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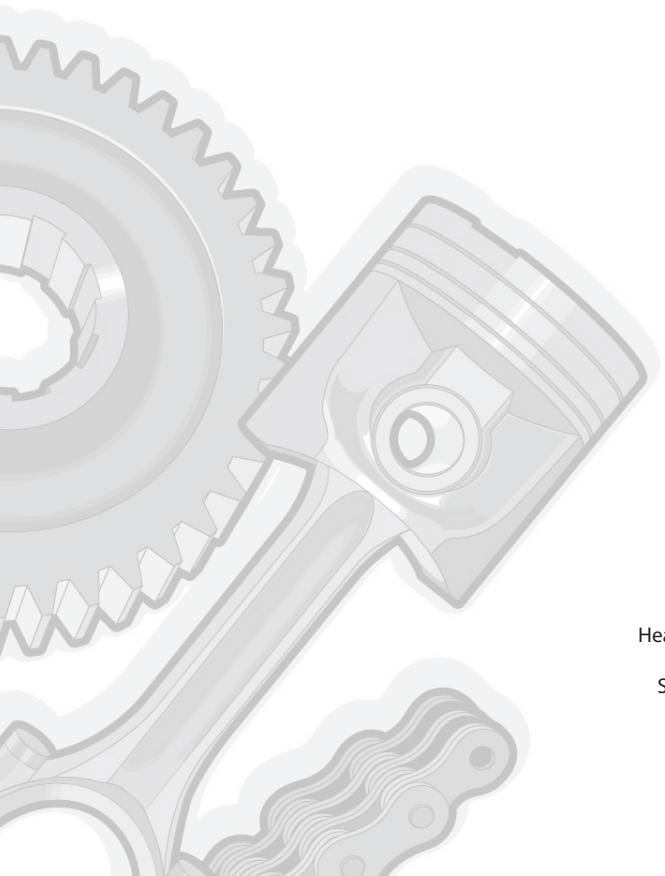

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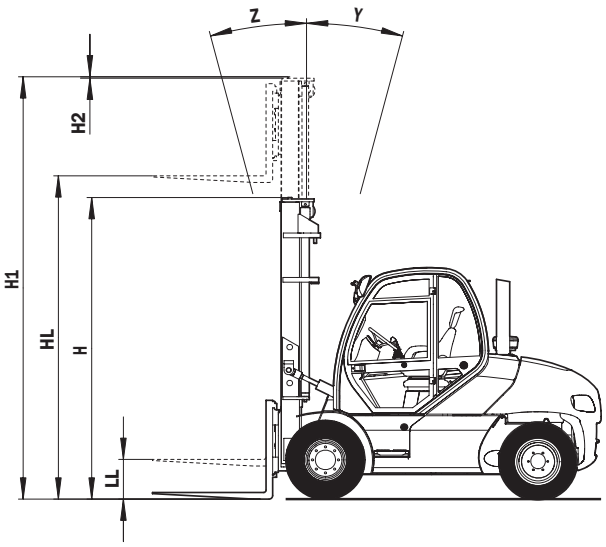
CHARACTERISTICS OF MASTS WITH ROLLERS

DOUBLE MAST WITH ALL-ROUND VISION							
MAST	HL	Z	Y	LL	H	H1	H2
3m60	3670	14°	12°	-	3191	4991	-
4m00	4070	14°	12°	-	3391	5391	-
4m50	4570	14°	12°	-	3641	5891	-

HL : Lift height in mm
Z : Forward tilting
Y : Backward tilting
LL : Free-acting lift in mm
H : Overall height with folded mast in mm
H1 : Overall height with spreaded out mast in mm
H2 : Carriage overshooting in mm



The fuel injector nozzle should be tested at the pressure in Table 1.

Leakage in 10 seconds ..... 0 drops

Table 1

Service Setting for the Fuel Injection Nozzle	
Color	**Injection Pressure**
Yellow	29.4 + 0.8 MPa (4264 + 116 psi)
Blue	29.4 + 0.8 MPa (4264 + 116 psi)
Red	29.4 + 0.8 MPa (4264 + 116 psi)

i01957629

Fuel Transfer Pump

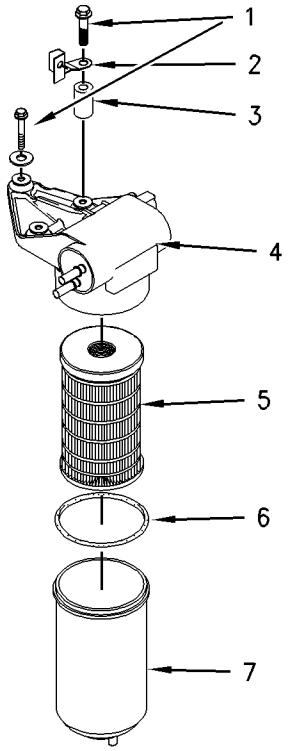


Illustration 12 g00986823

(1) Retaining bolts

(2) Clip

(3) Spacer

(4) Fuel transfer pump

Type ..... 12 or 24 volt electric motor

(5) Fuel filter element

(6) O ring

(7) Fuel filter bowl

Note: Tighten the fuel filter bowl by hand. Rotate the bowl 1/8 of a turn more by hand.

i01714153

Lifter Group

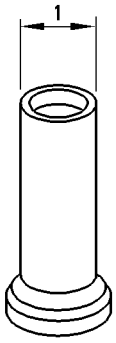


Illustration 13 g00629433

(1) Diameter of the lifter body .... 18.99 to 19.01 mm (0.7475 to 0.7485 inch)

Clearance of the lifter in the cylinder block bore ..... 0.04 to 0.09 mm (0.0015 to 0.0037 inch)

i01892700

Rocker Shaft

Note: The rocker shaft assembly for the 3 cylinder engine and the rocker shaft assembly for the 4 cylinder engine use the same components. The exception is the length of the rocker shaft.

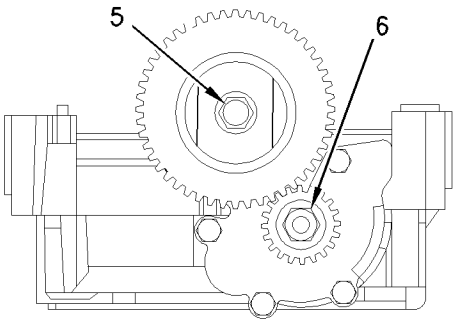


Illustration 38 g00989519

Idler gear and pump gear

Note: Replace the idler gear bolt (5) and the nut for the oil pump gear (6).

(5) Tighten the idler gear bolt to the following torque. ..... 26 N·m (19 lb ft)

Note: Set the engine to the TC position. Refer to Testing and Adjusting , “Finding Top Center Position for No. 1 Piston”. Install the balancer. Refer to the Disassembly and Assembly manual. Install the gear for the oil pump and tighten the nut (6).

(6) Tighten the nut to the following torque. .... 95 N·m (70 lb ft)

Tighten the bolts that hold the balancer to the cylinder block to the following torque. ..... 54 N·m (40 lb ft)

Four Cylinder and Three Cylinder Engines without Balancer Group

Type ..... Gear-driven differential rotor

Number of lobes

Inner rotor 5
Outer rotor 6

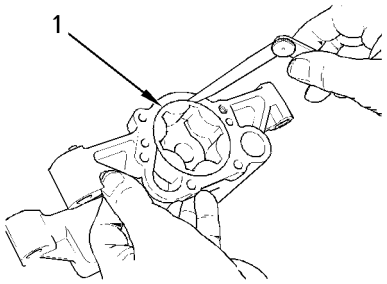


Illustration 39 g00938064

The oil pump

(1) Clearance of the outer rotor to the body ..... 0.152 to 0.330 mm (0.0059 to 0.0129 inch)

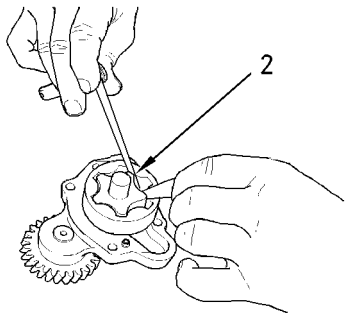


Illustration 40 g00938061

Checking the clearance

(2) Clearance of inner rotor to outer rotor ..... 0.040 to 0.127 mm (0.0015 to 0.0050 inch)

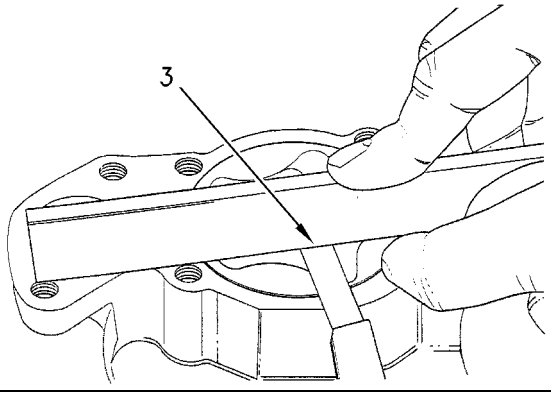


Illustration 41 g00938799

Checking the end play

(3) End play of rotor assembly

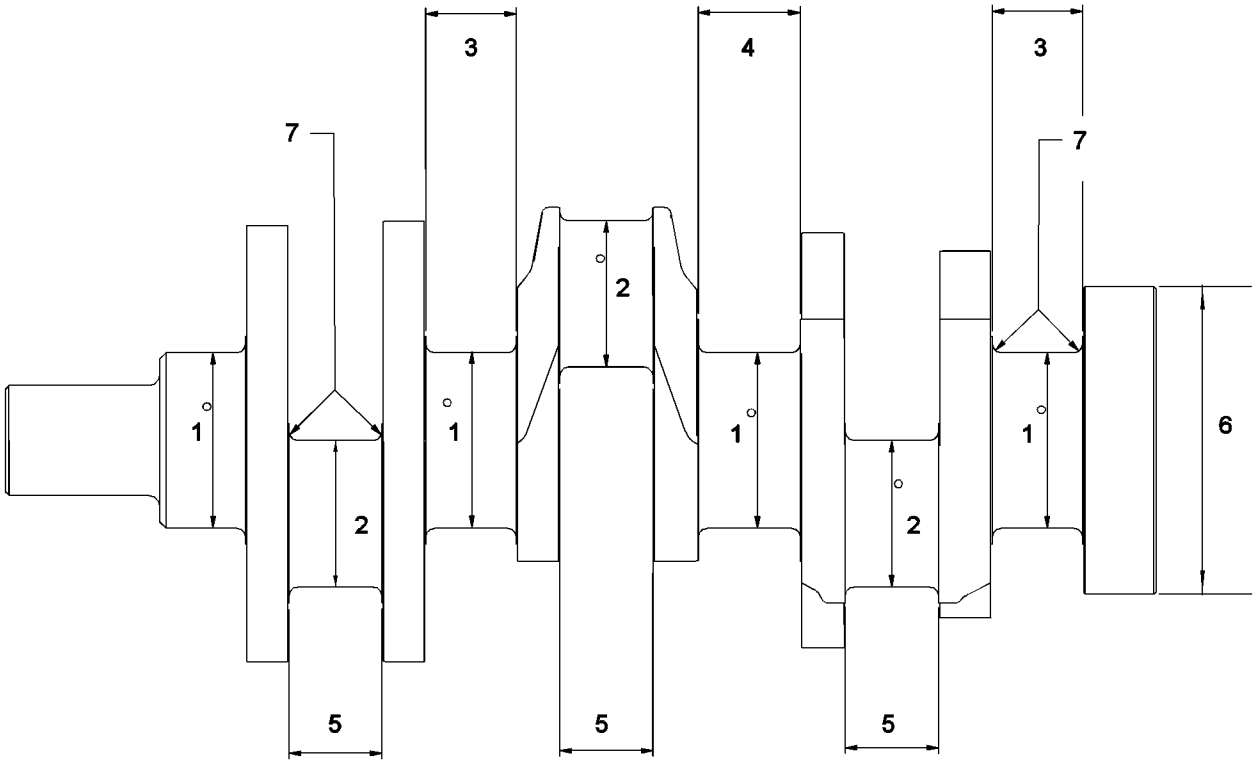


Illustration 62 g01017747

The crankshaft for the three cylinder engine

The crankshaft for the three Cylinder engine

Note: Lubricate the threads of the bolts with clean engine oil before installation.

(1) Tighten the three bolts for the crankshaft pulley to the following torque. ..... 115 N·m (85 lb ft)

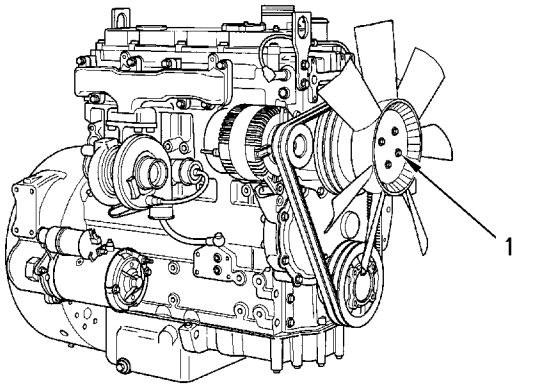
Note: Recheck the torque of the bolts (1) twice.

(2) Thrust block

(3) Crankshaft pulley

i01958344

Fan Drive



g00926178

Illustration 80

A typical fan drive

(1) Tighten the bolts for the fan to the following torque. ..... 22 N·m (16 lb ft)

Tighten the bolts that secure the fan drive pulley to the hub to the following torque (not shown). .. 22 N·m (16 lb ft)

Fan drive housing

Tighten the bolts that secure the fan drive housing to the cylinder head to the following torque (not shown). ..... 44 N·m (32 lb ft)

Bearing bore for the housing .. 61.986 to 62.005 mm (2.4404 to 2.4411 inch)

Outer bearing diameter ..... 61.987 to 62.000 mm (2.4404 to 2.4409 inch)

Interference fit for the bearing ..... 0.014 to minus 0.018 mm (0.0006 to minus 0.0007 inch)

The outer diameter of the shaft ... 25.002 to 25.011 mm (0.9843 to 0.9847 inch)

Maximum permissible end play of the shaft .. 0.20 mm (0.0079 inch)

i01721280

Engine Lifting Bracket

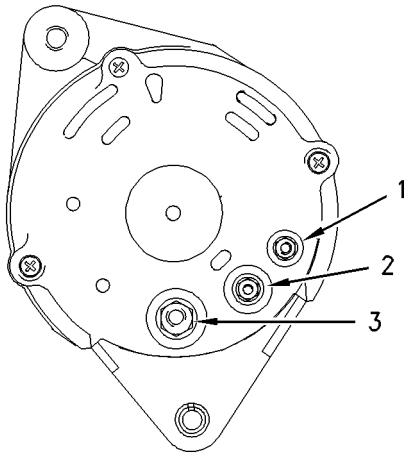
All engines are equipped with two engine lifting brackets.

Tighten the two bolts on each engine lifting bracket to the following torque. .. 44 N·m (32 lb ft)

i01958367

Alternator

12 Volt and 24 Volt Alternator



g00959541

Illustration 81

A typical alternator

(1) Tighten terminal nut “W” to the following torque. ..... 2 N·m (17 lb in)

(2) Tighten terminal nut “D+” to the following torque. ..... 4.3 N·m (38 lb in)

(3) Tighten terminal nut “B+” to the following torque. ..... 4.3 N·m (38 lb in)

Tighten the pulley nut (not shown) to the following torque. ..... 80 N·m (59 lb ft)

Disassembly and Assembly Section

i01939024

Fuel Priming Pump - Remove and Install

Removal Procedure

Start By:

a. Remove the assembly of the filter case and the fuel filter element. Refer to this Disassembly and Assembly Manual, “Fuel Filter Base - Remove and Install”.

Note: There is an option for the three cylinder engine. The fuel priming pump and the fuel filter can be installed onto the application rather than onto the engine. If this is the case, refer to the appropriate OEM information as well as this text.

Note: Put identification marks on all fuel hose assemblies and on all tube assemblies for installation purposes. After being disconnected, plug all fuel hose assemblies and plug all tube assemblies. This helps prevent fluid loss, and this helps to keep contaminants from entering the system.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

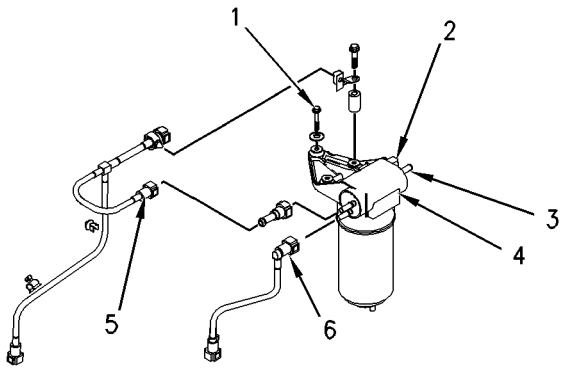


Illustration 1 g00952432
Typical example

1. Disconnect the tube assembly (5). Disconnect the tube assembly (6). Install dust covers onto the connectors for the fuel priming pump.

2. Disconnect the fuel return line from the connector (3). Install a dust cover to the connector (3).

3. Disconnect the harness assembly from the connector (2).

4. Support the fuel priming pump. Remove the three setscrews (1) and discard the rubber washers. Remove the fuel priming pump (4).

Installation Procedure

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

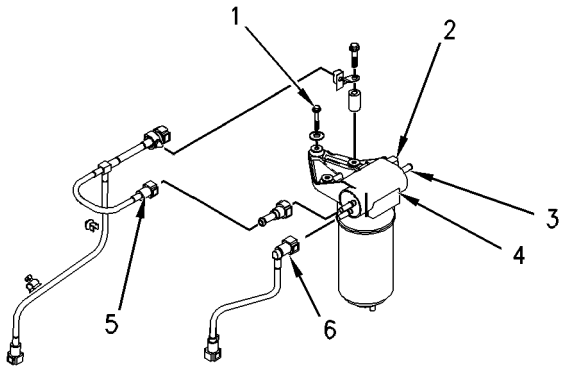


Illustration 2 g00952432
Typical example

1. Clean the external surfaces of the fuel priming pump (4). Position the fuel priming pump (4) and install the setscrews (1) and new rubber washers.

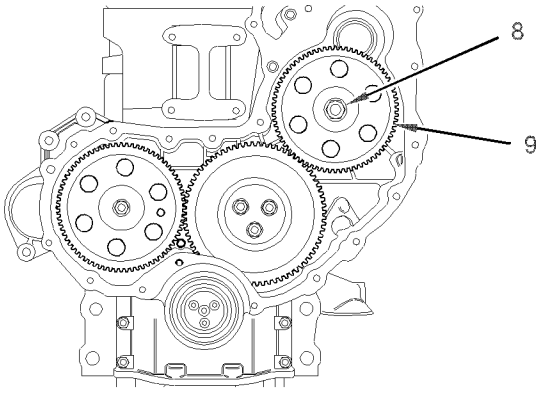


Illustration 23 g01011369

Typical example

Note: Ensure that the mating surfaces of the fuel injection pump gear and the shaft of the fuel injection pump are clean. Lubricate the threads of the shaft for the fuel injection pump. The nut (8) must turn freely until contact is made with the fuel injection pump gear.

5. Position the fuel injection pump gear (9) onto the shaft of the fuel injection pump. Install the washer and the nut (8). Rotate the fuel injection pump gear (9) in a counterclockwise direction in order to remove the backlash. Tighten the nut (8) to a torque of 24 N·m (17 lb ft).

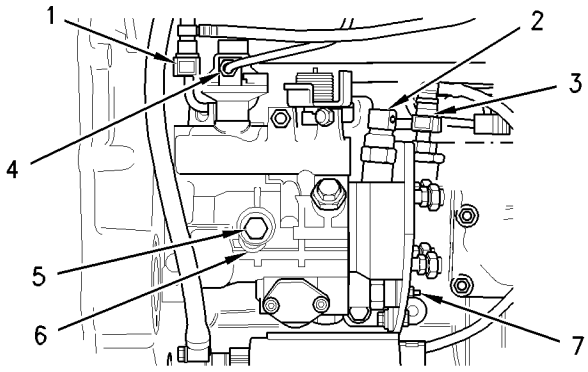


Illustration 24 g00956204

Typical example

6. Connect the harness assembly to the timing advance solenoid (7).

7. Connect the harness assembly (2).

8. Remove all of the dust caps from the connectors on the fuel injection pump. Remove all of the plugs from the fuel hose assemblies and from the tube assemblies.

9. Connect the fuel line (3), the fuel return line (1), and the tube assembly (4) to the fuel injection pump.

10. Loosen the locking screw (5). Move the spacer (6) in order to prevent the locking screw (5) from tightening against the shaft of the fuel injection pump. Tighten the locking screw (5) to a torque of 12 N·m (106 lb in).

Note: The spacer (6) must be correctly positioned and locking screw (5) must be tightened in order to prevent the locking screw from contacting the shaft of the fuel injection pump.

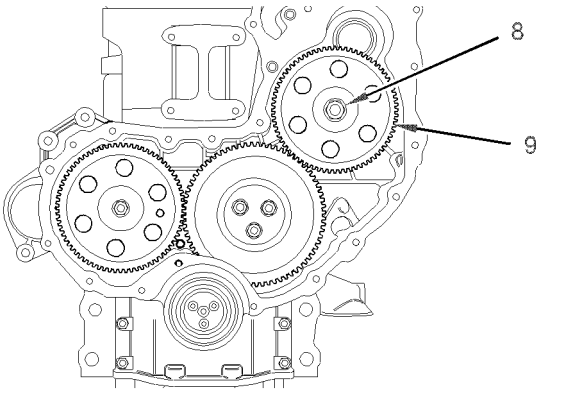


Illustration 25 g01011369

Typical example

11. Tighten the nut (8) to a torque of 88 N·m (65 lb ft).

End By:

a. Install the front cover. Refer to this Disassembly and Assembly Manual, “Front Cover - Remove and Install”.

b. Install the crankshaft pulley. Refer to this Disassembly and Assembly Manual, “Crankshaft Pulley - Remove and Install”.

c. Install the fuel injection lines. Refer to this Disassembly and Assembly Manual, “Fuel Injection Lines - Install”.

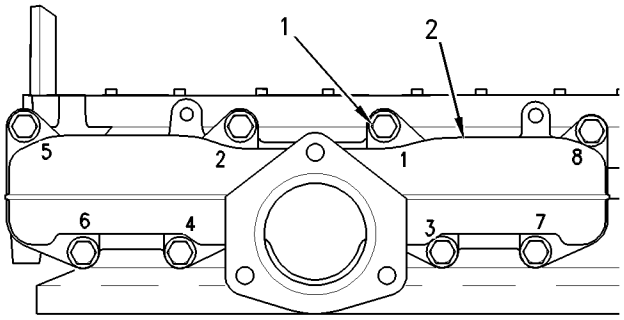


Illustration 46 g00951398

1. Loosely install two suitable studs into the holes (5 and 8) as guides.

Note: Do not use any sealant on the exhaust manifold gasket.

2. Position the new exhaust manifold gasket onto the studs in the cylinder head. Position the exhaust manifold (2) onto the studs. Install the setscrews (1) finger tight in order to secure the exhaust manifold to the cylinder head.

3. Remove the two studs and install the remaining setscrews (1). Ensure that the setscrews (1) are tightened in the sequence that is shown in Illustration 46. Tighten the setscrews evenly to a torque of 33 N·m (24 lb ft).

End By:

a. Install the turbocharger, if equipped. Refer to this Disassembly and Assembly Manual, “Turbocharger - Install”.

i01946915

Exhaust Elbow - Remove and Install (Option for Four Cylinder Engines Only)

Removal Procedure

Start By:

a. Remove the exhaust pipe. Refer to the OEM information for the correct procedure in order to remove the exhaust pipe.

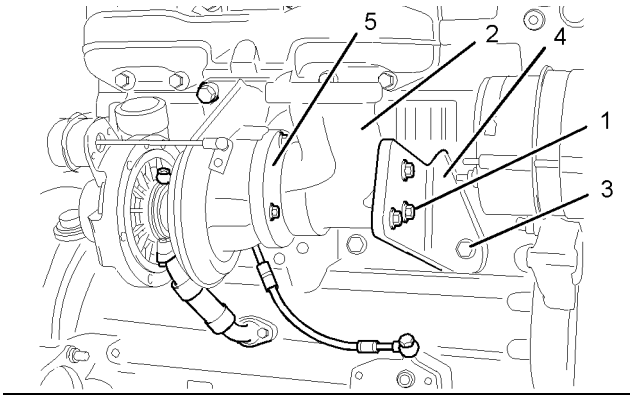


Illustration 47 g01013687

Typical example

1. Remove the setscrews (1) from the exhaust elbow (2). Remove the setscrews (3) and remove the bracket (4) from the cylinder block. Remove the exhaust elbow (2) from the exhaust adapter (5).

6. Set the diameter of the cutter (3) to the correct size for the valve seat to be cut. Refer to the Specifications Manual, “Cylinder Head Valves” for the correct diameter. Position the reamer (2) of the tool (1) into the appropriate valve guide. Carefully turn the handle in a clockwise direction and gradually move the reamer (2) into the valve guide until the valve guide is reamed to the finished size.

7. Continue to turn the handle in a clockwise direction in order to cut the valve seat insert. Remove the minimum amount of material in order to ensure a good valve seat. Keep the valve seat as narrow as possible.

8. Remove the tool (1). Clean the debris from the valve guide and the valve seat.

9. Repeat Step 6 to Step 8 in order to cut all of the appropriate valve seats.

End By:

a. Install the inlet valves and the exhaust valves. Refer to this Disassembly and Assembly Manual, “Inlet and Exhaust Valves - Remove and Install”.

i01958098

Engine Oil Filter Base - Remove and Install

Removal Procedure for an Oil Filter with a Separate Filter Element

Note: This procedure is for the removal of an oil filter with an oil filter housing and a separate oil filter element.

Note: The oil filter can be installed vertically or the oil filter can be installed horizontally.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

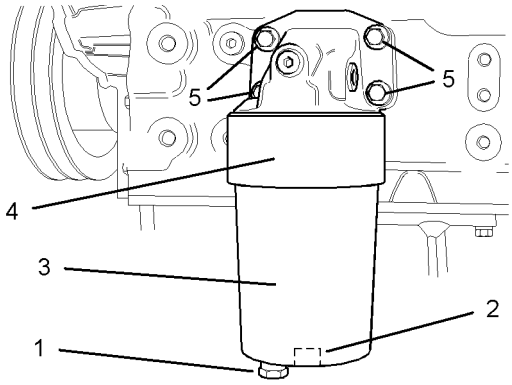
NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

1. Remove all dirt, oil, and grease from the engine oil filter assembly and from the drain plug of the engine oil pan. Place a suitable container beneath the drain plug of the engine oil pan.

2. Operate the engine until the engine is warm. Stop the engine.

3. Remove the oil drain plug and the O-ring from the engine oil pan. Drain the engine oil into the container for storage or disposal.



g01018261
Illustration 60
Typical example

Note: The drain plug (1) in the horizontal type of oil filter is installed in the filter head (4) instead of the oil filter housing (3). Do not remove the drain plug (1) from this type of oil filter.

4. Place a suitable container beneath the drain plug (1) in the oil filter housing (3). Remove the drain plug (1) from the oil filter housing (3) and remove the O-ring from the drain plug (1). Discard the O-ring. Collect any engine oil that drains from the oil filter housing (3).

5. Install a ratchet with a 1/2 inch square drive into the recess (2) in the base of the oil filter housing (3) in order to remove the oil filter housing.

i01958101

Engine Oil Pump - Remove (Engines Without a Balancer)

Removal Procedure

Start By:

a. Remove the engine oil pan. Refer to this Disassembly and Assembly Manual, “Engine Oil Pan - Remove and Install”.

Note: This procedure is for the removal of the engine oil pump on engines that are not equipped with a balancer. Refer to this Disassembly and Assembly Manual, “Balancer Group - Remove” for information on the removal of the engine oil pump on engines that are equipped with a balancer.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

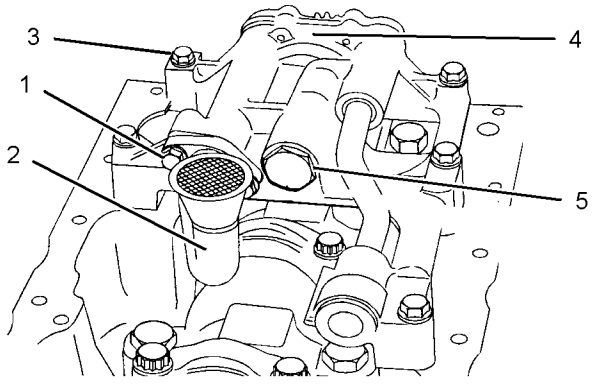


Illustration 80 g01019045

1. Remove the setscrews (1) and the suction pipe (2).

2. Remove the setscrews (3). Remove the assembly of the engine oil pump (4) from the cylinder block.

3. If necessary, remove the pressure relief valve (5) from the assembly of the engine oil pump (4). Refer to this Disassembly and Assembly Manual, “Engine Oil Relief Vave - Remove and Install”.

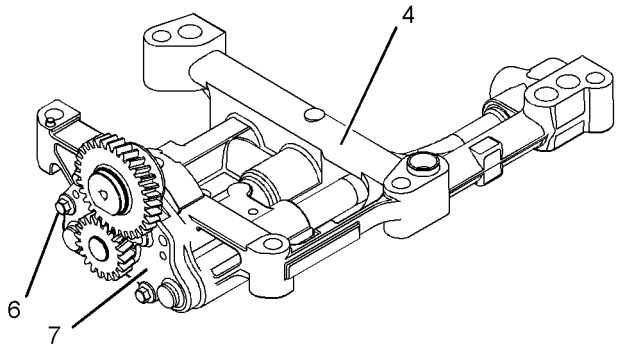


Illustration 81 g01019047

4. Remove the setscrews (6). Remove the engine oil pump (7) from the assembly of the engine oil pump (4).

5. If necessary, remove the setscrews and remove the front cover assembly from the engine oil pump (7) in order to inspect the components within the engine oil pump.

i01958102

Engine Oil Pump - Install (Engines Without a Balancer)

Installation Procedure

Note: This procedure is for the installation of the engine oil pump on engines that are not equipped with a balancer. Refer to this Disassembly and Assembly Manual, “Balancer Group - Install” for information on the installation of the engine oil pump on engines that are equipped with a balancer.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
If any of the parts on the engine oil pump are worn or damaged, the entire pump must be replaced.

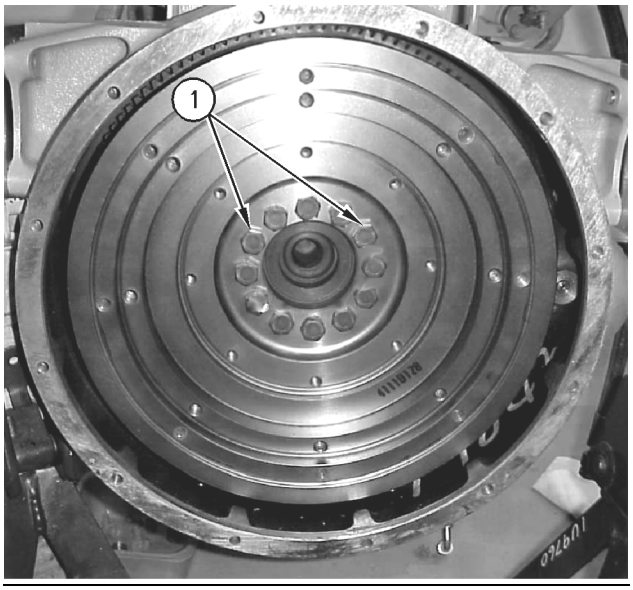


Illustration 106 g00905926

6. Install most of the setscrews (1) finger tight. Remove the guide studs (2). Install the remainder of the setscrews (1).

7. Tighten the setscrews (1) to a torque of 105 N·m (77 lb ft).

8. Check the alignment of the flywheel (3) with the crankshaft. Refer to the Testing and Adjusting Manual, “Flywheel - Inspect”.

i01963624

Crankshaft Rear Seal - Remove

Removal Procedure

Start By:

a. Remove the flywheel. Refer to this Disassembly and Assembly Manual, “Flywheel - Remove”.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

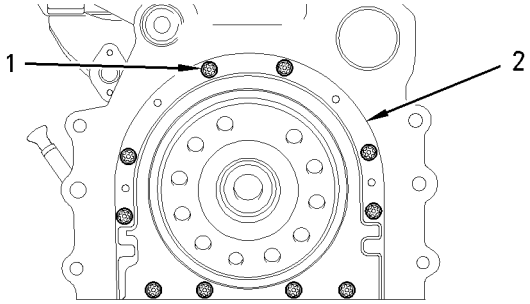


Illustration 107 g00991388

Note: The assembly of the crankshaft rear seal (2) is nonserviceable. If the assembly of the crankshaft rear seal (2) is removed, the assembly must be replaced.

1. Remove the setscrews (1) from the assembly of the crankshaft rear seal (2).

2. Remove the assembly of the crankshaft rear seal (2) from the cylinder block. Discard the assembly of the crankshaft rear seal (2).

i01963627

Crankshaft Rear Seal - Install

Installation Procedure

Note: The crankshaft rear seal and the housing for the crankshaft rear seal are manufactured as a one-piece assembly. The assembly of the crankshaft rear seal uses ten setscrews in order to fasten the assembly to the cylinder block.

Note: The assembly of the crankshaft rear seal is lubricated during manufacture. Do not lubricate the seal or the crankshaft flange before installation.

Note: Inspect the crankshaft rear seal and replace the assembly if there is the slightest sign of damage to the seal.

