

Hako MCR training 19.09.2012



Hako
Clean ahead

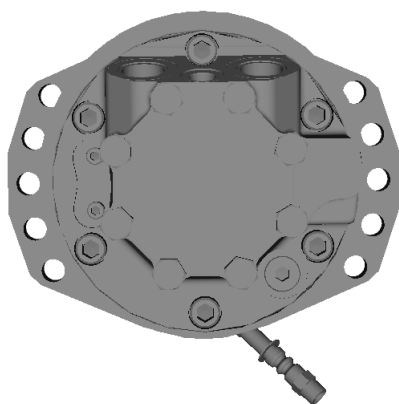
Stephen Elder

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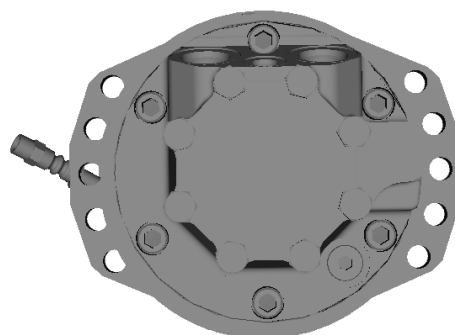
- Hako product information.
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- Motor code translation.
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 - Rear case
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 - Distributor
 - Brake
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- Bearing preload.
- Warranty information.

Hako Motor Information

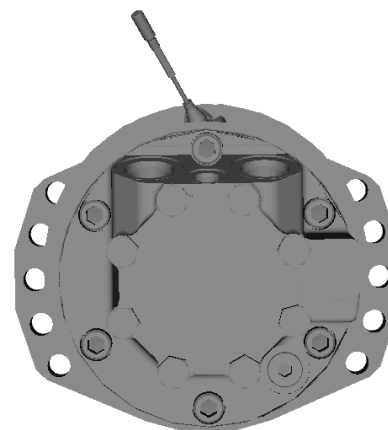
BR Ident. No.	Hako Ident. No.	Installation Drawing No.	GA Drawing No.	Motor Description Code
R921811114	90599853	DO71654	8744	MCR3 F 225 F180 Z 32 C2L M 1L 12 S - P0 SO389B
R921811115	90599861	DO71657	8785	MCR3 F 225 F180 Z 32 C2R M 1L 12 S - - SO389C
R921811116	90599762	DO71653	8743	MCR3 F 225 F180 Z 32 C2L M 1L 12 S - - SO389D
R921811117	90599770	DO71656	8786	MCR3 F 225 F180 Z 32 C2R M 1L 12 S - - SO389E



