SAUER BIBUS

J-RP Series

# Electric motor with integrated axial piston displacement pump

# Operating instructions

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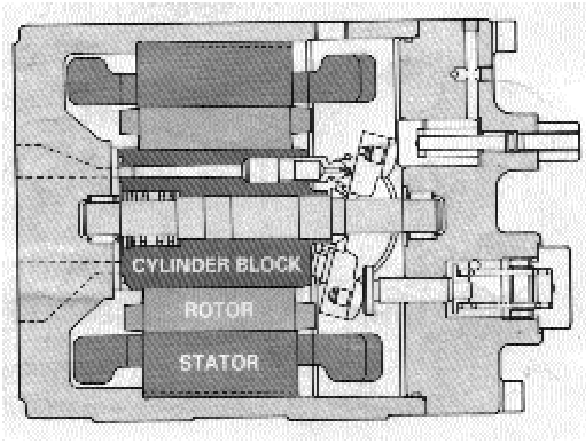



The J-RP Series rotor pump from SAUER BIBUS GMBH is an axial piston displacement pump of swash plate design integrated into a three-phase induction motor. Available as variable or fixed displacement pumps for hydraulic, open loop applications, these pumps have been developed specially for use in stationary systems. The electric motor is cooled by the pumping medium. Extremely low running noise and its highly compact design are distinctive features of this pump.

These operating instructions must be read and understood before the rotor pump is installed or used for the first time. The instructions provide information on commissioning, safety aspects, maintenance, testing and fault finding. Any work on hydraulic and electrical components may only be performed by properly trained personnel. If used correctly, this rotor pump will provide excellent performance characteristics over a long lifetime.

By far the commonest cause of failure in hydraulic pumps is the presence of dirt or other impurities in the hydraulic medium. Please refer to the pump's technical specification sheets for information on recommended hydraulic fluids.

## Essential information for safe and trouble-free operation

**1) Safety (hydraulic components)**

Our rotor pumps are designed and constructed to current manufacturing standards and provide safe and reliable operation. Nevertheless, hydraulic pumps represent a hazard if they are used incorrectly, e.g. by untrained personnel, or for purposes for which they were not designed. The following risks exist

- Danger to life and limb
- Risk of damage to machinery and property
- Risk of deterioration of operational efficiency.

Any person authorized to install, commission, operate or maintain a rotor pump must have read and understood this manual. Training courses are offered by SAUER BIBUS.

**Safety (electrical components)**

The rotor pump is designed to be connected to an industrial-type power supply. When operating, the rotor pump has hazardous, exposed live components, as well as moving and rotating parts. Severe injuries may be sustained or damage to property incurred if covers are removed (forbidden!), if the pump is operated incorrectly or used for purposes for which it was not designed, or if it is not properly maintained. Those responsible for the safety of the pump system must therefore ensure that

- only properly trained personnel are authorized to work with or on the machine,
- all appropriate operating and other documentation is available to those authorized to work on or with the machine and that these persons have undertaken to act in accordance with the instructions in these documents,
- no work is carried out on or in the vicinity of the rotor pump by unqualified persons.

Qualified personnel are persons who, as a result of their experience and training as well as their knowledge of the relevant standards, provisions, accident prevention regulations and shop-floor conditions, have been authorized to carry out the required tasks by those responsible for system safety and who are capable of recognizing and preventing risks. Further prerequisites are training in first-aid and knowledge of the local rescue and emergency arrangements. The use of unqualified persons to work on power installations is forbidden by, for example, the DIN VDE 0105 or IEC 364 regulations.

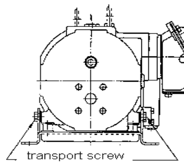
WARNING: It is assumed that the basic planning for the entire system and all transport, assembly, installation, commissioning, maintenance and repair work is carried out either by personnel qualified for the relevant area of work or is supervised by such.
The following requirements must be complied with:

- the technical data and information concerning proper use (requirements for proper assembly and connection, environmental and operating requirements) which are in part to be found in the catalogue, contract documentation, operating instructions, type plate information and other manufacturing documents,
- the generally applicable installation and safety regulations,
- the local, plant or system-specific provisions and requirements,
- the proper use of tools, transport and lifting machinery,
- the use of protective clothing and equipment.

For reasons of clarity, these operating instructions cannot include detailed information on all possible machine variants or on every conceivable situation that might arise during installation, operation or maintenance. The operating instructions are therefore restricted to information that is required for qualified personnel to use the rotor pump in a proper and safe manner in an industrial environment. If, in special cases, the proposed use of the rotor pump in a non-industrial environment would mean that more stringent demands must be met, then additional measures must be incorporated during on-site assembly to guarantee safe operation.
Any uncertainty in this regard, particularly concerning detailed product-specific information, must be resolved by contacting SAUER BIBUS. Please always quote the model type and identification number.
To prevent machine breakdown, the prescribed maintenance and inspection procedures must be carried out at regular intervals. Any changes in the normal operational behaviour of the pump such as increased power consumption, higher temperatures, abnormally intensive vibrations, unusual noises or smells, or the triggering of the pump monitoring devices indicate that the proper functioning of the pump is being impaired. In order to avoid machine malfunctions which could also cause severe personal injury or damage to goods and property, the maintenance personnel must be informed without delay.

**IN CASE OF DOUBT, SWITCH OFF THE ROTOR PUMP IMMEDIATELY !**

**2) Installing the pump:**




The rotor pump can be transported using the two special-purpose ring bolts. The ring bolts must be screwed right into the pump casing and no other parts must be attached to the pump. It is essential, for example, that an oil reservoir on which the rotor pump is mounted is not also lifted at the same time using the ring bolts! During transport, the rotor pump is immobilized by two locking screws (to protect the rubber buffer pads). The locking screws should only be removed once the pump has been fully installed, all connections made and the unit positioned at its final operating location. If the pump is to be moved again at a later date, the locking screws must be re-inserted. The rotor pump must always be installed so that the initial oil filling screw is uppermost and the mounting rail with the structure-borne noise decoupler points downward. The mounting rail is attached using four M8x16mm screws tightened to a torque of 27...34Nm (J-RP08) or four M10x20mm tightened to a torque of 53...67Nm (J-RP 15, 23, 38).