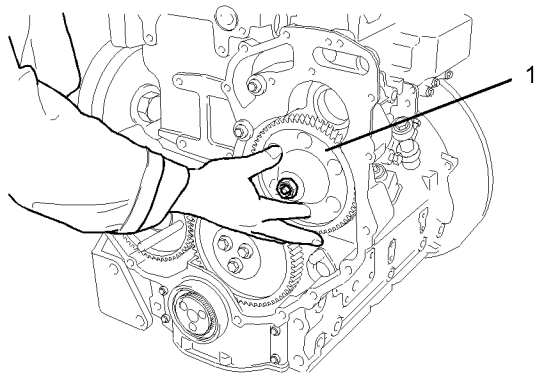


Illustration 127 g01021972

Typical example (Bosch drive gear)

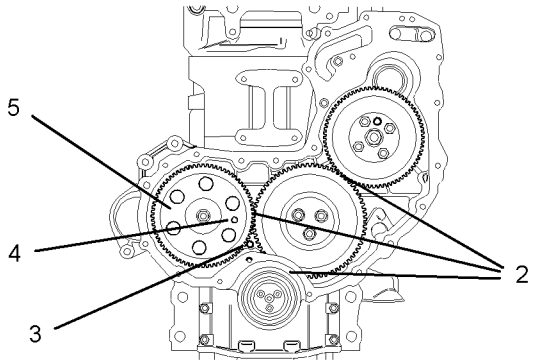


Illustration 128 g01021973

Typical example (Delphi fuel pump drive gear)

Note: Care must be taken in order to ensure that the fuel injection pump timing is not lost during the removal of the fuel injection pump and/or fuel injection pump gear. Carefully follow the appropriate instructions in order to remove the fuel injection pump and/or fuel injection pump gear.

Note: If necessary, remove the glow plugs in order to allow the crankshaft to rotate more freely. Refer to this Disassembly and Assembly Manual, “Glow Plugs - Remove and Install”.

1. Rotate the crankshaft to top dead center. Refer to the Testing and Adjusting Manual, “Finding Top Center for No. 1 Piston”. Apply hand pressure to the fuel injection pump gear (1) in a counterclockwise direction in order to remove the backlash (2) in the gears. Mark the orientation of each of the gears for installation purposes.

Note: Timing pins are used in order to time the engine at top dead center. The timing pins are a slip fit. Do not use excessive force to install the timing pins. Do not use the timing pins to lock the engine during repairs.

2. Insert the 27610211 Crankshaft timing pin (3) through the housing (front) and into the web of the crankshaft. Insert the 27610212 Camshaft timing pin (4) through the camshaft gear (5) and into the housing (front).

3. Remove the rocker shaft. Refer to this Disassembly and Assembly Manual, “Rocker Shaft and Pushrod - Remove”.

Note: The fuel injection pump must be locked before proceeding further.

Note: The three cylinder engine is equipped with the Delphi DP210 fuel injection pump.

Note: The four cylinder engine can be equipped with either the Delphi DP210 or the Bosch EPVE fuel injection pump. The two types of fuel injection pump have a different procedure for locking the fuel injection pump shaft.

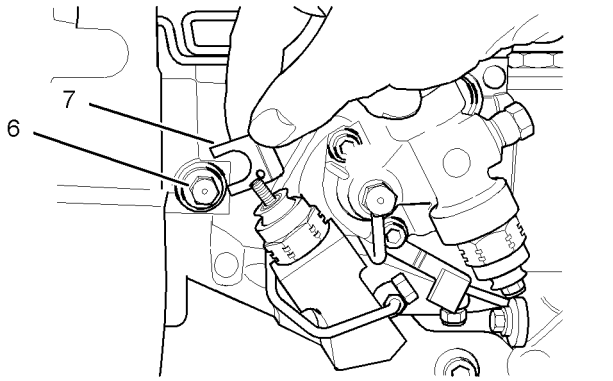


Illustration 129 g01022971

Four cylinder engine only

4. In order to lock the Bosch EPVE fuel injection pump, loosen the locking screw (6) and remove the washer (7). Tighten the locking screw (6) to a torque of 31 N·m (23 lb ft).

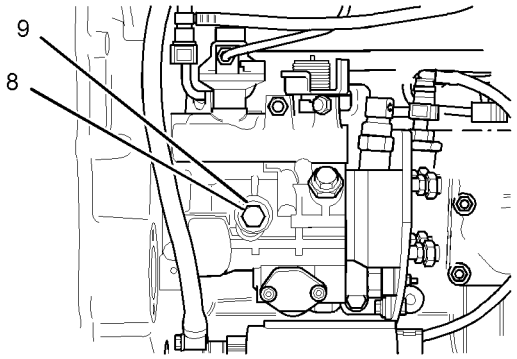


Illustration 130 g01022972

Three cylinder and four cylinder engines

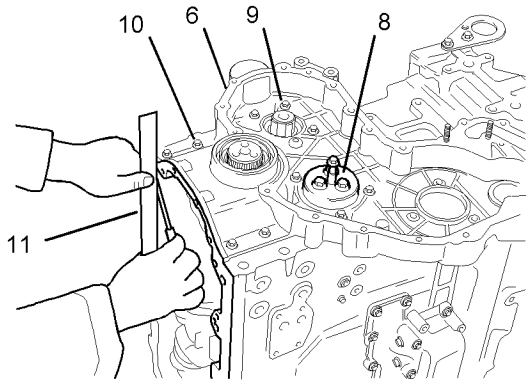


Illustration 158 g01024551

Typical example

4. Install the 27610216 Alignment Tool (8) into the recess within the cylinder block. Install the front housing (6) onto the cylinder block.

5. Install the setscrews (9). Tighten the setscrews (9) finger tight. Except for the two holes with the temporary studs (1), install the setscrews (10). Tighten the setscrews (10) finger tight. Remove the two temporary studs (1). Install the remainder of the setscrews (10). Tighten the remaining two setscrews (10) finger tight.

6. Align the front housing (6) to the lower machined face of the cylinder block (11). Use a suitable straight edge and a feeler gauge to check the tolerance for the alignment (11). Refer to the Specifications Manual, “Front Housing and Covers” for further information.

7. With the alignment within tolerance, tighten the setscrews (9) and the setscrews (10) to a torque of 22 N·m (16 lb ft). Remove the alignment tool (8).

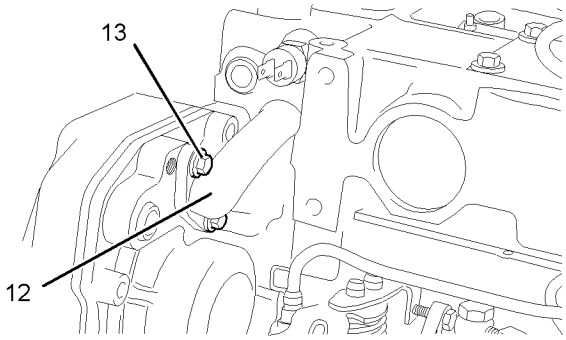


Illustration 159 g01024687

8. Install new O-rings onto the bypass tube (12). Apply POWERPART 21820221 Red Rubber Grease to the O-rings. Install the bypass tube (12) into the cylinder head. Install the setscrews (13).

End By:

a. Install the gear group (front). Refer to this Disassembly and Assembly Manual, “Gear Group (Front) - Install”.

b. Install the engine oil pan. Refer to this Disassembly and Assembly Manual, “Engine Oil Pan - Remove and Install”.

c. Install the fuel injection pump. Refer to the appropriate fuel injection pump within this Disassembly and Assembly Manual, “Fuel Injection Pump - Install”.

d. Install the alternator if the alternator was removed previously. Refer to this Disassembly and Assembly Manual, “Alternator - Install”.

e. Install the fan drive. Refer to this Disassembly and Assembly Manual, “Fan Drive - Remove and Install”.

f. At the appropriate time, fill the cooling system.

i01964528

Accessory Drive - Remove and Install

Removal Procedure

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

g. Remove the rocker shaft assembly and the pushrods. Refer to this Disassembly and Assembly Manual, “Rocker Shaft and Pushrod - Remove”.

h. Remove the glow plugs. Refer to this Disassembly and Assembly Manual, “Glow Plugs - Remove and Install”.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

Note: The removal procedure is identical for the three cylinder and the four cylinder engines.

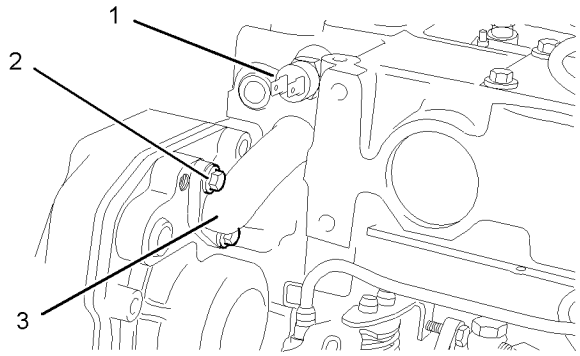


Illustration 181 g01039425
Typical example

1. Disconnect the harness assembly from the coolant temperature sensor (1).

2. Remove the setscrews (2). Remove the bypass tube (3) from the cylinder head (4). Remove the O-rings from the bypass tube (3).

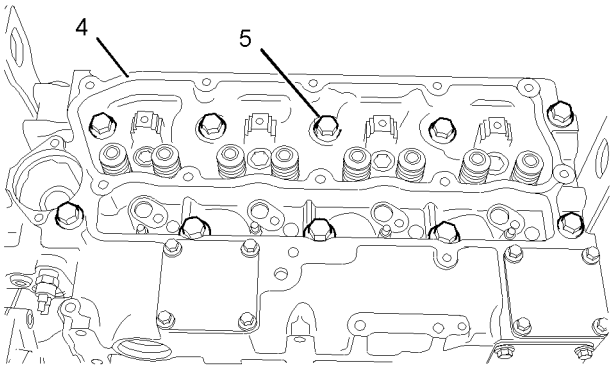


Illustration 182 g01039484
Typical example

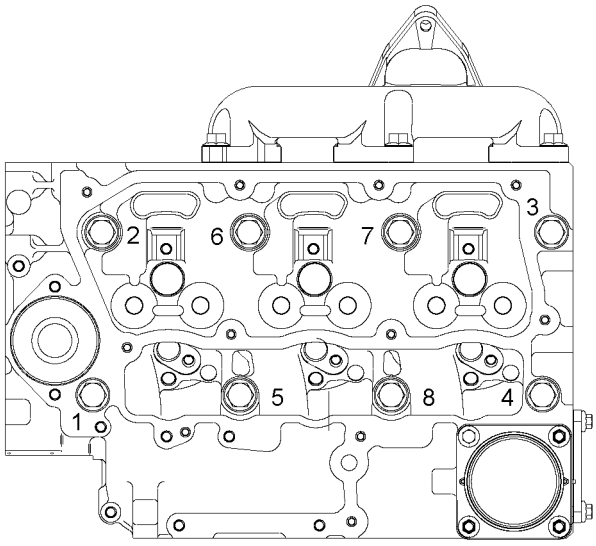


Illustration 183 g01039487
Sequence for tightening the setscrews for the three cylinder engine

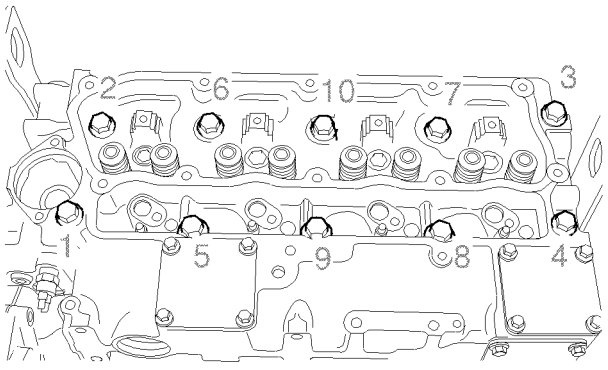


Illustration 184 g01039483
Sequence for tightening the setscrews for the four cylinder engine

i01979488

Balancer - Remove (Some 1104 Engines Only)

Removal Procedure

Table 25

Required Tools		
Part Number	**Part Name**	**Qty**
27610225	Timing Pin (Balancer)	1

Start By:

a. Remove the engine oil pan. Refer to this Disassembly and Assembly Manual, “Engine Oil Pan - Remove and Install”.

b. Remove the engine oil relief valve. Refer to this Disassembly and Assembly Manual, “Engine Oil Relief Valve - Remove and Install (Balancer Unit for the Engine)”.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

1. Put the No. 1 cylinder at top dead center on the compression stroke. Refer to this Testing and Adjusting Manual, “Fuel Injection Timing - Check”.

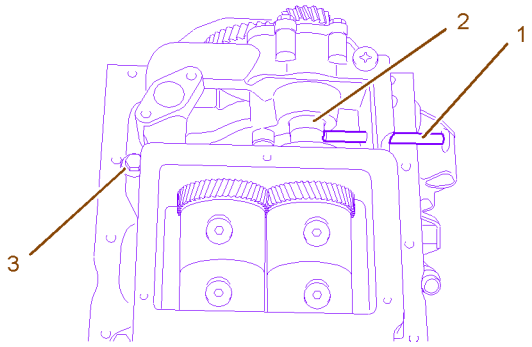


Illustration 207 g01042284

2. Install the 27610225 Timing Pin into the balancer. Ensure that the timing pin (1) is fully located into the drive shaft (2).

Note: The balancer is heavy. Take care when the balancer is lifted and/or when the balancer is lowered. If the engine is not inverted, support the balancer before removing the setscrews (3).

3. Refer to the Note above and remove the setscrews (3). Use a suitable lifting device to remove the balancer.

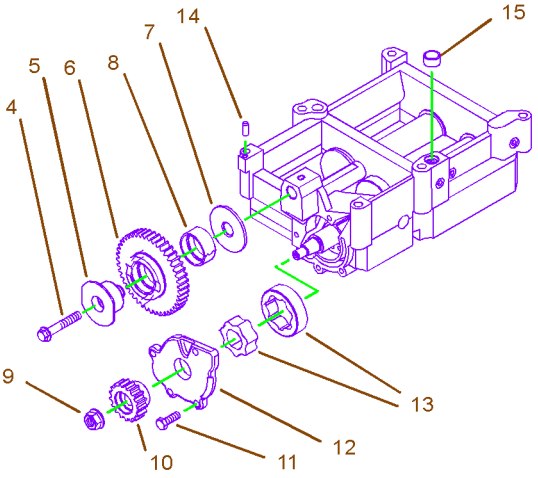


Illustration 208 g01042286

Note: The balancer is a nonserviceable item. Use the following procedure in order to remove the engine oil pump from the balancer.

4. Remove the setscrew (4) and the shaft (5). Remove the idler gear (6) and the thrust washer (7). Use a suitable adapter in order to press the bearing (8) from the idler gear (6). Discard the bearing (8).

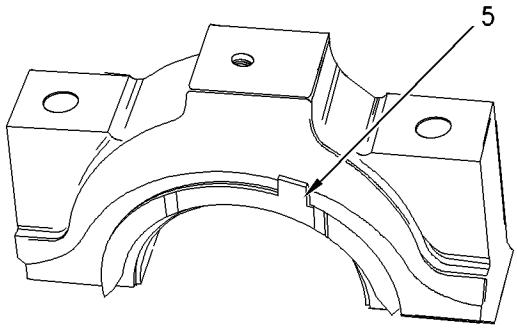


Illustration 229 g00934744
Typical example

6. Remove the lower half of the thrust washer (5) from each side of the appropriate main bearing cap.

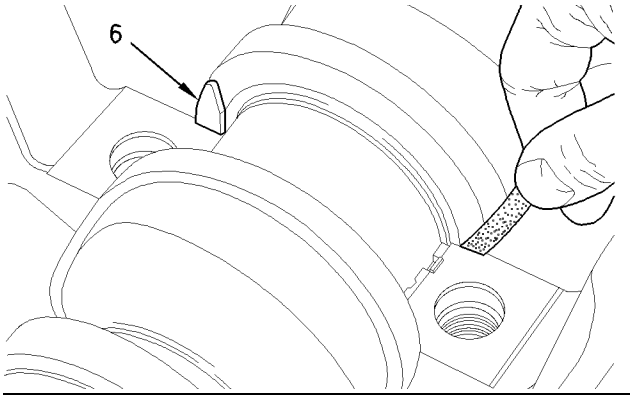


Illustration 230 g00947753
Typical example

7. Remove the upper half of the thrust washer (6) from each side of the appropriate main bearing in the cylinder block with a suitable tool. Carefully rotate the crankshaft while you push on the thrust washer (6). If necessary, move the crankshaft to the front or to the rear of the engine in order to loosen a tight thrust washer (6).

i01980478

Crankshaft Main Bearings - Install (Crankshaft in Position)

Installation Procedure

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

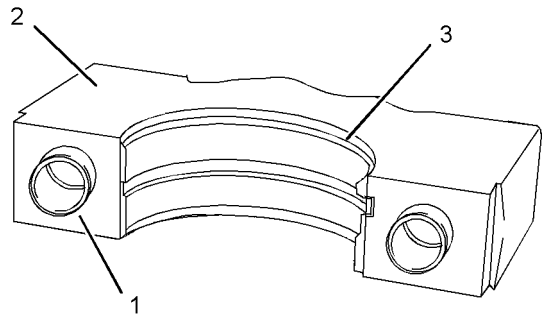


Illustration 231 g01026621

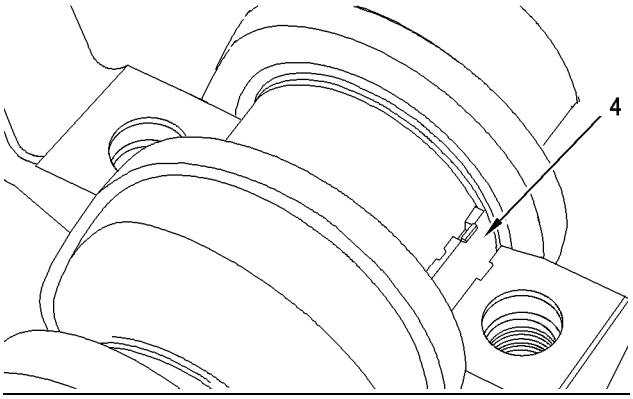


Illustration 232 g00934767

Note: Ensure that the lower bearing shells (3), the upper bearing shells (4), and the appropriate main bearing caps (2) are kept in sets and in the correct sequence for installation.

1. Ensure that all of the main bearing caps (2) are clean and dry. Ensure that both of the hollow dowels (1) are not damaged and that the hollow dowels are securely in place within the main bearing cap (2).

4. Remove all of the Plastic Gauge (1) before you install the bearing cap.

Note: When Plastic Gauge is used, the readings can sometimes be unclear. For example, all parts of the Plastic Gauge are not the same width. Measure the major width in order to ensure that the parts are within the specification range. Refer to the Specifications Manual, “Connecting Rod Bearing Journal” and refer to the Specifications Manual, “Main Bearing Journal” for the correct clearances.

i02011899

Glow Plugs - Remove and Install

Removal Procedure

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The removal procedure is identical for the three cylinder and the four cylinder engines. The illustrations show the four cylinder engine.

1. Turn the disconnect switch to the OFF position.

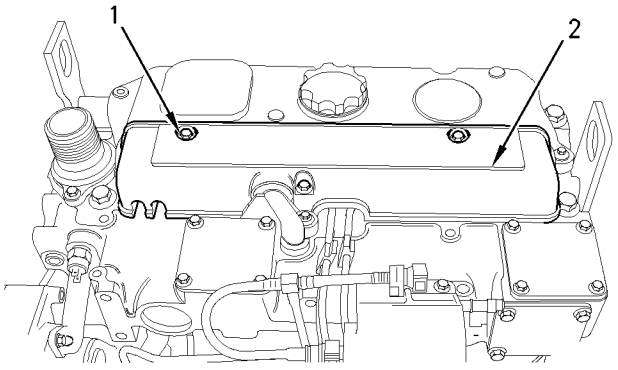


Illustration 255 g01001306
Typical example

2. Remove the setscrews (1). Remove the cover (2) from the cylinder head.

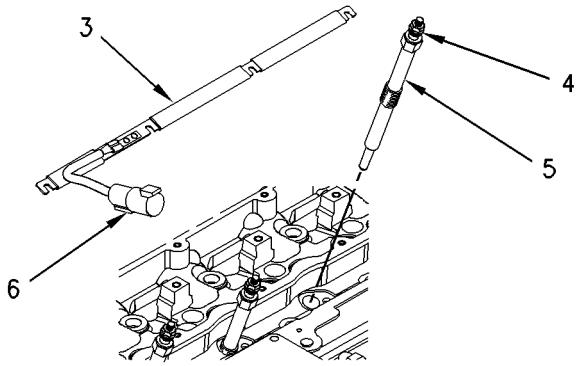


Illustration 256 g01001255

3. Disconnect the harness assembly (6).

4. Loosen the nuts (4) that secure the bus bar (3) to the glow plugs (5).

5. Remove the bus bar from the glow plugs.

6. Remove the glow plugs from the cylinder head.

Installation Procedure

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The installation procedure is identical for the three cylinder and the four cylinder engines. The illustrations show the four cylinder engine.

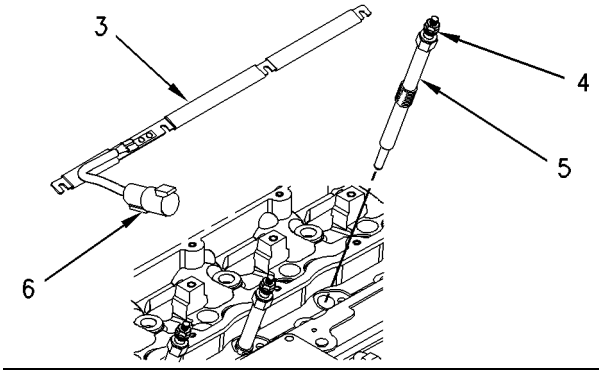


Illustration 257 g01001255
Typical example

1. Clean the threads of the glow plugs.

2. Install the glow plugs (5) into the cylinder head. Tighten the glow plugs to a torque of 18 N·m (13 lb ft).

1103 Engine Model Views

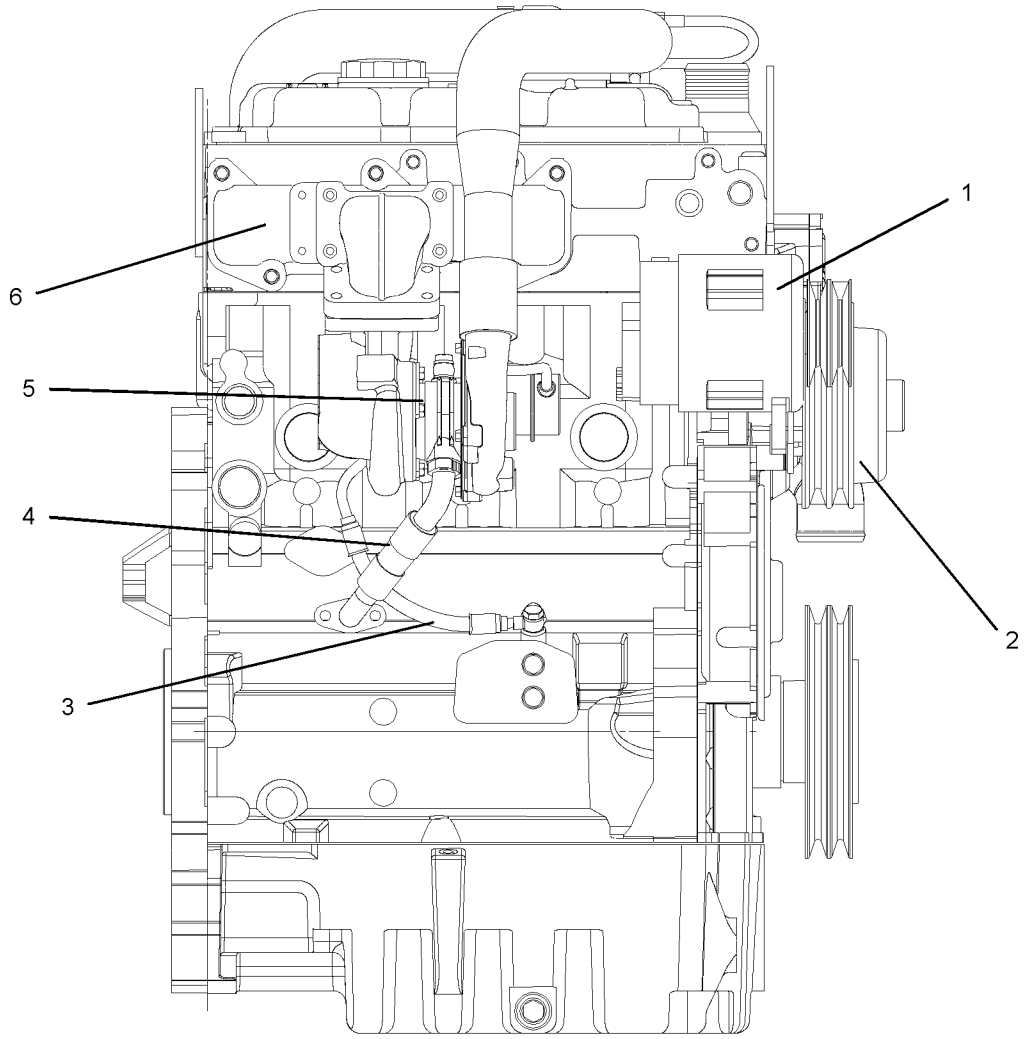


Illustration 5 g01011348

(1) Alternator
(2) Fan pulley
(3) Turbocharger oil supply
(4) Turbocharger oil drain
(5) Turbocharger
(6) Exhaust manifold

The cylinder block for the 1104 engine has five main bearings which support the crankshaft. Thrust washers on both sides of the center main bearing control the end play of the crankshaft.

The cylinder block for the 1103 engine has four main bearings which support the crankshaft. Thrust washers on both sides of the number three main bearing control the end play of the crankshaft.

A cylinder head gasket is used between the engine block and the cylinder head in order to seal combustion gases, water, and oil.

The engine has a cast iron cylinder head. The Inlet manifold is integral within the cylinder head. An inlet valve and an exhaust valve for each cylinder are controlled by a pushrod valve system. The ports for the inlet valves are on the left side of the cylinder head. The ports for the exhaust valves are on the right side of the cylinder head.

Pistons, Rings, and Connecting Rods

The pistons have a combustion chamber in the top of the piston in order to provide an efficient mix of fuel and air. The piston pin is off-center in order to reduce the noise level.

The pistons have two compression rings and an oil control ring. The groove for the top ring has a hard metal insert in order to reduce wear of the groove. The skirt has a layer of graphite in order to reduce wear.

The correct piston height is important in order to ensure that the piston does not contact the cylinder head. The correct piston height also ensures the efficient combustion of fuel which is necessary in order to conform to requirements for emissions.

Engines are equipped with connecting rods that are fracture split. The fracture split connecting rods are retained with torx screws. Connecting rods that are fracture split have the following characteristics:

- Higher integrity for the rod
- The splitting produces an accurately matched surface on each side for improved strength.
- Modern design

The connecting rod is matched to each cylinder. The piston height is controlled by the length of the connecting rod. Six different lengths of connecting rods are available in order to attain the correct piston height. The different lengths of connecting rods are made by machining the small end bearing off-center in order to form an eccentric bearing. The amount of the eccentricity of the bearing creates the different lengths of the connecting rods.

Each cylinder has a piston cooling jet that is installed in the cylinder block. The piston cooling jet sprays engine oil onto the inner surface of the piston in order to cool the piston.

Crankshaft

The crankshaft changes the combustion forces in the cylinder into usable rotating torque in order to power the engine. Vibration is caused by impacts from combustion along the crankshaft.

A gear at the front of the crankshaft drives the timing gears. The crankshaft gear turns the idler gear which then turns the following gears:

- Camshaft gear
- Fuel injection pump
- Lower idler gear which turns the gear of the lubricating oil pump

Lip type seals are used on both the front of the crankshaft and the rear of the crankshaft.

Camshaft

The engine has a single camshaft. The camshaft is driven by an idler gear in the front housing. The camshaft uses only one bearing on the front journal. The other journals rotate in the bore of the cylinder block. The front bearing and the camshaft bores in the cylinder block support the camshaft. As the camshaft turns, the camshaft lobes move the valve system components. The valve system components move the cylinder valves. The camshaft gear must be timed to the crankshaft gear. The relationship between the lobes and the camshaft gear causes the valves in each cylinder to open at the correct time. The relationship between the lobes and the camshaft gear also causes the valves in each cylinder to close at the correct time.

i01944991

Fuel System Pressure - Test

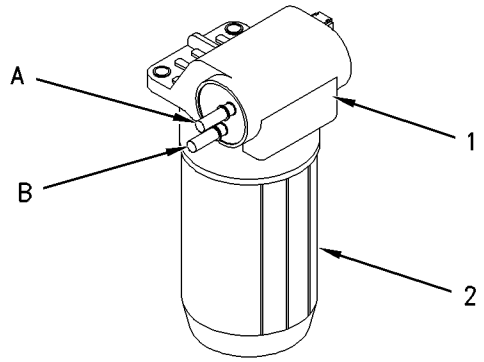


Illustration 25 g00928705

(A and B) Fuel outlet
(1) Fuel transfer pump
(2) Fuel filter

The pressure test measures the output pressure of the fuel transfer pump. Low fuel pressure and starting difficulty may be indications of problems with the fuel priming pump.

Check the Function of the Fuel Transfer Pump

1. Make a note of the location of the fuel lines from the fuel transfer pump. Remove the two lines from the outlets (A) and (B).
2. Connect two lengths of 5/16 inch rubber hose to outlets (A) and (B). Place the hoses into a suitable container that is capable of holding 3 L (3.17 qt) of fuel.
3. Energize the fuel transfer pump until a constant flow of fuel is running from the outlet for the supply for the fuel injection pump.

Note: The flow from the outlet for the return for the fuel tank will have a slower flow rate.

4. Measure the combined flow of both outlets with a stopwatch. Fuel flow should be a minimum of 2 L/min (0.53 US gpm).
5. If the combined flow is less than 2 L/min (0.53 US gpm), repair the pump or replace the pump.
6. Reconnect the outlet lines in the correct positions.
7. Start the engine and check for any leakage of fuel or air from the fuel lines.

Check the Function of the Pressure Regulator

1. Remove the fuel line from the outlet for the supply for the fuel injection pump (B).
2. Install a pipe with a tap for a pressure gauge. Connect a 0 to 80 kPa (0 to 12 psi) pressure gauge.
3. Start the engine and run the engine at idle for two minutes in order to remove any trapped air.
4. Record the pressure reading at idle and at rated speed. The pressure reading should be the following values:

   Bosch EPVE

   Idle ..... 31 kPa (4.49 psi)

   Rated speed ..... 31 kPa (4.49 psi)

   Delphi DP210

   Idle ..... 27.5 kPa (3.99 psi)

   Rated speed ..... 28 kPa (4.06 psi)

Note: Maximum pressure for the fuel injection pump is 80 kPa (12 psi).

5. Reconnect the fuel line. Run the engine at idle for two minutes in order to remove any trapped air.

Check for the following issues if the pressures are outside of the above specifications.

- All electrical connections are installed correctly.
- There are no leaks in the fuel lines or connections.
- The O-ring on the fuel filter housing (2) does not leak.

Cooling System

i01892576

Cooling System - Check (Overheating)

Above normal coolant temperatures can be caused by many conditions. Use the following procedure to determine the cause of above normal coolant temperatures:

1. Check the coolant level in the cooling system. If the coolant level is too low, air will get into the cooling system. Air in the cooling system will cause a reduction in coolant flow and bubbles in the coolant. Air bubbles will keep the coolant away from the engine parts, which will prevent the transfer of heat to the coolant. Low coolant level is caused by leaks or incorrectly filling the expansion tank.

2. Check the mixture of antifreeze and water. The mixture should be 50 percent water and 50 percent 21825166 POWERPART antifreeze.

3. Check for air in the cooling system. Air can enter the cooling system in different ways. The most common causes of air in the cooling system are not filling the cooling system correctly and combustion gas leakage into the cooling system. Combustion gas can get into the system through inside cracks, a damaged cylinder head, or a damaged cylinder head gasket. Air in the cooling system causes a reduction in coolant flow and bubbles in the coolant. Air bubbles keep the coolant away from the engine parts, which prevents the transfer of heat to the coolant.

4. Check the sending unit. In some conditions, the temperature sensor in the engine sends signals to a sending unit. The sending unit converts these signals to an electrical impulse which is used by a mounted gauge. If the sending unit malfunctions, the gauge can show an incorrect reading. Also if the electric wire breaks or if the electric wire shorts out, the gauge can show an incorrect reading.

5. Check the radiator for a restriction to coolant flow. Check the radiator for debris, dirt, or deposits on the inside of the core. Debris, dirt, or deposits will restrict the flow of coolant through the radiator.

6. Check the filler cap. A pressure drop in the cooling system can cause the boiling point to be lower. This can cause the cooling system to boil. Refer to Testing and Adjusting, “Cooling System - Test”.

7. Check the cooling system hoses and clamps. Damaged hoses with leaks can normally be seen. Hoses that have no visual leaks can soften during operation. The soft areas of the hose can become kinked or crushed during operation. These areas of the hose can cause a restriction in the coolant flow. Hoses become soft and/or get cracks after a period of time. The inside of a hose can deteriorate, and the loose particles of the hose can cause a restriction of the coolant flow.

8. Check for a restriction in the air inlet system. A restriction of the air that is coming into the engine can cause high cylinder temperatures. High cylinder temperatures require higher than normal temperatures in the cooling system.

9. Check for a restriction in the exhaust system. A restriction of the air that is coming out of the engine can cause high cylinder temperatures.

   a. Make a visual inspection of the exhaust system.

   b. Check for damage to exhaust piping. Check for damage to the exhaust elbow. If no damage is found, check the exhaust system for a restriction.