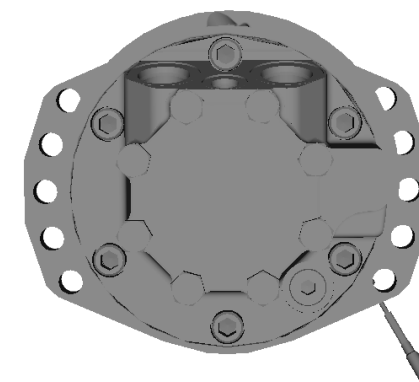
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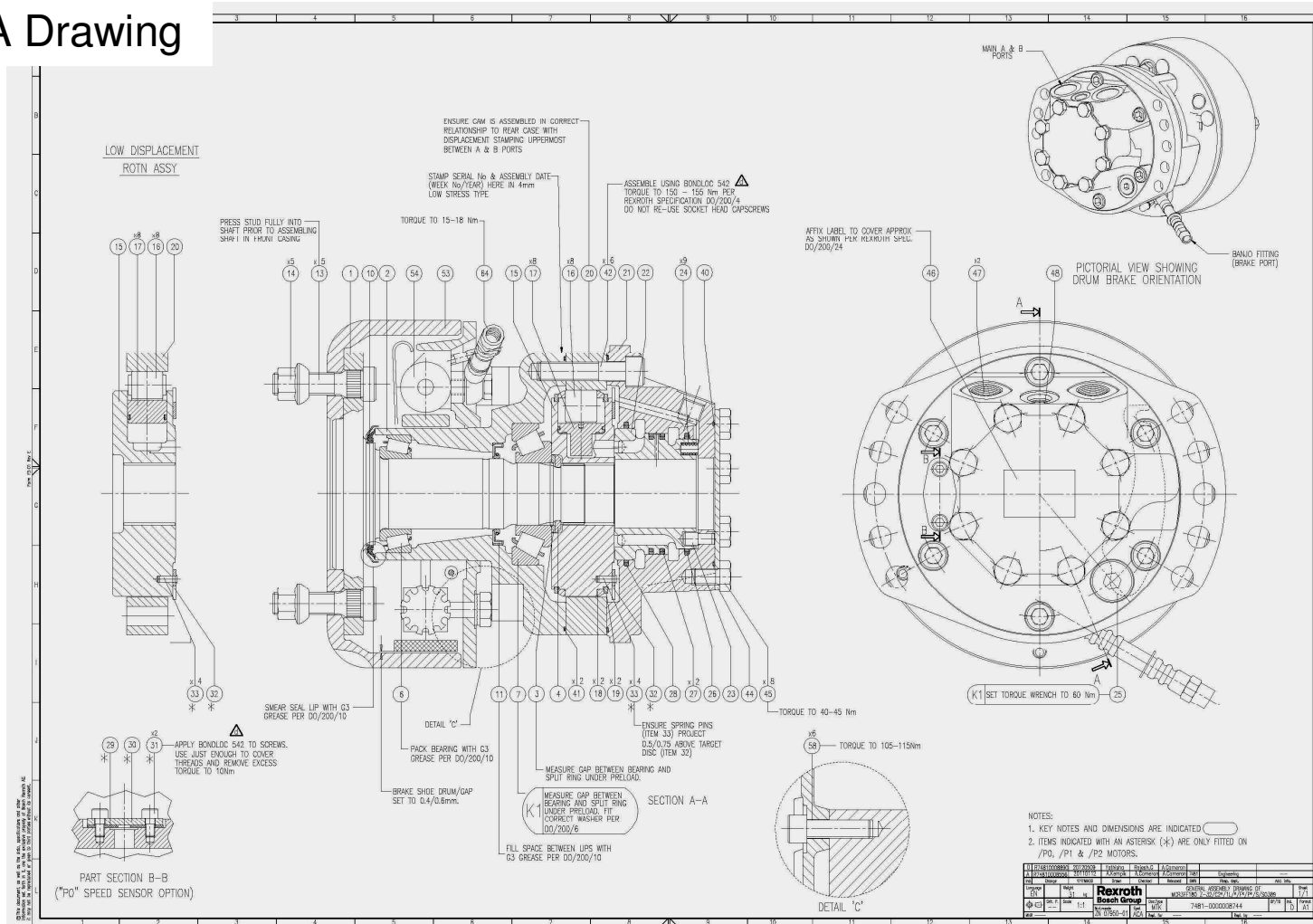
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Sources of data.

- **Data Sheets**
 - RE15205 to 15209 cover MCR3 to MCR20
 - For guidance only - always consult us for advice on new projects
- **Service Manual**
 - Covers general procedures for motor assembly
 - Use in conjunction with General Assembly Drawing
- **Operating Instructions**
 - Important information on the safe and correct installation, transport, commissioning, maintenance, removal and simple troubleshooting of MCR
- **General Assembly Drawings**
 - See drawing number on motor parts list
- **Installation Drawings**
 - See drawing number on motor parts list
- **Parts Lists**
- **Product Information Sheets**
 - Issued in the event of a change that affects motor installation

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GA Drawing



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MCR Motor Codes

Last update 22nd January 2004

Front Case

MCR 06 C 470 F180 32 C2L M 1L 12 S P SO

Front Case Type

06: 60 mm shaft diameter
 C: Cast iron
 470: 470 mm length
 F180: 180 mm shaft diameter
 32: 32 mm shaft diameter
 C2L: Cast iron
 M: Motor
 1L: 12 mm shaft diameter
 12: 12 mm shaft diameter
 S: 12 mm shaft diameter
 P: 12 mm shaft diameter
 SO: 12 mm shaft diameter

