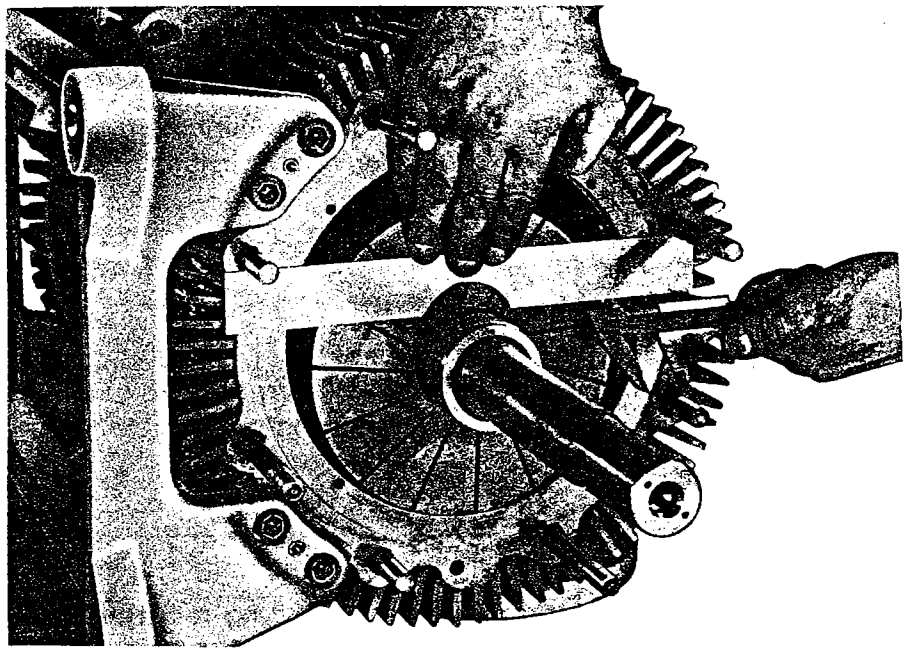


Fig.22

10.3 Adjustment of Axial Clearance

When the gaskets P_1 and P_2 are replaced, the rotor or the housing length turned or the adjustment of the oil space has been altered, the axial clearances Z and Ö must be corrected.

10.31 Gaskets P_1 - P_2

If the gasket between the housing and the end-plate is damaged, it must be replaced. When the compressor is assembled the new gasket must be exactly the same thickness as the old one. The old gasket must therefore be measured accurately with a micrometer.

Use pressboard, oil-saturated drawing paper or tracing paper for the gaskets. When calculating the thickness of the new gasket, it should not be forgotten that the old gasket has been compressed; upon compression, the thickness of the drawing paper is reduced by 20-30%, that of the pressboard by 10 % and that tracing paper by 10-15%.

It is essential that the combined thickness of gaskets P_1 and P_2 should remain the same. The thickness of the gaskets on both ends must be adequate to ensure that the compression chamber is sealed off from the atmosphere.

If the thickness of the gaskets cannot be measured in the way described, it can calculated as follows :

Gaskets ($P_1 + P_2$) = total clearance + L_R - LG

Measure with the micrometer : L_G = length of housing

L_R = length of rotor

The total clearance is engraved on the discharge-port flange beside the machine number, and is indicated in Section 10.1

Once the gasket has been placed in position, the total clearance must be checked, as follows.

Pull the rotor by hand hard up against the 'A' housing end-plate. Attach the measuring gauge rigidly to the 'B' end-plate (Fig.23) bring the feeler up to touch the shaft end and set the needle to zero. Push the rotor against the 'B' end-plate.

The dial shows the actual axial-clearance.

If the axial-clearance thus determined is to small, the thickness of the gaskets must be increased to make up the difference ; if it is too large, the thickness of the gaskets must be reduced.

This measurement must only be made when the compressor is cold.

When the housing end-plates, radial bearings and gaskets are fitted, the subsequent assembly of the compressor can be carried out according to the instructions given in Section 7.1

10.32 Adjusting oil clearance "O" (see Fig. 12 and 19)

There is a bearing ring pressed into each end-plate (2). Each ring has been ground so as to be flush with the flat surface of the end-plate. A spacer plate is screwed onto the end of the rotor (3), which protrudes by 0,05 - 0,08 mm from the end of the rotor and extends radially to the outer edge of the bearing ring.

If the rotor is subjected to thrust (thrust from jointed shafts, compressor in an inclined position), this prevents the full surface of the rotor end from rubbing against the end-plate surface.

The spacer plate dimensions must be checked after each disassembly (protrusion should equal 0,05 - 0,08 mm).

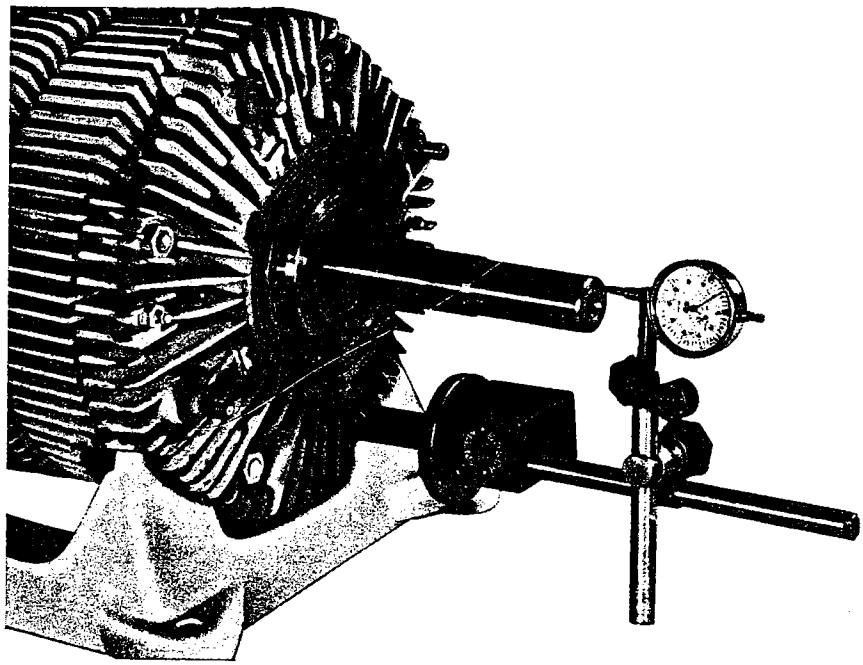


Fig. 23

11.0 ADJUSTMENT OF THE OIL VOLUME AT THE OIL PUMP

Screwed oil filler cap (54) from the oil tank (19) (Fig. 24 and 25) is to take away. The oil is to drain off at the screw (63). The setscrews at the pistons (H) of the oil pump (25) can be regulated by a screw-driver trough the oil inlet (Fig. 25). Clockwise rotation = more oil, anticlockwise rotation = less oil. One full turn of the setscrew changes the discharge volume **about** approx. 1/3 off full **stroke volume.**