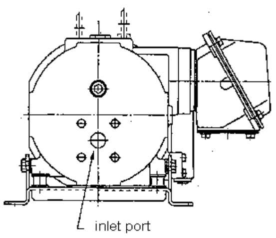
**When operating, the surface temperature of the rotor pump can reach values of up to 80°C.** It is essential that sufficient space is left around the pump and that flammable materials are kept away. If necessary, a protective shield or guard should be installed.

**3) Piping:**

The piping (in particular that of the inlet line) must be installed with the greatest of care. Bad piping/tubing is the most common reason for pump malfunction or breakdown. It is particularly important that the inlet and outlet lines remain clean both during and after assembly. When welding pipes, care must be taken to ensure that the pipes are kept free of welding beads and residual scale.

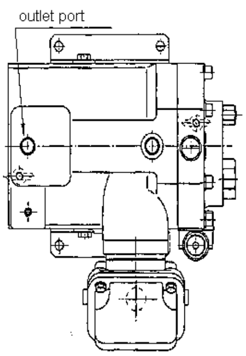
Flexible tubing is to be preferred to a rigidly plumbed in pump as it not only helps to dampen vibrations emanating from the pump but also makes disassembly considerably easier should the pump need to be serviced.

**Inlet port:**

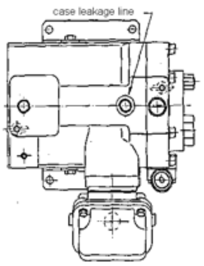



The inlet and outlet ports must not be confused. The inlet port must be configured so that the inlet pressure does not fall below the minimum permissible absolute pressure of 0.83 bar (an oil feed is the best arrangement). If the vacuum in the inlet line is too great, cavitation can occur (sudden development of air bubbles from the oil) which may damage internal pump components, cause vibrations and abnormal noise, and even lead to the destruction of the pump. The inlet line should be laid out without kinks and bends (do not use elbow joints) and should not be longer than 2 m. The joints between the sections of the inlet line must be absolutely vacuum-tight. The inlet port on the pump must not be higher than 1 m above the level of the oil. The inlet line flange is fixed using four M8x16mm screws tightened to a torque of 27...34Nm (J-RP 08) or using four M10x20mm screws tightened to a torque of 53...67Nm (J-RP 15, 23, 38).

**Outlet port:**




The outlet port on the pump should be equipped with an elastic adapter (e.g. a length of flexible hose) as only this will ensure that the very low pump noise levels are attained. Avoid connecting piping directly onto the casing cover as this will result in extreme amplification of pulsation noises from the pump. It is recommended that a check valve is inserted into the delivery line as this will prevent the uncontrolled rotation of the pump (when switched off) due to backflow of the oil. The screws should be tightened to a torque of 59 Nm for R3/8“ screws (J-RP 8, 15) or 98 Nm for R 1/2“ screws (J-RP 23, 38) 98 Nm.




**Case leakage line:**

The case leakage line, which should not be greater than 1 m in length, should be returned separately to the reservoir terminating below the surface of the oil and as far away as possible from the supply suction port. The case leakage pressure (and therefore the case pressure) may be 0.35 bar (max. 1bar for short periods). The torque limits for the case leakage line are 59 Nm for R 3/8“ screws (J-RP 08, 15) and 98 Nm for R 1/2“ screws (J-RP 23, 38). When connecting the case leakage line, ensure that it lies above the highest point of the pump casing. As on the outlet line, the oil overflow port must be equipped with a flexible hose adapter.

**4) Recommended oil flow rates:**

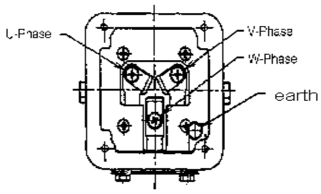
| Inlet line | Return lines | Outlet lines | | | | |
|---|---|---|---|---|---|---|
| | | up to 35 bar | up to 70 bar | up to 105 bar | up to 140 bar | up to 210 bar |
| up to 1 m/sec | up to 2 m/sec | up to 3 m/sec | up to 4 m/sec | up to 5 m/sec | up to 5.5 m/sec | up to 6 m/sec |

**5) Cleanliness:** It is absolutely essential that the oil reservoir, piping, tubing and any additional components are kept clean. Hydraulic components will be subject to wear if impurities such as sludge, abraded particulates, rust, paint residues, chips and swarf, etc. are allowed to enter the system. The filters used should have a minimum absolute gauge of 150 µm. It is essential that the contamination of the suction filters is monitored as suction filters that are used within a tank either cannot be checked visually or only with difficulty.
If return flow filters are used, which is preferable to the use of suction filters, these must have an absolute filter gauge of 25 µm. All filters must be tested after being used for the first time.

In order to maintain a high level of oil cleanliness the points listed below must be followed :

- the inlet port must be at a suitable height (at least 10 cm) above the bottom of the reservoir,
- use an inlet line filter with a sufficiently flow rating,
- return and suction lines must be well separated in the reservoir,
- install an aeration filter equipped with a contamination indicator,
- avoid any openings when dimensioning the oil tank.

**6) Electrical connections**




WARNING: all maintenance and repair work may only be carried out when the machine is disconnected from the electrical supply.
The mains voltage and frequency must agree with the specifications on the rating plate. A ±5% tolerance on the mains voltage or ±2% frequency is permissible with no deterioration in performance. Electrical connections must be made in accordance with the adjacent wiring diagram. All electrical cables must be suitably dimensioned. We recommend a phases and/or thermal supervision to the protection against the electromotor.The rotor pump has been designed for a right handed phase sequence. After completing the electrical wiring, remember to screw on the cover plate of the terminal box!. Please comply with the relevant instructions in Section 8.1
WARNING: Electrical wiring work that is not carried out in accordance with these operating instructions will not only lead to the pump malfunctioning but also represents a potentially fatal risk!