Optional coding

Special Order
 0: 0 mm shaft diameter
 1: 1 mm shaft diameter
 2: 2 mm shaft diameter
 3: 3 mm shaft diameter
 4: 4 mm shaft diameter
 5: 5 mm shaft diameter
 6: 6 mm shaft diameter
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 8: 8 mm shaft diameter
 9: 9 mm shaft diameter
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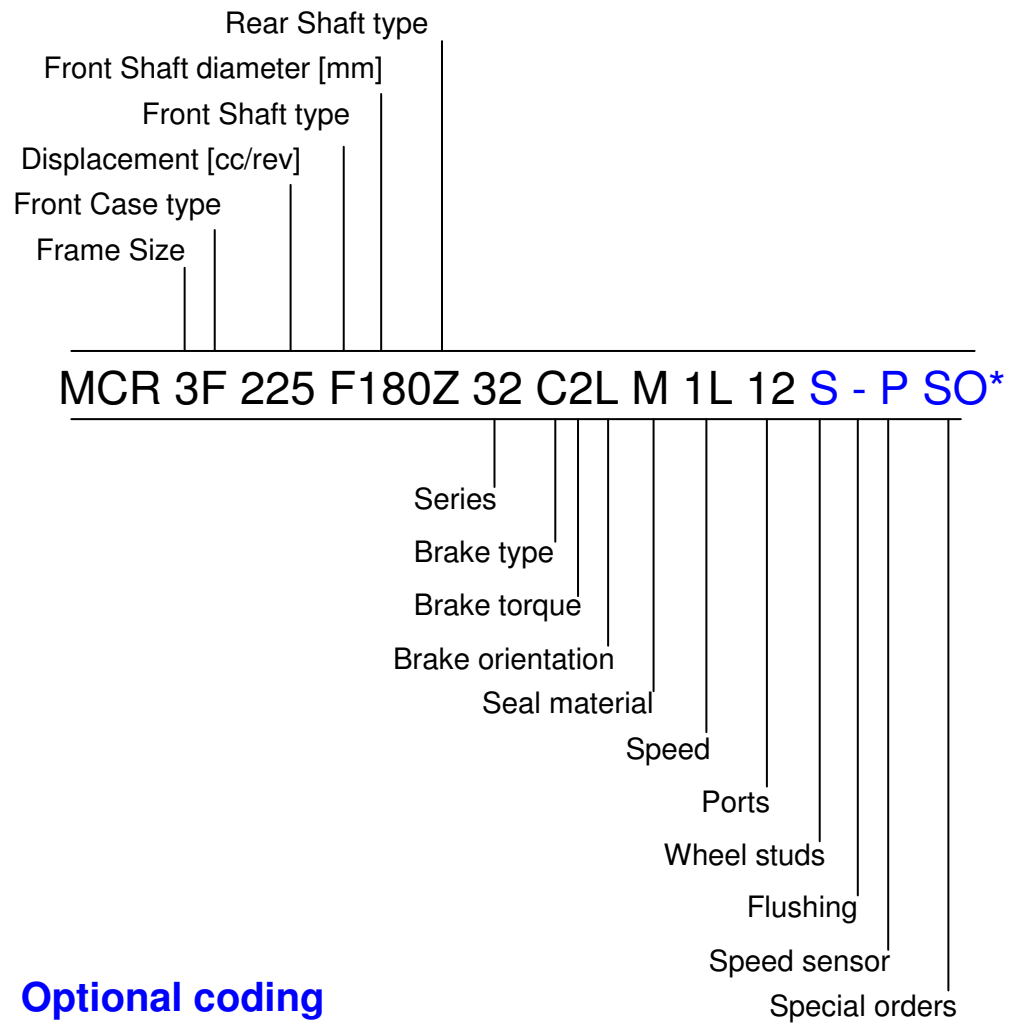
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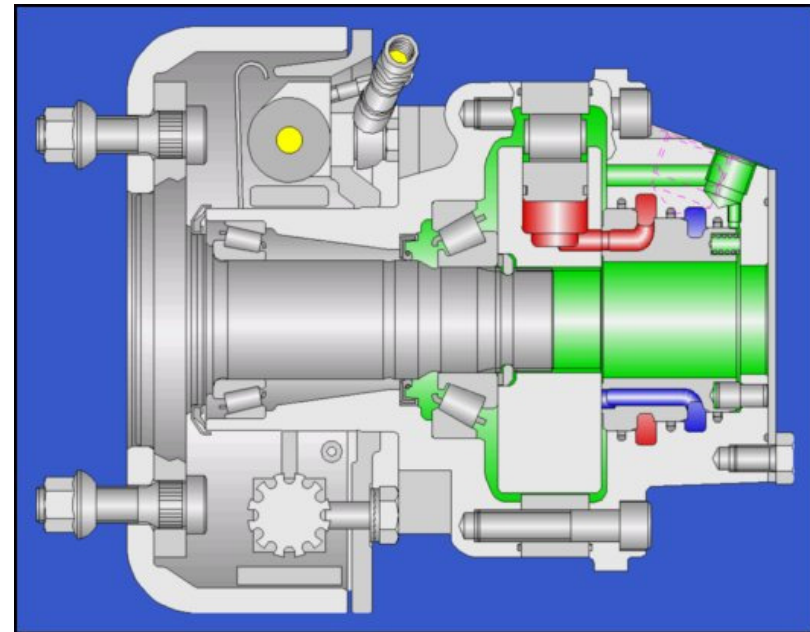
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MCR Operating principle.