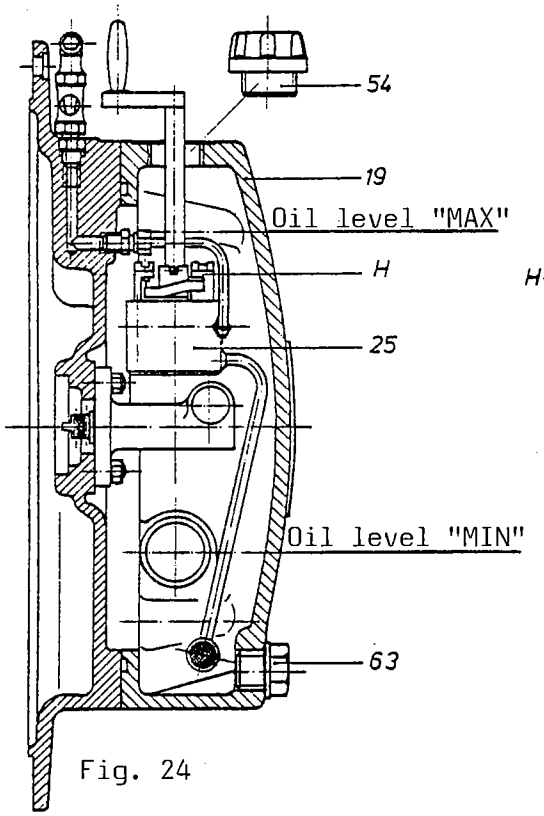


Fig. 24

Pre-Lubrication by the crank handle

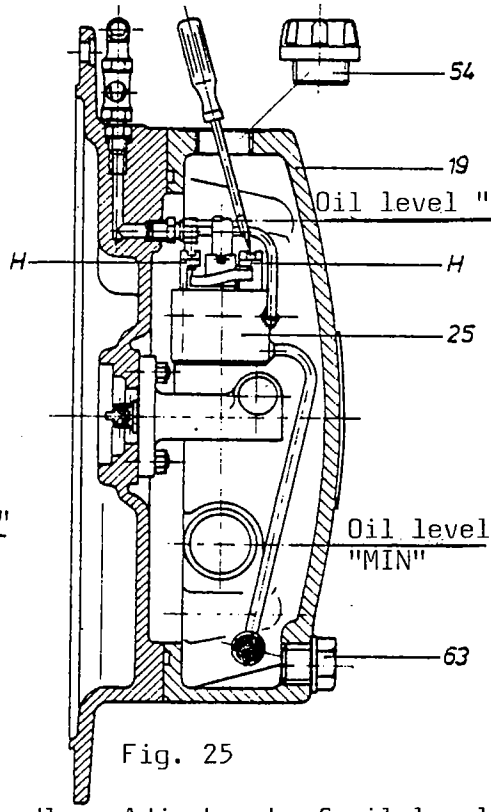


Fig. 25

Adjustment of oil-level

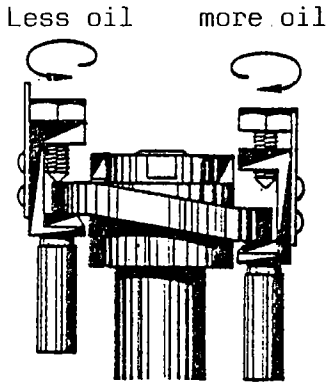


Fig. 26

Compressor Type	Over-pressure bar	Vacuum mbar	No.of turns back from full stroke of all pistons (see Fig. 26)	consumption of lubricant oil in cm^3/h	oil content sufficient for approx ... hours
LPK 50-1	0,5	up to 300	10	25	160
	1,0		10	25	160
	1,5		9	30	130
	2,0	below	8	40	100
	2,5	300-100	2	60	65
LPK 75-1	0,5	up to 300	8	40	100
	1,0		8	40	100
	1,5		4	50	80
	2,0	below	2	60	65
	2,5	300-100	1	120	32
* LPK 100-1	0,5	up to 300	10	55	70
	1,0		10	55	70
	1,5		8	65	60
	2,0	below	6	80	50
	2,5	300-100	1	120	32

* These indications are valid from machine no. 913 698/885 and 913 706/170.

Up to these machine numbers, see Instruction Manual BE 10/1985/4.

11.1 Lubricant table for aircooled rotary compressors

	Umgebungstemperatur über 5°C	**Umgebungstemperatur unter 5°C**	Lubricant greases for outer bearing on V-belt drives and oil pump drives [1]
Spezification	Single range motor oil	API: CC/SF CD/SF MIL-L: 2104 B 2104 C	
ARAL	Kowal M 40	Kowal M 30	HL2 multipurpose grease
BP	Vanellus-C3-40 Energol IC-D 40 Energol HD-S 40	Vanellus-C3-30 Energol IC-D 30 Energol HD-S 30	Energrease LS 2 Energrease L2
DEA	Regis SAE 40 Cronos Super SAE 40	Regis SAE 30 Cronos Super SAE 30	
ELF	Performance 2 B SAE 40	Performance XC SAE 30	
ESSO	Essolube HDX Plus+ 40 Essolube XD-3 + 40	Essolube HDX Plus+ 30 Essolube XD-3 + 30	multipurpose grease Beacon 2
MOBIL	Delvac 1340	Delvac 1330	Grease MP Mobilux 2
SHELL	Rotella X 40 Rimulla X Monograde 40	Rotella X 30 Rimulla X Monograde 30	Alvania Grease R 2 Retinax A
WINTERS-HALL	Rekord 40	Rekord 30	

1) The outer bearings are filled with lithium-saponified grease in the factory. Therefore only lithium-saponified greases may be used for relubrication. The use of other types of grease may cause damages.

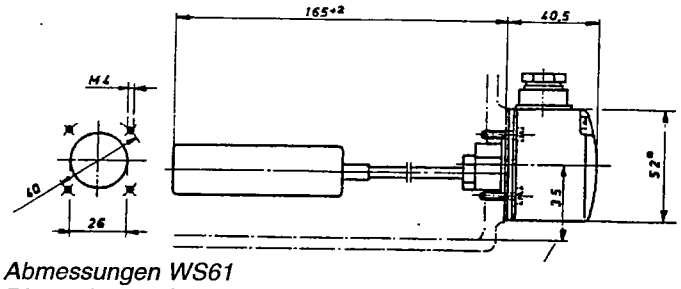
If the ambient or intake temperatures are 40°C or more, use the next highest viscosity class.

If the ambient or intake temperatures are 5°C or less, use the next lowest viscosity class.

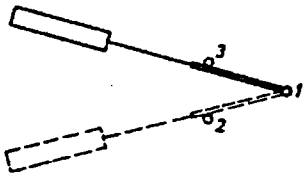
ATTENTION **Monograde oils are recommended for machines of the LPK series. If multigrade oils are used, the machine may be damaged. Moreover, all guarantees become extincted in this case.**

If your machine is used for sucking or compressing gases, the oils mentioned above must not be used in all cases. Please contact us and ask suitable oil types..