10. Check the water temperature regulator. A water temperature regulator that does not open, or a water temperature regulator that only opens part of the way can cause overheating. Refer to Testing and Adjusting, “Water Temperature Regulator - Test”.

11. Check the water pump. A water pump with a damaged impeller does not pump enough coolant for correct engine cooling. Remove the water pump and check for damage to the impeller.

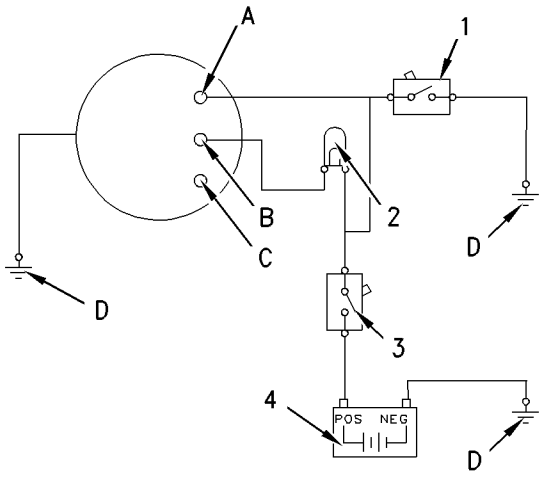
12. Consider high outside temperatures. When outside temperatures are too high for the rating of the cooling system, there is not enough of a temperature difference between the outside air and coolant temperatures. The maximum temperature of the ambient air that enters the engine should not exceed 50 °C (120 °F).

13. When a load that is applied to the engine is too large, the engine rpm does not increase with an increase of fuel. This lower engine rpm causes a reduction in coolant flow through the system. This combination of less air and less coolant flow during high input of fuel will cause above normal heating.

Electrical System

i01899123

Alternator - Test



g00931045

Illustration 44

Typical wiring schematic for an alternator

(A) Terminal “B+”
(B) Terminal “D+”
(C) Terminal “W”
(D) Ground
(1) Electrical switch
(2) Dash light
(3) Ignition switch
(4) Battery

Warning Lamp Does Not Illuminate

The warning lamp for the charging system should illuminate when the ignition switch is in the ON position. Follow the steps below in order to test the system.

1. Check the light bulb. Replace the light bulb if the element is broken.
2. Use a suitable Multimeter to check the battery voltage. Check the battery voltage with the ignition switch OFF.
3. Check the voltage between the terminal (A) and ground. The measured voltage should equal the battery voltage.
4. Turn the ignition switch to the ON position. Check the voltage between terminal (B) and ground. If the voltage is more than 2 Volts the alternator needs to be replaced.

Warning Light is On When the Engine is Running

1. Start the engine and run the engine at fast idle.
2. Measure the voltage between terminal (A) and ground.
3. Measure the voltage between terminal (B) and ground.
4. The measured voltage for terminal (A) and terminal (B) should be 13 to 15 volts for a 12 volt system. The measured voltage for terminal (A) and terminal (B) should be 26 to 30 volts for a 24 volt system.
5. If the voltages do not match replace the alternator.
6. Increase the engine to high idle. Turn an electrical load ON.
7. Measure the voltage between terminal (A) and ground.
8. Measure the voltage between terminal (B) and ground.
9. The measured voltage for terminal (A) and terminal (B) should be 13 to 15 volts for a 12 volt system. The measured voltage for terminal (A) and terminal (B) should be 26 to 30 volts for a 24 volt system.
10. Replace the alternator if the voltage does not match.

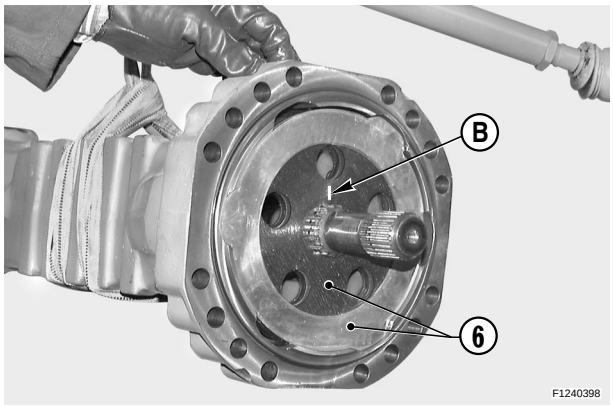
i01899136

Battery - Test

Most of the tests of the electrical system can be done on the engine. The wiring insulation must be in good condition. The wire and cable connections must be clean, and both components must be tight.

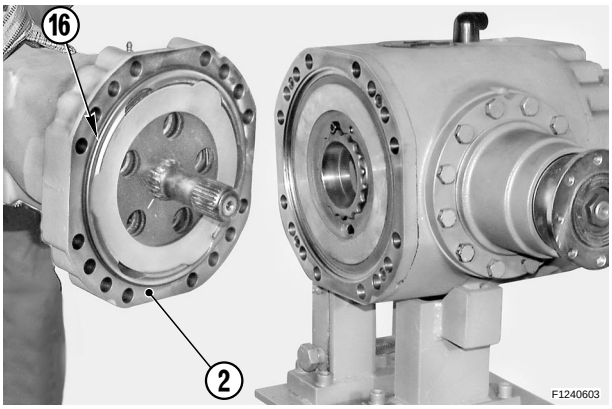
SCREW-LOCKING, SEALING AND LUBRICATING MATERIALS - MATERIALI PER BLOCCAGGIO VITI, TENUTA E LUBRIFICAZIONE - MATERIAL ZUR BLOCKIERUNG VON SCHRAUBEN UND FÜR DICHTUNGEN UND SCHMIERMITTEL - MATERIALES PARA EL BLOQUEO, ESTANQUEIDAD Y LUBRICACION - MATÉRIAUX POUR LE BLOCAGE VIS, ÉTANCHÉITÉ ET LUBRIFICATION

DENOMINATION **DENOMINAZIONE** **BEZEICHNUNG** **DENOMINACION** **DENOMINATION**	**APPLICATION - APPLICAZIONE - ANWENDUNG - APLICACION - APPLICATION**
Silicone ***Silicone*** **Silikon** ***Silicona*** **Silicone**	• Semi-fluid adhesive material used for sealing and filling and to protect components from environmental and physical elements. Polymerises with non-corrosive dampness. • *Materiale adesivo semifluido usato per sigillatura, riempimenti e per la protezione di componenti dagli elementi ambientali e fisici. Polimerizza con umidità non corrosiva.* • Halbflüssiger Klebstoff zum Befestigen, Füllen und zum Schutz von Bestandteilen vor äußeren Einwirkungen. Polymerisiert durch nicht korrosive Feuchtigkeit • *Material adhesivo semifluido usado para el sellado, llenado y para la protección de componentes de elementos ambientales y físicos. Polimeriza con humedad no corrosiva.* • Produit adhésif semi-fluide utilisé pour le scellage, remplissage et protection des éléments ambiants et physiques. Polymérise à une humidité non corrosive.
(TECNO LUPE/101) Silicone-based grease *Grasso al silicone* Silikonfett *Grasa a la silicona* Graisse au silicone	• Highly adhesive synthetic grease, with silicone compounds added. Applied to adjustment screws with hole communicating with oil-type fluids. Used when frequent adjusting is required. • *Grasso sintetico con elevato grado di adesività, additivato con composti siliconici.* *Applicato su viti di registrazione a foro comunicante con fluidi di tipo oleoso.* *Usato quando si richiedono frequenti interventi di registrazione.* • Synthetisches Fett mit hoher Haftfestigkeit, mit silikonhaltigen Stoffen legiert. Wird auf Stellschrauben mit Loch, die mit ölhaltigen Flüssigkeiten in Kontakt stehen, angebracht. Wird verwendet, wenn die Schraub öfters eingestellt werden muß. • *Grasa sintética con elevado grado de adhesión, aditivada con componentes silicónicos.* *Aplicada en tornillos de ajuste de orificio comunicante con fluidos de tipo oleoso.* *Se usa cuando se requieren frecuentes intervenciones de ajuste.* • Graisse synthétique ayant un degré d'adhésivité élevé, adjuvé de composés au silicone. Appliqué sur les vis de réglage à trou communiquant avec des fluides du type huileux. Utilisé quand il y a besoin de réglages fréquents.
Molikote (DOW CORNING)	• Lubricating compound containing molybdenum disulphide, used to lubricate articulation pins and to prevent sticking and oxidation of parts that are not lubricated on a regular basis. • *Composto lubrificante contenente bisolfuro di molibdeno, usato per la lubrificazione di perni snodo e per prevenire incollamenti ed ossidazioni di particolari non lubrificati in modo continuo.* • Schmierstoff mit Molybidändisulfid; wird zum Schmieren von Gelenkstiften und gegen Ankleben und Oxydation von nicht dauergeschmierten Einzelteilen verwendet. • *Compuesto lubricante que contiene bisulfuro de molibdeno, usado para la lubricación de rótulas y para prevenir encoladuras y oxidaciones de piezas no lubricadas de manera continua.* • Composé lubrifiant contenant du bisulfure de molybdène, utilisé pour lubrifier les axes d'articulation et prévenir collages et oxydations des pièces qui ne sont pas continuellement lubrifiées.
(Lithium-based) Grease ***Grasso (al Litio)*** **(Lithium) Fett** ***Grasa (al Litio)*** **Graisse (au Lithium)**	• Applied to bearings, sliding parts and used to lubricate seals or parts during assembly • *Applicato a cuscinetti, parti scorrevoli e per lubrificare guarnizioni o pezzi in fase di montaggio.* • Wird auf Lager, Gleitteilen aufgetragen und zum Schmieren von Dichtungen oder von Teilen bei der Montage verwendet. • *Aplicada a cojinetes, partes deslizables o para lubricar juntas o piezas en fase de montaje.* • Appliqué sur les paliers, parties coulissantes et pour lubrifier les garnitures ou pièces pendant la phase de montage.



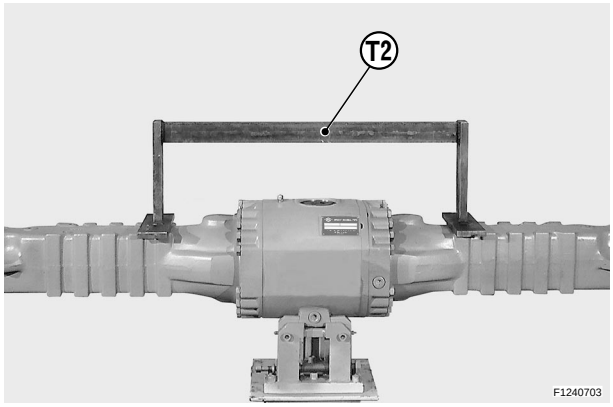
GB a

Slightly lubricate the braking disks (6) and fit them in the arm following the correct sequence; orient them so that the oil circulation holes and the marks "**B**" are perfectly lined up.



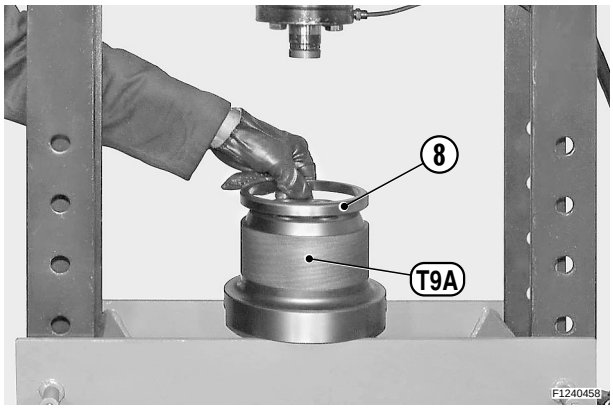
GB b

Check that the positioning of the sealing ring (16) on the arm is intact; install the complete arm (2). Lock it into position using two facing screws (3) and washers (4).



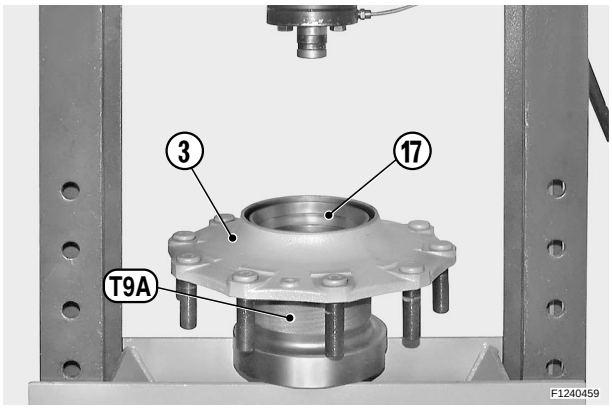
GB c

Check the flatness of the arms using tool **T2** and finally lock the arms with the screws (3) and the washer (4) using the cross-tightening method.
Torque wrench setting: 298 Nm



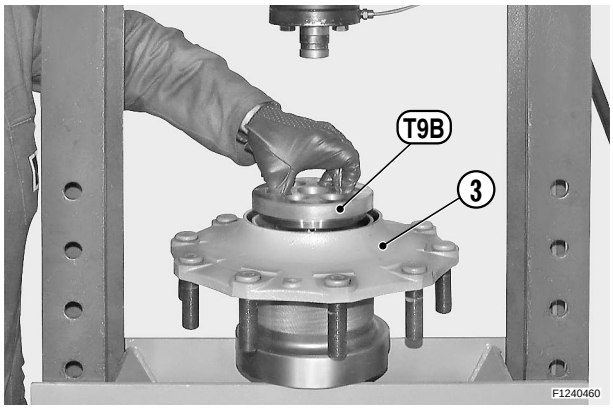
GB a

Position the lower part of tool **T9A** and the thrust block of the external bearing (8) under the press.



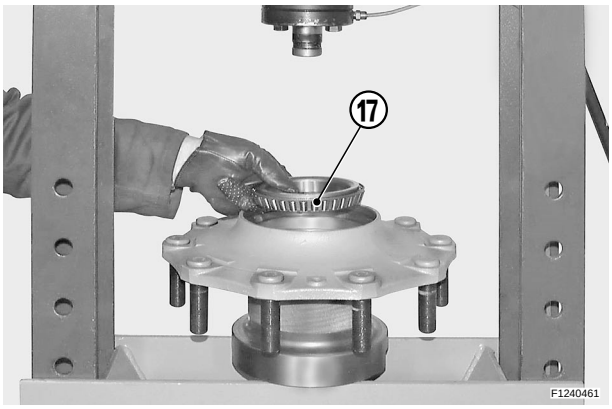
GB b

Lubricate the seats of the bearings and position the hub (3) on tool **T9A**; position the thrust block of the internal bearing (17).
NOTE. Check that the thrust block is correctly oriented.



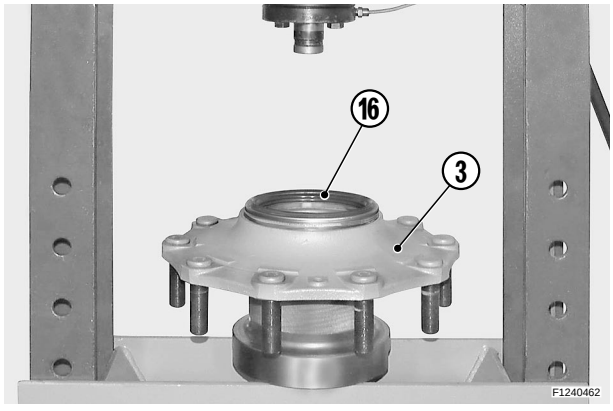
GB c

Position the upper part of tool **T9B** and press the thrust blocks into the hub (3) all the way down.



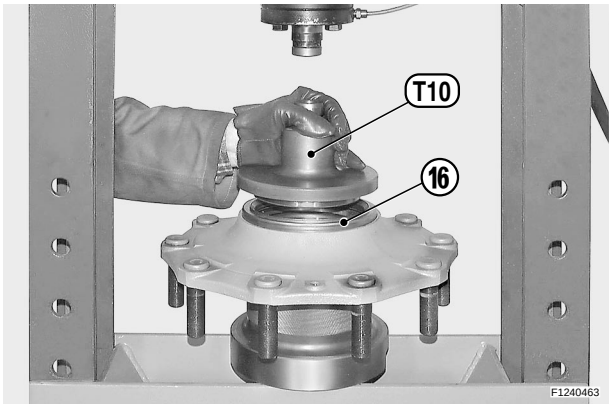
GB d

Fit the bearing (15) into the internal thrust block.



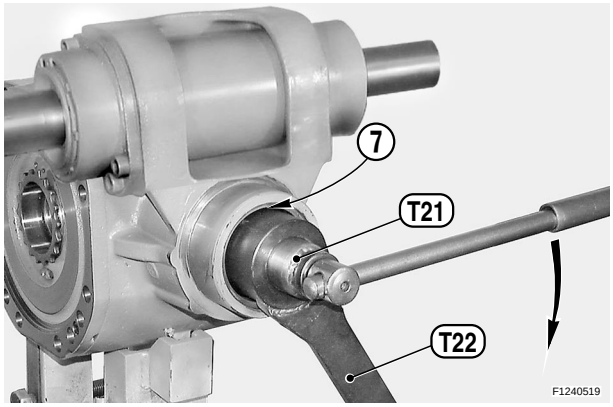
GB e

Apply a sealant for removable seals to the outer surface of the sealing ring (16). Position the sealing ring (16) in the hub (3).
NOTE. Check that the ring (16) is correctly oriented.



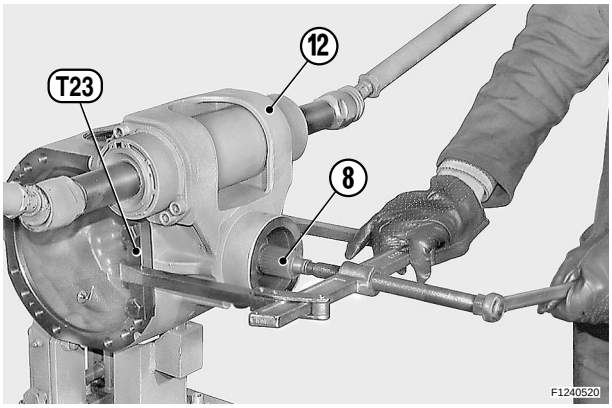
GB f

Position tool **T10** and press the sealing ring (16) into its seat.



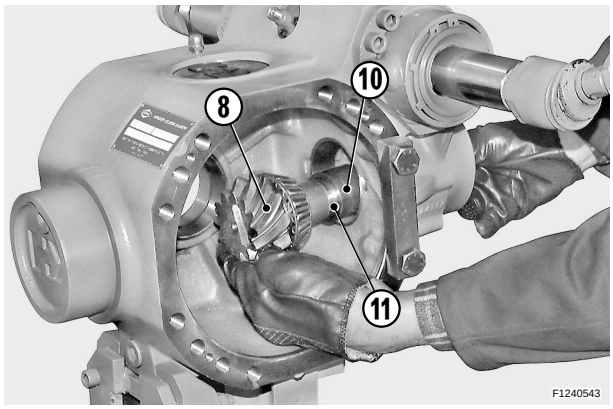
GB a

Position wrench **T22** onto the ring nut (7) and apply bar hold **T21** to the pinion (8).
Stop wrench **T22** and rotate the pinion so as to release and remove the ring nut (7).
NOTE. If disassembly proves awkward, weld the ring nut at approx. 80°C.



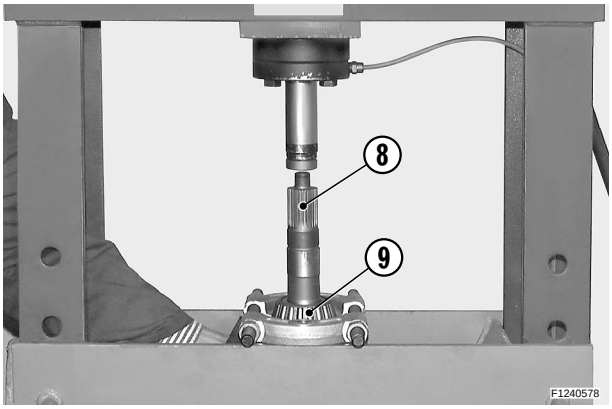
GB b

Apply blocks **T23** and, with the help of a puller, extract the pinion (8) complete with the internal bearing (9), the distance piece (10) and shims (11).
NOTE. The thrust blocks of the bearings remain in the central body (12).



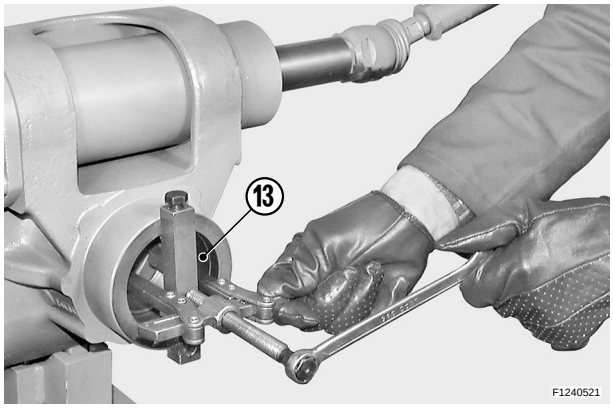
GB c

Remove the pinion (8), shims (11) and distance piece (10).



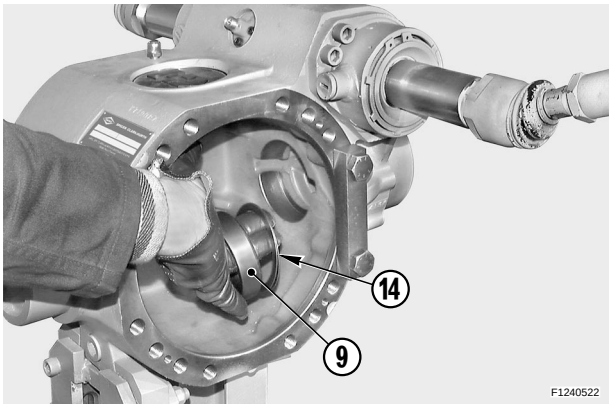
GB d

Using a puller and a press, remove the inner bearing (9) from the pinion (8).



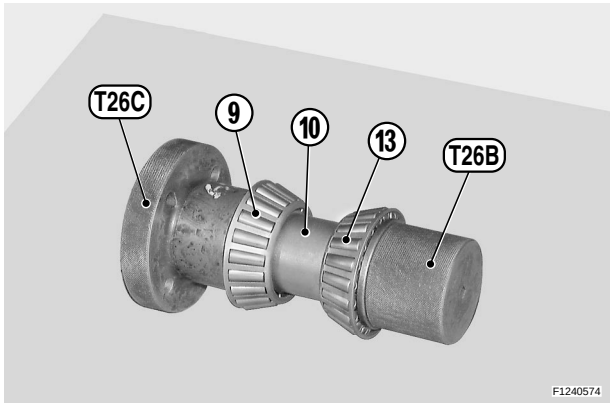
GB e

Remove the thrust block of the external bearing (13).



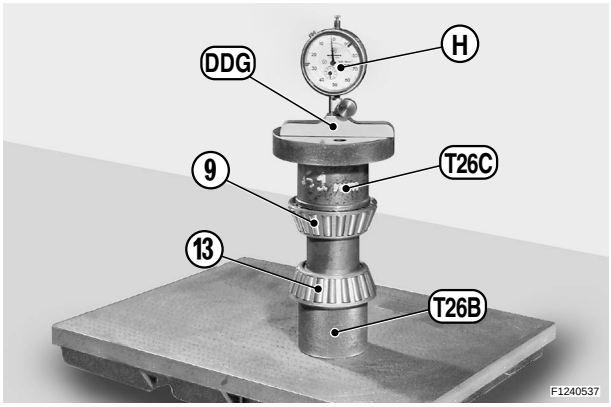
GB f

Insert a drift in the appropriate holes and remove the thrust block of the internal bearing (9) as well as the shim washers (14).



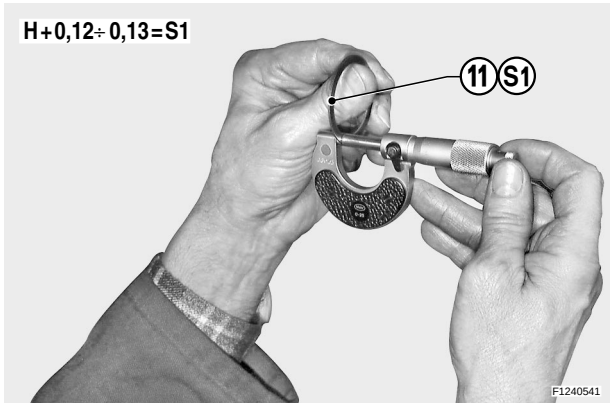
GB a

Remove the comparator and release tools and bearings from the central body.
Re-install all and insert the distance piece (10) between bearings (9) and (13); manually tighten the whole pack.



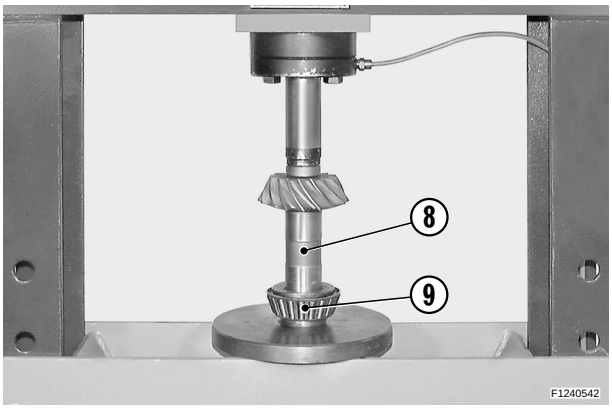
GB b

Insert depth comparator "**DDG**" into tool **T26B-T26C** and measure variation "**H**" in relation to the zero setting performed back at point d.



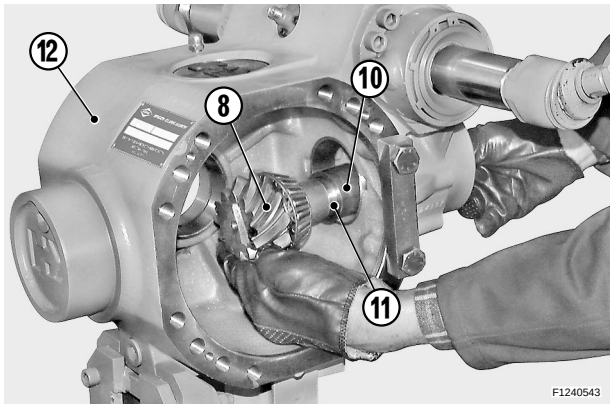
GB c

The variation is to be added to a set value of 0.12–0.13 mm., so as to obtain the size of shim "**S1**" (11) which will be inserted between the external bearing (13) and the distance piece (10) and subsequently, to determine the preload for the bearings.



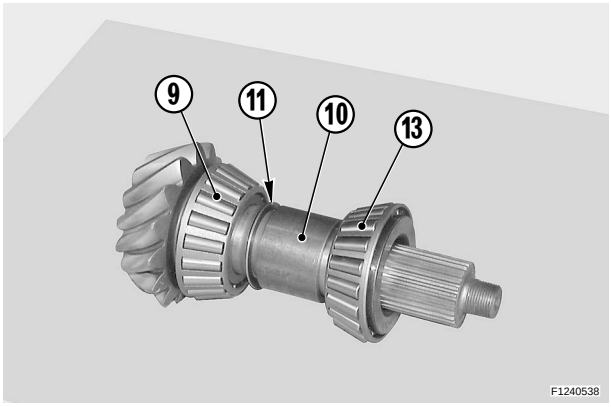
GB d

Position the internal bearing (9) and the pinion (8) under a press; force the bearing onto the pinion.



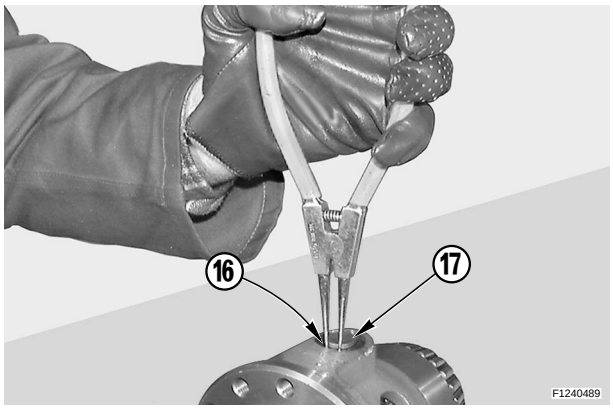
GB e

Fit the pinion (8), shim "**S1**" (11) and distance piece (10) in the main body (12).
NOTE. The finer shims must be placed in- between the thicker ones



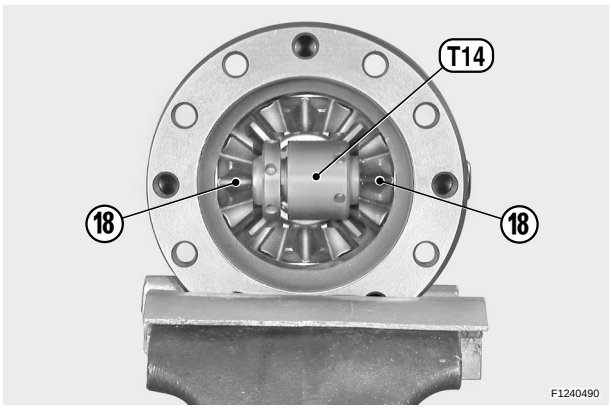
GB f

Insert the external bearing (13) in the central body in order to complete the pack arranged as in the figure.



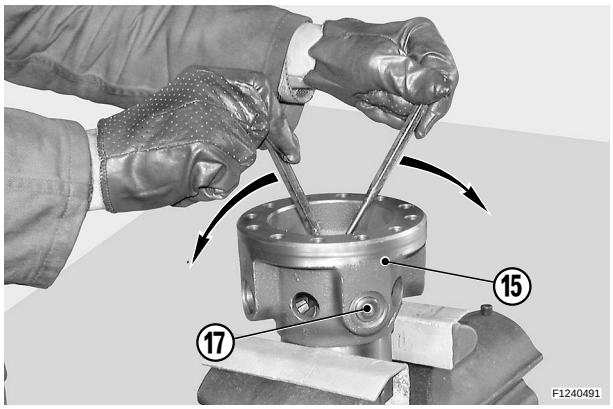
GB a

Remove the snap rings (16) from the two pins (17) of the planet wheel gears (18).



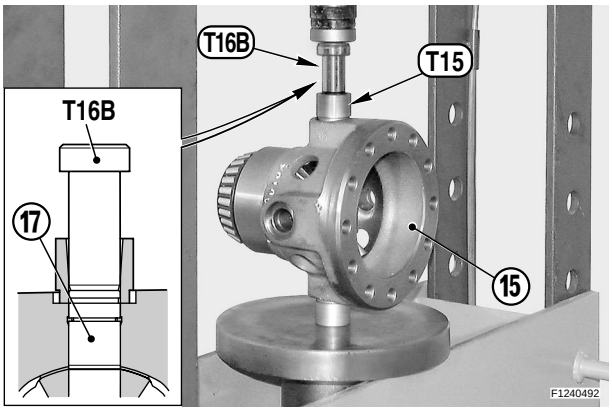
GB b

Insert tool **T14** between the planet wheel gears (18).



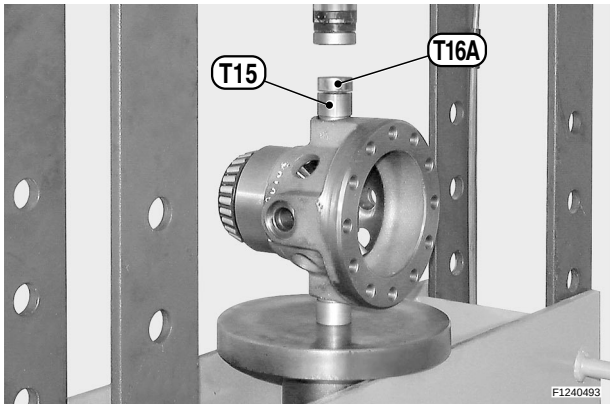
GB c

Force tool **T14** in-between the planet wheel gears (18) using two pin-drivers.
CAUTION! Make sure that tool **T14** is perfectly lined up with the pins (17) when locked.



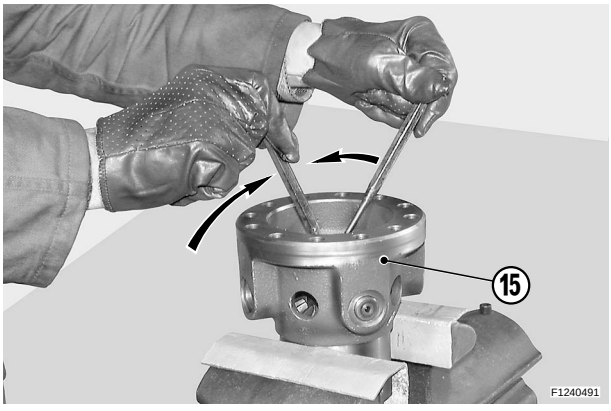
GB d

Place the differential carrier (15) under a press, position bush **T15** and insert gudgeon **T16A**. Press **T16A** pin to limit position.



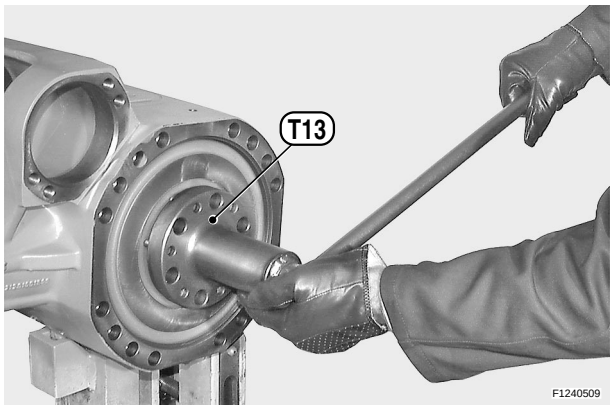
GB e

Remove gudgeon **T16A** and bush **T15**.
NOTE. In this condition the tool **T14** contains pin (17).