**7) Preparing the pump for first use:**

Because of the way in which the pump has been designed, it is essential that the pump case is filled with oil before the pump is switched on. Starting the pump without oil will very rapidly cause severe damage to the pump. To fill the case with oil, open the filling plug on the pump case and retighten the plug once filling is complete. The following approximate volumes are required when filling the case for the first time:

| | | | |
|---|---|---|---|
| J-RP08-07 | 1.1 litre | J-RP23-37 | 4.0 litre |
| J-RP15-15 | 2.3 litre | J-RP38-37 | 4.0 litre |
| J-RP15-23 | 2.3 litre | J-RP38-55 | 3.5 litre |
| J-RP23-22 | 4.5 litre | | |

Once the inlet and outlet lines have been checked, the electrical wiring has been tested and the case filled with oil, the rotor pump can be started. The rotor pump should only be started in touch-control mode. By repeatedly switching the pump on and off, a check can be made that all air has been removed from the hydraulic system. The rotor pump is started at a low working pressure, which is reduced by the pressure regulator on the pump or by an external pressure limiting valve. Since the pump is not equipped with a fan blower, the correct direction of rotation can only be demonstrated by correct pressure build up. Additionally, the oil level in the reservoir must also be monitored and, if necessary, topped up. If, after about one to two minutes, the pump noise is not at its normal level, the electrical wiring must be checked for errors (sense of rotation of the electrical motor may be reversed). Air in the hydraulic system is also highly detrimental to the stable running of the pump (abnormal operating noises, pump vibrations, unstable pump control behaviour. It is very important that all air is carefully removed from the system when the rotor pump is first put into service, or after an oil change or when piping or valves have been opened.

**8.0) Maximum outlet pressure:**

When operating at the rated pressure and maximum displacement, the relative duty cycle should be limited to 10% and the load period should not exceed six successive seconds per cycle time. The rotor pump will not be damaged if used continuously at the maximum rated pressure, but its operating life will be reduced.

**8.1) Minimum outlet pressure:**

The design of the rotor pump is such that to function properly a back pressure of at least 5 bar is needed in the outlet line. This is independent of the compensating pressure set on the pump's controller.

**8.2) Overloading the motor:**

The electric motor that drives the rotor pump has been designed to be able to run under overload conditions. The oil cooling system used for the electric motor allows it to be run under the following overload conditions without any reduction in operating safety or lifetime:

- 150% of the rated power output at continuous duty
- 200% of the rated power output for at most six successive seconds in a one minute cycle

In both of these overload modes, the temperature of the oil in the reservoir must be held at 60 °C or below. <u>It is not permitted to overload the motor if the temperature of the oil in the reservoir is above 60 °C.</u>

The electric motor must be protected by a motor protection switch and an additional main fuse. The motor protection switch must be such that it activates in accordance with the permissible overload conditions detailed above. In all other cases, VDE regulations (Association of German Electrotechnical Engineers) shall apply.

**9) Maintenance and repairs:**

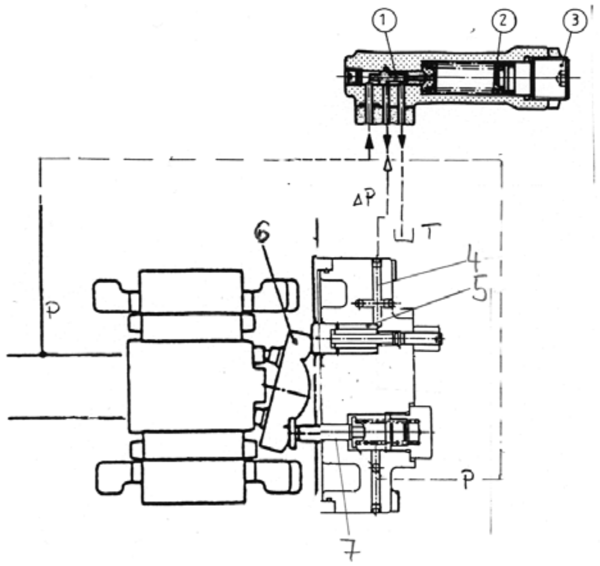
The hydraulic system must be subjected to regular inspection. The following areas must be checked:

- normal start-up behaviour and normal pressure build-up,
- no oil leakage from the case,
- normal operating noise,
- no abnormal vibrations of the pump,
- filter inspection,

- testing of piping and tubing on the pump.

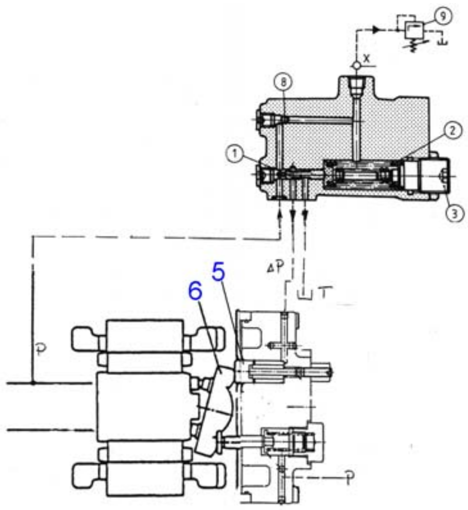
The oil is the central element in the entire hydraulic system. It is therefore recommended that the first oil change is carried out some 200 to 300 operating hours after commissioning. Subsequent oil changes should be performed every 3000-5000 hours or at least once a year.

**10) The pressure compensator controller:**



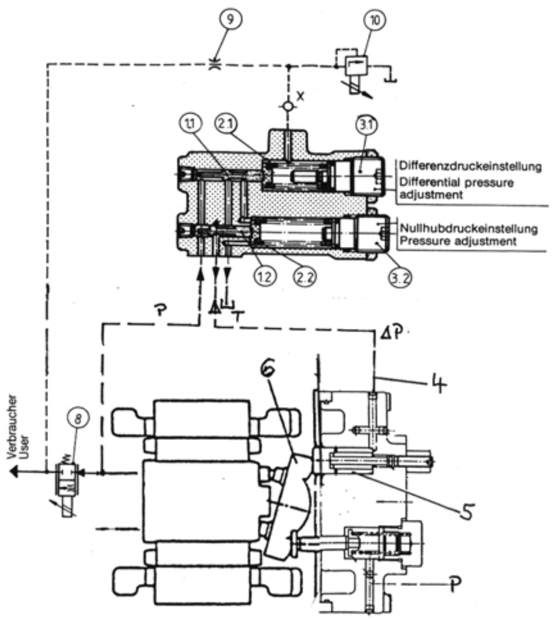

The pressure compensator controller ensures that the pressure set is maintained in the hydraulic system. The pump's displacement is controlled so that when the pre-set compensating pressure has been reached, the pump is only delivering that flow required to meet the demands of the attached load. The figure illustrates the way in which the mechanically adjustable pressure compensator functions. For as long as the system pressure is below the pressure set, the swash plate (6) is at its maximum angle of tilt enabling the pump to deliver maximum flow (displacement). When the pre-set compensating pressure has been reached, the regulator valve (1) moves against the spring (2). This opens a control edge transmitting the drop in the operating pressure Δp to the adjusting cylinder (5) which then reduces the angle of the swash plate (6) until the pump flow is at the level required by the system. For as long as the attached load does not demand oil flow, the pressure will be maintained at the value set on the regulator, with the pump merely replacing any losses due to leaks in the system. If the system pressure falls below that of the pressure set, the compression spring (2) pushes the sliding control valve (1) back into its original position. The chamber (4) of the adjusting cylinder (5) is linked to the oil leakage chamber, so that the piston returns the swash plate (6) to its position of maximum tilt.

