Radial Piston Motors
with fixed displacement
Series RM...X
Vg = 250 cm³/U - 900 cm³/U

Repair manual

Doc.-No. HM3-005 UK
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1. General

Great attention is to be paid to cleanliness when dismantling or assembling. Do not use fraying cleaning cloths or cleaning wool. Do not assemble in workshops where cutting or grinding is carried out or where dust occurs.

A hoist is required to handle and transport the motors.
The weight of the motors is as follows:

<table>
<thead>
<tr>
<th>Motor</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 250X - RM 500X</td>
<td>76 kg</td>
</tr>
<tr>
<td>RM 710X - RM 900X</td>
<td>132 kg</td>
</tr>
</tbody>
</table>

Suitable jacking-up of the motor eases dismantling.

If the motor is disconnected from its connecting pipes or opened, then the oil flowing out is to be caught in a suitable container and disposed of according to regulations.

Attention is to be paid that the dismantled parts, particularly sliding surfaces and seals, are not dirtied or damaged.

It is recommended that the dismantled parts be laid in a table covered with clean oiled paper.

The following spare parts list explains the individual parts of the motors:

<table>
<thead>
<tr>
<th>Model</th>
<th>RM 59.55</th>
<th>RM 59.55Ca</th>
<th>RM 59.55St</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 250X</td>
<td>RM 59.55</td>
<td>RM 59.55Ca</td>
<td>RM 59.55St</td>
</tr>
<tr>
<td>RM 355X</td>
<td>RM 59.55</td>
<td>RM 59.55Ca</td>
<td>RM 59.55St</td>
</tr>
<tr>
<td>RM 450X</td>
<td>RM 59.55</td>
<td>RM 59.55Ca</td>
<td>RM 59.55St</td>
</tr>
<tr>
<td>RM 500X</td>
<td>RM 59.55</td>
<td>RM 59.55Ca</td>
<td>RM 59.55St</td>
</tr>
<tr>
<td>RM 710X</td>
<td>RM 59.60</td>
<td>RM 59.60Ca</td>
<td>RM 59.58St</td>
</tr>
<tr>
<td>RM 900X</td>
<td>RM 59.60</td>
<td>RM 59.60Ca</td>
<td>RM 59.60St</td>
</tr>
</tbody>
</table>

2. Dismantling the distributor unit

Jack the motor in a vertical position with the driveshaft pointing downwards.

Remove the allen-type screws (45).

Remove the cover plate (47).

Remove lockwasher (43.7) using two strong screwdrivers, whereby the bush (46) must be depressed by approx. 1 mm, so that the lockwasher is free of axial pressure and can be eased out with two screwdrivers.

The bush (46) can be extracted by fitting two M8 screws in the tapped holes provided and pulling the bush by the screws. The seals could be damaged and must in each case be replaced prior to fitting. The pressure pad (43.2) with spring (44) and seals (56.1 and 56.2) is in most cases located centrally in the bush and is removed at the same time.

**Note:** All faces of the interior, the bush and the pressure pad are sealing surfaces and must not show any scoring (do not damage).

Extract distributor eccentric (43.1) together with roller cage and cylindrical rollers.

Control inner ring (41.1) and control outer ring (42) with seals (55.1/55.21, 57.1/57.2), spring discs (43.4) and ball valve (41.2/41.3) to be removed completely.

Damage to the distributor (40) occurs only rarely. As special tools and experience is required, please return this item to our works for repair.

Changes reserved!
3. **Dismantling the drive unit**

The motor is jacked-up with the take-off shaft upwards. The oil flowing out is to be caught in a suitable container and disposed of according to regulations.

In the case of motors with cylindrical shaft with feather key, then the feather key (11) has to be removed from the crankshaft takeoff peg.

Loosen and remove the bearing cover screws (27). (The screws are glued in and may be very tight, warming may ease unscrewing).

Press the bearing cover (21) evenly out of the motor casing (20) by screwing in two cheese head screws (27) in the two opposite taps and remove the o-rings (52) as well as the alignment disc (24). Carefully store the alignment disc for possible use later. If components necessary for bearing settings, e.g. motor casing, taper roller bearings, bearing cover or crankshaft, are not replaced; then the alignment disc (24) may be re-used and the bearings do not have to be re-set in this case.

The crankshaft (10) can now be pulled out vertically. In order to do so, a lifting screw is to be screwed into the frontal thread of the crankshaft and the crankshaft carefully pulled out using this screw. The bearing inner disc (26) is to be pushed off the crankshaft when removing the crankshaft. If the bearing ring sticks, hitting the accessible part of the shoulder may facilitate removal.