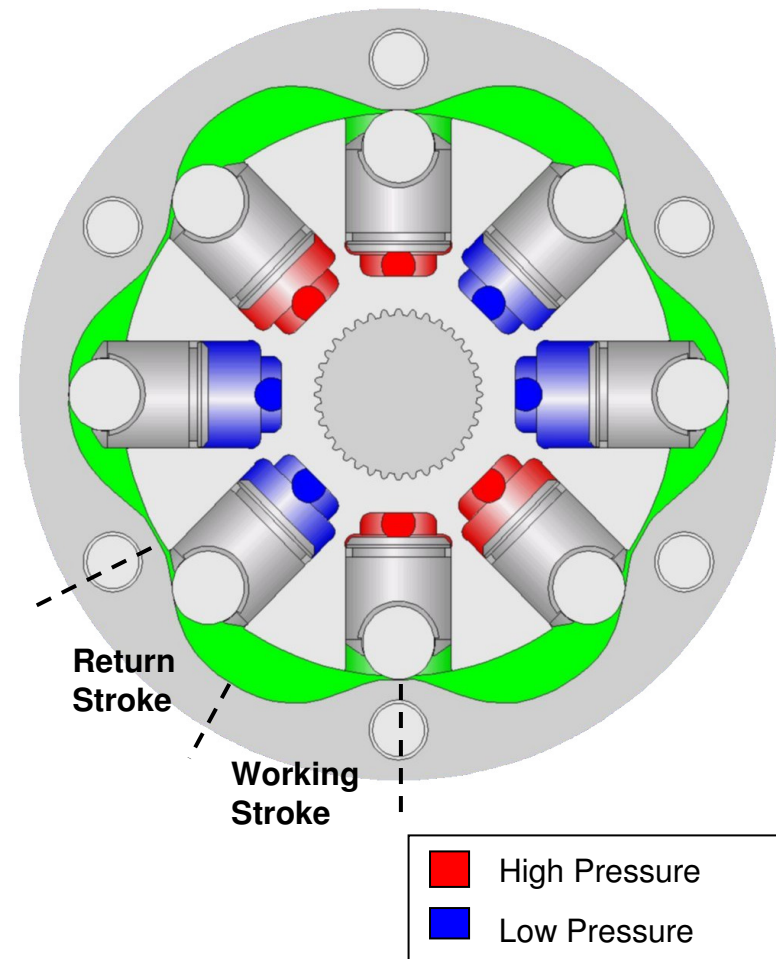
- This motor section shows a complete overview of the main components of a typical drum braked motor.
- The cam and distributor are always fixed, only rotary group and shaft rotates.
- There is a pin between the distributor and rear case (called stop pin) which is very important for the correct timing (otherwise noise, unsteady rotation, wear).



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Operating principal.