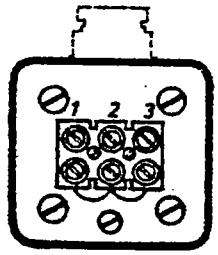
11.2 Ölmangel-Sicherung Typ WS61 (bis 05/98)
Oil Failure Device type WS61 (until 05/98)



Abmessungen WS61
Dimensions WS61



Schaltungsschema WS61
Switching schematic WS61



El. Anschluß WS61
El. connection WS61

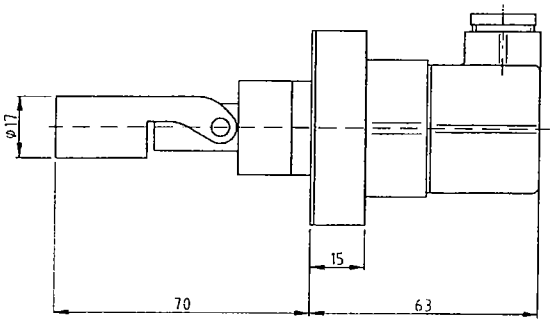
*) 35 mm = Mindestmaß bis Behälterboden
*) 35 mm = minimum space to recdeiver bottom

Kontaktart:	Wechsler:	Kontakte 1 und 3 öffnen	bei sinkendem Niveau
		Kontakte 1 und 2 schließen	bei sinkendem Niveau
Kind of contact:	Changer:	Contacts 1 and 3 open	at sinking niveau
		Contacts 1 and 2 close	at sinking niveau

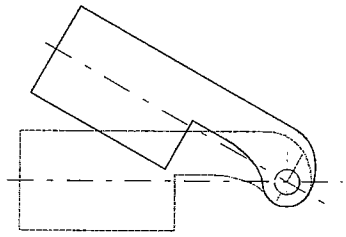
Schutzart:	IP 43	*Enclosure:*	IP 43
Spannung:	max. 250 VAC	*Voltage:*	max. 250 VAC
Schaltstrom:	max. 1 A	*Contact current:*	max. 1 A
Schaltvermögen:	max. 110 VA	*Contact rating:*	max. 110 VA
Schaltdifferenz:	ca. 10 mm Niv.-Unterschied	*Switching difference:*	ca. 10 mm niveau difference
Einbaulage:	wie abgebildet	*Mounting position:*	as shown
Kabelverschraubung:	Pg 11	*Cable gland:*	Pg 11

Die Kabeldurchführung ist mit Kappe um je 90° versetzbar. The cable conduit with cap is replaceable by steps of 90°.

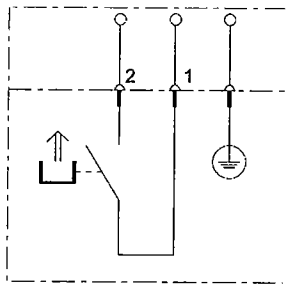
11.2 Ölmangel-Sicherung Typ WS63 (ab 06/98)
Oil Failure Device type WS63 (from 06/98)



Abmessungen WS63
Dimensions WS63



Schaltungsschema WS63
Switching schematic WS63



El. Anschluß WS63
El. connection WS63

Kontaktart:	Schließer:	Kontakte 1 und 2 schließen	bei sinkendem Niveau
Kind of contact:	Closer:	Contacts 1 and 2 close	at sinking niveau

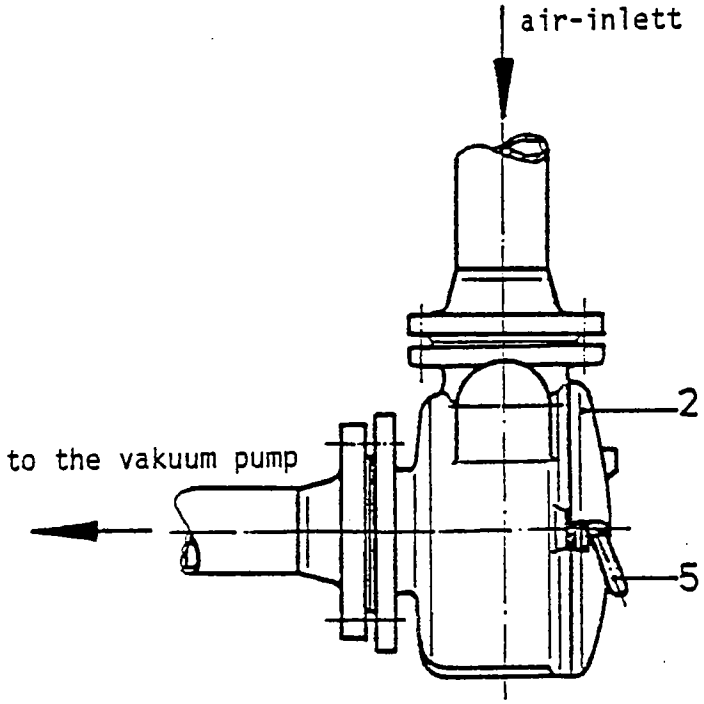
Aufgrund der Einbausituation darf der Schalter nicht über Kopf montiert werden (Einbau als „Öffner" nicht möglich)!
Due to mounting situation the switch must not be mounted overhead (mounting as „closer" not possible)!

Schutzart:	IP 65		*Enclosure:*	IP 65	
Spannung:	max. 250 VAC	max. 250 VDC	*Voltage:*	max. 250 VAC	max. 250 VDC
Schaltstrom:	max. 1 A	max. 2 A	*Contact current:*	max. 1 A	max. 2 A
Schaltvermögen:	max. 100 VA		*Contact rating:*	max. 100 VA	
Schaltdifferenz:	ca. 15 mm Niv.-Unterschied		*Switching difference:*	ca. 15 mm niveau difference	
Einbaulage:	wie abgebildet		*Mounting position:*	as shown	
Kabeldose:	DIN 43 650		*Junction box:*	DIN 43 650	
Kabelverschraubung:	Pg 11		*Cable gland:*	Pg 11	

Die Kabeldurchführung ist mit Kappe um je 90° versetzbar. The cable conduit with cap is replaceable by steps of 90°.

12.0 VACUUM FILTERS (Fig. 27 and 28)

12.1 In order to protect the vacuum pump from impurities in the incoming air such as rust, weld spatter, dust, mud, sand, etc., it is essential to install an intake filter at the vacuum pump suction point. The vacuum filters SFA 2 through SFA 4, specially developed by us for this purpose, are equipped either with a fine-mesh wire netting of stainless steel or, in design "F" with moisture and solvent resistant special fine filter cartridges.



For installation in the suction pipe or mounting on the intake nozzle of the vacuum pump, fig. 27 should be observed.

ATTENTION !

The vacuum filters are not suitable for use with pressure in excess of atmospheric pressure.

Fig. 27

However, the vacuum filter cannot prevent pure liquids such as water from entering the system. Any liquids which collect should be drained off by opening the filter cover **when the vacuum pump is switched off.**

12.2 In order to open the filter, the two tapered machine handle (5) must be loosened sufficiently to allow the filter cover (2) with its two fastening tabs to be rotated counter-clockwise by approx. 15° out of the studs bolt (6) and then pulled out.

12.3 Cleaning of filter types SFA 2 through SFA 4

These filter elements are made of wire netting of stainless steel and may be cleaned using gasoline or solvent.

12.4 Cleaning of filter types SFA 2 F through SFA 4 F

These filters are equipped with moisture and solvent resistant special fine filter cartridges. After extracting the fine filter cartridge, clean the filter case as described above in para. 12.3 and clean the cartridge by blowing through steam from inside to outside.

12.5 Before reinserting the cartridge inspect it for damage.

Always replage damaged cartridges with new ones.

12.6 To reassemble, the steps described unter 12.2 are carried out in reserve order. For types SFA 2 F through SFA 4 F, first insert the filter cartridge. Check to see if the O-ring (4) in the filter cover (2) is in good condition. Press the washers (7) towards the outside against the tapered machine handle. Then, for all filter types, slide the cover (2) into the housing, twist it with its two fastening tabs clockwise by about 15° into the studs bolt and tighten using the tapered machine handle (5).