**Caution!** Be careful not to damage the lower areas of the connecting rod.

Then gently pull all the piston and connecting rod units (30) towards the motor casing middle axis, until both connecting rod retaining rings (23) can be removed and take out the upper ring. Then push the piston and connecting rod units (30) outwards until the rear ring can be removed. If necessary, the piston and connecting rod units can be pulled inwards, out of the cylinder ducts.

4. **Dismantling the cylinder cover**

Loosen and remove the cylinder cover screws (28) and lift off the cylinder cover (22). (The screws are glued in and may be very tight, warming may ease unscrewing).

5. **Dismantling a piston / connecting-rod subassembly:**

Clamp the piston firmly (but avoiding damage using a vice with soft jaws). Unscrew the set-screw with hole (35) with a screw driver. This set-screw is glued in and also caulked and thus difficult to loosen!

Carefully bore open the pipe (36) with a drill bit size 4,2 mm and cut an M5 thread. Remove the pipe (36) using an M5 screw. Press the bolt (34) out of the piston side.

When assembling the bolt (34) in the piston (32), whereby the bolt must also be inserted through the connecting rod eye (31), be careful that the bolt is turned so that the duct in the bolt is fitted in the direction of the connecting rod longitudinal axis. Drive in the pipe (36) through the piston and the duct in the bolt (34) from the head of the piston (32). Degrease the thread in the piston, glue in the set-screw with hole (35) with Loctite 324 or a comparable adhesive and secure additionally by caulking.

6. **Condition of the parts**

Thoroughly clean all parts after dismantling and then examine them to establish whether they can be re-used or not. Particular attention should be paid to the following components: connecting rod eyes and lower areas, connecting rod running surface on the crankshaft (large eccentric diameter), shaft seal slide ways and edges, taper roller bearing slide ways, cylinder duct surfaces and piston surfaces as well as orings and their supporting rings.
The fronts of the bush, the thrust piece, the eccentric, the distributor inner ring and outer ring and the distributor contact surface are all sealing surfaces and should not have any furrows, such damaged parts are to be replaced.

If the taper roller bearing slide ways show any pitting, eruptions or other signs of wear then both bearings are to be completely replaced.

If the measuring-shaft (64) is damaged then a new unit (crankshaft, measuring-shaft and dowel pin) is to be ordered, since the measuring-shaft (64) is shrunk into the crankshaft (10) and additionally secured with a straight pin (49.3).

The dirt stripper (51.1) as well as all o-rings in the distributor including their supporting rings should always be replaced.

The order designations and numbers for the parts to be replaced can be seen in the respective spare parts lists.

7. Setting the taper roller bearings

Setting the taper roller bearings is always necessary when parts which influence the bearing settings have been replaced, e.g. motor casing, bearing cover, crankshaft or taper roller bearings, or if the original alignment discs are no longer usable or have been lost.

Setting the axial initial tension is carried out during assembly using alignment discs. To this end, the crankshaft with the bearings is placed in the motor casing and axially braced by screwing on the bearing cover.

The appropriate initial tension is reached by removing or adding individual alignment disc films between the bearing cover and the casing. The moment of friction of the bearing under initial tension serves as the measure for the correct setting.

No parts which may influence the result may be fitted in the motor. These include the piston and connecting rod units, the distributor as well as the shaft seals in the bearing cover, that is the radial packing ring cover (only for motors with measuring-shaft).

The moment of friction is checked by turning the journal using a dynamometric key. In doing so, it is imperative that the bearing is fitted with the lubrication originally applied by the manufacturer and the shaft is manually turned at least two complete rotations. The correct torque setting can be seen in the table on page 7.

The crankshaft is to be dismantled again after bearing setting.

8. Assembly the drive unit

Thoroughly clean all parts before assembling and thoroughly degrease the taps in the motor casing for the cylinder cover and bearing cover screws.

With regard to sub-assembly of the piston/rod - units see point 5 (above).

To assemble the cylinder cover (22), firstly place the supporting rings (54.2) in the space provided and above that the o-ring (54.1) that is towards the inside of the motor. Then place the cylinder cover with its centering shoulder in the motor casing cylinder duct and secure with the 4 cheese head screws (28). These screws are to be grease-free, phosphatised and wetted below the thread with Loctite 324 or a comparable adhesive. The screw torque can be seen in the table on page 10. Repeat this procedure for all other dismantled cylinder covers.

Mark the shaft in the rear transition radius of the distributor square with a prick punch if not already thus marked. This is necessary to provide an optical impression of the fitting position relative to the rotational angle of the crankshaft eccentric.
Now place the taper roller bearing inner ring (26) in the bearing outer ring in the motor casing and loosely place the rear connecting rod retaining ring in the casing with the smaller inner diameter upwards.