- The MCR motor converts hydrostatic energy into mechanical energy.
- Hydraulic fluid is directed from the motor inlet port in the rear case via the flow distributor through galleries to the cylinder block.
- The radially arranged pistons in the cylinder block bores face a pressure increase and perform via rollers a stroke movement against the cam ring.
- The reaction force at the cam ring generates a torque, which is transferred to a output shaft via splines in the cylinder block.
- If the torque exceeds the shaft load, the cylinder block turns, causing the pistons to stroke (working stroke). Once the end of a stroke is reached the piston is returned to its bore by the reaction force at the cam (return stroke) and the fluid is fed to the motor outlet port in the rear case.
- The output torque is produced by the force resulting from the pressure and piston surface. It increases with the pressure difference between the high- and low-pressure side.
- The output speed depends on the displacement and is proportional to the inward flow.
- Low speed: can go down to 0.5 rpm.



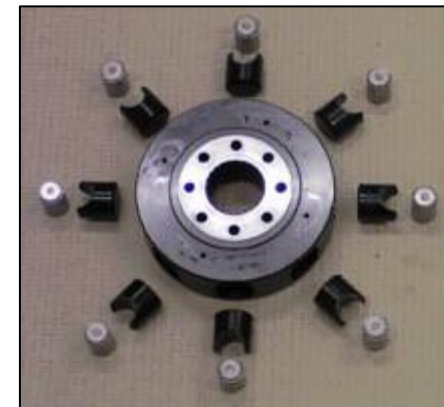
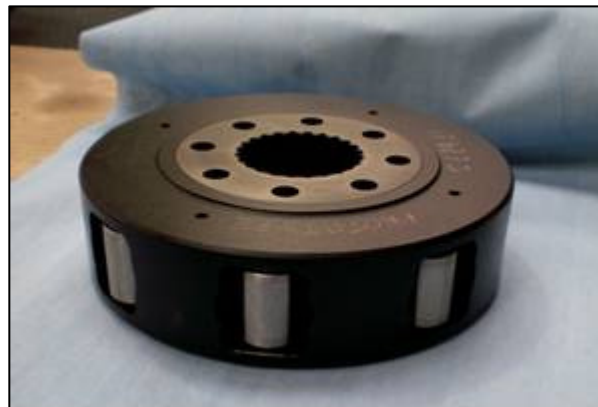
Point to note: Front case components

- **Bearings** In order for shaft to run true bearing locations must be concentric and the axis must be perpendicular to the vehicle mounting flange. Diameters for bearing cups must be correct (diameter and roundness) in order to grip the bearing cup during operation. Spinning bearing cups cause contamination and ruin motors.
- **Shaft seal** It is important that the seal is concentric with and perpendicular with the shaft. Sealing diameters in the front case/shaft must be correct. Shaft seals rely on a rough surface finish to retain the seal in the housing

Points to note: Rear case components

- **Distributors** These are tending towards the Machine from Cast option. Casting tolerances mean that we must take extra care to ensure there is sufficient material on the seal retaining areas to withstand the high pressures involved.
Diameters must be correct to ensure that the distributor can “travel” within the rear case.
- **Rear case** There are hidden galleries cast into the casings. On casings for flushing / 2 speed in particular these galleries can be complex. It is important to ensure these are free from contamination prior to the assembly stage.
- **Timing** The timing of the motor is controlled here. Bolt hole positions, stop pin positions are extremely important to ensure the motor functions correctly.
- **Timing faces** Timing faces must be flat and free from handling dents / scratches.

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Points to note: Rotary group

The rotary group components are the heart of the motor and must therefore be correct.

Pistons can be performing up to 3200 cycles per minute at pressures of up to 400 bar.

The basic function of the motors relies on the fit of these parts. It is extremely important that these components are clean and free from burrs prior to assembly.

- **Pistons/Piston Rings**
 - The efficiency of the motor depends mainly on minimising leakage. Steady speed operation of the motor depends on maintaining steady leakage.
 - Leakage is affected by :Piston / Bore fits
 - Piston ring scoring
 - Contamination between pistons / rings
 - Pistons should fit easily into the motor by hand (if force is required, then there is a problem). An example of such a problem is inadequate deburring or damage to the bores, poor fitting of piston rings.
 - Forcing the pistons into the bores damages the rings and will result in high/unsteady leakage.