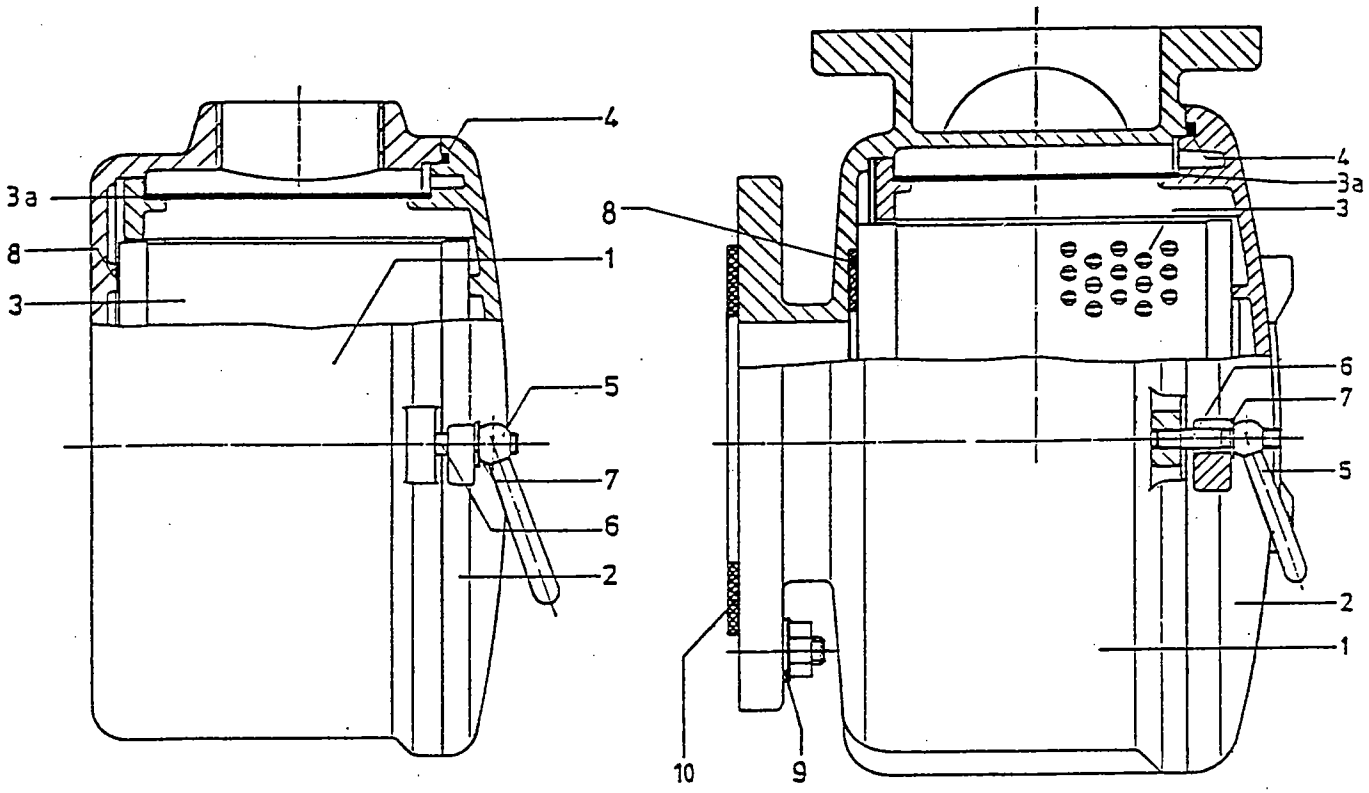


Fig. 28

Filter type SFA 2 F

Filter type SFA 4 F

12.7 Because of the oblong bore holes at the flanges of the vacuum filter types SFA 3 and SFA 4, the washers delivered (according DIN 9021) having a greater outer diameter (Fig.28 , Pos. 9) must be used with the clamping bolts or nuts.

13.0 Non-return valve (See Fig. 6 of the spare parts list)

Any maintenance of the non-return valve is not necessary. But we recommend the first control after 500 service hours for oil carbon deposits. The next control is to fix according the necessity. The thickness of the oil carbon deposits should not exceed max. 1 mm.

If a cleaning is necessary, dismount the valve. Remove the clamping bolts and withdraw the non-return valve between the mounting flanges.

For dismounting the valve plate (71) press same against the action of the pressure spring (73) till impact of valve guiding (72) and press out carefully the valve plate from the centering (70) by means of a press.

After cleaning throughout, check the valve seat for tightness. At leakiness lapping-in by means of emery paste. Before re-assembling (to be effected in inversed order) smear the gliding surfaces of the cylindrical pin (74) with MOLYKOTE OIL, type M 55 (Messrs. DOW CORNING).

14.0 Silencer

The silencer has to be installed in such a way that the gas flow direction corresponds to the directional marker impressed in the case.

The silencer can be installed vertically and horizontally.

In the case of horizontal installation you have to see to it that the 3/8"-socket points to the bottom so that the water of condensation can be drained off. In the case of vertical installation the water of condensation can be drained off trough the angle socket.

PLEASE NOTICE !

When ordering spare parts, please quote the machine-type, machine number, date of construction, the part number, designation of part, the quantity and the order-number.

Examples:	Spare parts list no.	BE 10/1986/5 US
	Type	LPK 75 - 1
	Maschine no.	913 738/10
	Date of construction	1986
	Spare parts	8 rotor vanes, po. no., order-number
		2 cylindrical roller bearings, pos. no., order-number

For manufacturers who operate with a bigger number of compressors it is advantageous to lay out a store for spare parts.
Following parts should be given priority:

quantity	designation	Pos.no.	order - no.		
			LPK 50	LPK 75	LPK 100
8	rotor vane	16	342 598	342 599	342 600
2	cylindrical roller bearings	18	411 342	411 342	411 342
4	rotary shaft seal	20	461 038	461 038	461 038
1	toothed rim for coupling	22	341 090	341 090	341 090
1	O-ring	42	463 691	463 691	463 691
1	complete set gaskets, parts-no. 4 - 5 - 9a - 12 - 38 - 44				
1	filter cartridge for intake air filter		432 609	432 632	432 625
1	safety cartridge		---	432 438	432 439

For V-belt drive

2	radial ball bearing 223	-	-	410 034
2	Nilos ring 6014 AV 225	-	-	416 140

Screws, nuts and washers after DIN-Standard are not stated in the list for spare parts. In some cases, the illustration do not correspond in all details to the machine parts.