**11) The remote controlled pressure compensator A-RC:**




The remote controlled pressure compensator enables the regulating pressure to be stepped up or down via one or more switchable pressure limiting valves (9) or to be continuously varied via a proportional valve (9). The principle of operation is shown in the accompanying figure. The regulating pressure is not determined by the force of an adjustable spring but rather by the low constant force from a spring and by the pressure in the spring chamber, which is limited by the external pressure valve (9). The pressure in front of the slide control valve (1) corresponds to the pressure in the spring chamber, and it is only the force of the spring (2) that holds the slide control valve (1) in its end position. This connects the adjusting cylinder (5) to the leakage oil chamber in the pump and holds the swash plate (6) at maximum tilt. Once the pre-set pressure has been reached, the pressure valve (9) opens and a control oil current flows via the throttle (8). A pressure difference is created at the throttle which acts on the sliding control valve (1). A further increase in the operating pressure causes a higher pressure differential which moves the sliding control valve (1) up against the spring (2). This opens a control edge which transmits the drop in the operating pressure Δp to the adjusting cylinder (5) which then reduces the angle of the swash plate (6) until the pump's displacement is at the level required to meet the demands of the system at this pressure. The compensator spring (2) is set at the factory within the range 6-10 bar and the throttle cross-section adjusted to deliver a control oil current of approximately 0.7-0.8 l/min (based on a compensating pressure of 210 bar). These settings should normally not be changed. Any alteration to the compensating pressure should only be performed on the remote control valve (9). The settings described above provide good control loop amplification, i.e. only a minor increase on the high pressure side is required to change the pump displacement from its maximum to its minimum value. Reducing the cross-section of the throttle (8) means that a greater pressure increase is required to swing back the swash plate. This is recommended practice if, as a result of a large gain, the control system becomes unstable (vibrations). However, if the cross-section of the throttle (8) is too small, the resulting low level of control loop amplification can then cause larger permanent deviations (errors) and longer response times. A compensating pressure of $p_{comp.}$ = approx. 17 bar is re-established after discharging via port X to the reservoir.

**12) The combined displacement and pressure compensator controller SA:**

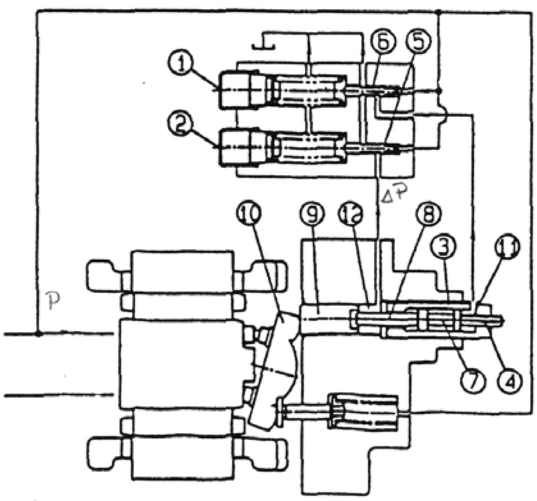



This control unit ensures that the pump continues to deliver a constant flow (displacement) despite fluctuations in drive speed and pressure. A mechanically adjustable pressure compensator is combined with a displacement controller thus dispensing with the need for additional pressure control via a pressure limiting valve.

The principle of operation is shown in the accompanying figure. The pressure difference across the throttle (8) which forms part of the pump's output line acts on the sliding control valve (1.1). The spring (2.1) maintains a constant pressure of approx. 7 bar at the throttle valve, (see the J-V catalogue for alternative controller springs and setting ranges) as the sliding control valve functions like the pressure balance in a flow control valve.

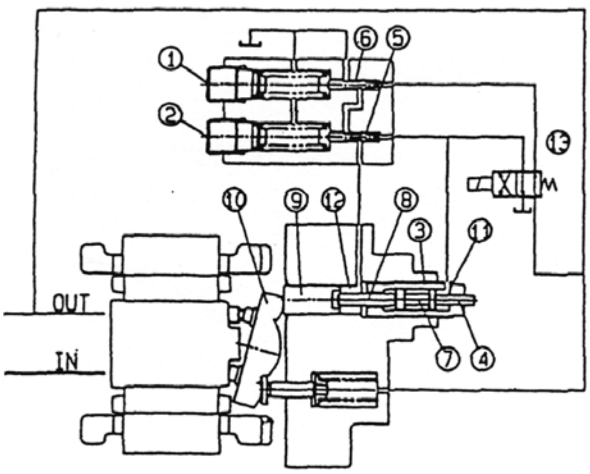
A reduction in the cross-section of the throttle valve (8) or an increase in the volume delivered by the pump due to increased motor speed will increase the pressure differential and cause the slide control valve (1.1) to move up against the compensation spring (2.1). The control edge then opens transmitting the drop in the operating pressure $\Delta p$ to the adjusting cylinder (5) (via line 4). This enables the swash plate (6) to be tilted back reducing the pump's displacement until the standard pressure differential of approx. 7 bar has been restored. This control mechanism is load dependent. In addition, the slide control valve (1.1) can be used for hydraulically remote controlled pressure regulation. This is superimposed on the displacement control. A fixed orifice (9) with a diameter in the range 0.8 ... 1.0 mm is also required. The orifice serves to restrict the flow of the oil control current of the pilot valve (10) and influences the amplification of the control system. Enlarging the diameter of the orifice reduces the control response time as the gain is increased, i.e. only a small increase on the high pressure side is required to change the pump displacement from its maximum to its minimum value. Reducing the diameter of the orifice (9) means that a greater pressure increase is required to swing back the swash plate. This is recommended practice if, as a result of a large gain, the control system becomes unstable (vibrations). However, too low a level of control loop amplification can cause larger permanent deviations (errors) and longer response times. It should also be realized that altering the diameter of the orifice (9) e.g. to optimize the control loop gain in the pressure regulation mechanism, can also influence the pump displacement control loop. Normally the pressure regulation system is slower, which is why the common controller must be optimized for the pressure regulation loop. A compensating pressure of $p_{comp.}$ = approx. 17 bar is re-established after discharging via port X to the reservoir with the throttle valve closed.