Points to note: Rotary group

- **Timing Face** The basic function of the motor relies in the correct positional relationship between the holes on the timing face and the bores.
Timing faces must be flat and free from handling dents / scratches.
The efficiency of the motor depends mainly on minimising leakage.
Steady speed operation of the motor depends on maintaining steady leakage.
Leakage is affected by : Timing Face damage
Flatness
T/face damage is only important if it generates a connection A to B or A, B to case.
Damage in other areas will not affect the performance of the motor. If timing faces are not flat to the extent that there is separation of the faces, there will be high leakage to case.
- **Cams** The cam stroke determines the speed/power delivered by the motor.
Small changes in profile can affect the performance of the motor significantly.
Mounting bolt holes are designed to have sufficient material around them to withstand the huge loads transmitted through the motor.
The cam is hardened in order to cope with these loads.

Points to note: Distributor

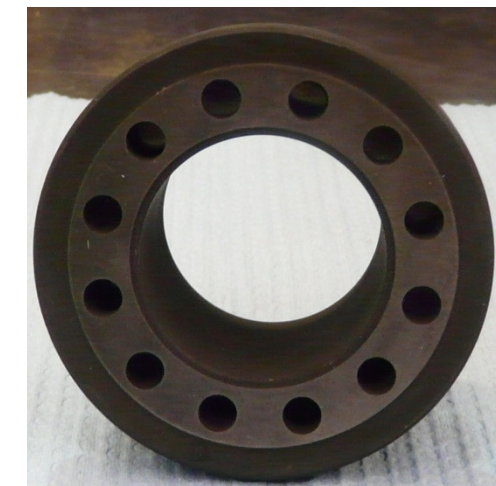
The distributor is assembled with springs. This provides the necessary force to keep the timing faces together during start-up.

The design of the distributor provides additional closing force (proportional to sum of pressures) during motor operation.

When assembling the distributor in the rear case, the assembly should be placed in a press, to ensure that the distributor “bounces” in the rear case.

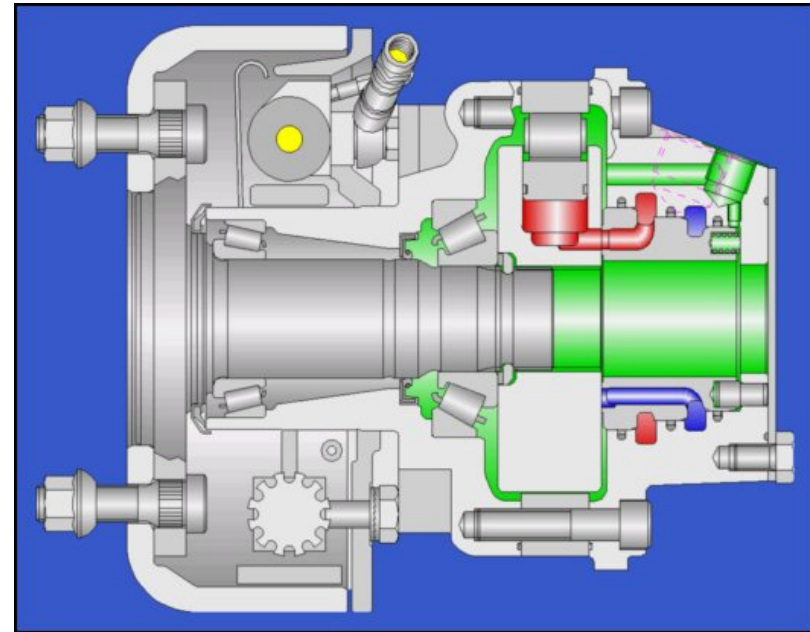
Note: Some motors have 2 stop pin positions. The assembly drawing should be referred to in order to determine which position should be used for the required direction.

Distributor seals should be allowed to “rest” before assembling distributor into the rear case. This prevents cutting of the seal as the parts are assembled.



Points to note: Brake

- Where mechanical dynamic braking is required, a drum brake may be specified.
- The drum brake is mounted directly onto the front case subassembly. Removal of the brake back plate requires disassembly of the front case sub assembly.
- Braking torque is provided by brake shoes acting on the inside of the drum.
- **Operation of brake:**
 - for dynamic braking: hydraulic brake fluid (special order required for mineral oil operation)
 - for holding brake: mechanical brake cable.