HOUSING, HOUSING COVER

Part No.	Designation	Quantity	Order - number			Explanations
			LPK 50	LPK 75	LPK 100	
1	Housing, complete	1	913 700	913 730	913 743	
2	Housing cover, complete	2	913 714			
3	Cover plate	2	913 737			
4	Gasket 0,3 thick	-	465 237			Between parts 1 and 2
	Gasket 0,4 thick	-	465 238			Quantity according
	Gasket 0,5 thick	-	465 239			existing machine
5	Gasket	2	464 773			Between parts 2 + 3 + 31
6	Flat packing	1	464 532	464 540	464 540	For suction side
7	Flat packing	1	464 528	464 532	46 536	For pressure side
8	Tapered pin	4	448 466			For adjusting of housing-covers
9	Lifting eye bolt	1	444 803			For part 1
9a	Gasket ø 16/35 x 2	1	464 506			Between parts 1 and 9
10	Pipe connection with non ret.valve	4	425 420			For parts 2 and 3
11	Locking screw	1	444 898			For part 1
12	Gasket ring	1	421 721			For part 11
13	Locking screw	4	444 860			For part 2 (only f. vacuum pumps)
14	Pipe connection	4	425 423			For part 2 + 3 (only f. compressors)

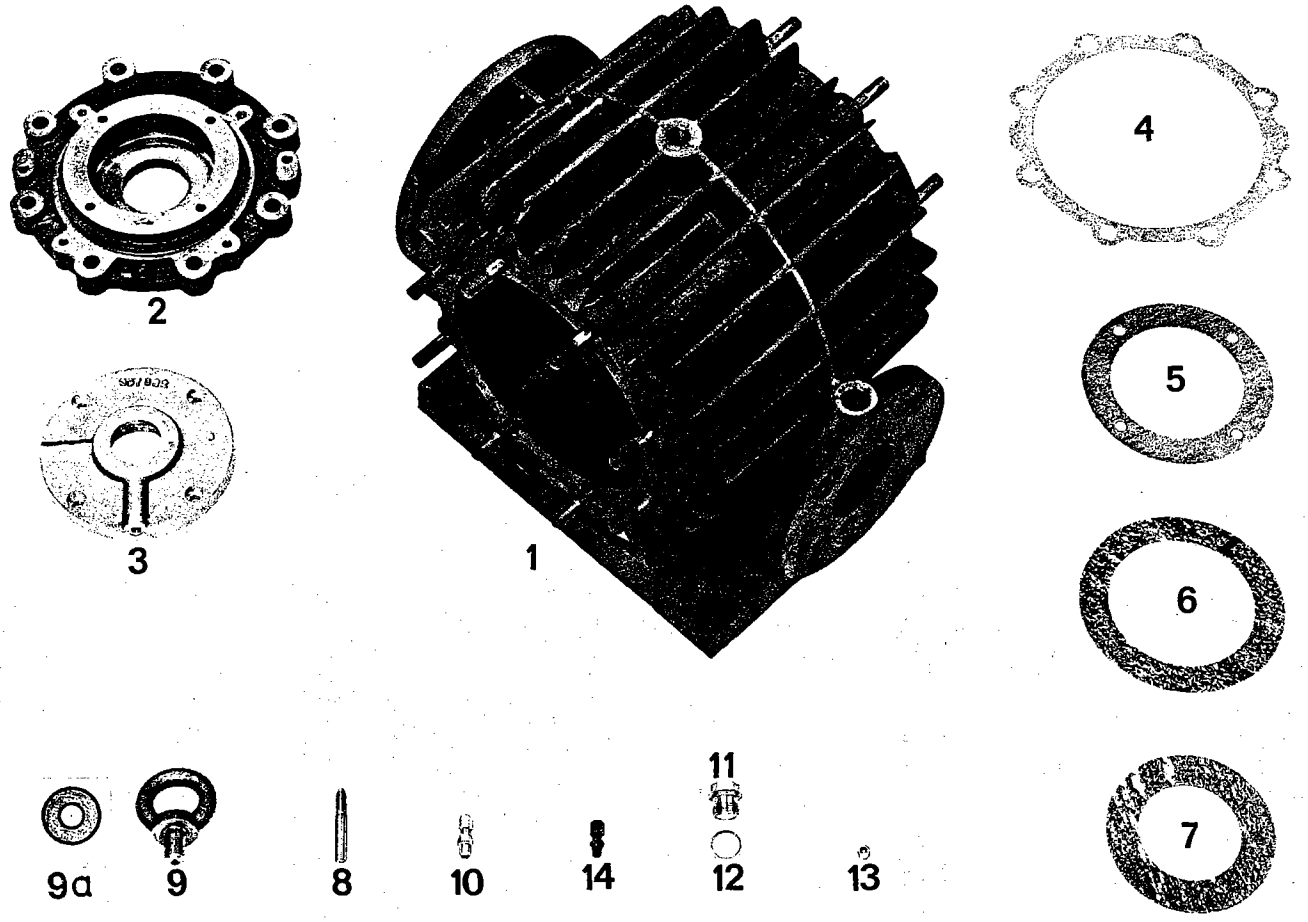


Fig. 1

ROTOR, BEARINGS, SHAFT SEALING

Part No.	Designation	Quantity	Order - number			Dimension	Explanations
			LPK 50	LPK 75	LPK 100		
15	rotor, complete	1	913 691	913 692	913 693		
16	rotor vane	8	342 598	342 599	342 600		
17	distance ring	2	913 327	913 327	913 327		between parts 15 + 18
18	cylindrical roller bearing	2	411 342	411 342	411 342		
19	coupling for oil pump	1	341 092	341 092	341 092		for drive of part 32
20	rotary shaft seal	4	461 038	461 038	461 038	40x52x7	for part 3
21	adjusting spring	1	454 451	454 451	454 451	A10x8x63	for part 15
22	toothed rim for coupling	1	341 090	341 090	341 090		for part 19