**13) The two-stage pressure compensator CH:**




This controller enables two different pump displacements, qv2.I and qv2.II, to be invoked via the pump's pressure range. Switching from the higher volume flow rate qv2.I to the lower flow rate qv2.II is carried out hydraulically. The flow rates are set using the pump's displacement setting screws (3) and (4). The associated pressure stages are set via the pressure adjusting screws (1) and (2) on the controller. Screw (4) on the pump is used to set the maximum pump flow qv2.I and screw (3) used to set the desired minimum flow qv2.II. The accompanying diagram shows the principle of operation of the two-stage pressure compensator. In the initial position, the piston chamber (12) and the adjusting cylinder chamber (11) are joined to the reservoir. The swash plate (10) is therefore tilted to enable maximum displacement. When the pressure P.I set on the adjusting screw (1) on the controller has been reached, the sliding control valve (6) is moved against the compensating spring. This opens a control edge which feeds back the drop Δp in the operating pressure P.I to the piston (7). The piston is driven against the stop rod (8) and the swash plate swung-in, reducing the pump flow rate to the level qv2.II. The pump now delivers a lower flow rate at the pre-set pressure. Through further increases in the system pressure, the pressure set on the adjusting screw (2) will be attained. The sliding control valve (5) bears against the spring and the control edge opens to the adjusting cylinder chamber (12) thereby transmitting the drop Δp in the operating pressure P.II to the adjusting cylinder (9). The adjusting cylinder (9) now reduces the angle of tilt of the swash plate (10) until the displacement meets the requirements of the system with the pump merely serving to replace any loss by leakage from the system. If the system pressure falls below the lower of the pre-set operating pressures, the compensator springs return the sliding control valves (1) and (1) to their original positions so that the piston chamber (12) and the adjusting cylinder (11) are once again joined to the reservoir and the swash plate is at its maximum angle of tilt.

**14) The two-stage pressure compensator CJ:**



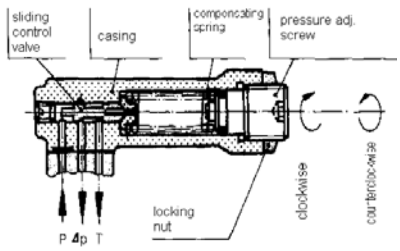

This controller enables two different pump flow rates, qv2.I and qv2.II, and their associated pressure stages, to be invoked separately and independently of one another. Switching between the two pump flow rate settings is effected with an electrically operated directional control valve. The two flow rates are set using the displacement setting screws (4) and (11) on the pump, the associated pressure stages are set via the pressure adjusting screws (1) and (2) on the controller. Screw (4) on the pump is used to set the maximum pump flow rate qv2.I and screw (11) used to set the desired minimum flow rate qv2.II.

The accompanying figure shows the principle of operation of the two-stage pressure compensator. In the initial position, with the directional control valve (13) idle (position b), the piston chamber (10) and the adjusting cylinder chamber (11) are joined to the reservoir. The swash plate (10) is therefore tilted to enable maximum displacement. When the pressure P.I, which was set by adjusting screw (1) on the controller, has been reached, the sliding control valve (6) is moved against the compensating spring. This opens a control edge which feed back the drop Δp in the operating pressure P.I to the adjusting cylinder (9). The adjusting cylinder (9) reduces the angle of the swash plate until the pump's displacement is at the level required to meet the requirements of the system, with the pump merely replacing any oil lost through leaks. If the second displacement with its associated pressure compensator cut-off is required, the directional control valve (13) is switched to position a. This transmits the drop Δp in the operating pressure P.II to the sliding control valve (2) and the piston chamber (11). At the same time, the fall in pressure acts on piston (7) which is driven against the stop rod (8) and the adjusting cylinder (9). This reduces the angle of tilt of the swash plate (10) until the second of the pre-set displacements has been set. Once this pressure P.II has been reached, the sliding control valve (2) compresses the spring which opens a control edge allowing the pressure in the adjusting cylinder chamber (11) to rise. The adjusting cylinder (5) reduces the tilt angle of the swash plate (10) until the displacement meets the requirements of the system, with the pump merely serving to replace any loss by leakage from the system.

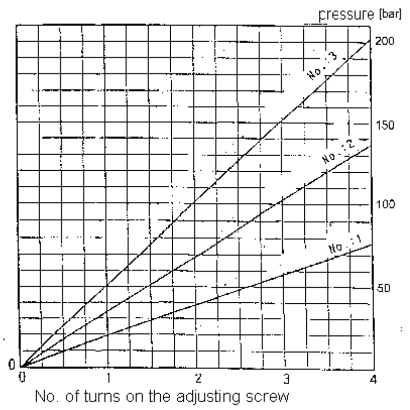
**15) Setting the compensating pressure**

On the mechanically adjustable pressure compensator control (standard controller) or the combined displacement-compensator control, the pressure can be set by turning the adjusting screw on the controller:

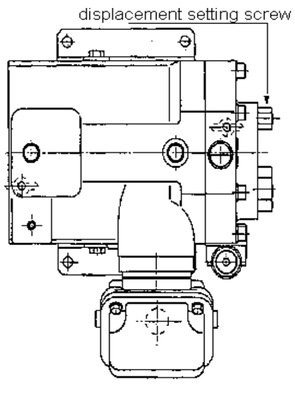
Clockwise turn: increases pressure
Anticlockwise turn: decreases pressure




The compensating pressure can be continuously varied between 15 bar and 210 bar. Depending on the pressure range chosen, the correct compensator spring must be fitted in accordance with the table below.
Replacing a spring can be done without difficulty. The following diagram shows how the compensating pressure varies with the number of turns on the adjusting screw for each of the compensating screws used.