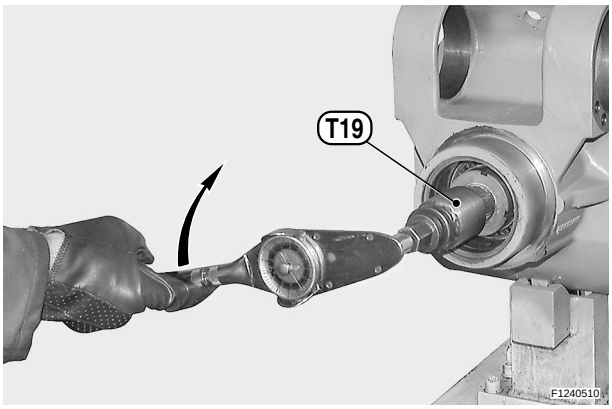
GB f

Remove tool **T14** together with the pin (17) of the planet wheel.



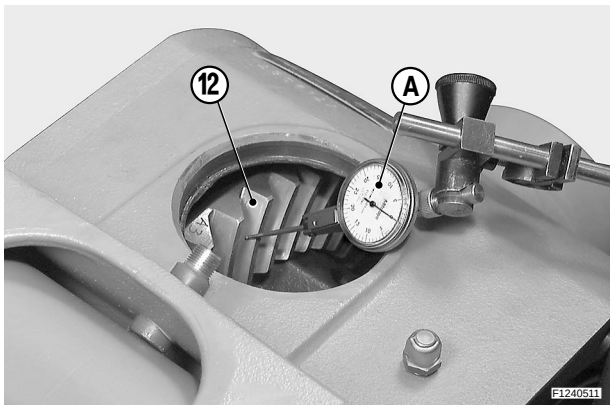
GB a

NOTE. If the ring nuts (1) are removed, spread them with Loctite 242.
Tighten ring nuts on the crown side until clearance between pinion and crown is zero, then lock the crown; go back 1/4÷1/2 turn.



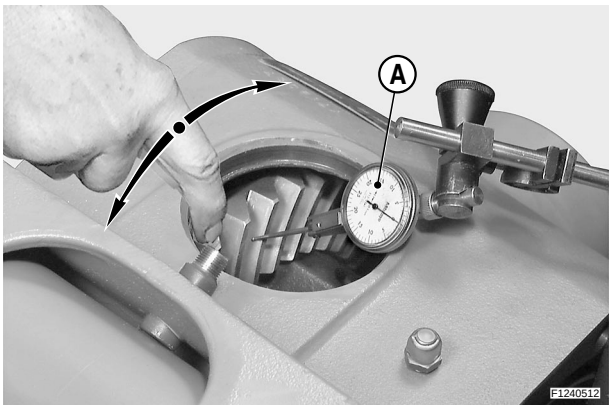
GB b

Pre-set the bearings by means of the ring nut situated on the opposite side of the crown, so as to increase pinion torque up to 140÷210 Ncm.
CAUTION! If bearings are not new, check the static torque; if bearings are new, check the continuous torque.



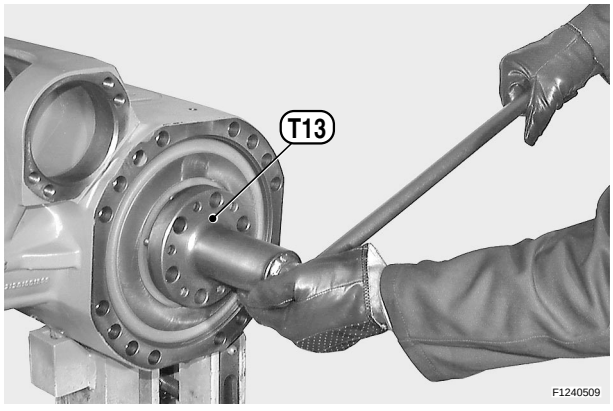
GB c

Introduce a comparator with rotary key "**A**" through the top plug hole (10). Position the comparator on the centre of one of the teeth of the crown (12), pre-set it to 1mm and reset it.



GB d

Manually move the crown (12) in both directions in order to check the existing backlash between the pinion and the crown.



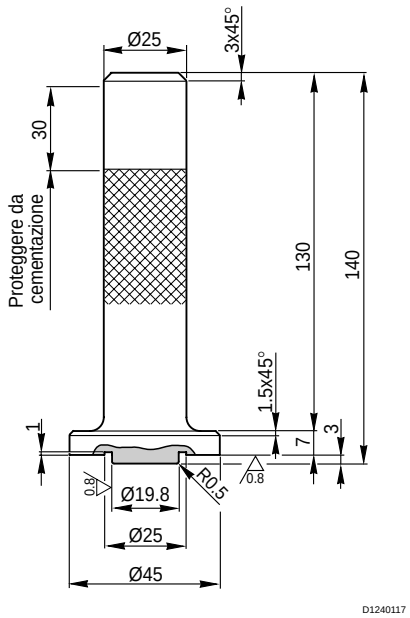
GB e

Adjust the backlash between the pinion and the crown by unloosing one of the ring nuts (1) and tightening the opposite to compensate.
Normal backlash: see table.

RATIO - RAPPORTO VERHÄLTNIS RAPORTE - RAPPORT	CLEARANCE - GIOCO - SPIEL JUEGO - JEU	
	MIN.	MAX.
9÷34	0,18	0,23
9÷35	0,13	0,18
11÷31	0,20	0,28
11÷35	0,13	0,18
12÷35	0,13	0,18
12÷41	0,15	0,20
14÷32	0,18	0,23
14÷36	0,15	0,20
14÷41	0,15	0,20
15÷32	0,18	0,23
15÷47	0,13	0,18

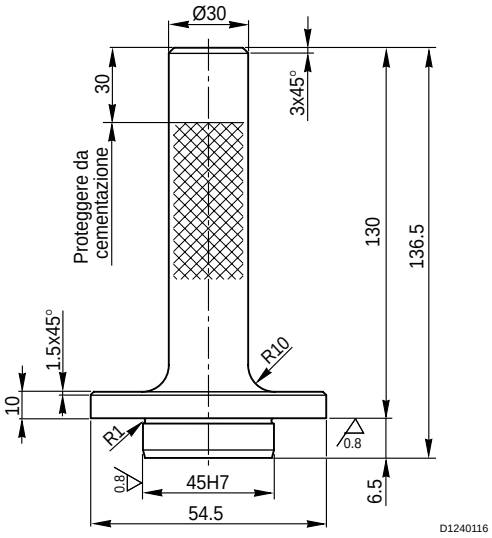
Difference between MIN and MAX clearance for whole circumference should not exceed 0.09 mm.
La differenza tra gioco MIN e MAX rilevata sull'intera circonferenza non deve superare il valore di 0,09 mm.
Der Unterschied zwischen dem MIN e MAX Spiel der gesamten Kreislinie darf den Wert von 0,09 mm nicht überschreiten.
La diferencia entre el juego Min y Max determinada sobre la entera circonferencia no debe de superar el valor de 0,09 mm.
La différence de jeu entre MIN et MAX relevée sur toute la circonférence ne doit pas aller au-delà de la valeur de 0,09 mm.

T33



2321

T34



2322

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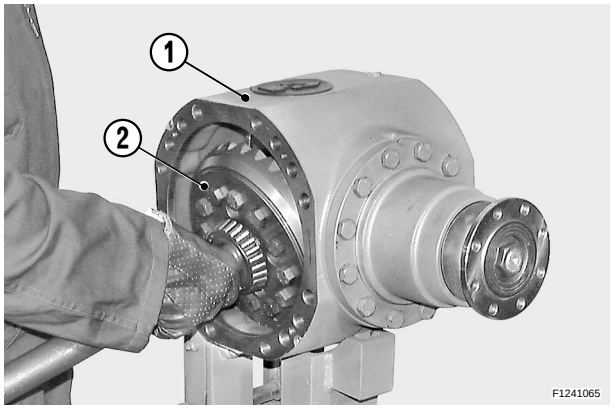
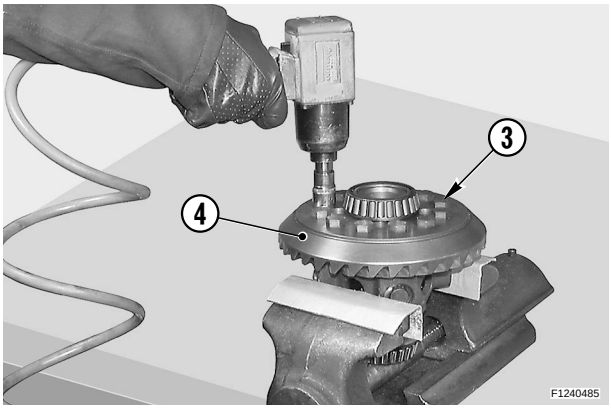


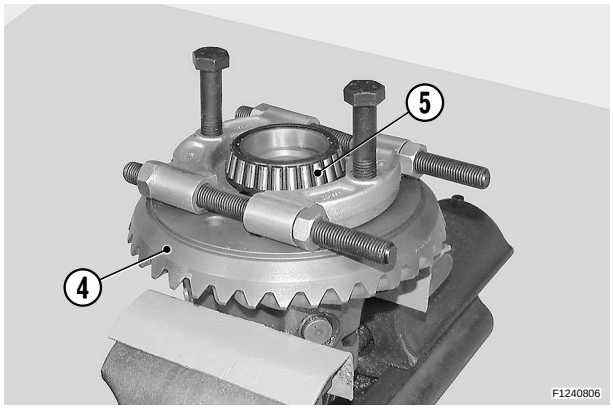
GB a

Remove the whole differential unit (2) from the central axle unit (1).
For details, see «REMOVING THE DIFFERENTIAL UNIT».



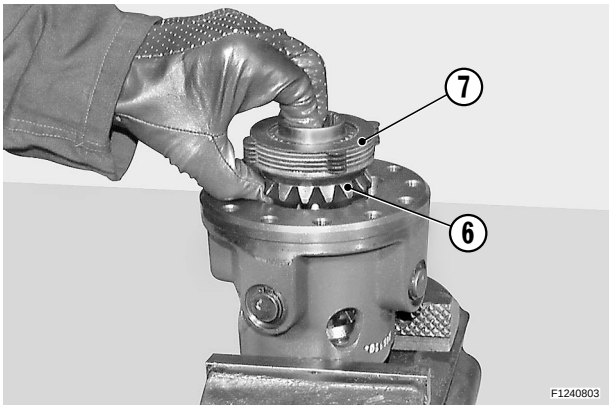
GB b

Remove the check screws (3) of the crown (4).
NOTE. Note down the position of the niches of the central hole in relation to the protrusions of the friction unit steel discs.



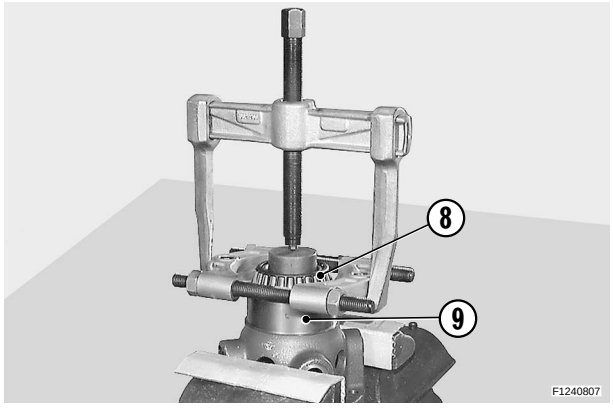
GB c

If bearing (5) needs replacing, remove it; remove crown (4).



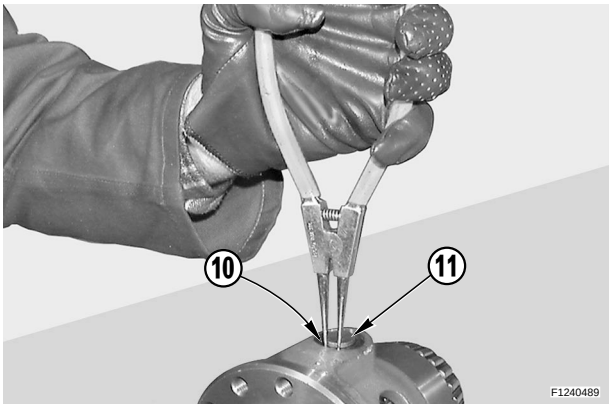
GB d

Remove the planetary gear (6) and the whole friction unit (7).



GB e

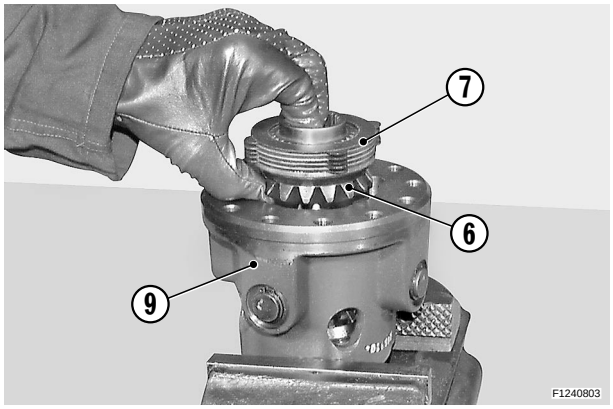
If bearing (8) needs replacing, extract it from the differential unit (9).



GB f

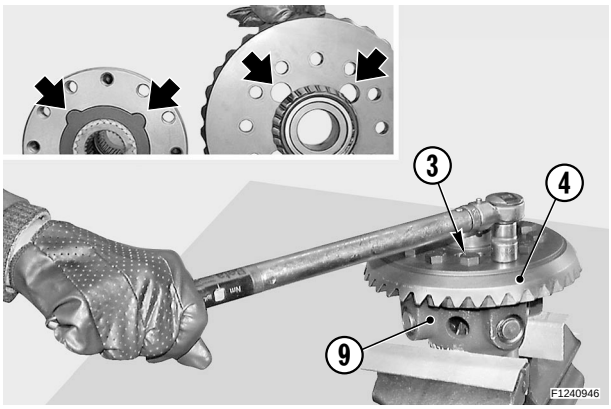
Remove the snap rings (10) from the pins (11) of the planet gears (12).

HOW TO ASSEMBLE THE LIMITED SLIP DIFFERENTIAL UNIT (25% AND 45%) - ASSEMBLAGGIO DIFFERENZIALE A SLITTAMENTO LIMITATO (25% E 45%) - DIFFERENTIAL MIT BEGRENZTEM GLEITVERMÖGEN (25% UND 45%) MONTIEREN - ASEMBLAJE DIFERENCIAL A DESLIZAMIENTO LIMITADO (25% Y 45%) - MONTAJE DIFFERENTIEL A GLISSEMENT REDUIT (25% ET 45%)



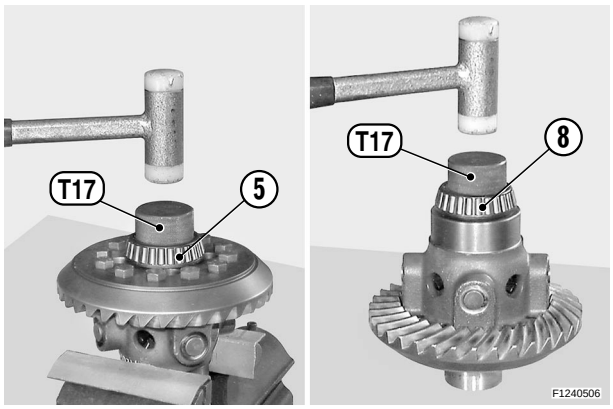
GB a

Check that planets have a light clearance in relation to the first planet gear.
Position the second planetary gear (6) and the second friction unit (7) into the differential unit (9).



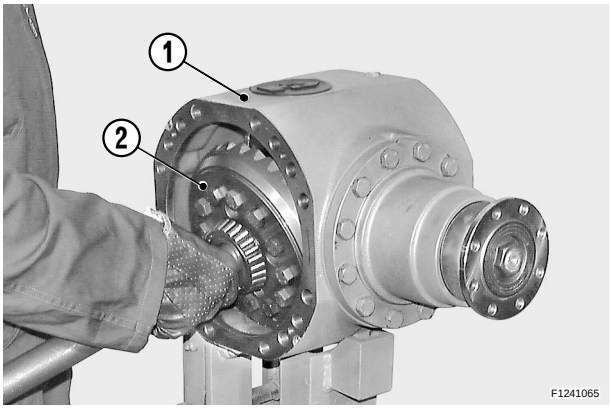
GB b

Line the lubrication holes up with the slots in the differential carrier.
Orient the holes of the crown (4) towards the protrusions of the braking unit.
Position the crown (4) on the differential unit (9) and lock it with the screws (3) previously coated with Loctite 242.
Torque wrench setting for screws: 128 – 142 Nm.
NOTE. Tighten screws using the criss-cross method.



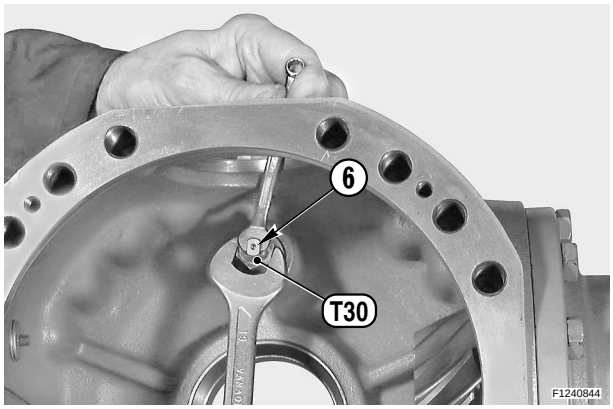
GB c

If bearings (5) and (8) have been removed, install them using tool **T17**.



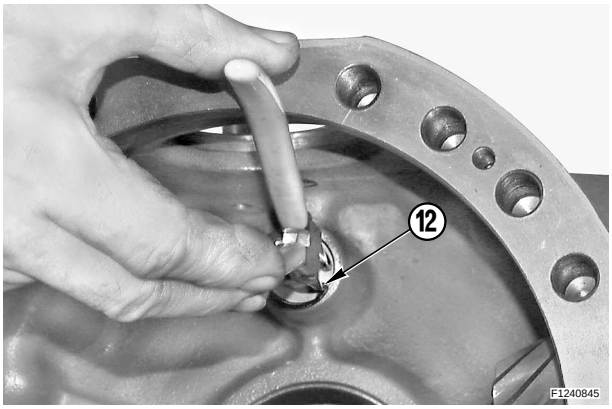
GB d

Install the whole differential assembly (2) into the central body (1).
For details, see «INSTALLING THE DIFFERENTIAL UNIT».



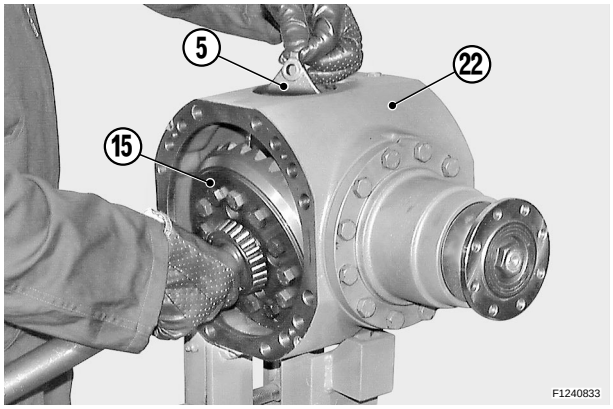
GB a

Screw tool **T30** on the thread of the piston (6) to compress spring (7) and vacate the seat for introducing the snap ring (12).



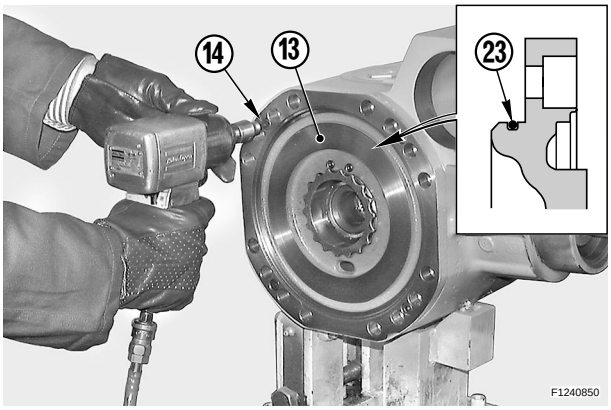
GB b

Fit the snap ring (12) of the unit.
Remove tool **T30** and fit the snap ring (9) of spring (7).



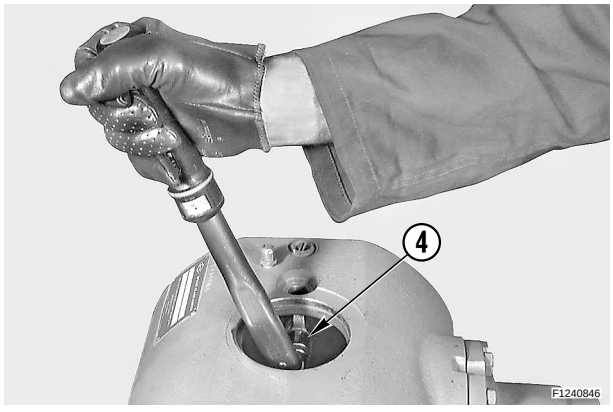
GB c

Insert the fork (5) and the differential unit (15) into the central unit (22).
Engage the fork (5) in the coupling (19) and on the piston (6).



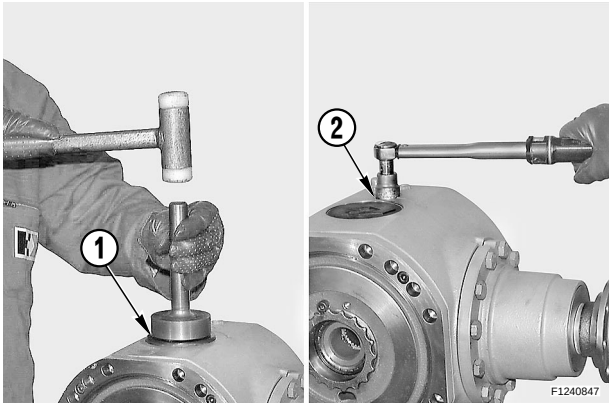
GB d

Fit the intermediate cover (13) and lock it with screws (14). Tighten screws using a torque wrench setting of 23.8 – 26.2 Nm.
NOTE. Carefully check the state of the O-ring (23).



GB e

Fit the lock nut (4) of the fork (5) and lock it with a dynamometric wrench set to a torque of 70 – 75 Nm.



GB f

Fit the microswitch (2) complete with O-ring; torque wrench setting: max. 30 Nm.
If necessary, adjust differential unit clearances. (see «DIFFERENTIAL UNIT ASSEMBLY»).
Fit the top cap (1) and the arms. (For details, see «CHECKING WEAR AND REPLACING THE BRAKING DISKS»).

der Montage müssen die Ränder der Dichtringe geschmiert werden. Wenn beim Kegelradpaar ein Zahnrad ausgewechselt werden muß, muß auch das andere Zahnrad ausgewechselt werden. Bei der Montage müssen die vorgeschriebenen Spiele, Vorspannungen und Drehmomente strengstens eingehalten werden.

GÜLTIGKEIT: Das Handbuch gibt an zu welchen Kennummern die Einheiten gehören. Der Einfachheit halber sind die Angehörigkeiten folgendermaßen aufgeführt:

▶▶ _____ = bis Kennummer

_____ ▶▶ = ab Kennummer

Wenn keine Angehörigkeit angegeben ist, verstehen sich die Arbeiten zur Zerlegung und Montage für alle Ausführungen gültig.

SPEZIFISCHE WERKZEUGE UND ERSATZTEILE: die Zeichnungen der für Wartungsarbeiten erforderlichen spezifischen Werkzeuge, sind am Ende des Handbuchs aufgeführt; Ersatzteile können beim Fahrzeughersteller oder direkt bei der Kundendienststelle oder bei einem zugelassenen Händler der DANA ITALIA S.p.A. bezogen werden.

E

El rendimiento y la duración de los órganos mecánicos depende, además que del constante y correcto mantenimiento, también de la intervención inmediata en caso de averías o anomalías.
Al proponer este manual, ha sido considerada la suposición de una revisión general del grupo, pero es el mecánico quien tiene que valorar la necesidad de montar cada uno de los componentes en caso de reparación. El manual es una guía rápida y segura que permite intervenciones precisas por medio de fotografías y de planos que muestran las distintas fases de las operaciones. A continuación figuran todas las informaciones y advertencias necesarias para ejecutar un montaje correcto, para las comprobaciones y el montaje de cada uno de los componentes. Para remover el puente diferencial del vehículo hay que consultar los manuales de los fabricantes del vehículo. En la descripción de las operaciones siguientes se supone que el puente ya ha sido sacado del vahículo.

IMPORTANTE: Para facilitar el trabajo salvaguardando al mismo tiempo las superficies mecanizadas y la seguridad de los operadores, se aconseja que se usen equipos y herramientas adecuados como caballetes y bancos de soporte, martillos de plástico o de cobre, palancas adecuadas, extractores y llaves específicas.
Antes de desmontar las partes y descargar el aceite, es conveniente que se haga una limpieza minuciosa del puente sacando las incrustaciones y acumulaciones de grasa.

INTRODUCCION: Todos los órganos mecánicos desmontados tienen que ser limpiados minuciosamente con productos adecuados y restaurados o sustituidos en el caso de que presenten daños, desgaste, rajaduras, agarrotamientos, etc. En particular, comprobar la integridad de todas las partes en movimiento (cojinetes, engranajes, par cónico, ejes) y de estanqueidad (anillos OR, detenedor de aceite) sujetas a mayores solicitaciones y desgaste. Se aconseja, de todas formas, que se sustituyan los órganos de estanqueidad cada vez que se ejecute la revisión o reparación de los componentes.
Al volver a montar, los segmentos de compresión tienen que estar lubricados en los bordes de estanqueidad. En el caso del par cónico, la sustitución de uno de sus engranajes comporta también la sustitución del otro. Al montar hay que tener en cuenta escrupulosamente los juegos, las precargas y los pares descriptos.

VALIDEZ: El manual suministra la validez de los grupos en forma de matrícula. Para poder tener una interpretación correcta, la validez está indicada:

▶▶ _____ = hasta la matrícula

_____ ▶▶ = desde la matrícula en adelante

Si no ha sido indicada validez, las operación de desmontaje y montaje son comunes a todas las versiones.

HERRAMIENTAS ESPECIFICAS Y RECAMBIOS: Los planos de las herramientas especificas necesarias para la ejecución de las intervenciones de mantenimiento figuran al final del manual; los recambios se pueden pedir al fabricante de la máquina o directamente al Service Center o a Distribuidores autorizados de DANA ITALIA S.p.A..

F

Le rendement et la continuité des organes mécaniques dépendent, non seulement d'une maintenance correcte et constante, mais également de la rapidité d'intervention en cas de pannes ou d'anomalies. En vous proposant ce manuel, on envisage l'hypothèse d'une révision générale du groupe, mais c'est au mécanicien d'évaluer la nécessité de monter ou non chacun des composants en cas de réparation. Le manuel est un guide rapide et sûr consentant des interventions précises, au travers de photographies et de dessins prospectifs qui illustrent les différentes phases des opérations. Ensuite, sont reportées toutes les informations et précautions nécessaires pour un démontage correct et les vérifications et assemblage de chaque composant. En ce qui concerne le déplacement du pont d'étai du véhicule, il est nécessaire consulter les manuels fournis par le constructeur du véhicule. En décrivant les opérations suivantes, on présume que le pont ait déjà été enlevé du véhicule.

IMPORTANT: Pour faciliter le travail en sauvegardant en même temps les surfaces usinées et la sécurité des opérateurs, il est préconisé d'utiliser des installations appropriées telles que des étais ou banc de support, maillets en plastique ou cuivre, leviers appropriés, extracteurs et clés spécifiques.
Avant de procéder au démontage des parties et vidanger l'huile, il vaut mieux nettoyer soigneusement le pont, en enlevant incrustations et blocs de gras.

PRELIMINAIRE: Tous les organes mécaniques démontés doivent être soigneusement nettoyés à l'aide de produits appropriés et réparés ou remplacés dans le cas où ils seraient abîmés, usés, fêlés, grippés, etc. Vérifier, l'intégrité, en particulier, de toutes les parties en mouvement (paliers, engrenages, couple conique, arbres) et l'étanchéité des bagues (bagues OR, parahuile), qui sont sujettes à plus de sollicitations et à l'usure. Il est préconisé, de toute façon, de substituer les organes d'étanchéité, chaque fois que l'on effectue une révision ou une réparation des composants. Au moment du montage, les bagues d'étanchéité doivent être lubrifiées sur les bords étanches. Dans le cas du couple conique, la substitution de l'un de ses engrenages comporte également la substitution de l'autre. En phase de montage, il faut respecter scrupuleusement les jeux, les précharges et les couples prescrits.

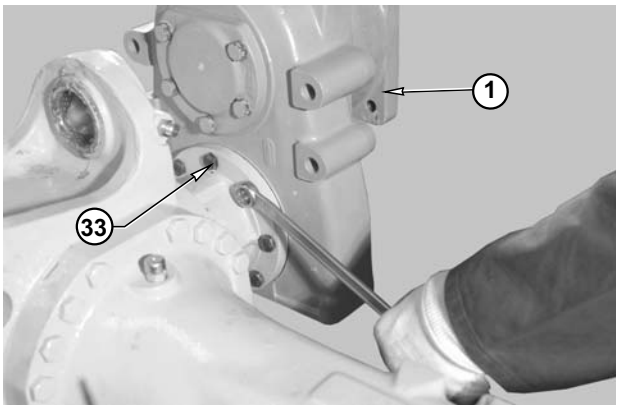
VALIDITE: Le manuel fournit la validité des groupes sous forme de matricule. Pour une meilleure interprétation, les validités sont indiquées comme:

▶▶ _____ = jusqu'à l'immatriculation

_____ ▶▶ = à partir de l'immatriculation et après

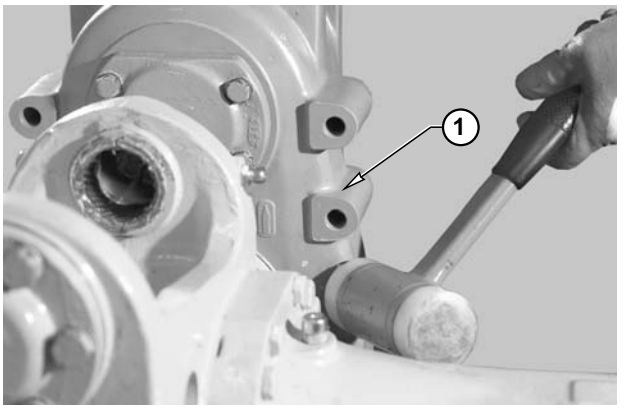
Si les validités ne sont pas indiquées, les opérations de démontage et d'assemblage sont pareilles dans toutes les versions.

INSTALLATIONS SPECIFIQUES ET PIECES DETACHEES: Les dessins des installations spécifiques nécessaires pour effectuer des interventions d'entretien sont reportées à la fin du manuel, les pièces détachées peuvent être commandées au constructeur de la machine ou directement aux Centres de Services, ou Distributeurs agréés de la Société DANA ITALIA S.p.A..



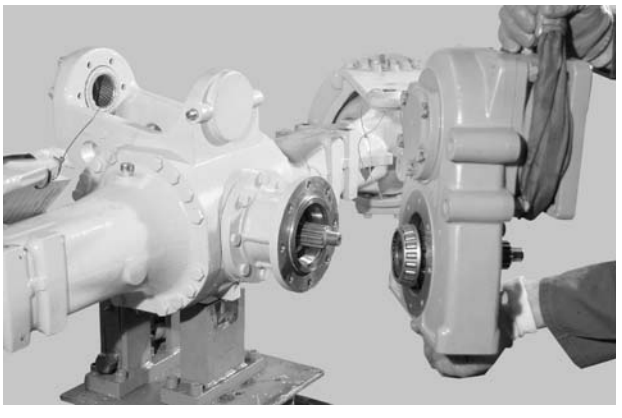
GB a

Remove fastening screws (33) from the reduction unit (1).



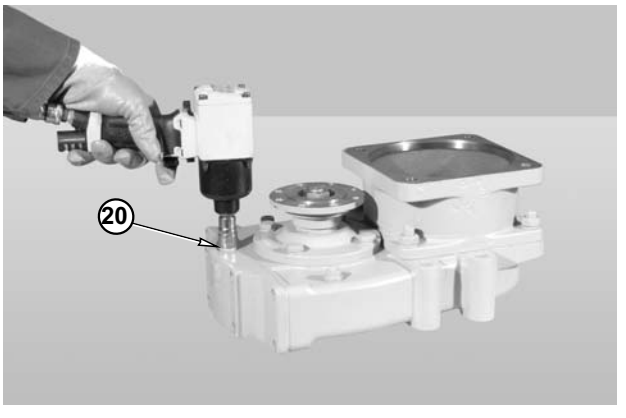
GB b

Disjoin the entire reduction unit (1) from the axle and place it on a bench.