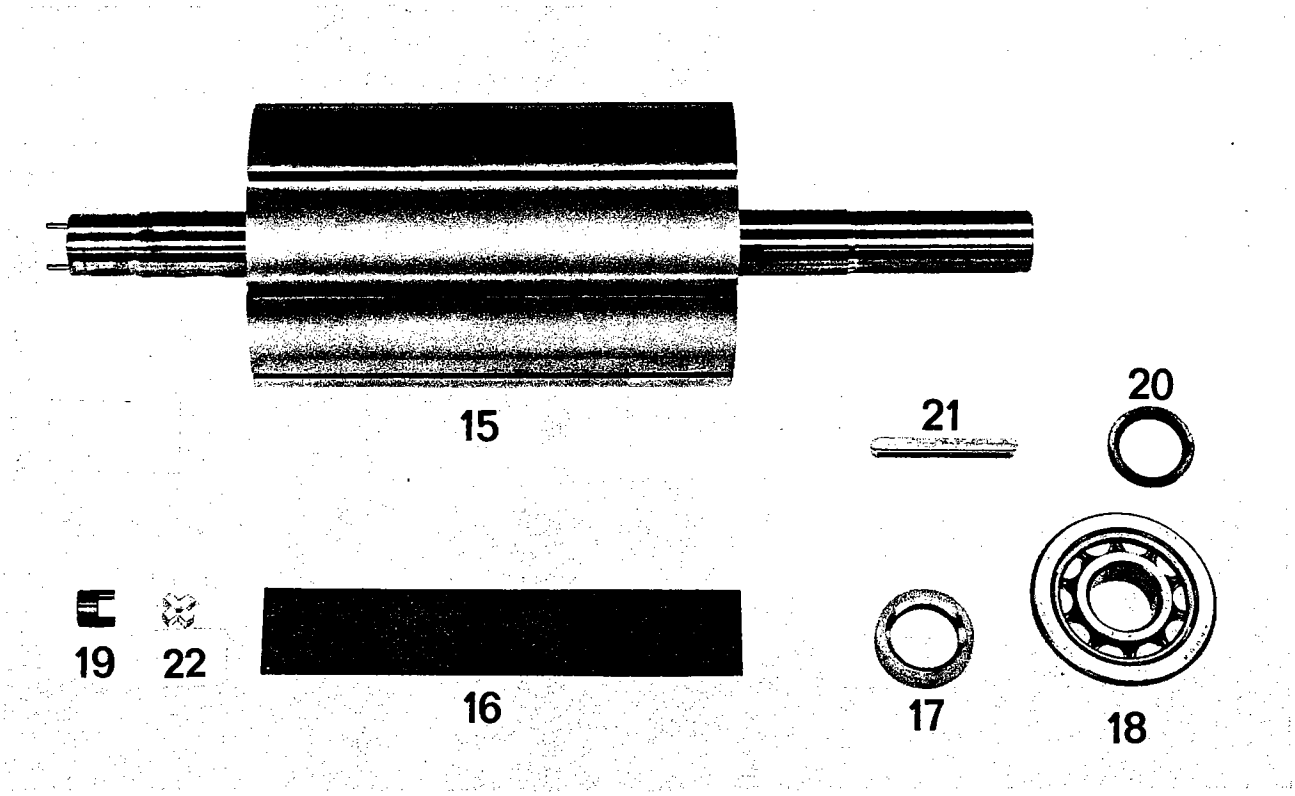


Fig. 2

AIR COOLING

Part No.	Designation	Quantity	Order - number			Explanations
			LPK 50	LPK 75	LPK 100	
23	Fan protection	2	913 708	913 736	913 745	At part 24
24	Fan cowling, complete	2	913 710			At part 2
25	Fan complete, clockwise rotation	1	913 711			On shaft, part 15
25a	Fan complete, anti clockwise rotation	1	913 713			On shaft, part 15
25b	Clamping disk	2	913 786			At part 25 and 25a
25c	Slotted tensioning element	2	340 450			In part 25 and 25a
26	Fan cover	1	913 328			At part 24, A-side
27	Coupling guard	1	913 355			At part 26, A-side
28	Data plate (rating plate)	1	455 893			At part 23
29	Direction rotation plate	1	455 912			At part 23

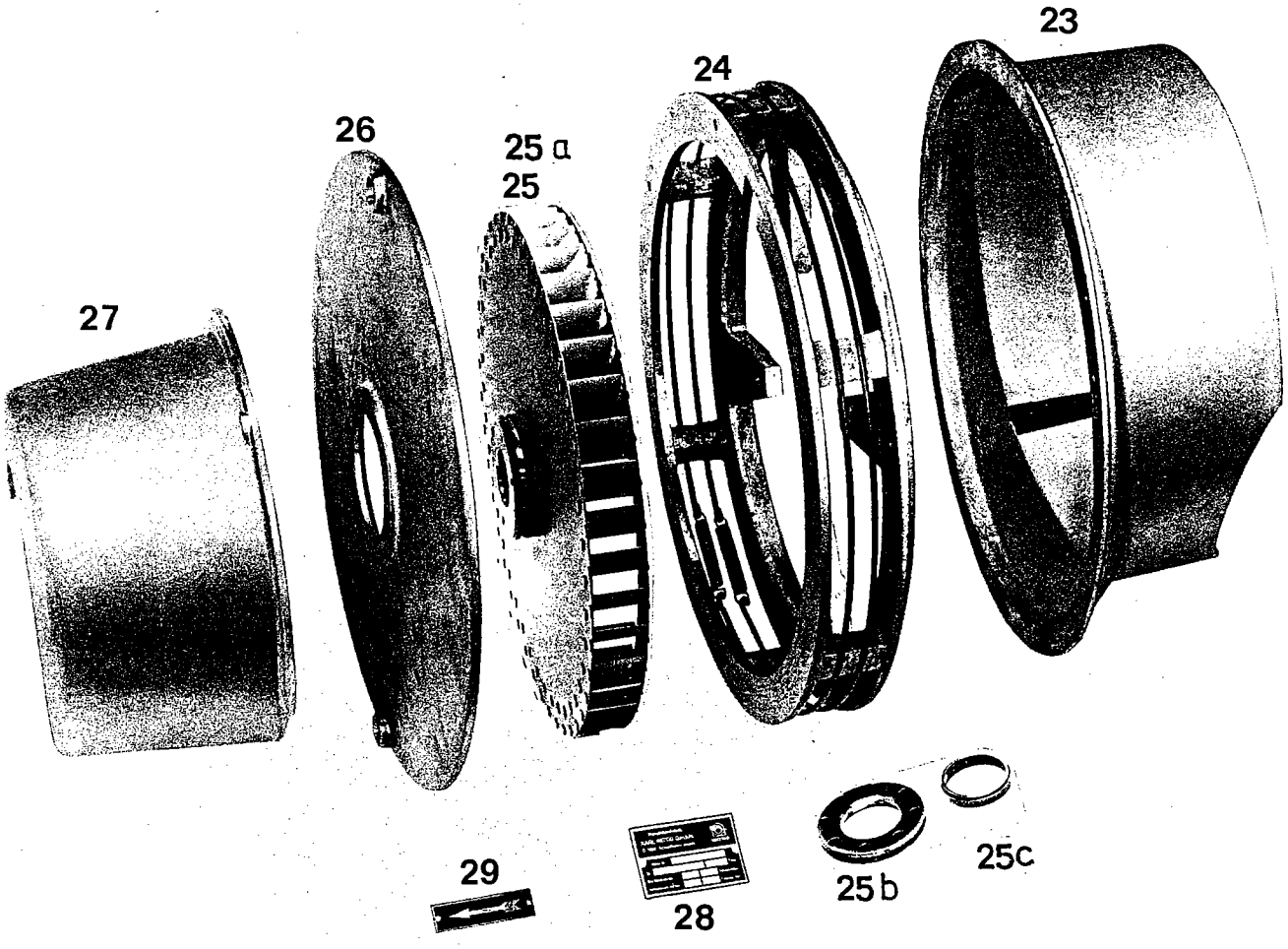


Fig. 3

OIL TANK, OIL PUMP, LUBRICATION PARTS

Part No.	Designation	Quantity	Order - number			Dimensions	Explanations
			LPK 50	LPK 75	LPK 100		
30	oil tank	1	903 808	903 808	903 808		at part 31
31	oil tank cover	1	913 847	913 847	913 847		at part 24
32	oil pump with crank handle	1	425 060	425 054	425 054	AFG 6	at part 31
33	oil-flow indicator	2	425 232	425 232	425 232	M 8 x 1	at part 31
34	pipe connection	4	425 159	425 159	425 159	M 8	at parts 31 and 33
35	angle piece	2	425 236	425 236	425 236	M 8 x 1	at part 33
36	oil filler cap	1	472 019	472 019	472 019	R 1"	at part 30
37	pipe connection	4	425 422	425 422	425 422		at parts 31
38	gasket	1	465 635	465 635	465 635	Ø38x28x0,3	for part 32
40	oil level sight glass	2	426 474	426 474	426 474	R 1 1/4"	for part 30
41	oil suction sieve	1	425 373	425 373	425 373	OSJ29S6Z	for part 32
42	O-ring	1	463 691	463 691	463 691	250 x 5	between parts 30 + 31
43	locking screw	1	444 900	444 900	444 900	R 3/4"	for part 30
44	gasket ring	1	421 658	421 658	421 658	DIN 7603	for part 43
45	plate for oil type	1	455 915	455 915	455 915		at part 30