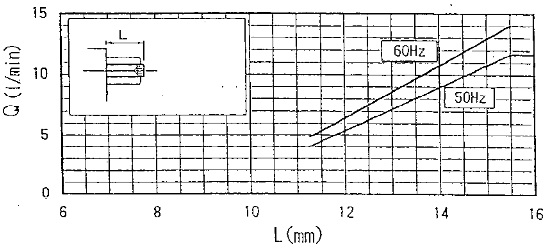

| Spring no. | Pressure range (bar) |
|---|---|
| 1 | 15...70 |
| 2 | 15...140 |
| 3 | 35...210 |



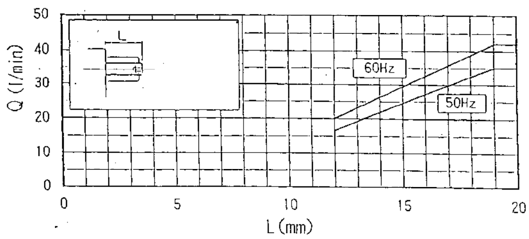

**Setting the pump displacement (flow rate)**

The pump displacement can be adjusted within the given ranges by turning the displacement setting screw. Turning the adjusting spindle clockwise reduces the pump's displacement, turning it anticlockwise increases the volume displaced per revolution. (see following diagram). The displacement setting can be measured by the length (L) of the displacement setting screw.

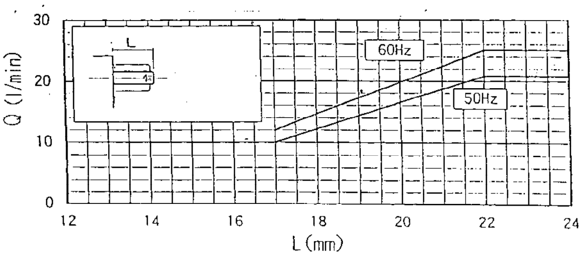
**J-RP08**



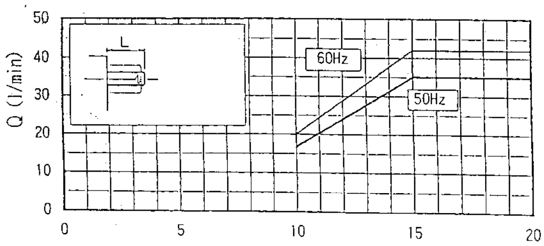

**J-RP23-22**



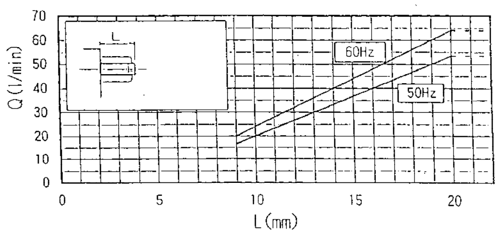

**J-RP15**




**J-RP23-37**



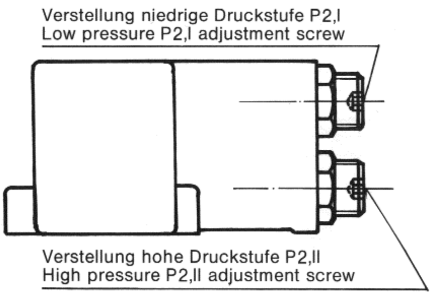

**J-RP38**




**16) Instructions for setting the CH- and CJ controllers:**

The following pressure setting ranges are possible for the two pressure stages **(lower / higher pressure)**

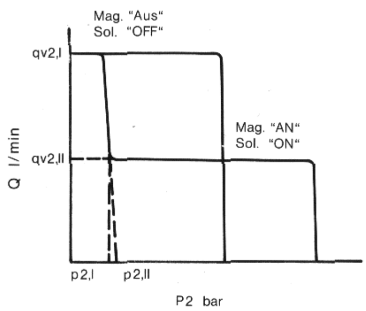
| Series | Control | 11 | 12 | 13 |
|---|---|---|---|---|
| J-RP15 - 1.5 kW | | 50 / 70 bar | 50 / 140 bar | 50 / 210 bar |
| J-RP15 - 2.2 kW | | 50 / 70 bar | 70 / 140 bar | 70 / 210 bar |
| J-RP23 - 2.2 kW | | 50 / 70 bar | 50 / 140 bar | 50 / 210 bar |
| J-RP23 - 3.7 kW | | 50 / 70 bar | 70 / 140 bar | 70 / 210 bar |
| J-RP38 - 3.7 kW | | 50 / 70 bar | 50 / 140 bar | 50 / 210 bar |
| J-RP38 - 5.5 kW | | 50 / 70 bar | 70 / 140 bar | 70 / 210 bar |




The pressure can be set using the adjusting screw on the controller.

Clockwise turn: increases pressure

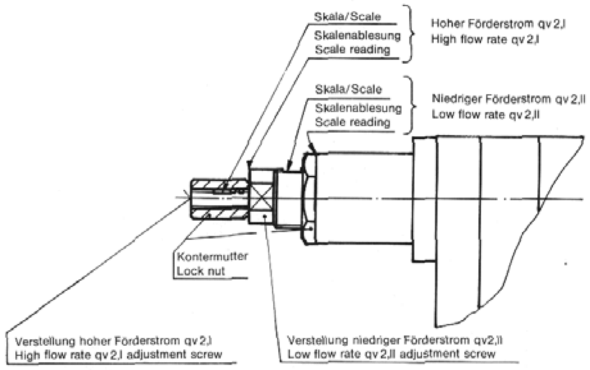
Anticlockwise turn: decreases pressure




The adjacent figure shows that when the directional control valve on the CJ controller is switched there is no accompanying change in the displacement if pressure $P_{2,II}$ is below $P_{2,I}$. For a change in displacement to occur pressure $P_{2,II}$ must be grater than pressure $P_{2,I}$ .