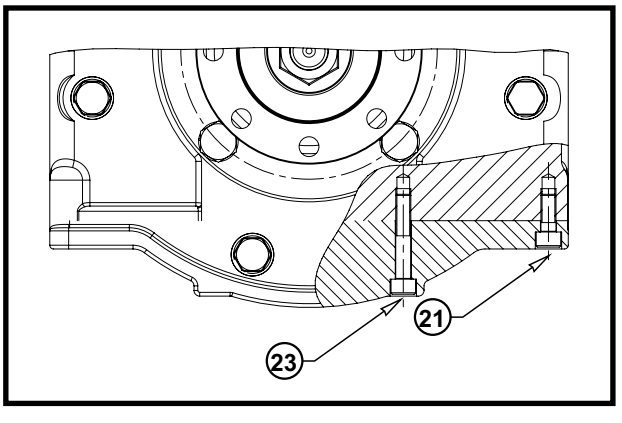
GB c

Sling the entire unit and connect it to the hoist, putting the rod under light tension.

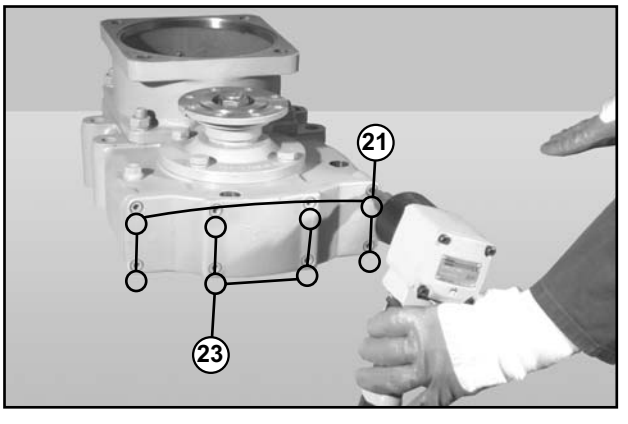


GB d

Remove the oil-level plug (20) and oil.

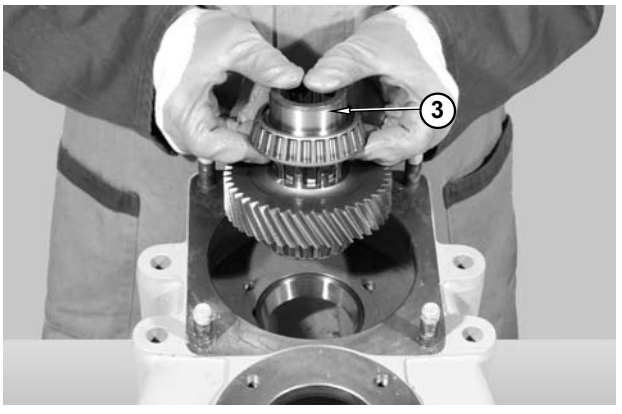


GB e



GB f

Remove screws (21)(23) from the cover (24).

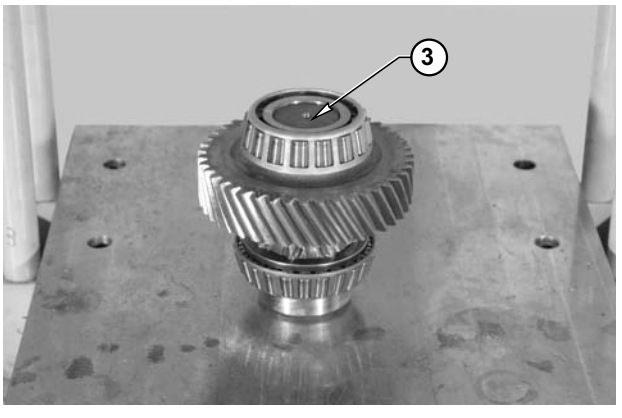


GB a

Remove the upper shaft (3).

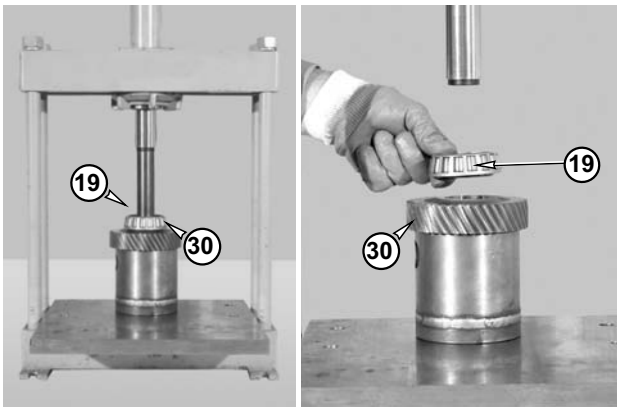
GB b

Remove the thrust block (19).



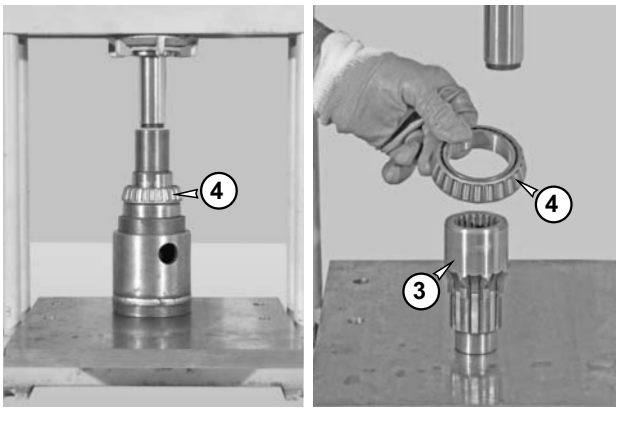
GB c

Position the upper shaft (3) under the press.



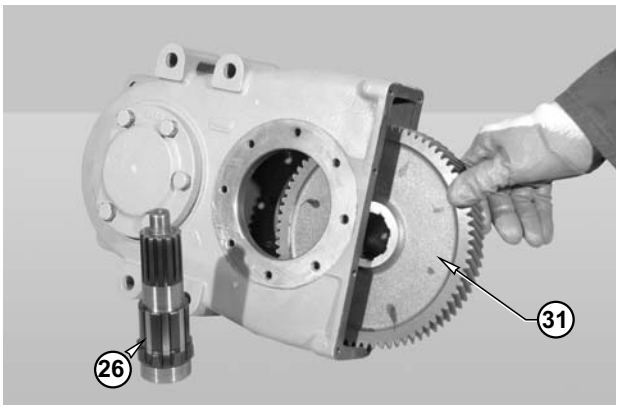
GB d

Remove gear (30) and bearing (19).



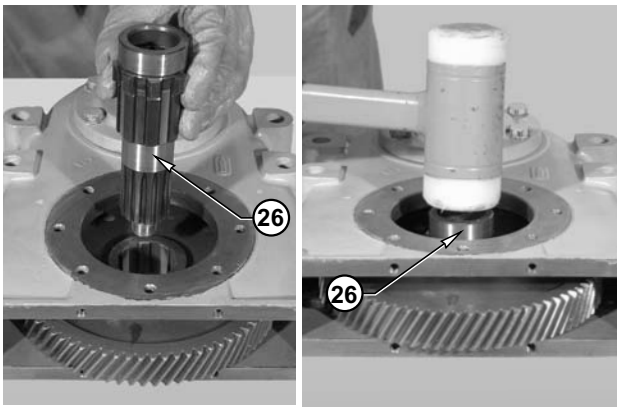
GB e

Remove the bearing (4).



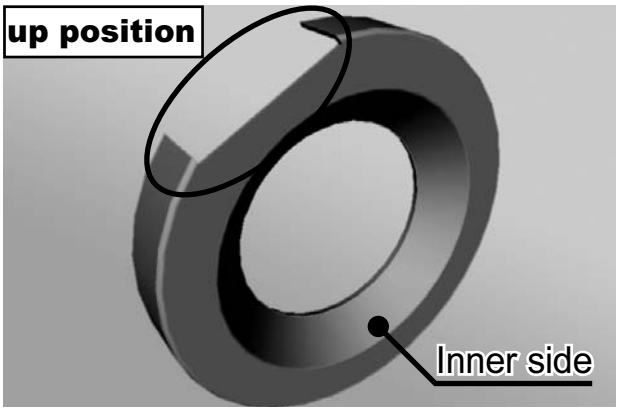
GB a

Install the gear (31).



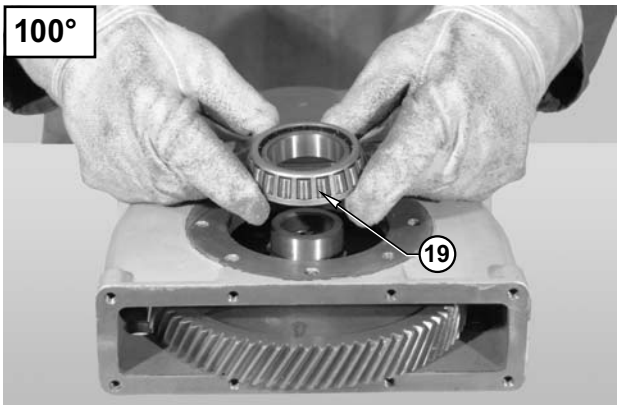
GB b

Using a plastic hammer, install the lower shaft (26).



GB c

Using a plastic hammer, fit the oil collector into the drop box cover.
ATTENTION: Place the cut always on the top.

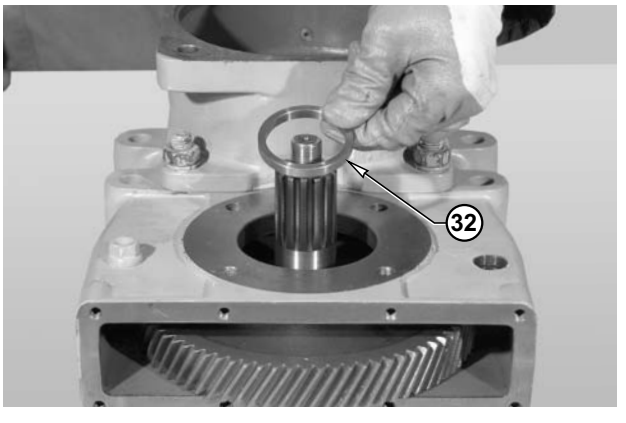


GB d

Install the bearing (19).

GB e

Install the external bearing (8).
NOTE. Using a plastic hammer, drive the bearing to the limit stop by lightly hammering around the edge.



GB f

Install the spacer (32).

B) LIFTING CYLINDER DISASSEMBLY

To repair or replace in the event of:

- *Oil leaks*
- *Distortion, problems*
- *Wear, bending in cylinder rod*
- *Scratches*

- Raise mast.

- Place block (dimensions: height 740, thickness/width 70 x 175) between fixed and moving uprights (Fig. B1).

- Lower mast until moving upright touches block.

- Remove elevation cylinder pipe mounting bracket (Fig. B2).

- Place oil collection container under mast.

- Disconnect elevation cylinder (Fig. B3).

- Push spring pin into bottom of cylinder (Fig. B4).

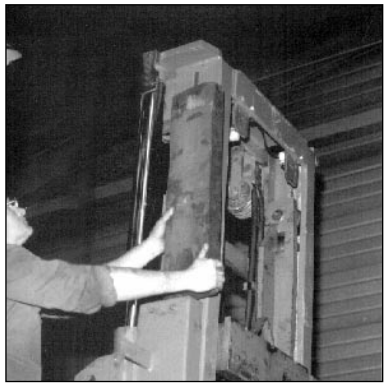
- Remove attachment pipe mounting brackets (Fig. B5) from cylinder side to be removed.

- Tilt mast forwards (approx. 12°).

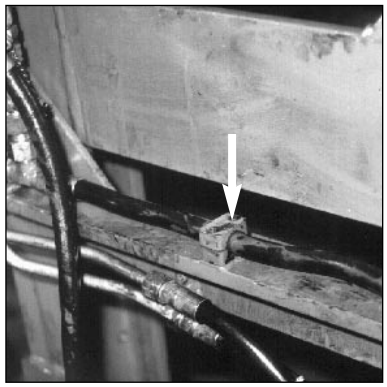
- Place sling around elevation cylinder and secure to hoist (Fig. B6).

- Remove pin at top of cylinder.
  - 2 clips.
  - 1 pin (Fig. B7).
  - 1 adjusting washer (Fig. B8).

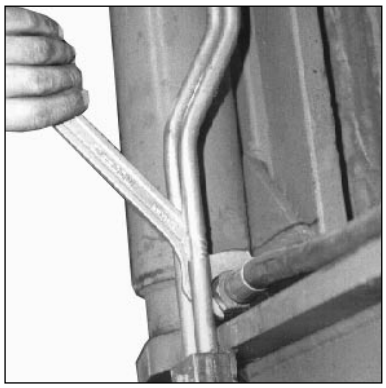
B1



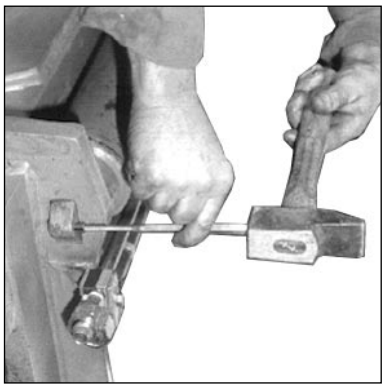
B2



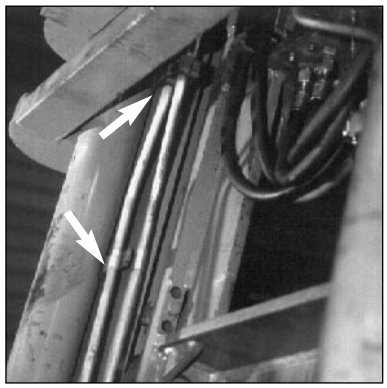
B3



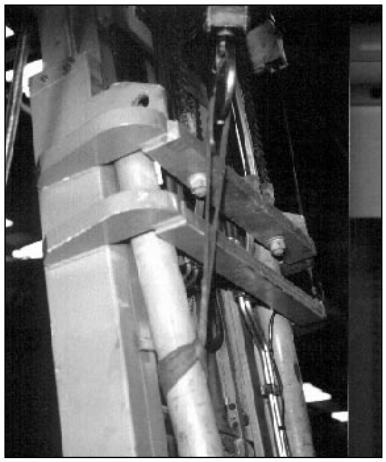
B4



B5

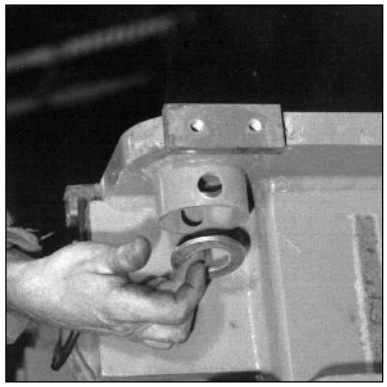


B6



B7

B8



EB - SEPARATING MOVING AND FIXED UPRIGHTS

- Place mast on stands using hoist (Fig. EB1 and EB2) (mast is in contact with moving upright).

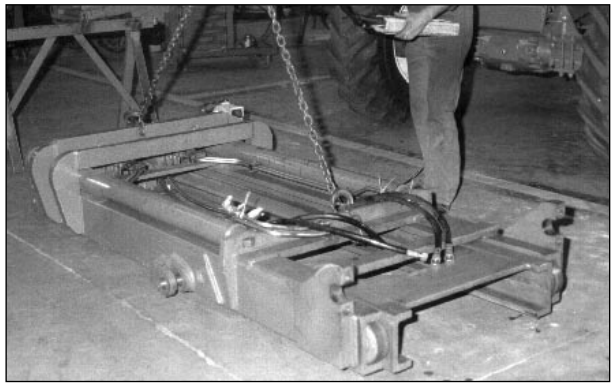
- Remove attachment hoses from pulleys (Fig. EB3).

- Remove elevation cylinder pin.

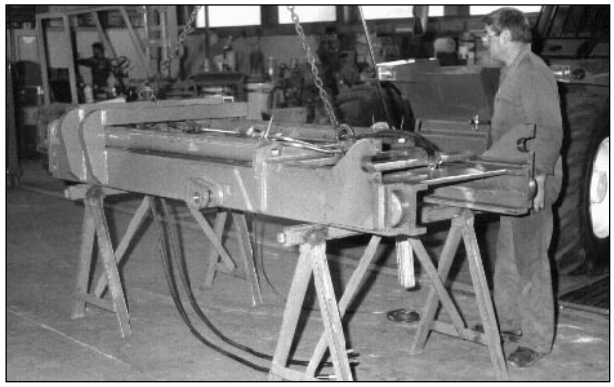
    - 2 V clips
    - Pin (Fig. EB7)

- Separate fixed upright from moving upright using a lever (Fig. EB8).

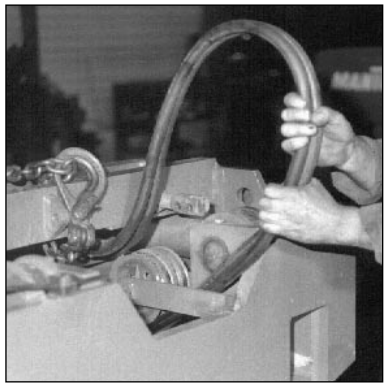
EB1



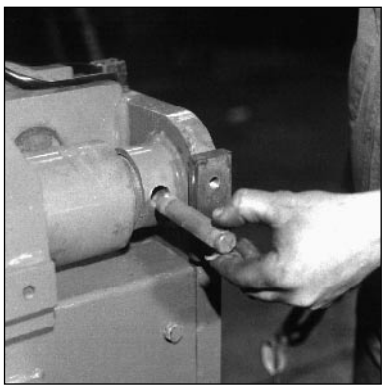
EB2



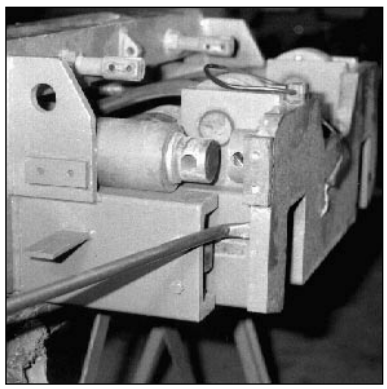
EB3



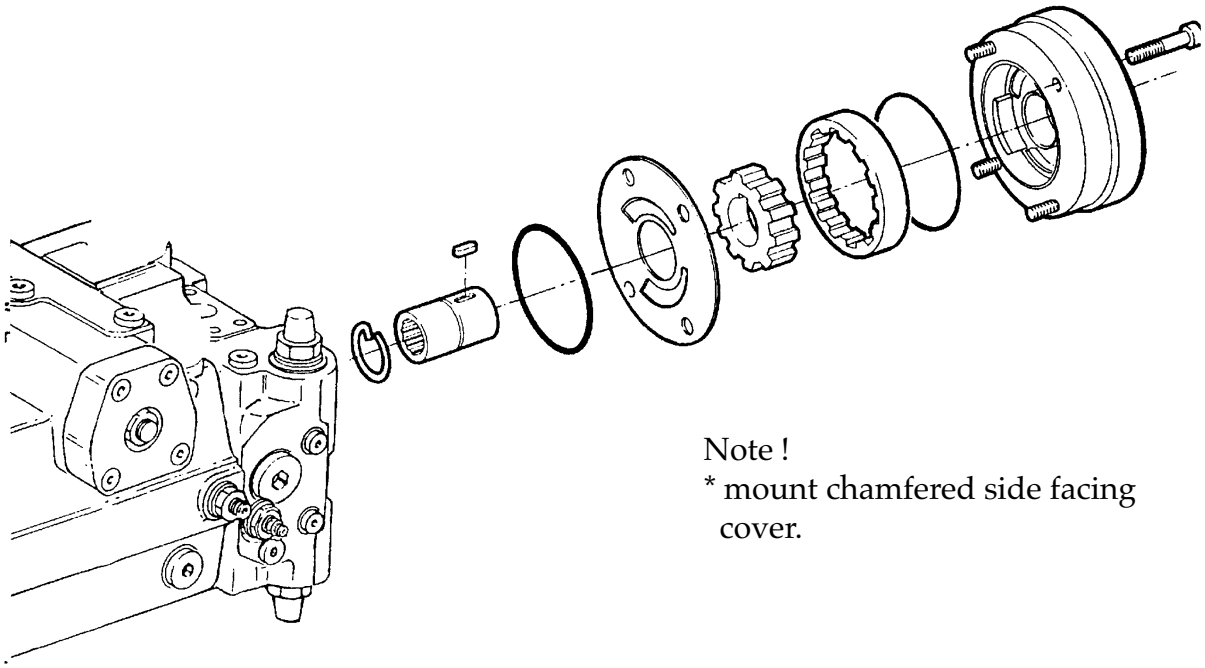
EB7



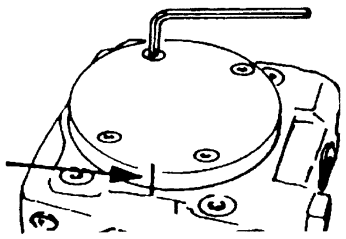
EB8



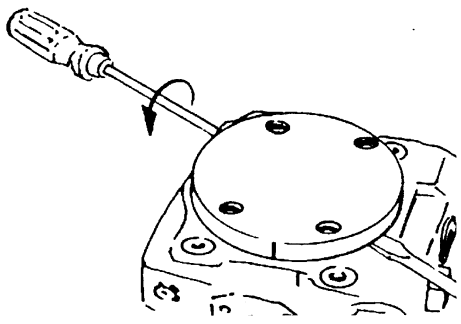
Sealing of the boost pump



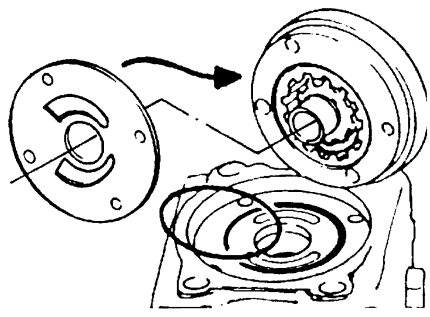
Note !
* mount chamfered side facing cover.



Mark position,
remove fixing screws.

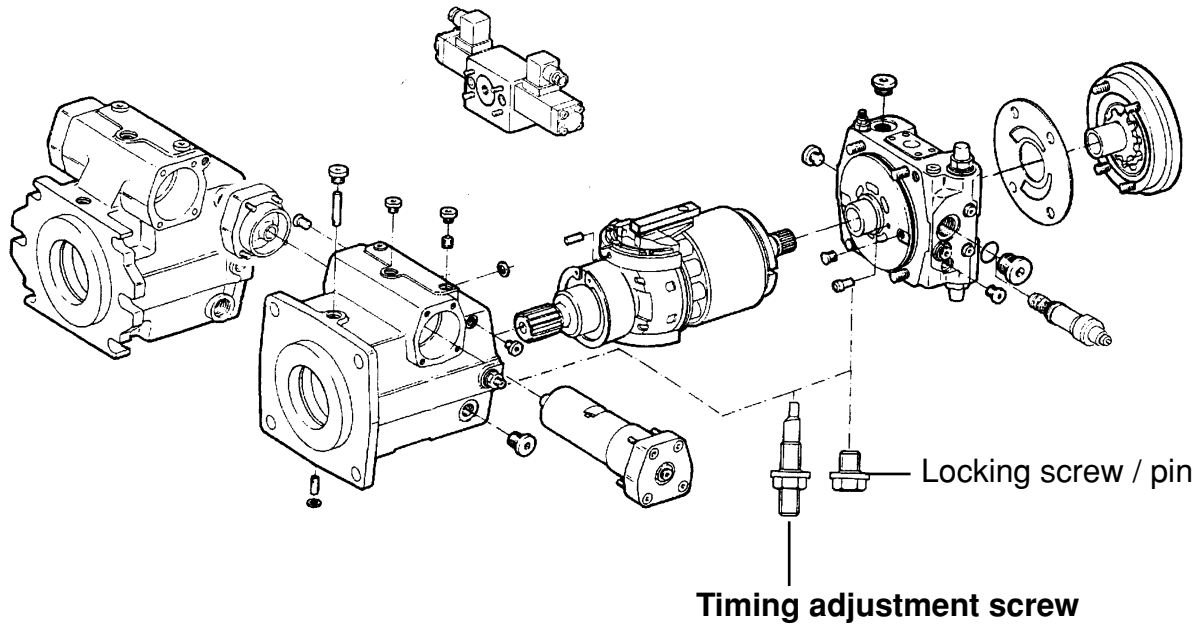


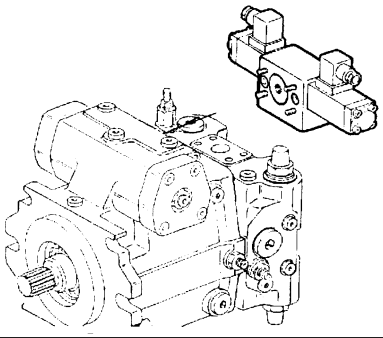
Pry-off cover.



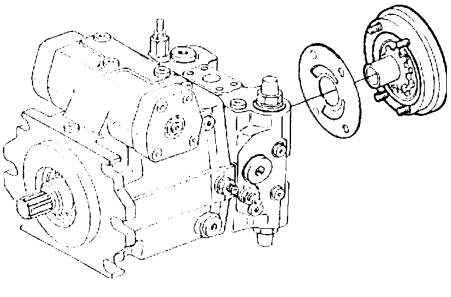
Check :
O-ring, groove, gliding surface, connection plate.

Démontage de la pompe



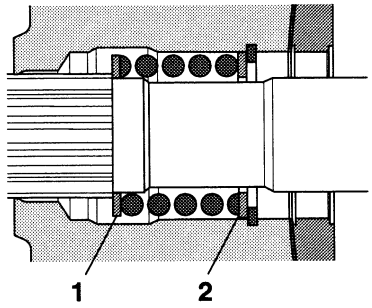


Remove control device.

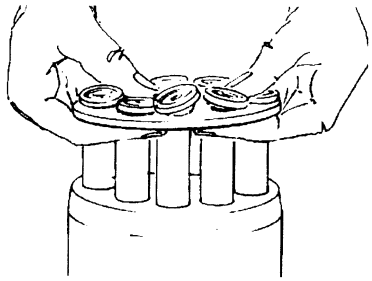


Remove auxiliary pump.
Note :
Mark assembly position previously.

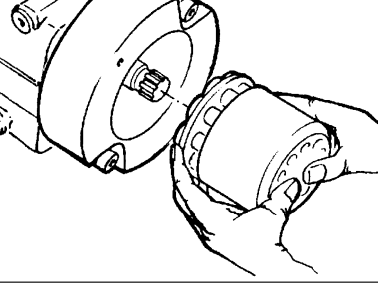
Installation of the rotary group



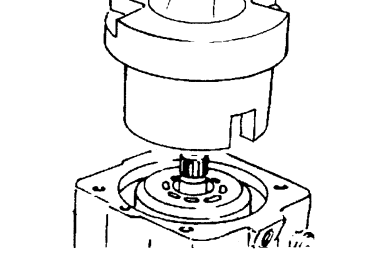
Disc 1, 2



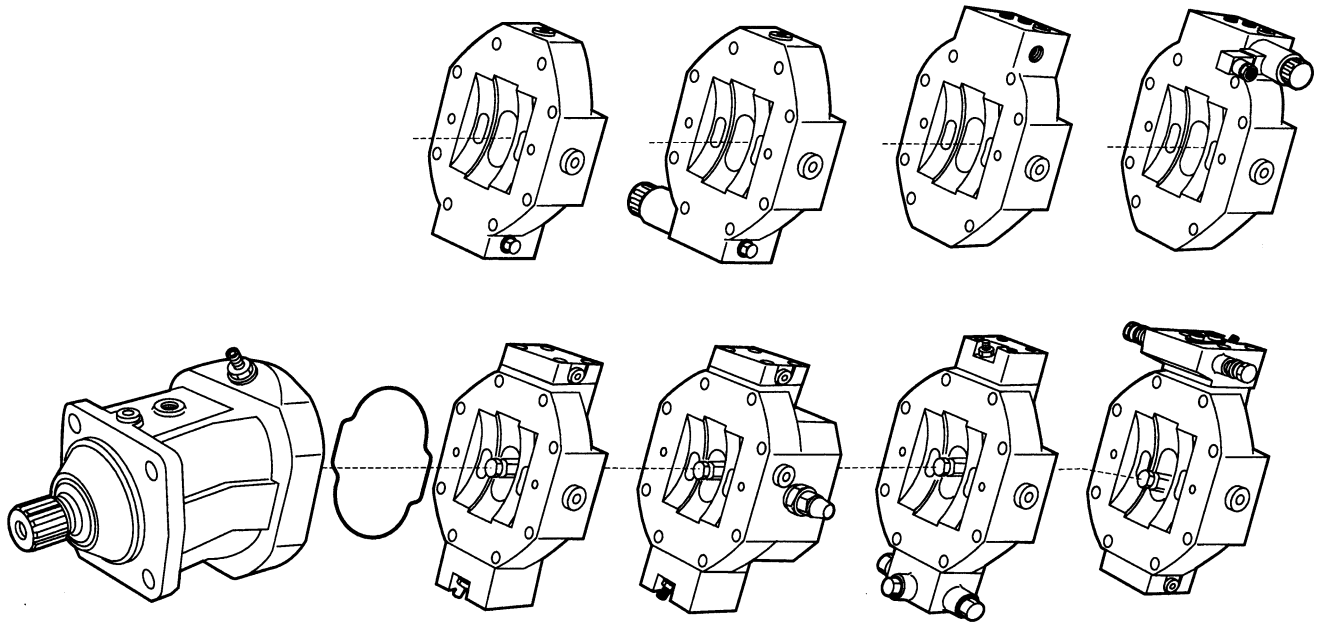
Assemble piston with retaining plate.
Note :
Oil piston and piston pad.



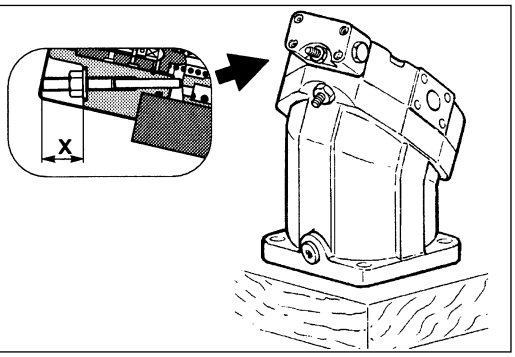
Assemble cylinder completely.



Remove assembly device.



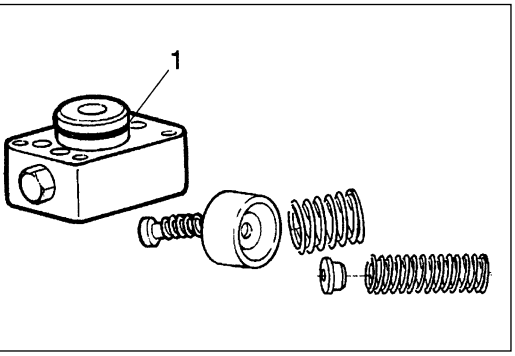
24



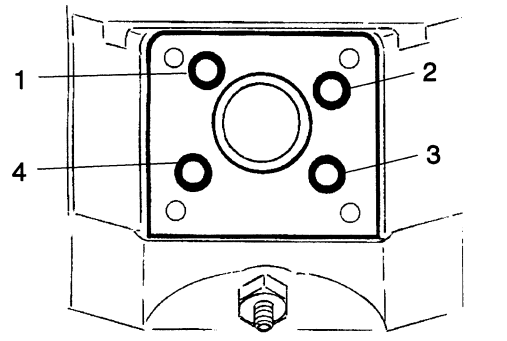
25 Example : A6VM…Control - **différential piston**.

Disassembly position : Remove cover Pos. 2.

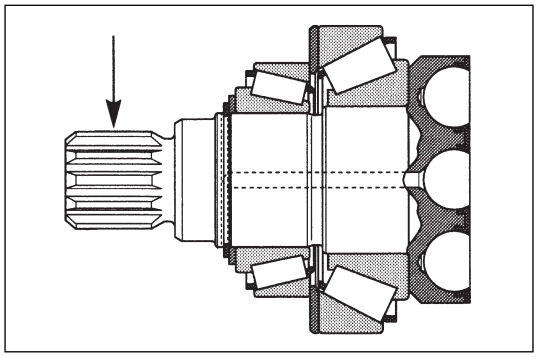
Attention ! Spring load.
Dimension X : Note dimension (begin of regulation).



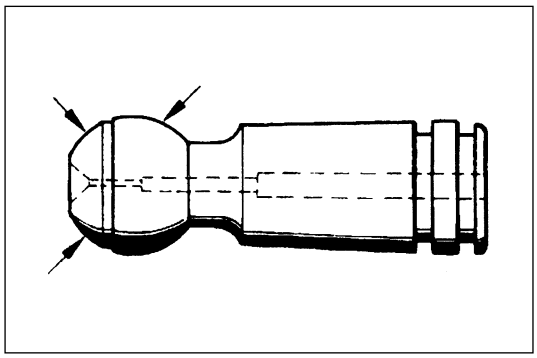
26 1. Check of O-ring.



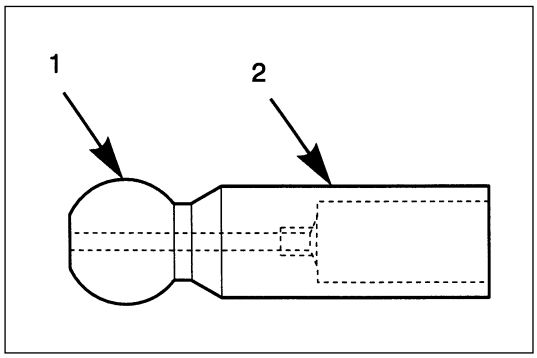
27 1. High pressure - small control piston side
2. Control pressure
3. High pressure - check valve
4. High pressure - check valve



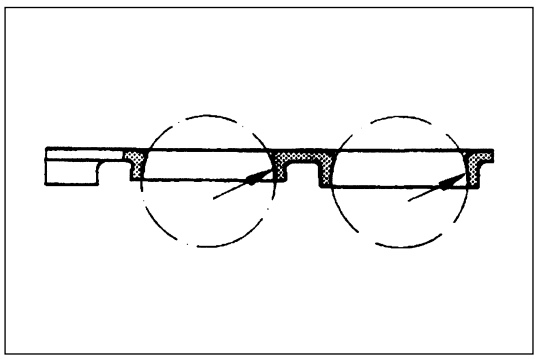
45 Free of corrosion, erosion or fretting, no damage to splines or keyways.