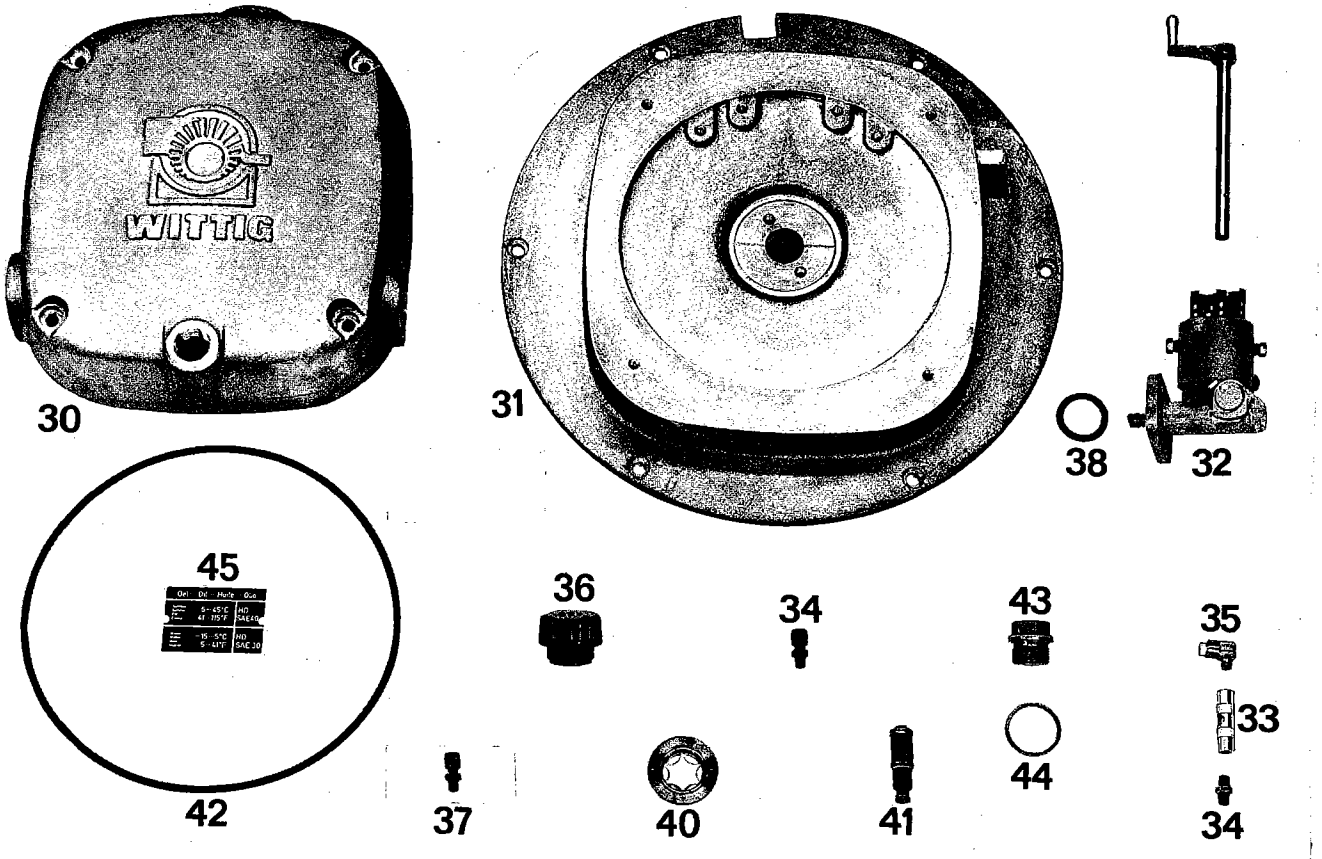


Fig. 4

VACUUM FILTERS SFA 2 (F) THROUGH SFA 4 (F)

Pos. No.	Designation	Type / Quantity	SFA 2	SFA 2 F	SFA 3	SFA 3 F	SFA 4	SFA 4 F
		Type	SFA 2	SFA 2 F	SFA 3	SFA 3 F	SFA 4	SFA 4 F
		Quantity	Order - Number					
50	Filter-housing	1	900 127 00		900 132 00		900 138 00	
51	Filter cover	1	900 128 00	900 128 00	900 133 00	900 134 00	900 139 00	900 140 00
51a	Wire netting of stainless steel	1	455 323 00	-	455 327 00	-	455 345 00	-
52	Filter cartridge	1	-	432 617 00	-	432 604 00	-	432 603 00
53	O-ring	1	463 680 00		463 690 00		463 698 00	
54	Tapered machine handle	2	449 703 00					
55	Stud bolt	2	446 073 00		446 075 00			
56	Washer (DIN 125)	2	451 010 00					
57	Gasket	1	-	463 254 00	-	463 261 00	-	463 253 00
58	Washer (DIN 9021)	12	-		451 823 00			
59	Flat-sealing	1	-				464 829 00	

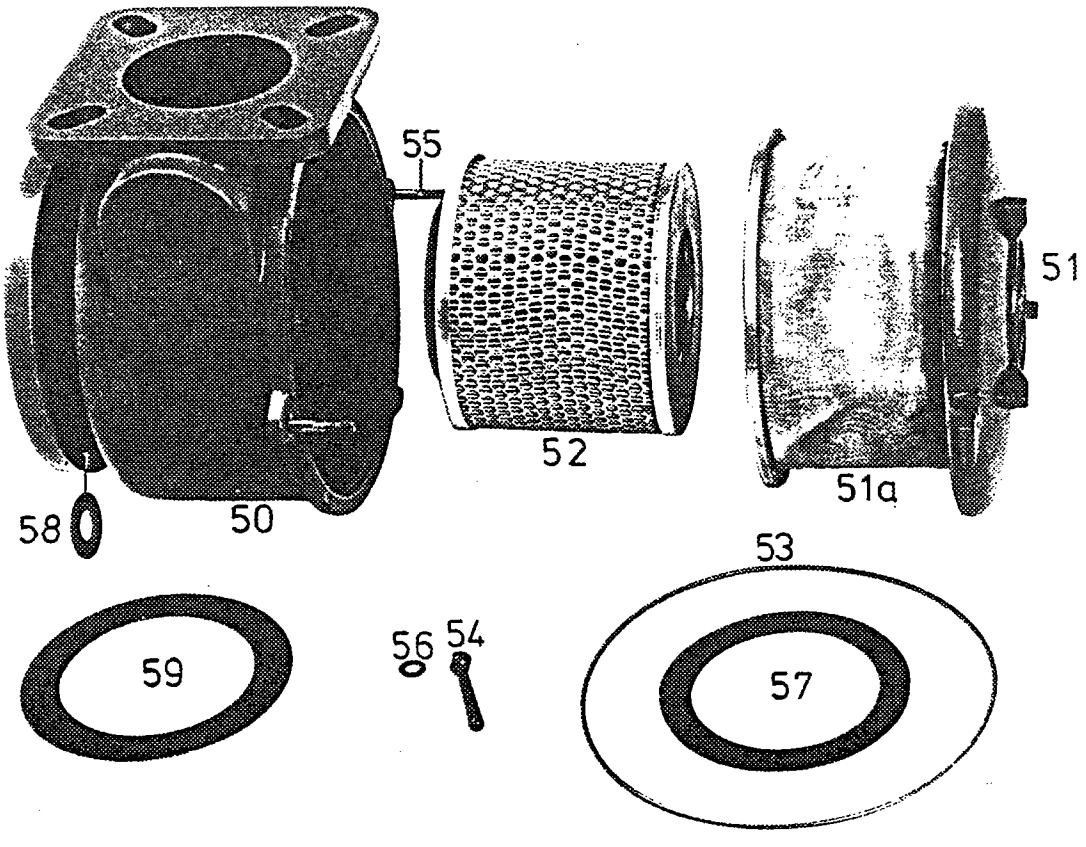


Fig. 5

NON - RETURN VALVE

Part.No.	Designation	Quan-tity	Order - number			Explanations
			LPK 50	LPK 75	LPK 100	
70	Valve housing	1	999 050	993 601	993 553	
71	Valve plate	1	999 053	993 602	993 654	
72	Valve guiding	1	-	993 603	993 555	In part 70
73	Valve spring	1	423 040	423 131	423 143	Between part 71 and 72
74	Cylindrical pin	1	999 046	448 691	448 691	In part 72
75	Flat packing	1	464 528	464 532	464 536	