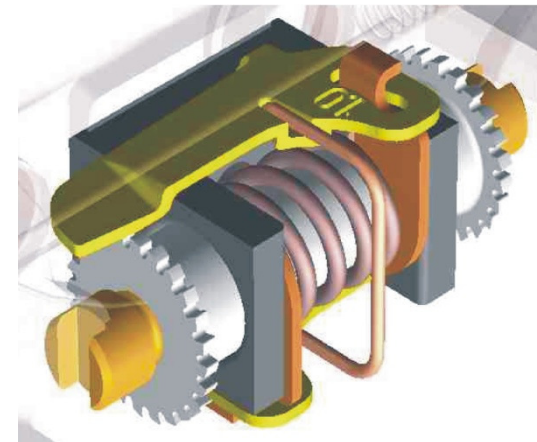
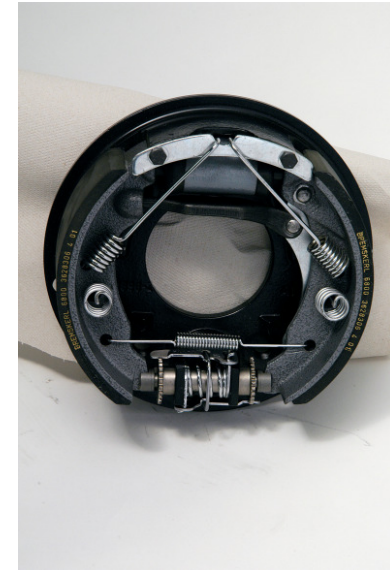
Brake components:

- Hydro duo-servo brake with automatic adjuster and integrated parking brake.
- Detailed description in [Technical Information TM 25/82](#)

Functional principle for the auto adjuster:

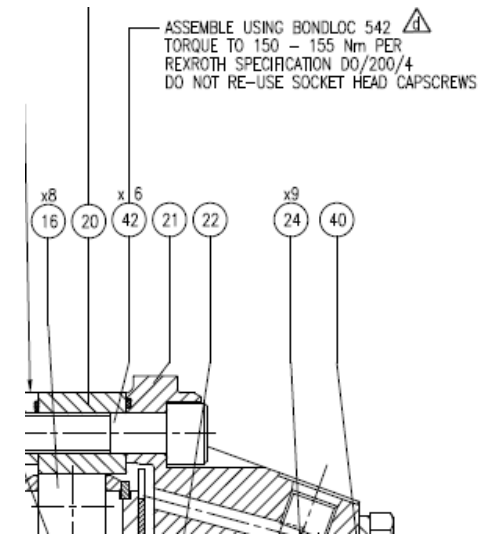
By applying pressure to the wheel cylinder, the rotation of the drum imposes the rotation of the brake shoes in the same direction by axial slipping the moving parts of the adjuster until they rest on the top of the anchor plate. The adjuster disc moves the adjuster lever downwards until it clicks into the next tooth of the ratchet adjuster wheel. On releasing the brake, the force of the centre spring in the adjuster, plus the force of the shoe return springs drives the adjuster lever upwards, rotating the bushing with the ratchet wheel for 1 tooth. The respective adjuster bolt is threaded out and the brake shoe is thereby readjusted.

- Detailed description in [Technical Information TM49/93](#)



Points to note: Bolt torques

- All bolts should be torqued to the settings shown on the assembly drawing using calibrated torque wrenches.
- The motors transmit high torques from the mounting flange to the shaft. In order to prevent the housings / cams slipping in relation to each other they must be clamped together. The amount of clamping force required is related to the amount of torque being transmitted through the motor. This force is obtained by the number of bolts used and the torques applied.
- If housings move due to a loose bolt the remainder of the bolts will quickly work loose.
- The bolt torques are calculated to give sufficient clamping force at the housing joints to cope with the torques transmitted through the motor housings. It is important that these are set correctly.
- Bondloc 542 should always be used. The calculated bolt torques rely on the lubrication offered by the Bondloc 542 to achieve the required clamping force at the joint.



Points to note: Seal damage

Primary causes of leaks are:

Cut/trapped O-rings, square section seals.