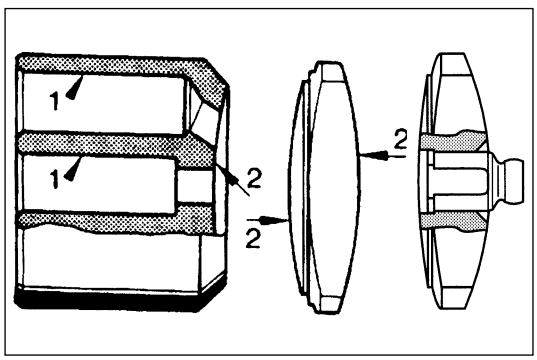
46 Pistons
No scoring and no pittings.



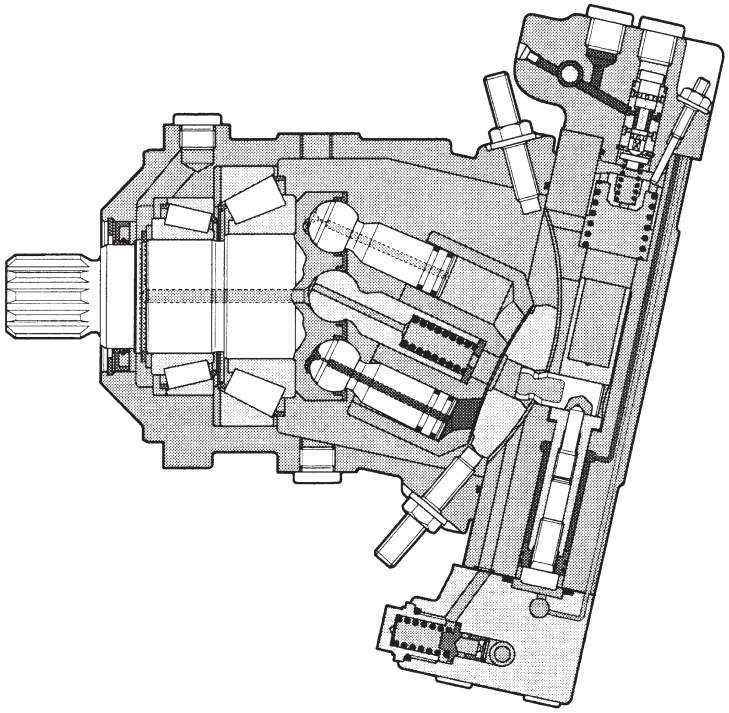
47 Center pin
No scoring and no pittings.

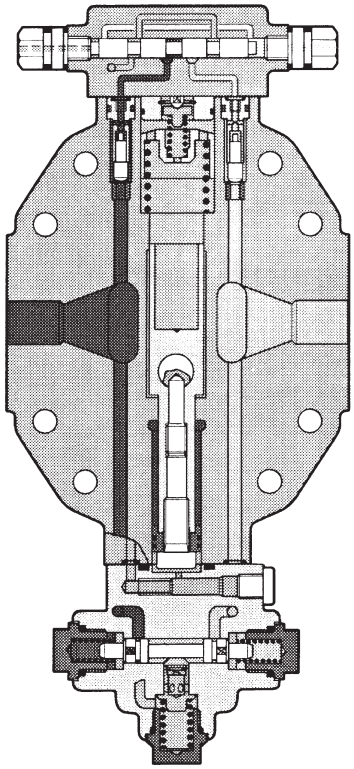


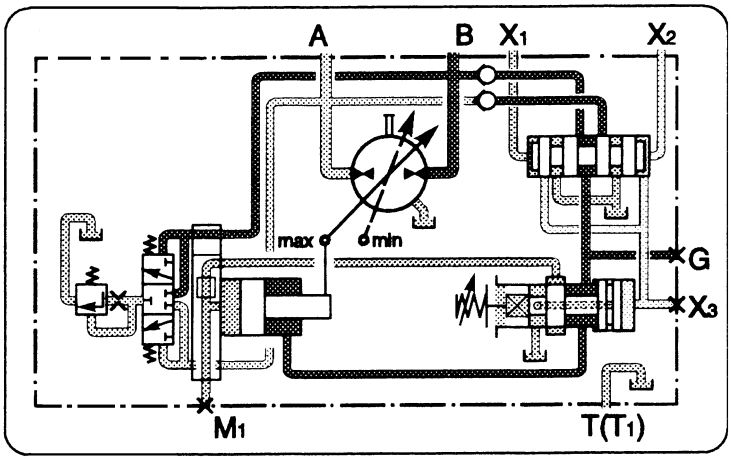
48 Retaining plate
No scoring and no evidence of wear.

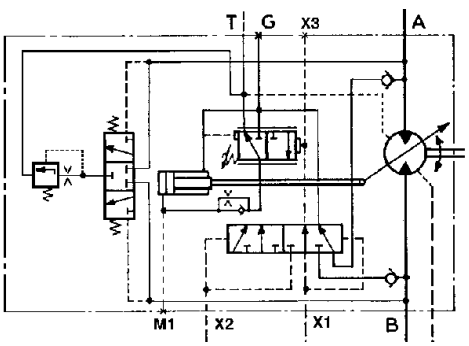


49 1. Bores free of scoring, no evidence of wear.
2. Faces smooth and even, free of cracks and scoring.



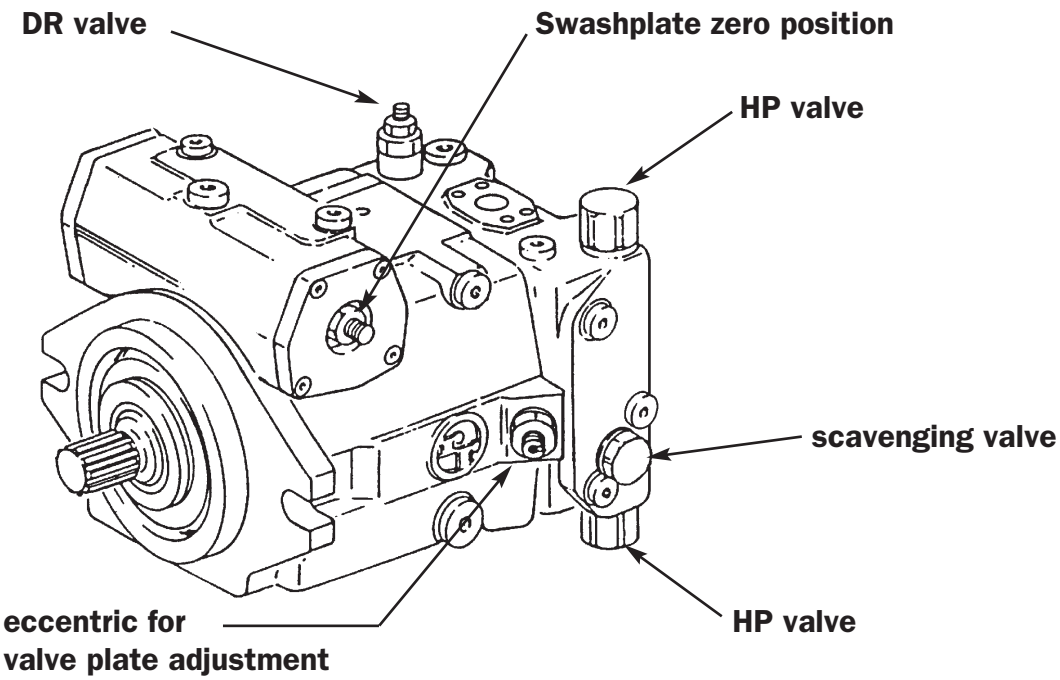




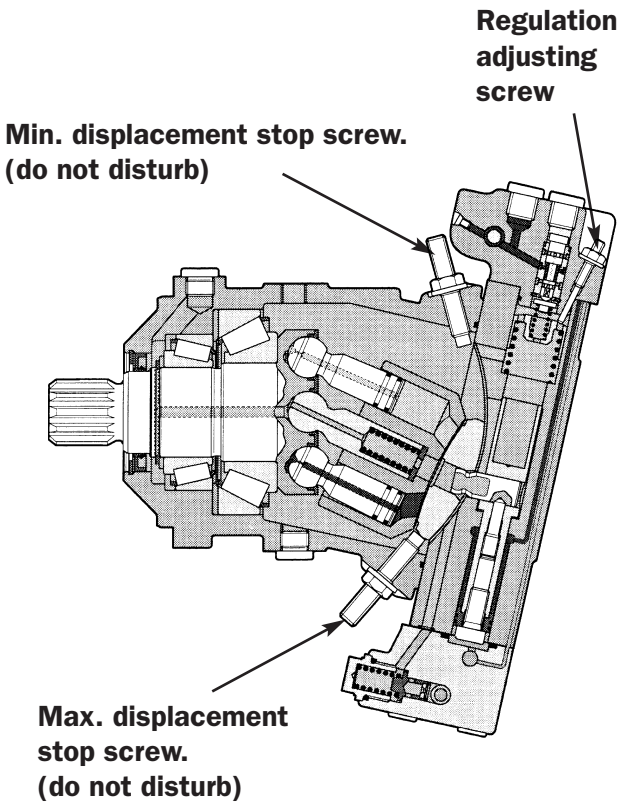


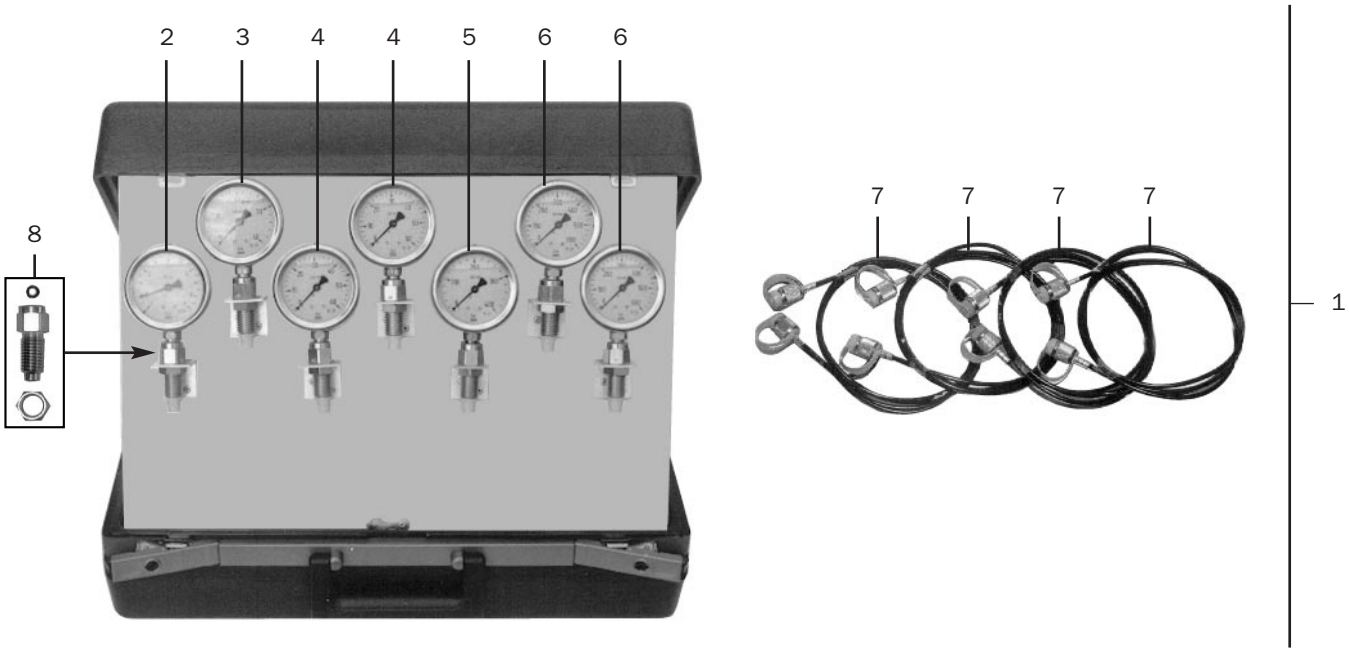
HYDRAULIC DIAGRAM MOTOR
A 6 VM / DA SERIE 63

PUMP A 4 VG

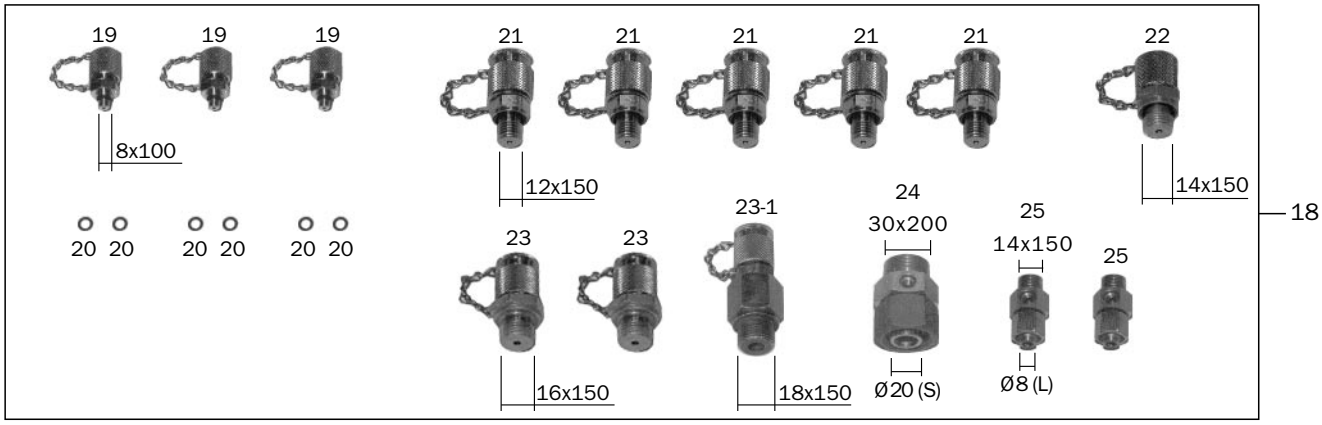


MOTOR A 6 VM



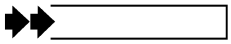


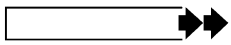
HYDROMATIK Kit - 2nd MOUNTING - Pump A 4 VG - Motor A 6 VM - DA



der Montage müssen die Ränder der Dichtringe geschmiert werden. Wenn beim Kegelradpaar ein Zahnrad ausgewechselt werden muß, muß auch das andere Zahnrad ausgewechselt werden. Bei der Montage müssen die vorgeschriebenen Spiele, Vorspannungen und Drehmomente strengstens eingehalten werden.

GÜLTIGKEIT: Das Handbuch gibt an zu welchen Kennummern die Einheiten gehören. Der Einfachheit halber sind die Angehörigkeiten folgendermaßen aufgeführt:

 = bis Kennummer

 = ab Kennummer

Wenn keine Angehörigkeit angegeben ist, verstehen sich die Arbeiten zur Zerlegung und Montage für alle Ausführungen gültig.

SPEZIFISCHE WERKZEUGE UND ERSATZTEILE: die Zeichnungen der für Wartungsarbeiten erforderlichen spezifischen Werkzeuge, sind am Ende des Handbuchs aufgeführt; Ersatzteile können beim Fahrzeughersteller oder direkt bei der Kundendienststelle oder bei einem zugelassenen Händler der SPICER CLARK-HURTH bezogen werden.

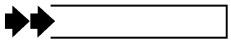
ESP

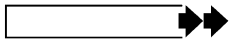
El rendimiento y la duración de los órganos mecánicos depende, además que del constante y correcto mantenimiento, también de la intervención inmediata en caso de averías o anomalías.
Al proponer este manual, ha sido considerada la suposición de una revisión general del grupo, pero es el mecánico quien tiene que valorar la necesidad de montar cada uno de los componentes en caso de reparación. El manual es una guía rápida y segura que permite intervenciones precisas por medio de fotografías y de planos que muestran las distintas fases de las operaciones. A continuación figuran todas las informaciones y advertencias necesarias para ejecutar un montaje correcto, para las comprobaciones y el montaje de cada uno de los componentes. Para remover el puente diferencial del vehículo hay que consultar los manuales de los fabricantes del vehículo. En la descripción de las operaciones siguientes se supone que el puente ya ha sido sacado del vahículo.

IMPORTANTE: Para facilitar el trabajo salvaguardando al mismo tiempo las superficies mecanizadas y la seguridad de los operadores, se aconseja que se usen equipos y herramientas adecuados como caballetes y bancos de soporte, martillos de plástico o de cobre, palancas adecuadas, extractores y llaves específicas.
Antes de desmontar las partes y descargar el aceite, es conveniente que se haga una limpieza minuciosa del puente sacando las incrustaciones y acumulaciones de grasa.

INTRODUCCION: Todos los órganos mecánicos desmontados tienen que ser limpiados minuciosamente con productos adecuados y restaurados o sustituidos en el caso de que presenten daños, desgaste, rajaduras, agarrotamientos, etc. En particular, comprobar la integridad de todas las partes en movimiento (cojinetes, engranajes, par cónico, ejes) y de estanqueidad (anillos OR, detenedor de aceite) sujetas a mayores solicitaciones y desgaste.
Se aconseja, de todas formas, que se sustituyan los órganos de estanqueidad cada vez que se ejecute la revisión o reparación de los componentes.
Al volver a montar, los segmentos de compresión tienen que estar lubricados en los bordes de estanqueidad. En el caso del par cónico, la sustitución de uno de sus engranajes comporta también la sustitución del otro. Al montar hay que tener en cuenta escrupulosamente los juegos, las precargas y los pares descriptos.

VALIDEZ: El manual suministra la validez de los grupos en forma de matrícula. Para poder tener una interpretación correcta, la validez está indicada:

 = hasta la matrícula

 = desde la matrícula en adelante

Si no ha sido indicada validez, las operación de desmontaje y montaje son comunes a todas las versiones.

HERRAMIENTAS ESPECIFICAS Y RECAMBIOS: Los planos de las herramientas especificas necesarias para la ejecución de las intervenciones de mantenimiento figuran al final del manual; los recambios se pueden pedir al fabricante de la máquina o directamente al Service Center o a Distribuidores autorizados de SPICER CLARK-HURTH.

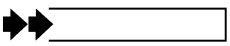
F

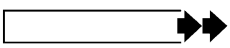
Le rendement et la continuité des organes mécaniques dépendent, non seulement d'une maintenance correcte et constante, mais également de la rapidité d'intervention en cas de pannes ou d'anomalies. En vous proposant ce manuel, on envisage l'hypothèse d'une révision générale du groupe, mais c'est au mécanicien d'évaluer la nécessité de monter ou non chacun des composants en cas de réparation. Le manuel est un guide rapide et sûr consentant des interventions précises, au travers de photographies et de dessins prospectifs qui illustrent les différentes phases des opérations. Ensuite, sont reportées toutes les informations et précautions nécessaires pour un démontage correct et les vérifications et assemblage de chaque composant. En ce qui concerne le déplacement du pont d'étai du véhicule, il est nécessaire consulter les manuels fournis par le constructeur du véhicule. En décrivant les opérations suivantes, on présume que le pont ait déjà été enlevé du véhicule.

IMPORTANT: Pour faciliter le travail en sauvegardant en même temps les surfaces usinées et la sécurité des opérateurs, il est préconisé d'utiliser des installations appropriées telles que des étais ou banc de support, maillets en plastique ou cuivre, leviers appropriés, extracteurs et clés spécifiques.
Avant de procéder au démontage des parties et vidanger l'huile, il vaut mieux nettoyer soigneusement le pont, en enlevant incrustations et blocs de gras.

PRELIMINAIRE: Tous les organes mécaniques démontés doivent être soigneusement nettoyés à l'aide de produits appropriés et réparés ou remplacés dans le cas où ils seraient abîmés, usés, fêlés, grippés, etc. Vérifier, l'intégrité, en particulier, de toutes les parties en mouvement (paliers, engrenages, couple conique, arbres) et l'étanchéité des bagues (bagues OR, parahuile), qui sont sujettes à plus de sollicitations et à l'usure. Il est préconisé, de toute façon, de substituer les organes d'étanchéité, chaque fois que l'on effectue une révision ou une réparation des composants. Au moment du montage, les bagues d'étanchéité doivent être lubrifiées sur les bords étanches. Dans le cas du couple conique, la substitution de l'un de ses engrenages comporte également la substitution de l'autre. En phase de montage, il faut respecter scrupuleusement les jeux, les précharges et les couples prescrits.

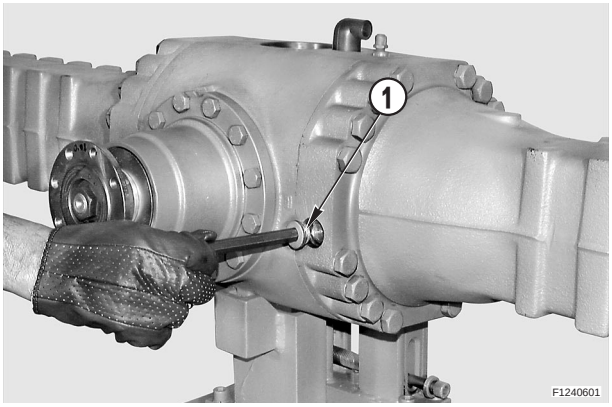
VALIDITE: Le manuel fournit la validité des groupes sous forme de matricule. Pour une meilleure interprétation, les validités sont indiquées comme:

 = jusqu'à l'immatriculation

 = à partir de l'immatriculation et après

Si les validités ne sont pas indiquées, les opérations de démontage et d'assemblage sont pareilles dans toutes les versions.

INSTALLATIONS SPECIFIQUES ET PIECES DETACHEES: Les dessins des installations spécifiques nécessaires pour effectuer des interventions d'entretien sont reportées à la fin du manuel, les pièces détachées peuvent être commandées au constructeur de la machine ou directement aux Centres de Services, ou Distributeurs agréés de la Société SPICER CLARK-HURTH.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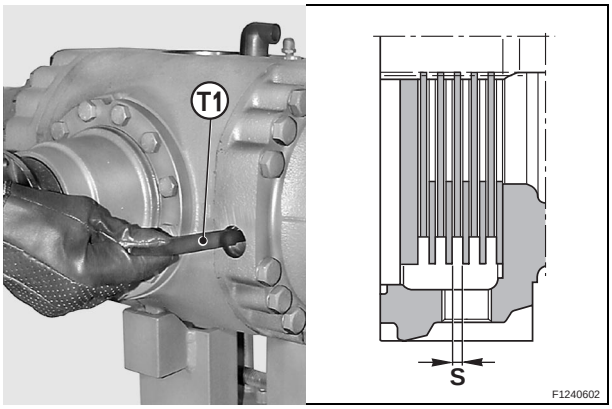
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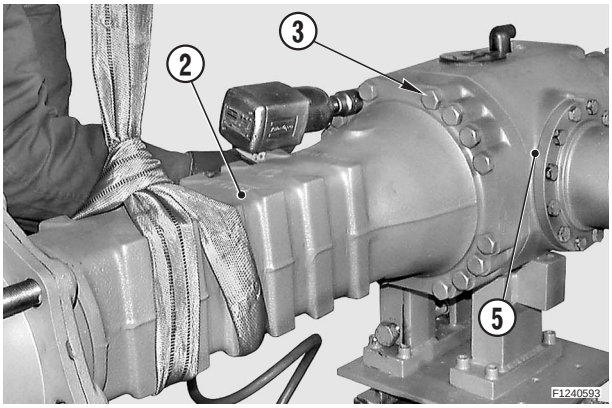
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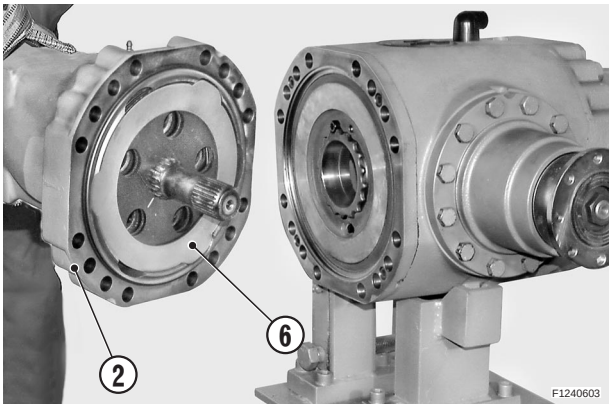
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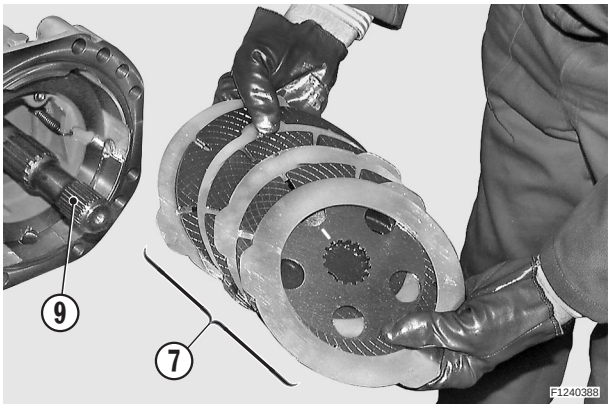
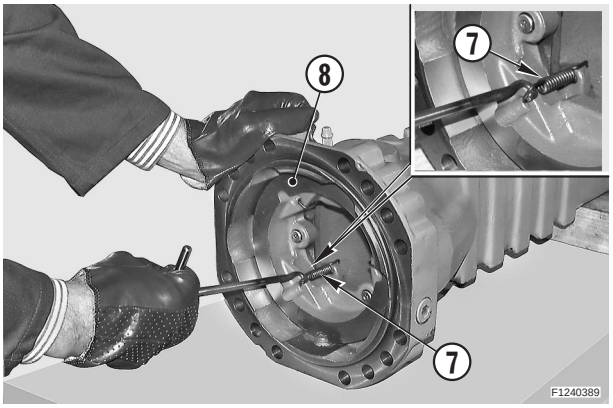
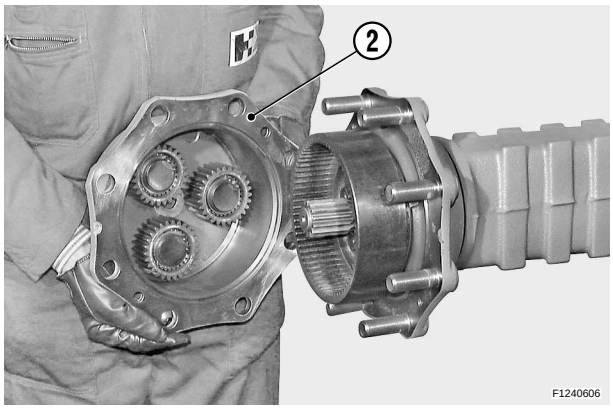
2
F1240603

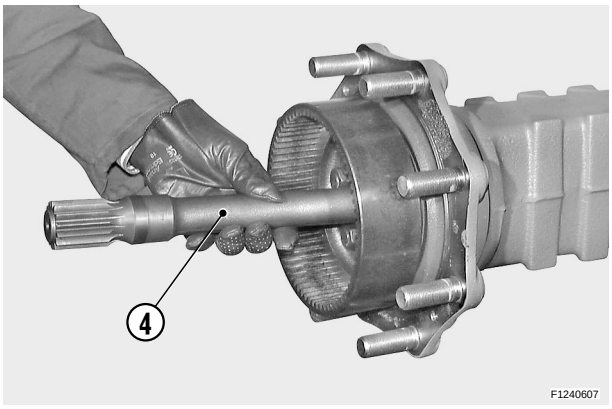

9
7
F1240388


8
7
7
F1240389



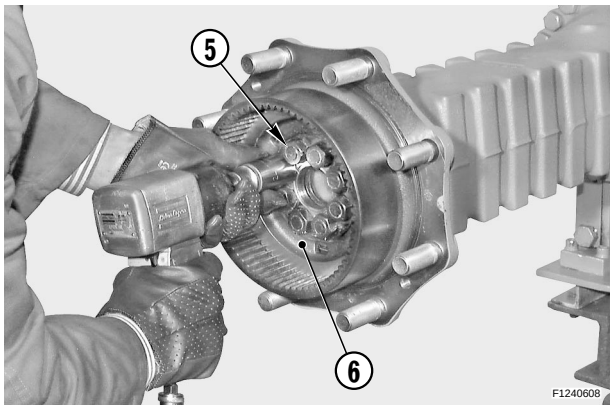
GB a

Remove the complete planetary carrier cover (2).



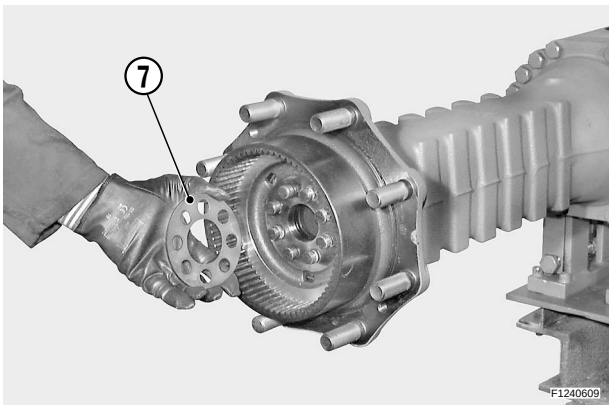
GB b

Remove the complete axle-shaft (4).



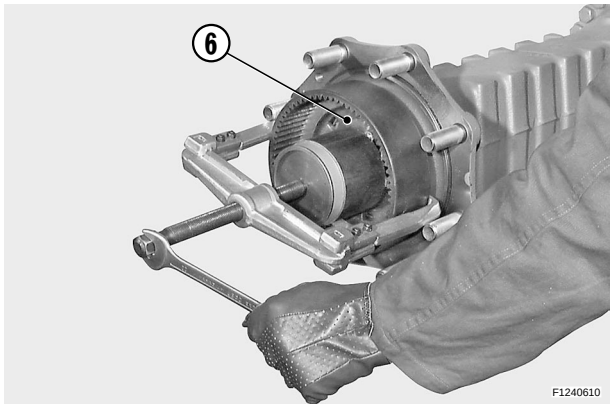
GB c

Unloose and remove the tightening nuts (5) from the crown flange (6).



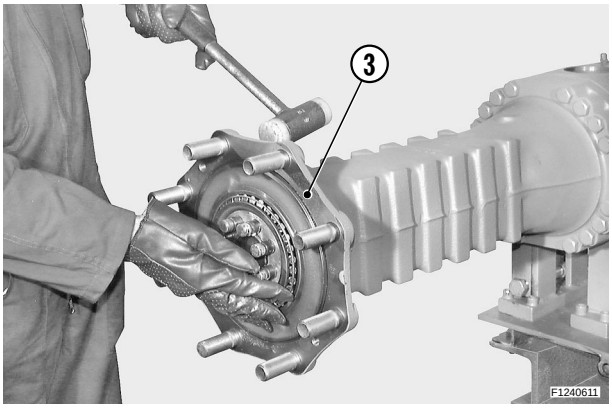
GB d

Remove the safety flange (7).



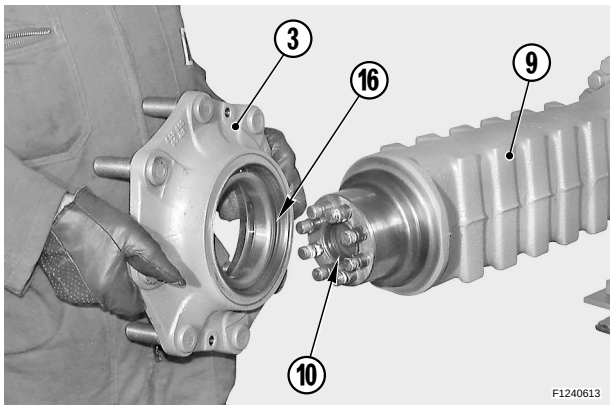
GB e

Using and puller, remove the complete crown flange (6) by acting on the stud bolts.



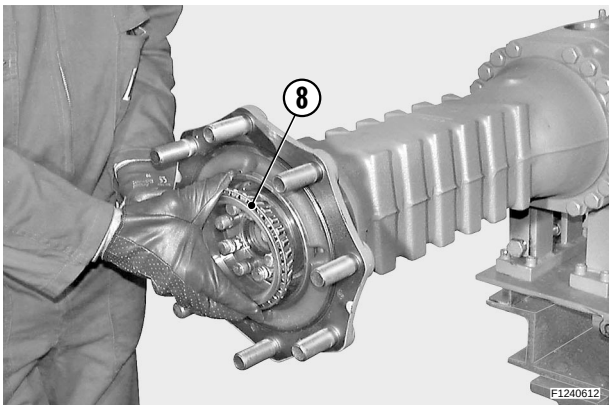
GB f

Partially extract the hub (3) using a plastic hammer.
NOTE. Alternately hammer on several equidistant points.