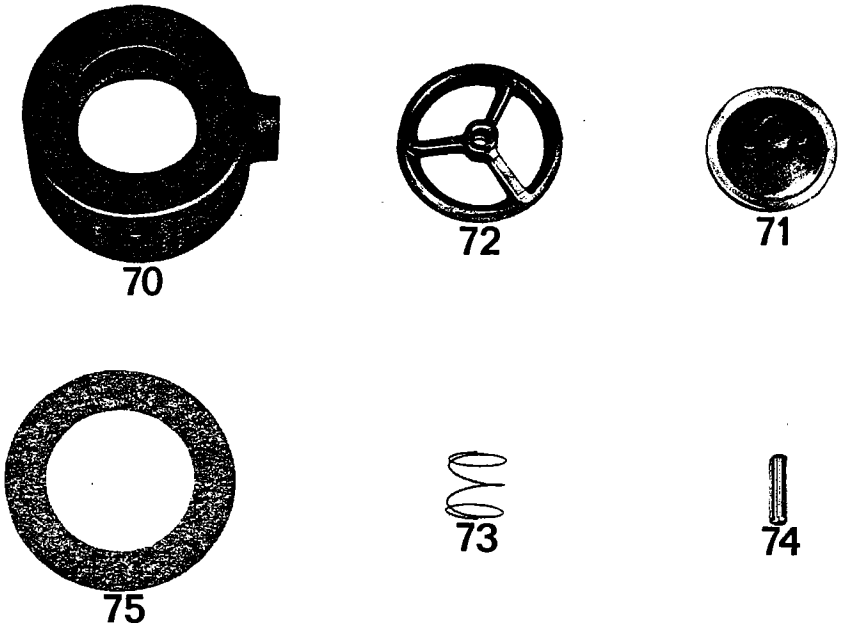


Fig. 6

V - BELT DRIVE

Part No.	Designation	Quantity	Order - number			Dimensions	Explanations
			LPK 50	LPK 75	LPK 100		
220	bearing plate	1			913 373		
221	V-belt disc	1			913 747	SPA5grooves	Diarneter = 200 mm
222	fast ring	1			418 939	FR80/7,5	between parts 223
223	radial ball bearing	2			410 034	6014	DIN 625, on part 220
224	Nilos - spacer ring	2			417 140	A 70	for part 225
225	Nilos - ring	2			416 140	6014 AV	
226	Seeger - L - ring	1			425 650	A 70x2,5	DIN 9021, on part 220
227	safety disc	1			913 748		
228	hexagon cap screw	1			441 167	M 10 x 40	DIN 933
229	grease nipple	1			426 588	M 6	DIN 3402, for part 221
230	distance washer	1			913 742		between parts 221 + 15

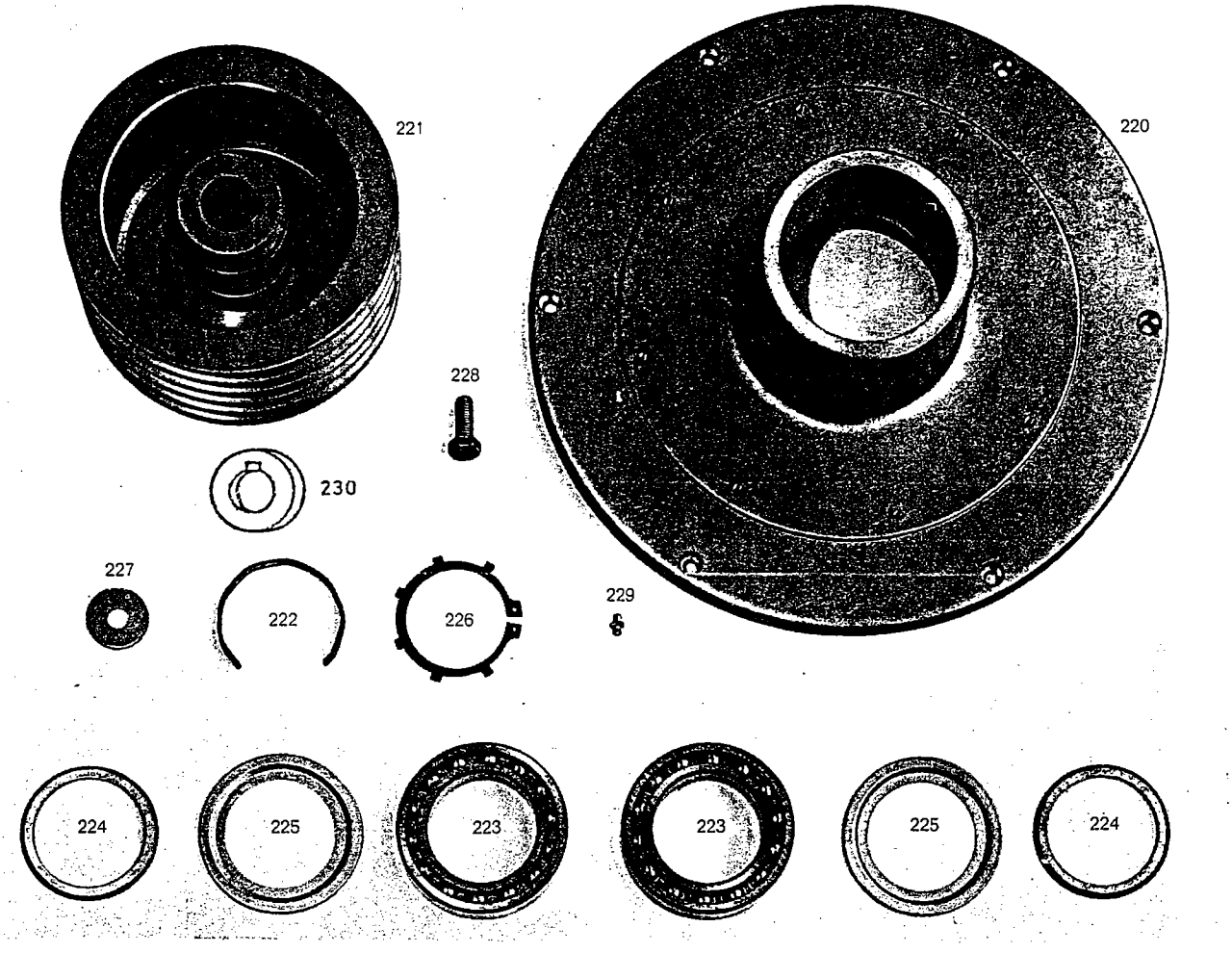


Fig. 7