Shaft seal damage during assembly(splines, seal not seated in housing correctly).

Face seal not seated correctly or damaged during assembly.

Duo cone face seals not clean at assembly. High level of cleanliness is required to prevent failure and leakage from this seal type. **Note: front case sub assembly should always be air tested after assembly prior to assembling the rest of the motor.**

Loose plugs/bolts.

Points to note: Cleanliness

The nature of hydraulic circuits means that cleanliness is all important. Improving cleanliness in your area helps improve cleanliness overall.

Hydraulic circuits motors, pumps and valves all contain pistons operating in bores to high tolerances. These rely on oil film to prevent wear.

Contamination significantly reduces the life of components in hydraulic circuits.

Failure of 1 part often causes contamination in the circuit which then damages other components.

Sources of contamination:

Components not washed.

Dirty benches. Benches not cleaned down after removing damaged components.

Nylon from mallets used during assembly.

The list is unlimited, but every care should be taken to ensure cleanliness.

Bearing preload

The front case bearings are preloaded to 4 tons during assembly.

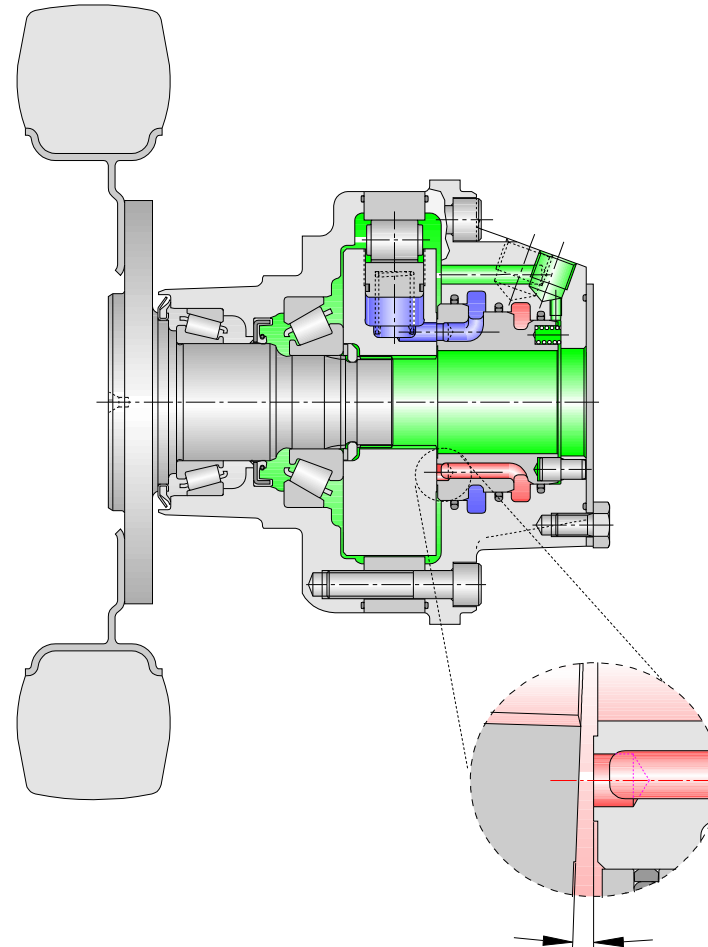
Why preload?

- Compresses the taper roller bearings.
- Stiffens the bearings to minimise shaft movement under load.
- Ensures the bearings are running correctly. Preload is recommended by bearing suppliers to obtain best results for radial and axial load capacity.
- Prevents separation of the timing faces.

Bearing preload

What happens if bearing preload is too low(radial load)?

- The bearings are loose.
- Excessive movement on shaft.
- Cylinder block moves with the shaft.
- Distributor can't follow as it is fixed in rear case.
- Timing faces separate.
- All pump flow goes to motor case drain(full flow).
- Vehicle stops- cannot be started(without removing flow and radial forces).
- Damage to pump.
- Will keep happening until preload is corrected.



Warranty handling

Data required to process claims:

- Warranty Claim Number
- Motor type
- Serial number
- Date of motor installation
- Date of motor failure
- Hours of operation
- Fault reported
- Fault found
- Repair work performed
- Value claimed - explanation of parts and materials