Displacement settings: min qv2,II and max. qv2,I:

| Series | minimum flow rate setting | maximum flow rate setting |
|---|---|---|
| J-RP 15 | 0...12 ° | 0...15 ° |
| J-RP 23 | 0...8 ° | 4...15 ° |
| J-RP 38 | 0...8 ° | 4...15 ° |




Factory settings of displacement adjuster screws:

The higher displacement is set equal to the maximum flow rate The lower displacement is set to the value given in the corresponding table:

| | **Displacement adjustment screw setting for small volumes [°]** | | |
|---|---|---|---|
| **Series** | high pressure level 1 | high pressure level 2 | high pressure level 3 |
| J-RP15C - 1.5 kW | 2 | 2 | 2 |
| J-RP15C - 2.2 kW | 4 | 4 | 4 |
| J-RP23C - 2.2 kW | 2 | 2 | 2 |
| J-RP23C- 3.7 kW | 3 | 3 | 3 |
| J-RP38C- 3.7 kW | 3 | 3 | 3 |
| J-RP38C- 5.5 kW | 5 | 5 | 5 |

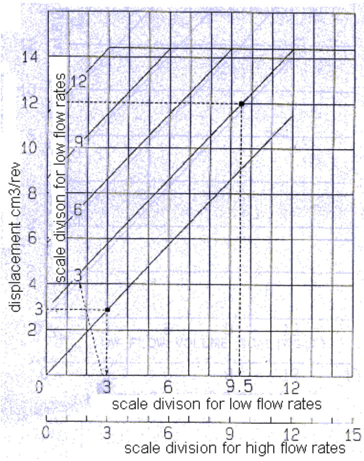
Example:

Procedure for setting the pump displacement:

Pump: J-RP 15C

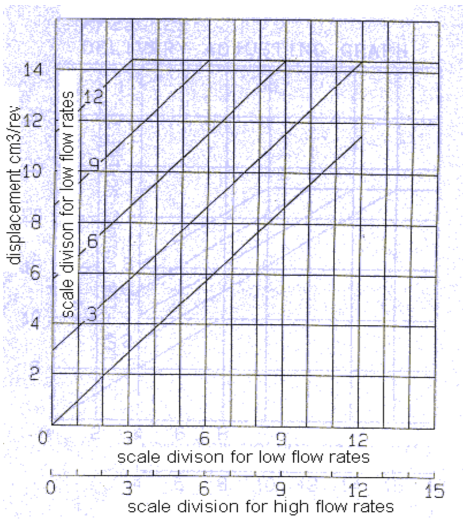
Displacement: qv2,II = 3 $cm^3$/rev (5,4l /min)

qv2,I = 12 $cm^3$/rev (21,6 l/min)

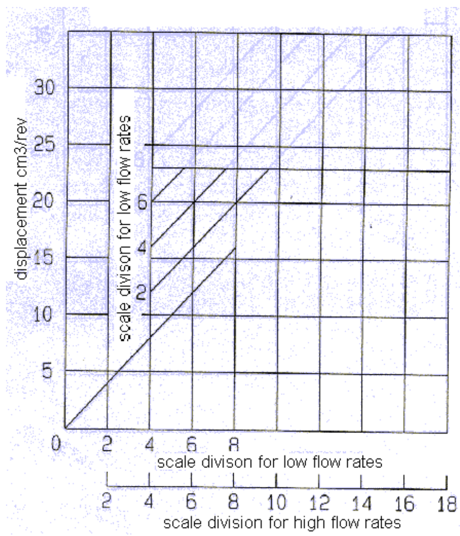



Scale setting for low flow rate 3° - scale setting for higher flow rate to match lower flow rate value 9.5°

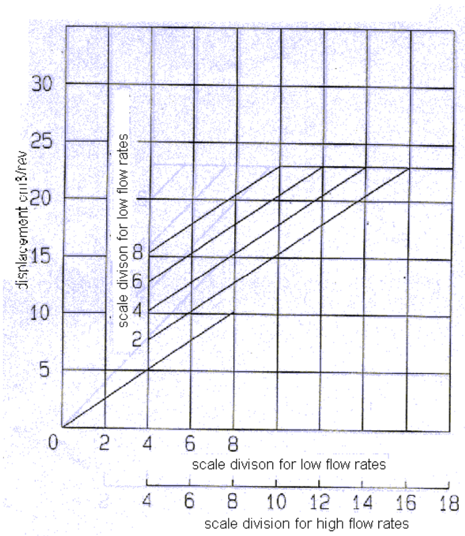
J-RP 15C



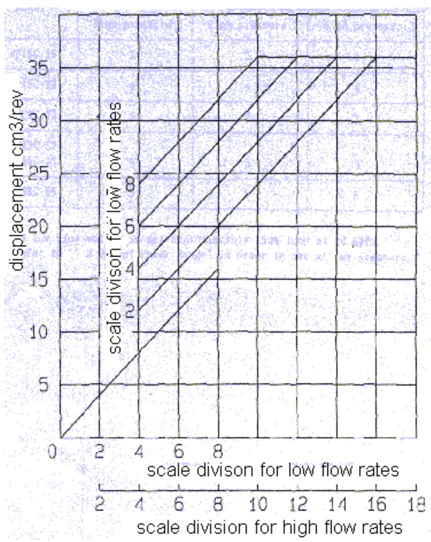

J-RP 23C - 3,7kW




J-RP 23C - 2,2kW




J-RP 38C



## 17) Detecting and remedying faults:

**Fault 1: Electric motor does not start or stops immediately**

| Problem with ... | Cause | Remedy |
|---|---|---|
| Electrical power supply | Power supply defective | Check that power supply complies with specifications on the type plate |
| Fuse open or activated | Fuse capacity does not comply with specifications on the type plate | Insert fuse of correct type |
| | Short circuit within rotor pump | Replace rotor pump |
| | Electrical wiring defective | Locate error and repair |
| System settings | $Q_{max}$ and $P_{max}$ simultaneous (corner power) | Alter settings in accordance with documentation |

**Fault 2: Electric motor starts but there is no build-up of pressure and/or pump does not deliver expected output**

| Problem with ... | Cause | Remedy |
|---|---|---|
| Incorrect direction of rotation of rotor pump | Error with electrical wiring | Inspect electrical connections |
| Oil viscosity | Oil viscosity too high | Check oil viscosity |
| | Oil viscosity too low | Raise temperature of oil to the recommended value |
| Inlet line | Suction pressure too low | Inspect inlet line and filter (refer to Section 5 on cleanliness) |
| Cavitation in inlet line | Diameter of inlet line too small | Fit larger diameter piping |
| | Too many bends (angles) in the inlet line | Eliminate bends |
| | Sealed reservoir | Install venting filters |
| | Suction head too high | Reduce suction head (1 m max.) |
| Foaming or air tapped in oil | Oil level in reservoir too low | Refill oil |
| | Reservoir incorrectly designed | Improve design |
| | Return line does not enter reservoir below the surface of the oil | Ensure that return line enters below the surface of the oil |
| | Screw fittings in the inlet line admit air | Retighten or replace fittings |
| | Poor venting | Ensure that system is properly vented |
| Flow limiting screw incorrectly set | Mechanical limitation on pump output | Reset the flow limiting screw to the desired position |
| Oil level in pump case | Initial oil fill was not performed | Fill pump case (see page 10) |
| Pressure regulator on pump incorrectly set | Pressure regulator on pump set to minimal pressure | Reset regulator to desired value |
| | Pressure regulator defective | Replace pressure regulator |
| Pump | Pump worn (for possible causes refer to Fault 6) | Replace pump |
| Pipework | Faulty pipework | Inspect and remedy according to the plan of the hydraulic system |