Insert the piston and connecting rod units (30) into the cylinder ducts using a special piston ring collet chuck or appropriate piston ring clamp.

Place the connecting rod retaining rings (23) in the connecting-rod guide channel and press the connecting rod out completely so that the connecting rod lower areas lie in the rings. Move the rings and connecting rod lower areas into a position externally centered around the crankshaft eccentric.

The crankshaft (10) can now be pushed with its rear bearing journal in the taper roller bearing (26) and with the large eccentric diameter in the connecting rod shoes held by the rings (23).

Now place the alignment disc (24) required for the taper roller bearing setting in Point 6, on the inner flange of the bearing cover so that the ducts are covered. Then graze the oring (52) over the bearing cover casing-side centering diameter so that the o-ring comes against the corner with the alignment ring.

Then lay a new dirt stripper (51.1) and the spacer ring (51.2) in the bearing cover (21). Now press the shaft seal (51.3) with its dust lip downwards and the seal edge upwards evenly at the circumference of the outer ring into the bearing cover.

An appropriate tool is to be used for assembly.

The completely assembled bearing cover is to be pushed onto the crankshaft (7) using a conical assembly sleeve on the crankshaft take-off peg, so that the cover screw holes and the motor casing taps are on top of one another. Then remove the assembly sleeve from the shaft.

When screwing in the hexagonal socket head screws (27) these screws are to be grease-free, phosphatised and wetted below the thread with Loctite 324 or a comparable adhesive.

Tighten the screws evenly crosswise with a dynamometric key. The torque setting can be seen in the table on page 7.

For motors with cylindrical take-off shafts with feather key the feather key are now replaced in the take-off shaft pegs.

9. **Assembly the distributor**

Assembly of the control unit in reverse order to dismantling - see 2.

Jack motor with the shaft end pointing downwards.

Renew all seals of the control unit.

Fit completely assembled control ring (items 41.1, 41.2, 41.3, 42, 43.4, 55.1, 55.2, 57.1, 57.2) and according to 7.5 push eccentrically towards the centre axis.

Assemble the roller cage (43.5) with the eccentric (43.1). Assemble the cylindrical roller (43.6) in the cage (43.5). Push this assembled unit over the crankshaft.

This method of assembly of the distributor provides right-hand rotation, with the flow passing from port 2 to 1. (See catalogue sheet for further details).

Care should be taken when assembling the distributor eccentric (43.1), that the upmost point of the distributor eccentric is pushed upwards by 90° to the crankshaft eccentric, (10) to the right of the upmost point of the crankshaft eccentric on the square section of the crankshaft.

Changes reserved!
The upmost point of the crankshaft eccentric is marked by means a punch mark on the face of the square section of the control spigot of the crankshaft (when viewed in the direction of the distributor).

10. Starting-up
The motor must be filled with hydraulic fluid via a leakage fluid connection before starting up. The motor leakage oil connection is to be positioned so that the casing always remains full of hydraulic fluid.

Leakage from the radial piston motor must be returned to the tank separately from runback and from other users, to avoid retained pressure. The leakage pressure measured directly at the leakage fluid connection should not exceed 1 bar.

The entire hydraulic system should be completely vented to ensure faultless operation of the motor.

When starting up the motor, do not operate immediately at maximum pressure and / or maximum speed, but allow newly fitted parts time to settle or run in.

Recommendation for the first hours of operation:

<table>
<thead>
<tr>
<th>Pressure approx.</th>
<th>100 - 150 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed approx.</td>
<td>50 - 100 rpm</td>
</tr>
</tbody>
</table>

Optimum running properties only occur after a running-in phase of approx. 20 - 30 hours.

11. Table of torque / setting torque of bearings

<table>
<thead>
<tr>
<th>RM 250X - RM 500X</th>
<th>Screw (27)</th>
<th>65</th>
<th>Bearing cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Screw (28)</td>
<td>85</td>
<td>Cylinder cover</td>
</tr>
<tr>
<td></td>
<td>Screw (45)</td>
<td>25</td>
<td>End cover</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RM 710X - RM 900X</th>
<th>Screw (27)</th>
<th>65</th>
<th>Bearing cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Screw (28)</td>
<td>210</td>
<td>Cylinder cover</td>
</tr>
<tr>
<td></td>
<td>Screw (45)</td>
<td>25</td>
<td>End cover</td>
</tr>
</tbody>
</table>

| RM 250X - RM 500X | Bearing setting torque | 1,0-3,0 |
| RM 710X - RM 900X | Bearing setting torque | 1,5-4,0 |
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