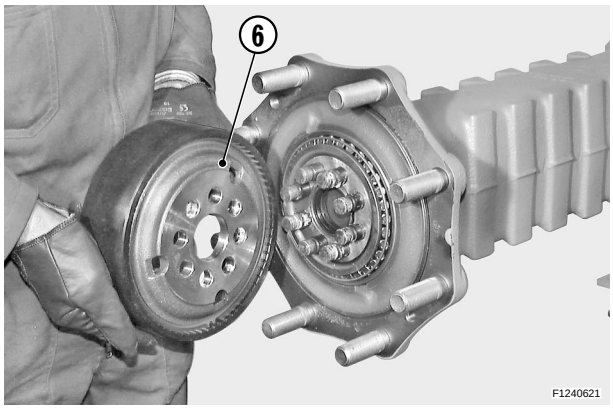
GB a

Lubricate with grease the sealing ring (16) and the hub of the arm (9).
Install the hub (3).



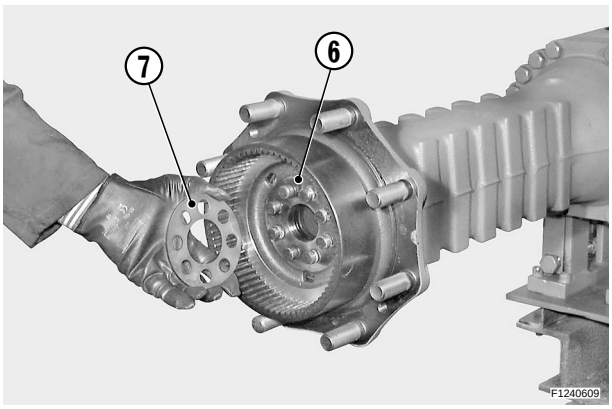
GB b

Install the external bearing (8).
NOTE. Using a plastic hammer, drive the bearing to the limit stop by lightly hammering around the edge.



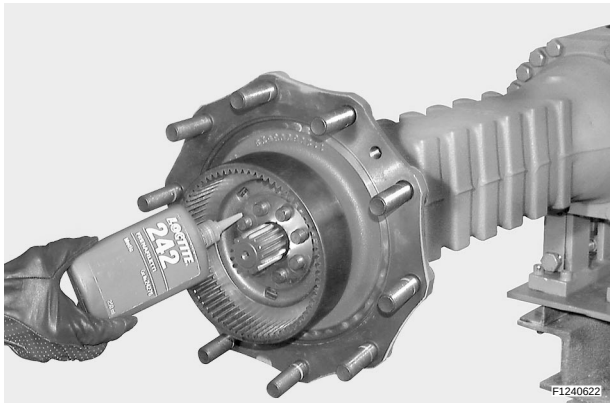
GB c

Fit the complete crown flange (6).
NOTE. In order to fasten the flange (6), use a plastic hammer and alternately hammer on several equidistant points.



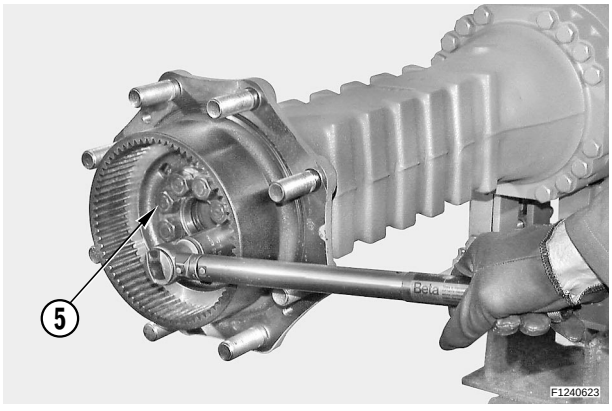
GB d

Apply Tecnolube Seal 101 grease to the surface of the safety flange (7) which touches the crown flange (6).
Fit the safety flange (7).



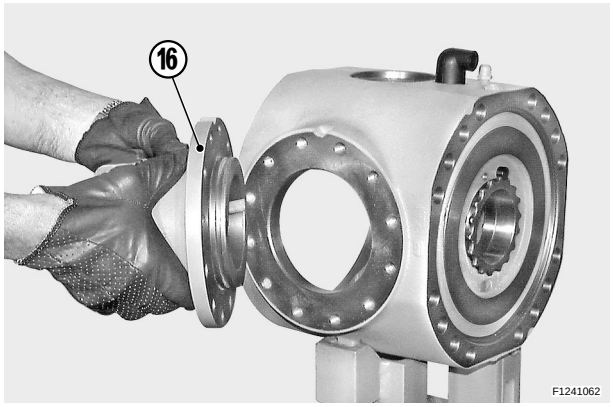
GB e

Apply Loctite 242 to the studs and fit in the nuts (5).



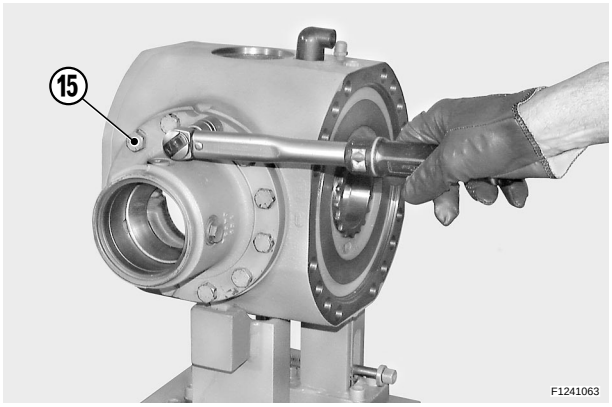
GB f

Cross tighten the nuts (5) in two stages.
Initial torque wrench setting: 130 Nm
Final torque wrench setting: 255–285 Nm



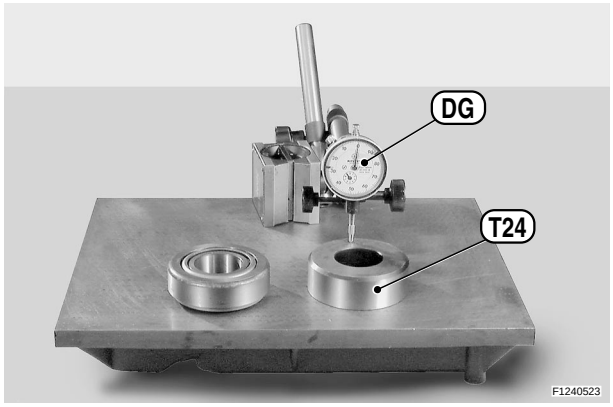
GB a

ONLY IF HAS BEEN REMOVED
Fit support (16), including O-ring (20), onto the intermediate body.
NOTE. 1- The cavity located on the outer diameter must face upwards.
2- Check and lubricate the O-ring (20).



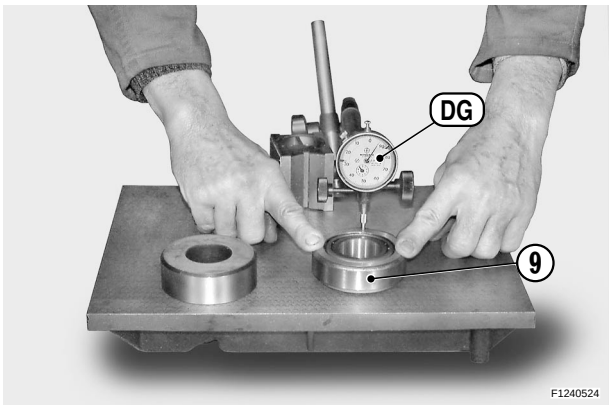
GB b

Fasten support with screws (15) previously coated with Loctite 270. Tighten using the criss-cross method to a tightening torque of 90 – 100 Nm.



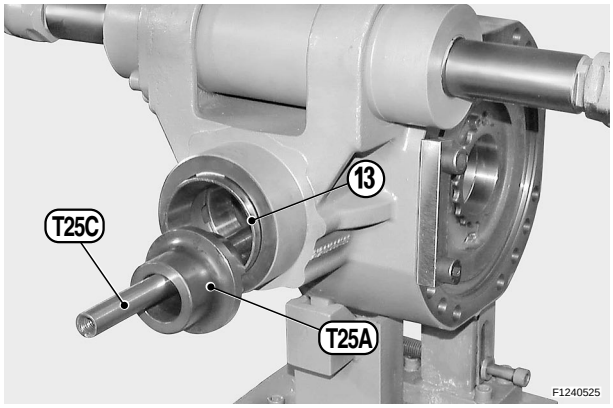
GB c

Using a surface plate, reset a centesimal comparator "**DG**" and place it on the measurement ring **T24** (with a thickness of 30.2 mm).
Preset the comparator to approx. 2 mm.



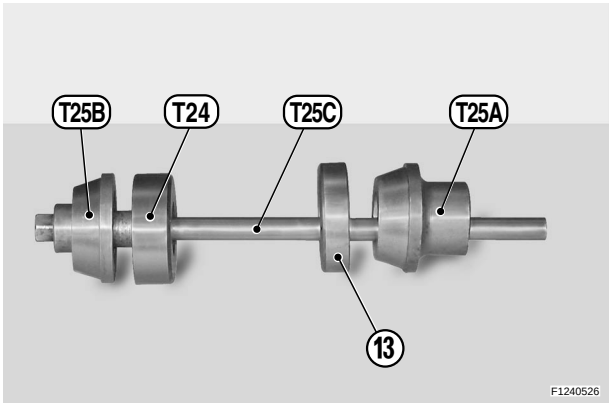
GB d

Bring the internal bearing (9), complete with its thrust block, under the comparator "**DG**".
Determine overall thickness "**D**" of the bearing checking the discrepancy between this size and the size of the measurement ring.
CAUTION! Press the thrust block in the centre and take several measurements while rotating the thrust block.



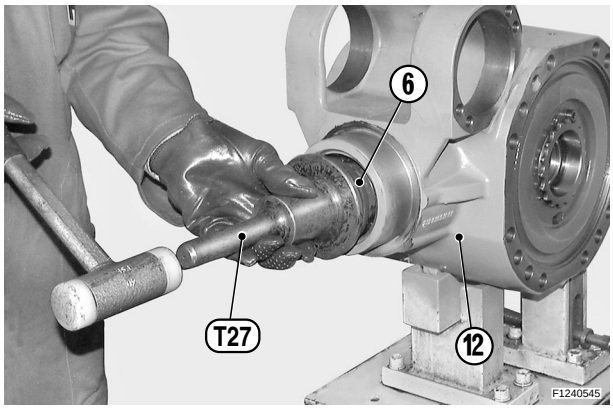
GB e

Partially insert the thrust block of the external bearing (13).



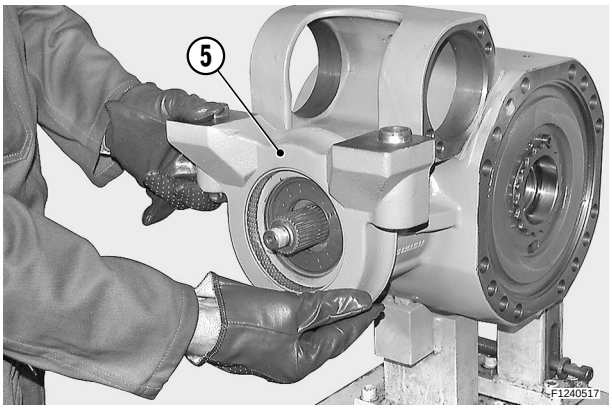
GB f

Install tension rod **T25C**, measurement ring **T24** and front guide tool **T25A** on the thrust block of the external bearing (13).



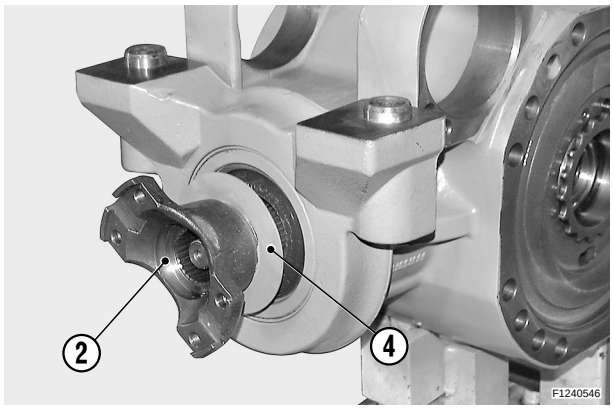
GB a

Lubricate the outer surface of the new sealing ring (6) and fit it onto the central body (12) using tool **T27**.



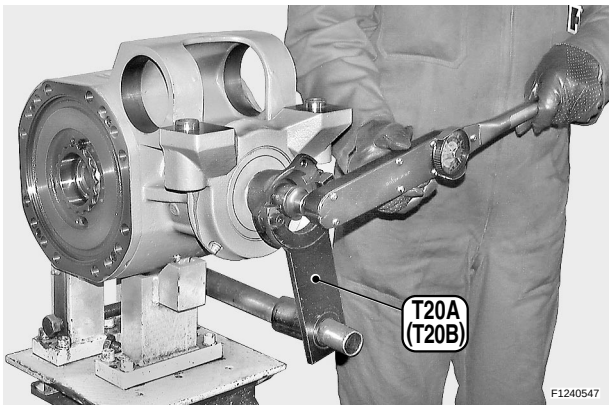
GB b

ATTENTION! This operation does not apply to the fixed axle.
NOTE. Check that it is properly oriented.



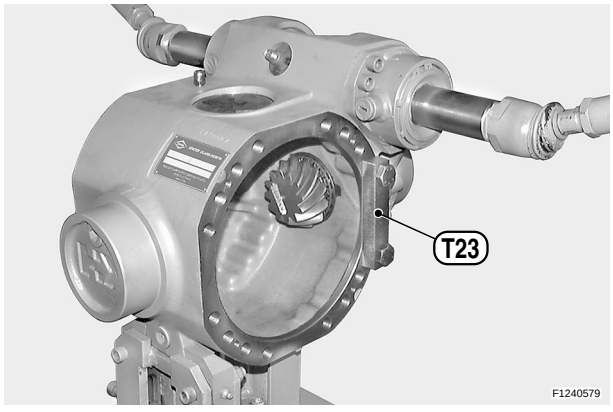
GB c

Fit the flange (2) complete with the guard (4) and fasten it.
For keying the flange (2), use a plastic hammer if necessary.
NOTE. Make sure that the guard (4) is securely fastened onto the flange and that it is not deformed.



GB d

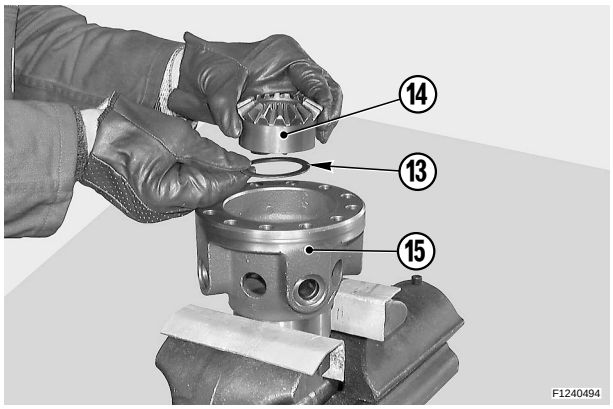
Apply Loctite 242 to the threaded part of the pinion (8).
Position tool **T20A** (or **T20B**) and fasten it in order to avoid rotation.
Insert O-ring (3) the nut (1) and tighten it using a dynamometric wrench.
Torque wrench setting: 280–310 Nm



GB e

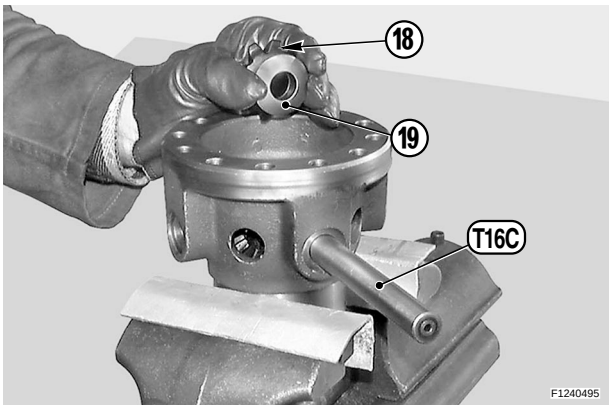
Remove blocks **T23** (used for extracting the pinion) and re-install the arms.
For details, see «CHECKING WEAR AND REPLACING THE BRAKING DISKS».

ASSEMBLING - ASSEMBLAGGIO - MONTIEREN - MONTAJE - MONTAGE



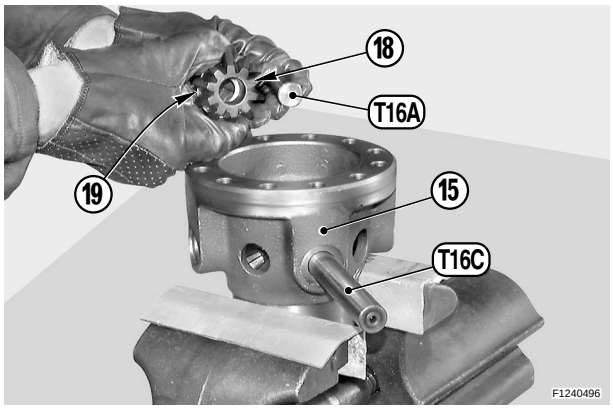
GB a

Insert the shim washer (13) and the planetary gear (14) in the differential carrier (15).



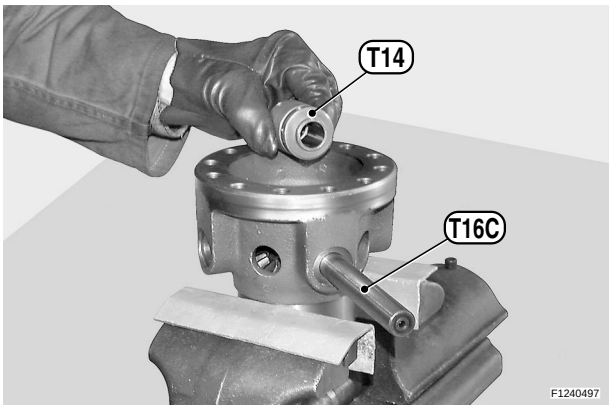
GB b

Position the shim washer (19) and the first planet wheel gear (18). Hold them in position using bar **T16C**.



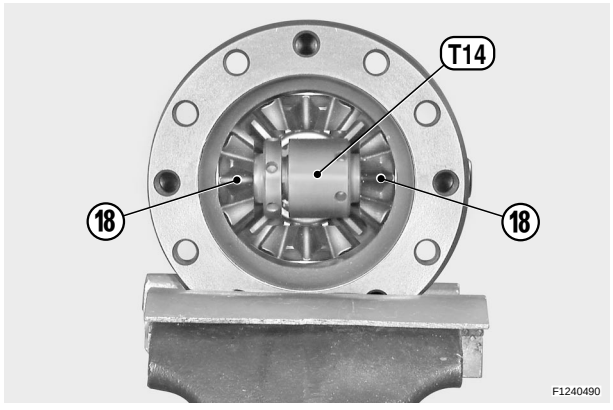
GB c

With the help of gudgeon **T16A**, position the second planet wheel gear (18) and the relative shim washer (19).



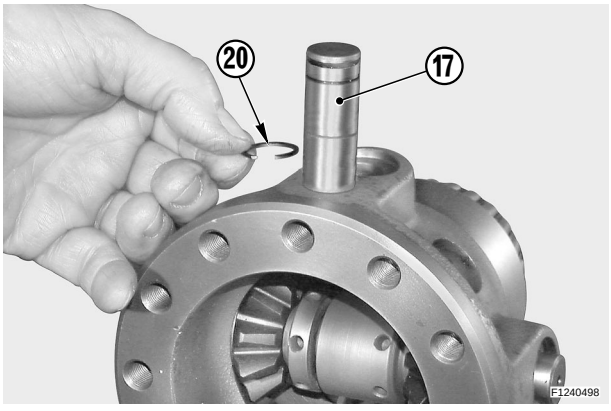
GB d

Insert tool **T14** between the two planetary gears (18). Line up the entire unit by pushing bar **T16C** all the way down until gudgeon **T16A** is ejected.



GB e

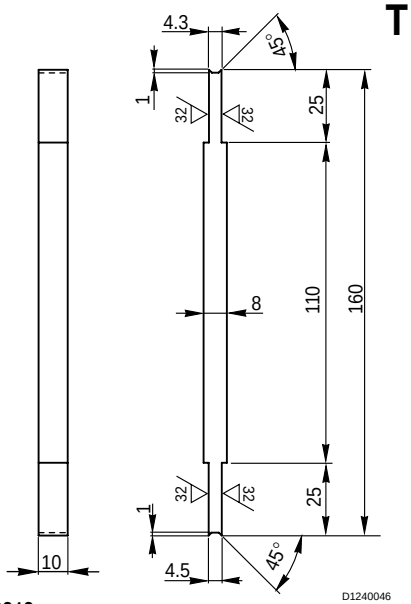
Lock tool **T14** behind the planet wheel gears (18).
After locking, remove bar **T16C**.



GB f

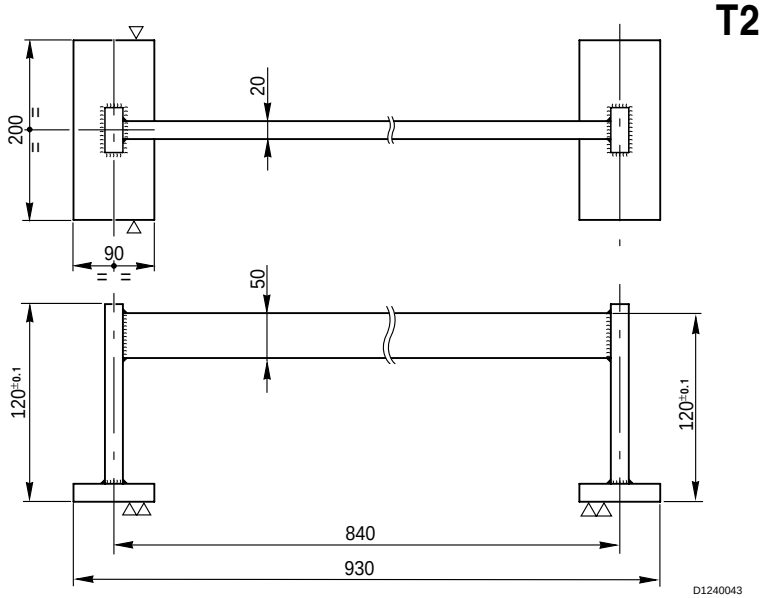
Fit the snap rings (20) onto the pins (17).

T1



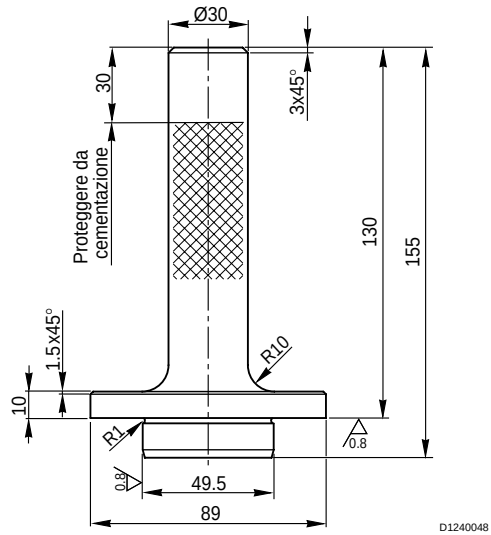
2313

T2



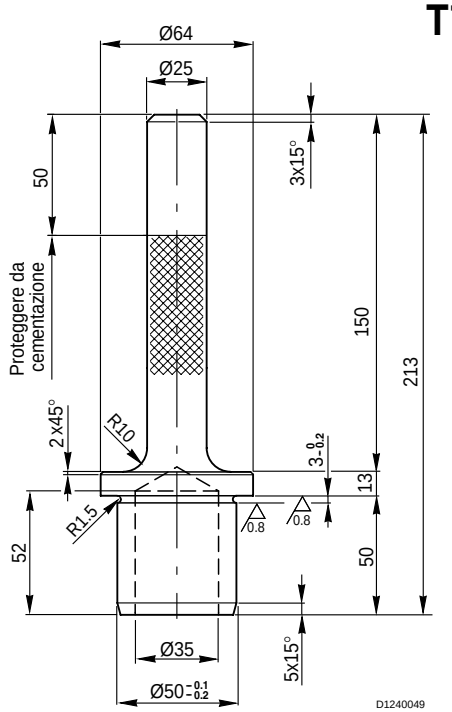
2305

T6



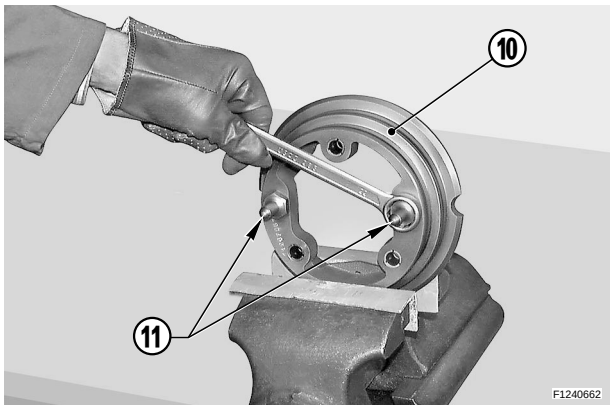
2301

T7



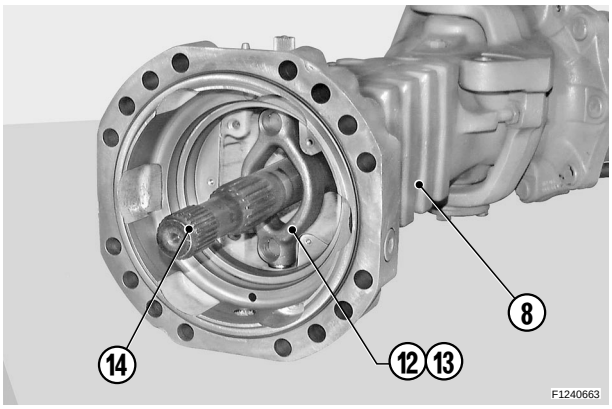
2303

PROBLEM - PROBLEMA - PROBLEM - PROBLEMA - PROBLEME	CAUSE - CAUSE - URSACHE - CAUSAS - CAUSE	CORRECTION - RIMEDI - ABHILFE - REMEDIOS - REMEDE
Soft brake pedal *Pedale del freno non risponde* Leichtes Bremspedal *El pedal del freno no funciona* Pedale du frein ne repond pas	6. Air in brake circuit *6. Aria nel circuito frenante* 6. Luft in der Bremsanlage *6. Aire en el circuito frenante* 6. Air dans le circuit	Bleed brakes as described in the vehicle's service manual. *Spurgare il circuito frenante come da istruzioni di spurgo del manuale del veicolo.* Bremsen entlüften gemäß Anweisungen im Handbuch des Failrzeuges. *Purgar el circuito frenante se acuerdo con las instrucciones de purga del manual del vehículo.* Purger le circuit de frein selon «instructions de purge» du manuel du véhicule.
Ineffective safety brake *Freno negativo inefficiente* Federspeicherbremse ohne Funktion. *Freno negativo ineficiente* Inefficacite du frein negatif	7. Incorrect adjustment *7. Registrazione incorretta* 7. Fehlerhafte Einstellung des Bremsscheibenspieles *7. Ajuste incorrecto* 7. Mauvais reglage	See correction N. 1. *Vedere rimedio N. 1.* Siehe Abhilfe N. 1. *Véase remedio N.1.* Voir remède N. 1.
	8. Brake disc worn out *8. Dischi freno usurati* 8. Bremslamellen verschlissen *8. Discos del freno gastados* 8. Usure disques frein	See correction N. 2. *Vedere rimedio N. 2.* Siehe Abhilfe N. 2. *Véase remedio N. 2.* Voir remède N. 2.
Overheating *Surriscaldamento* Überhitzung *Sobrecalentamiento* Surchauffe	9. Oil level wrong *9. Livello olio non corretto* 9. Niedriger Ölspiegel-Falscher Ölstand *9. Nivel de aceite no correcto* 9. Niveau d'huile pas incorrect	Drain, flush and refill oil to proper level. *Scaricare, eseguire un lavaggio e riempire d'olio fino a livello.* Öl ablassen, reinigen und richtigen Ölstand wieder herstellen. *Descargar, ejecutar un lavado y llenar con aceite hasta el nivel.* Vidanger, rincer et refaire le niveau d'huile.
	10. Too small of a brake gap *10. Poco gioco tra i dischi freno* 10. Zu wenig Spiel zwischen den Bremslamellen *10. Poco juego entre los discos del freno* 10. Peu de jeu entre les disques frein	Readjust brakes to the specifications in the vehicle's service manual. *Registrare il freno come istruzioni da manuale del veicolo.* Spiel gemäß Anweisungen im Handbuch des Fahrzeuges herstellen. *Ajustar el freno de acuerdo con las instrucciones del manual del vehículo* Regler le frein selon les instructions du manuel du véhicule.
	11. Park brake dragging *11. Freno di parcheggio in trazione* 11. Feststellbremse zieht *11. Freno de estacionamiento en tracción* 11. Frein de parc mal réglé	Unlock the brake and adjust the correct gap. *Sbloccare il freno ripristinando il gioco corretto.* Bremsen lösen und richtiges Lamellenspiel einstellen. *Desbloquear el freno restableciendo el juego correcto.* Débloquer le frein et régler le jeu.



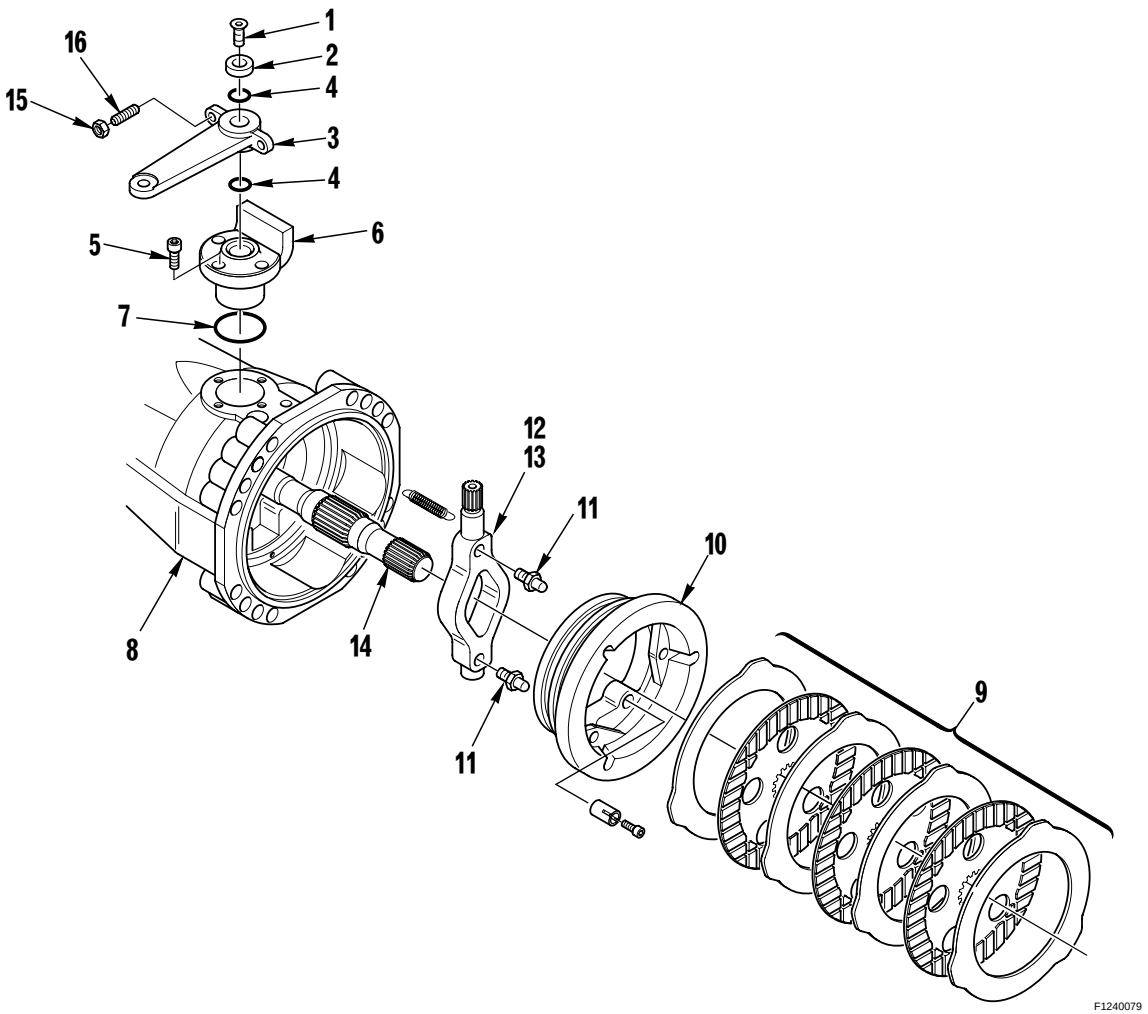
GB a

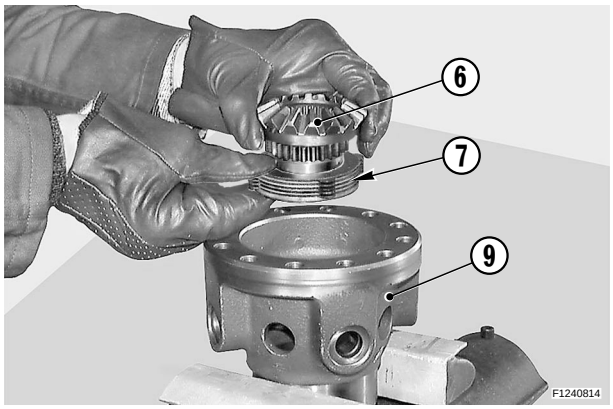
If pins (11) need replacing, block the piston (10) into a vice whose jaws are covered in smooth material and remove the pins.