**Fault 3: Abnormally excessive system noise**

| Problem with ... | Cause | Remedy |
|---|---|---|
| Oil viscosity | Incorrect oil viscosity | Check viscosity |
| Mechanical vibrations | Vibrations in the pipework | Retighten mounting bolts or improve mounting arrangements |
| | Transport bolts still attached to rotor pump | Remove transport bolts |
| Cavitation in inlet line | refer to Fault 2 | |
| Oil level in pump / reservoir | refer to Fault 2 | |
| Safety or pressure limiting valve | Vibrations | Correct valve settings or replace |
| Case pressure | Pressure too high | Re-dimension oil leakage line |

**Fault 4: Oil leaking from rotor pump**

| Problem with ... | Cause | Remedy |
|---|---|---|
| Case seals | Seals defective | Service required |
| Screw fittings | Loose or leaking | Replace or retighten |

**Fault 5: Surface temperature of rotor pump very high (above 90 °C)**

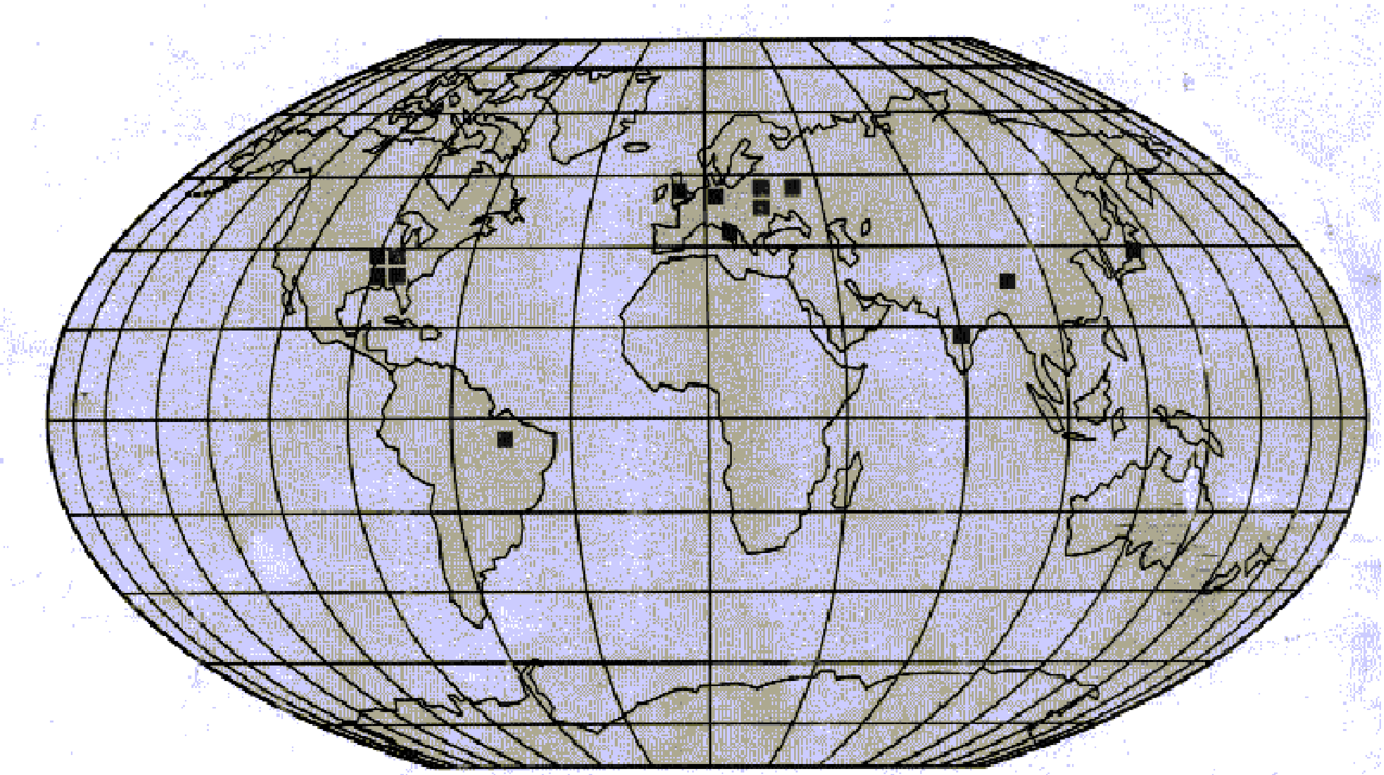
| Problem with ... | Cause | Remedy |
|---|---|---|
| Oil too warm | Oil in reservoir over 60 °C | Reduce temperature of oil in reservoir (by using e.g. a larger reservoir, a cooling system,...) |
| Power consumption too high | Rotor pump overloaded | Power rotor pump in accordance with the data specified on the type plate |
| Pump | Internal pump components damaged | Replace pump (see Fault 6) |

**Fault 6: Pump pressure malfunction**

| Problem with ... | Cause | Remedy |
|---|---|---|
| Pressure regulator | Maximum pressure of the pressure range exceeded | Adjust accordingly |
| | Defective | replace |
| Air in hydraulic system | See Fault 2 | |
| Pump | Damage to internal pump components | Replace pump |

**Fault 7: Wear on pump**

| Problem with ... | Type of fault | Cause |
|---|---|---|
| Cylinder block, Valve plate | Welding<br>Wear<br>Discoloration | Contamination of hydraulic fluid<br>Unacceptable operating temperature<br>Cavitation<br>Insufficient lubrication<br>Case not filled with oil<br>Unsuitable oil type |
| Piston shoes | Wear<br>Destruction | Contamination of hydraulic fluid<br>Unacceptably high case pressure<br>Inlet pressure too low<br>Cavitation / Insufficient lubrication<br>Unsuitable oil type |
| Bearings | Destruction | Unacceptably high operating pressure |
| Retainer plate | Deformation | Case pressure too high<br>Suction pressure too high<br>Unacceptable operating temperature<br>Contamination of hydraulic fluid |



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