GB b

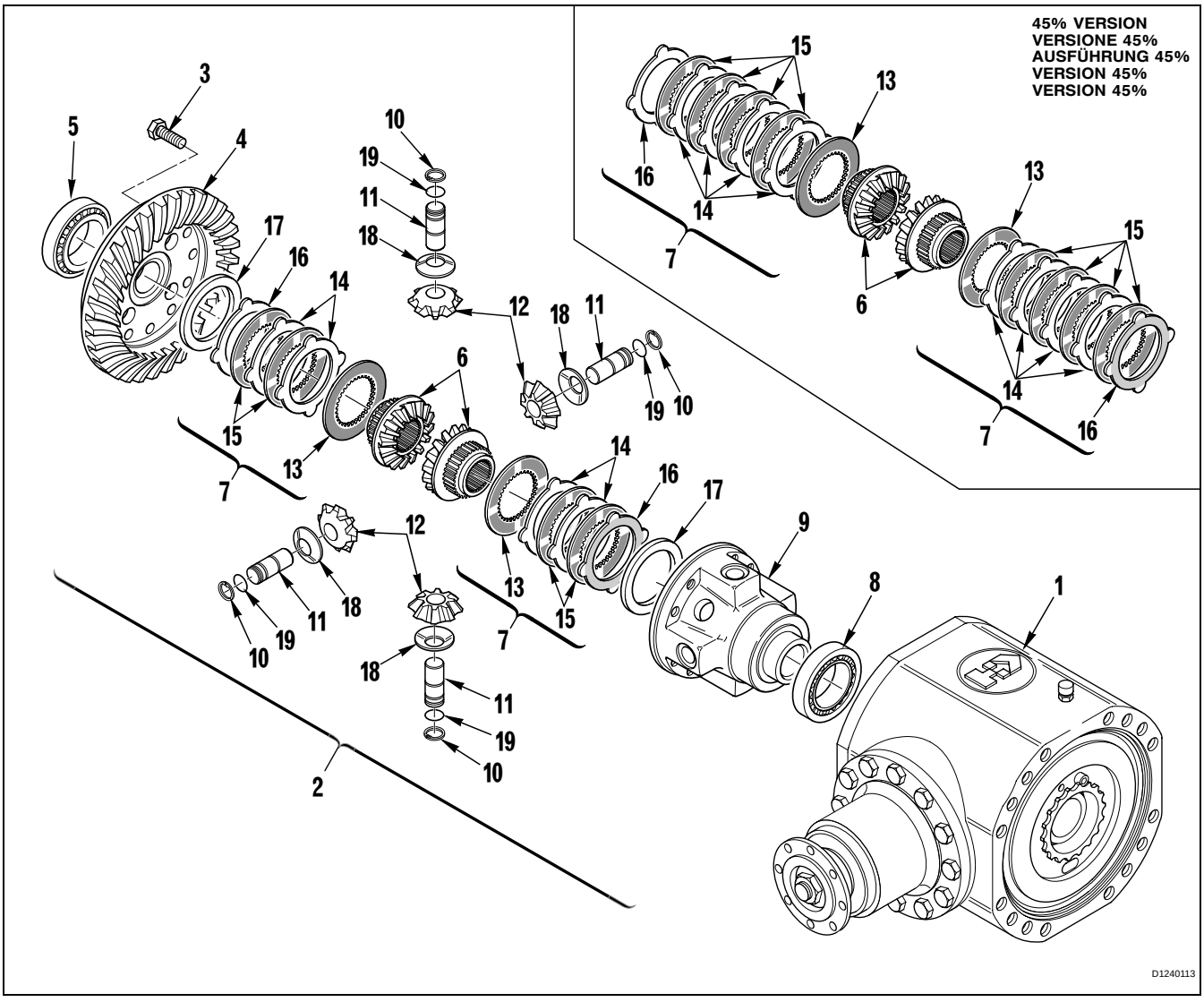
If thrust levers (12) and (13) need replacing, remove the axle shaft (14) before removing the arms (8).
For details, see «HOW TO REMOVE THE AXLE SHAFT».

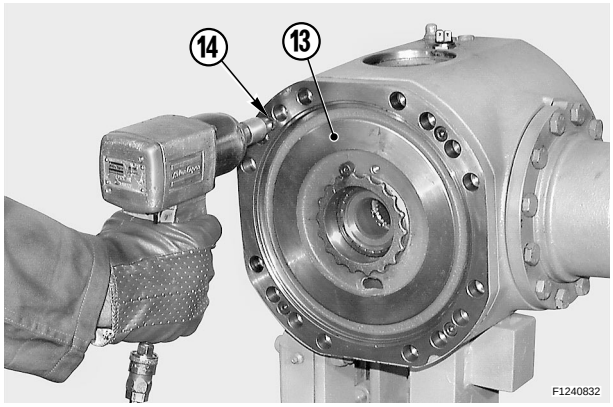




GB a

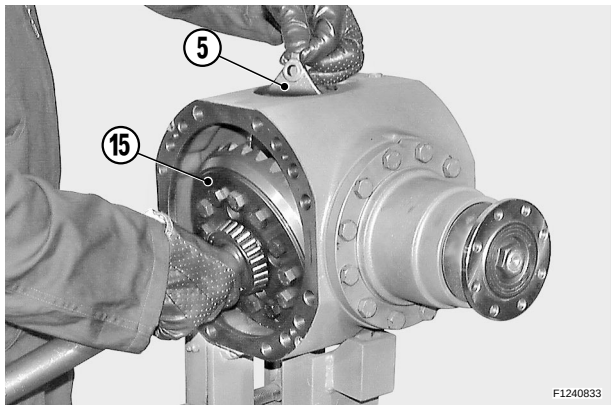
Remove tool **T14** and extract from the differential unit (9) the two final planet gears (12), the 2nd planet gear (6) and the whole friction assembly concerned (7).





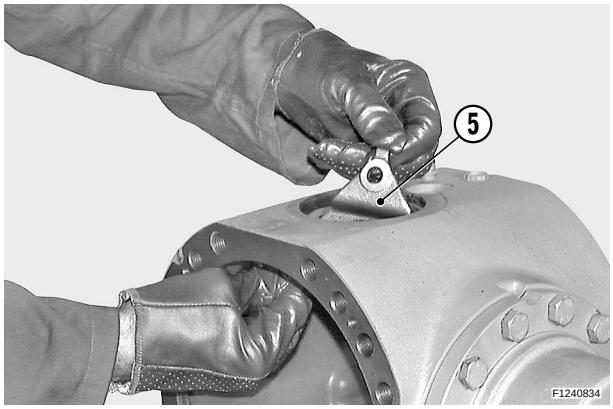
GB a

Remove screws (14) and remove the intermediate cover (13).
NOTE. Support the differential unit with a lever.



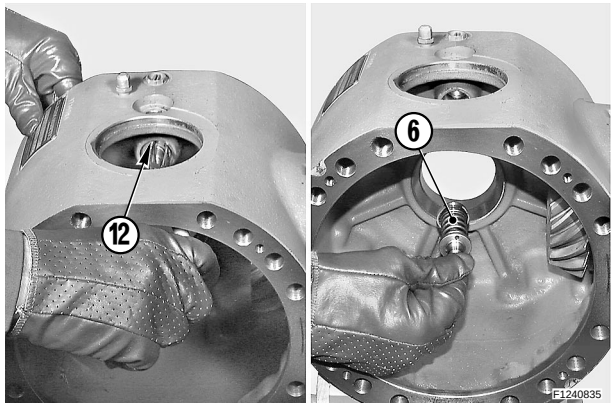
GB b

Disconnect fork (5) from piston (6). While holding the fork up, remove the differential unit (15).



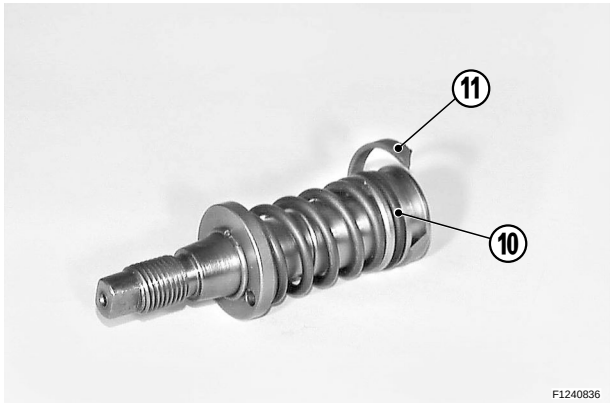
GB c

Extract fork (5).



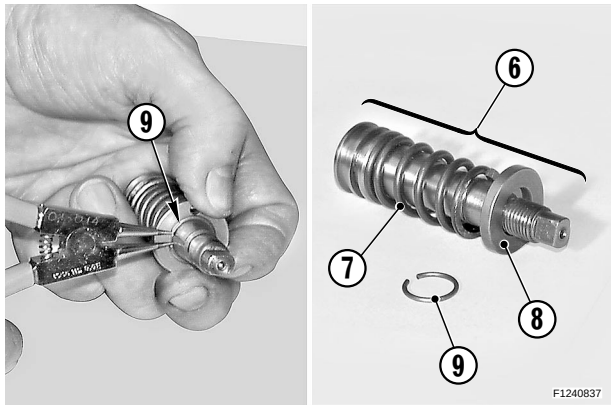
GB d

Remove snap ring (12) and whole piston (6).



GB e

Remove guide ring (11) and O-ring (10).
NOTE. The guide ring (11) and O-ring (10) must be replaced each time the unit is disassembled.

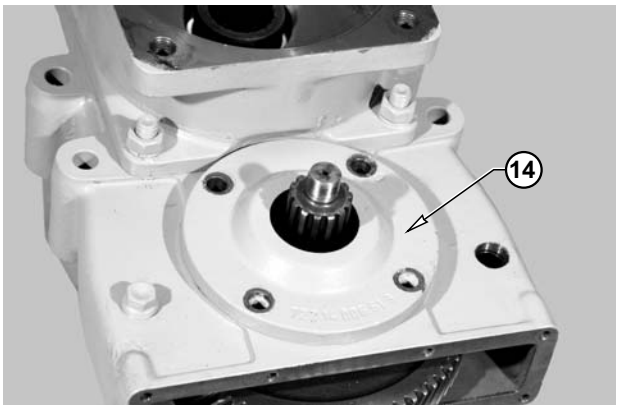


GB f

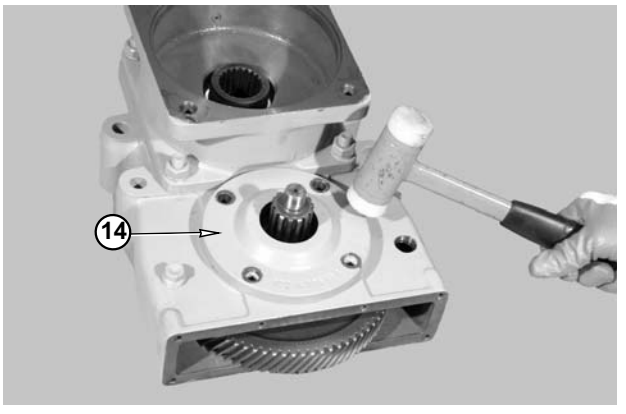
Remove snap ring (9) and take piston unit (6) apart. Remove all component parts.

SCREW-LOCKING, SEALING AND LUBRICATING MATERIALS - MATERIALI PER BLOCCAGGIO VITI, TENUTA E LUBRIFICAZIONE - MATERIAL ZUR BLOCKIERUNG VON SCHRAUBEN UND FÜR DICHTUNGEN UND SCHMIERMITTEL - MATERIALES PARA EL BLOQUEO, ESTANQUEIDAD Y LUBRICACION - MATÉRIAUX POUR LE BLOCAGE VIS, ÉTANCHÉITÉ ET LUBRIFICATION

DENOMINATION **DENOMINAZIONE** **BEZEICHNUNG** **DENOMINACION** **DENOMINATION**	**APPLICATION - APPLICAZIONE - ANWENDUNG - APLICACION - APPLICATION**
Loctite 510	• Anaerobic product for the hermetic sealing of flanged units and screw holes communicating with fluids. Can seal clearances between flanges up to 0.2 mm. • *Prodotto anaerobico adatto alla tenuta ermetica di fluidi tra assiemi flangiati e di viti a foro comunicante con i fluidi. Può sigillare giochi tra le flange fino a 0,2 mm.* • Anaerobes Produkt zur Abdichtung von Flüssigkeiten an Flanschen und Schrauben mit Löcher, die mit Flüssigkeiten in Kontakt stehen. Kann ein Spiel zwischen Flanschen bis 0,2 mm abdichten. • *Producto anaeróbico apto para le estanqueidad de fluidos entre grupos bridados y de tornillos de orificio comunicante con los fluidos. Puede sellar juegos entre las bridas hasta 0,2 mm.* • Produit anaréobic apte à la tenue étanche des fluides entre les pièces à brides et des vis à trou en contact avec les fluides. Il peut sceller un jeu parmi les flasques jusqu'à 0,2 mm.
Loctite 577	• Quick anaerobic sealant for sealing threaded portions of conical or cylindrical unions up to M80. Before using it, remove any lubricant with the specific activator. After polymerisation, disassembly may result rather difficult, so heating may be necessary for larger diameters. • *Prodotto anaerobico sigillante rapido per la tenuta di filettature di raccordi conici o cilindrici fino a M80. Deve essere usato dopo aver asportato ogni traccia di lubrificante con l'attivatore specifico. Dopo la polimerizzazione presenta una moderata difficoltà di smontaggio per cui può richiedere, per i diametri maggiori, un riscaldamento.* • Anaerobes Produkt zum schnellen Siegeln und Abdichten von Kegel- oder Zylinderkupplungen bis M80. Darf erst aufgetragen werden, nachdem mit einem spezifischen Wirkstoff jede Spur von Schmiermittel abgetragen worden ist. Nach der Polymerisation könnte das Abmontieren etwas schwierig sein weshalb größere Durchmesser zuerst erhitzt werden müssen. • *Producto anaerobico sellante rapido para el estanqueido de tornillos de empalme conico o cilindrico hasta M80. Debe de ser utilisado despues de haber quitado cada mancha de lubrificante con activador especifico. Despues de la polimeracion presenta una moderada dificultà de desmontaje por lo tanto puede necesitar, para los diametros majores, un calientamiento.* • Produit anaérobie collage rapide assurant l'étanchéité des filetages des raccords coniques ou cylindriques jusqu'à M80. Il doit être utilisé après qu'on ait enlevé toute trace de lubrifiant à l'aide d'un activeur spécial. Une certaine difficulté de démontage se présente après la polymérisation, on peut donc avoir la nécessité de devoir chauffer préalablement pour de plus amples diamètres.
Loctite 638	• Anaerobic adhesive for fast and high-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with clearance ranging between 0.1 and 0.25 mm. • *Adesivo anaerobico per l'incollaggio rapido ad alta resistenza di giunti cilindrici in metallo (mozzo su albero). Può incollare particolari con gioco tra 0,1 e 0, 25 mm.* • Anaerober Klebstoff für große Widerstandskräfte für Zylinderkupplungen aus Metall geeignet (Wellennaben). Kann Einzelteil mit einem Radialspiel zwischen 0,1 mm und 0,25 mm zusammenkleben. • *Adhesivo anaeróbico para el encolado rápido de alta resistencia de juntas cilíndricas de metal (cubo en el eje). Puede encolar piezas con juego entre 0,1 mm y 0,25 mm.* • Adhésif anaérobic servant à un collage rapide et hautement résistant des joints cylindriques en métal (moyeu sur l'arbre). Il peut servir à coller des pièces avec un jeu allant de 0,1 à 0,25 mm.
Loctite 648	• Anaerobic adhesive for fast and medium-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with radial clearance below 0.1 mm. • *Adesivo anaerobico per l'incollaggio rapido a media resistenza di giunti cilindrici in metallo (mozzo su albero). Può incollare particolari con gioco radiale inferiore a 0,1 mm.* • Anaerober Klebstoff für mittlere Widerstandskräfte für Zylinderkupplungen aus Metall geeignet (Wellennaben). Kann Einzelteil mit einem Radialspiel von weniger als 0,1 mm zusammenkleben. • *Adhesivo anaeróbico para encolado rápido de media resistencia juntas cilíndricas de metal (cubo en el eje). Puede encolar piezas con juego radial inferior a 0,1 mm.* • Adhésif anaérobic servant à un collage rapide moyennement résistant des joints cylindriques en métal (moyeu sur l'arbre). Il peut servir à coller des pièces avec un jeu radial inférieur à 0,1 mm.
(AREXONS) Repositionable jointing compound for seals *Mastice per guarnizioni riposizionabile* Klebstoff für verstellbare Dichtungen *Pasta para juntas reposicionable* Mastic pour garnitures à remettre en place	• Solvent-based sealing compound for elastic seals, drying through evaporation. Used for sealing the outer diameter of sealing rings for rotating shafts with outer metal reinforcement. • *Mastice sigillante per guarnizioni elastiche a base di solvente, essicante per evaporazione. Viene utilizzato per la tenuta sul diamentro esterno di anelli di tenuta per alberi rotanti con armatura metallica esterna.* • Klebstoff für Gummidichtung auf Lösemittelbasis, trocknet durch Verdampfung. Wird am äußeren Durchmesser von Dichtungsringe bei rotierenden Wellen mit Metallmantel verwendet. • *Pasta para juntas de sellado para juntas elásticas a base de disolvente, deshidratante por evaporación. Se utiliza para la estanqueidad en el diámetro externo de segmentos de compresión, para ejes giratorios con armadura metálica exterior.* • Mastic adhésif à base de solvants pour garnitures élastiques, séchant par évaporation. Il sert garder étanche le diamètre extérieur des bagues d'étanchéité des arbres rotatifs ayant une armature métallique externe.

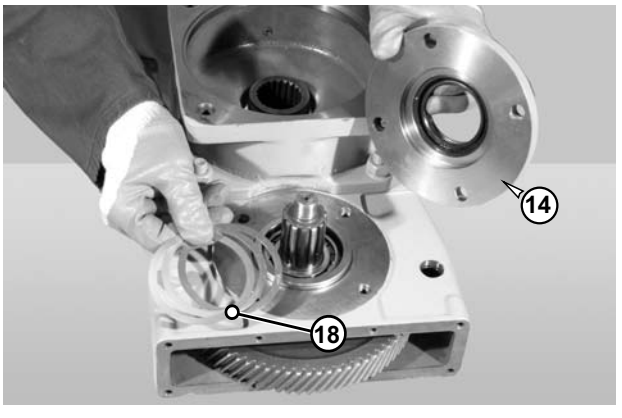


GB a



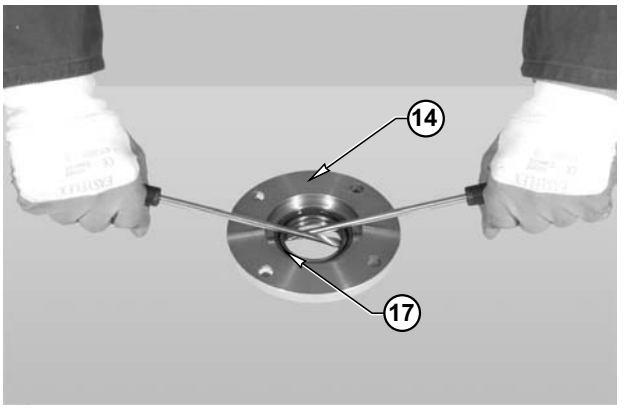
GB b

Disjoin the cover (14)



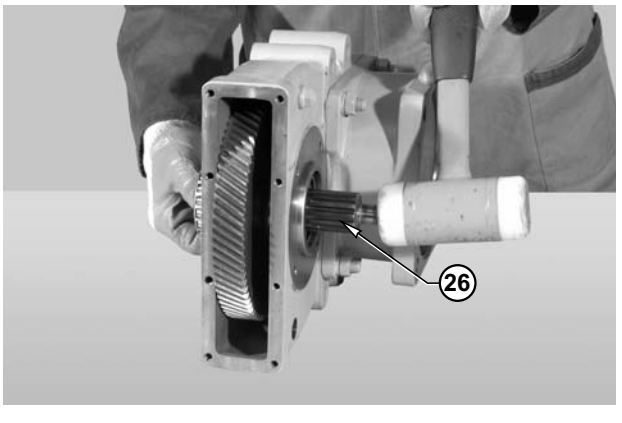
GB c

Remove the shims S1 (18).



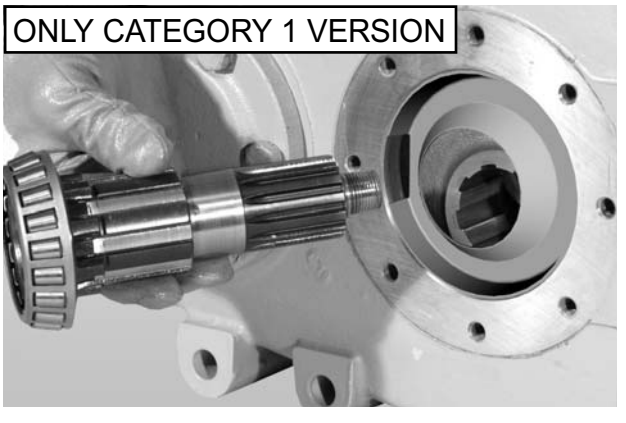
GB d

Using two levers, remove the sealing ring (17).



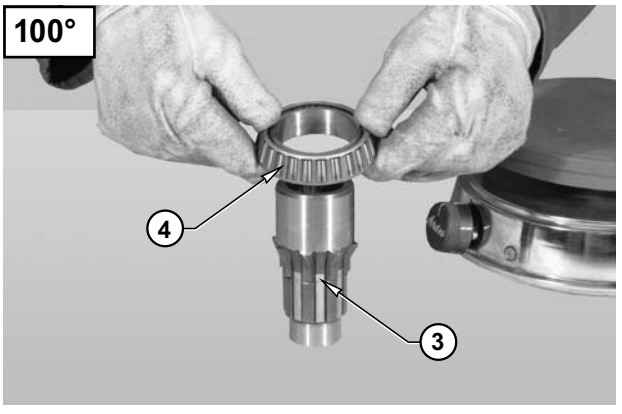
GB e

Remove the lower shaft (26).



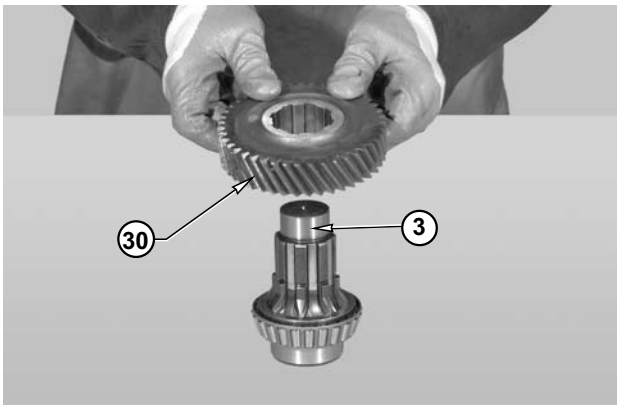
GB f

Remove the oil collector from the drop box cover.



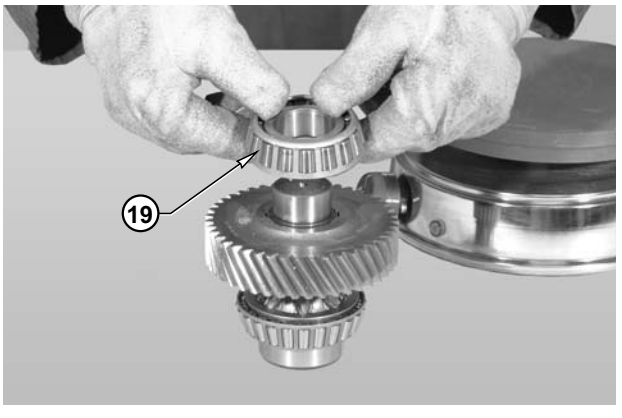
GB a

Install the bearing (4).



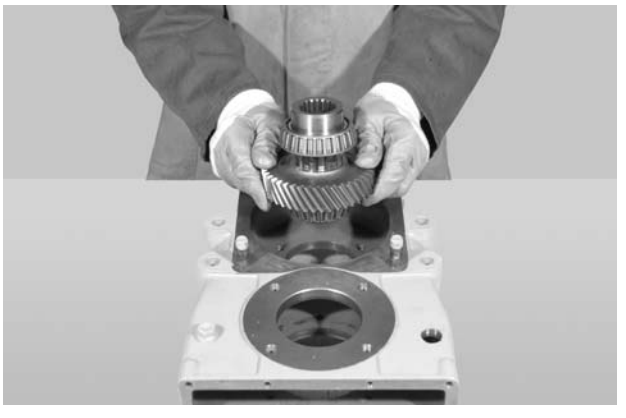
GB b

Install the gear (30) onto the upper shaft (3).



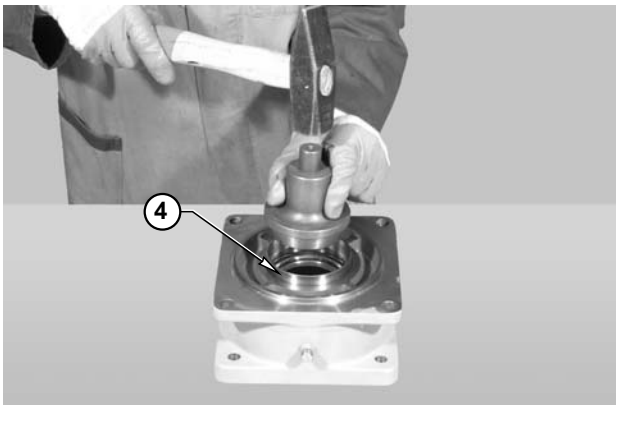
GB c

Install the bearing (30).



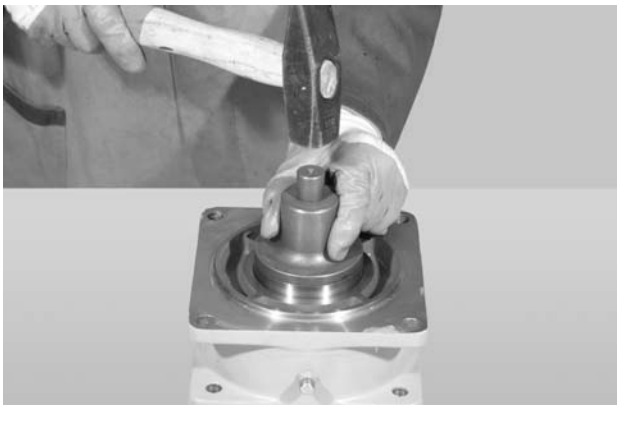
GB d

Fit the complete upper shaft in the front case.



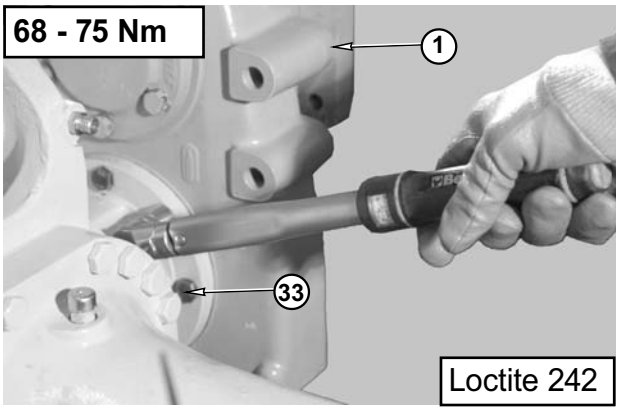
GB e

Lubricate and fit the sealing ring (4), install the rings into the cover.



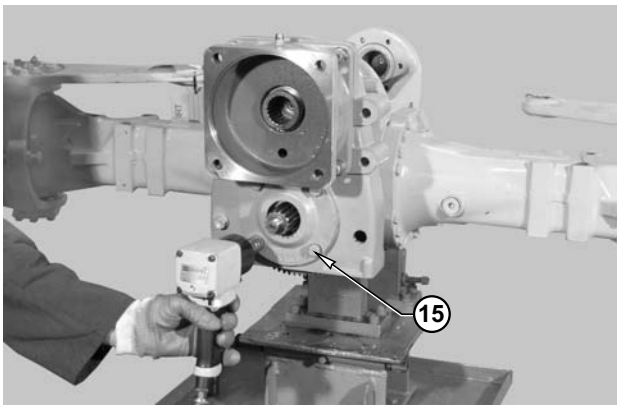
GB f

CAUTION! Pay particular attention to the direction of assembly of the rings (4).



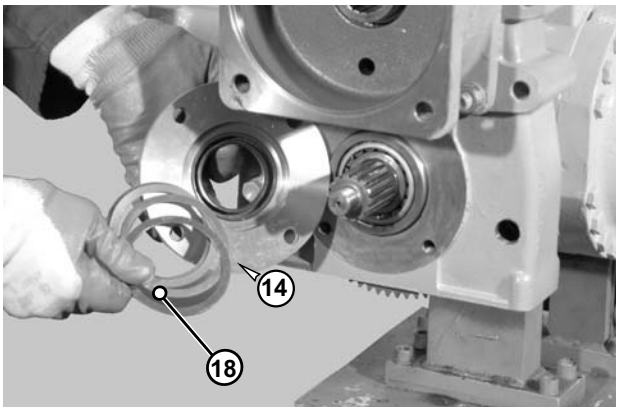
GB a

Fit fastening screws from the reduction unit (1)
Tighten screws (33) using a torque wrench setting of 68 - 75Nm.



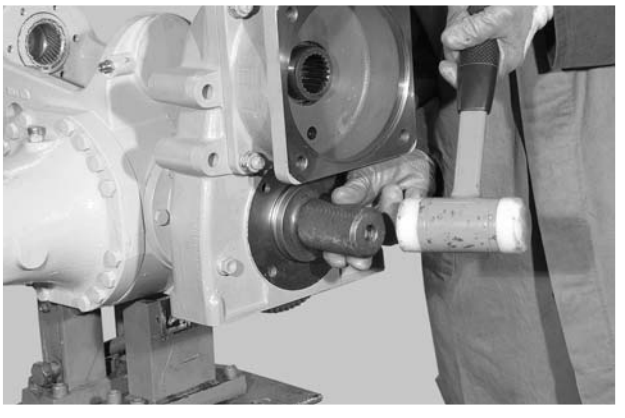
GB b

Remove the screws (15).



GB c

Remove shims (18) and cover (14).

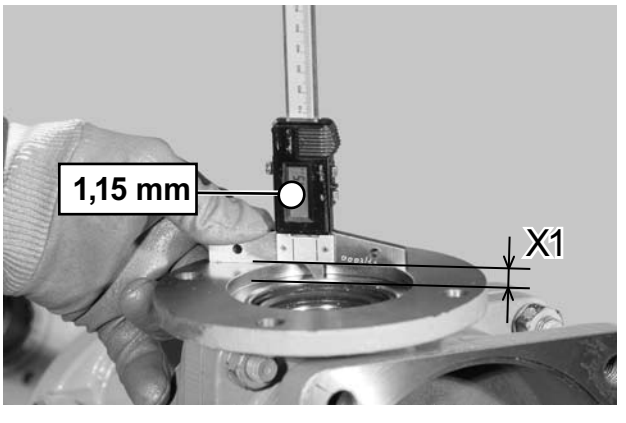


GB d

Level shaft and bearings.

GB e

Zero the depth gauge between the surface and thrust block.



GB f

Measure distance “X1” between the cover surface and the face of bearing.
ES: X1 = 1,15

D) DISASSEMBLING THE CARRIER (No disassembling the mast)

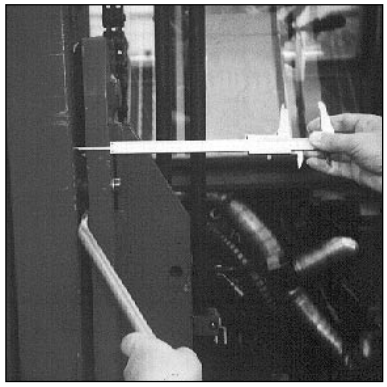
To repair or replace guide and carrier rollers.

- Play in "lateral play" guide rollers.

- Check to be performed in several places along mast length (by moving carriage in moving upright).
  - Insert a lever between carriage and mast moving upright.
  - Press guide rollers against inside of moving upright.
  - At top and bottom of carriage, measure lateral movement (play). Tolerance = 0/1.5 mm (Fig. D1, D2).

- Play in carrier rollers (tolerances = 0.75 / 2.25 mm).
  - Check to be performed using a set of shims (Fig. D3).

D1



Removing carriage

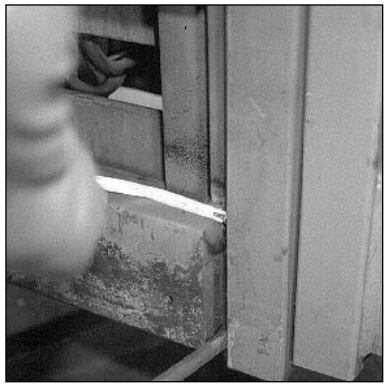
- Secure carriage to hoist.

- Lift carriage slightly, to tension chains.

- Release chains from tensioners.
  - Split pins (Fig. D5).
  - Quick release coupling (Fig. D6).
  - Chain (Fig. D7).

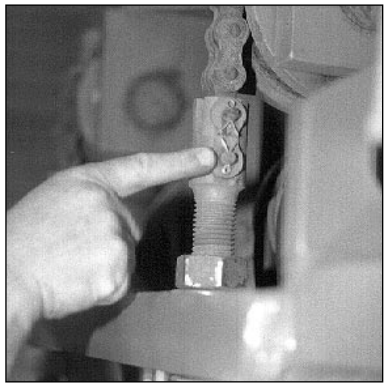
- Remove attachment hose mountings and brackets.

D2

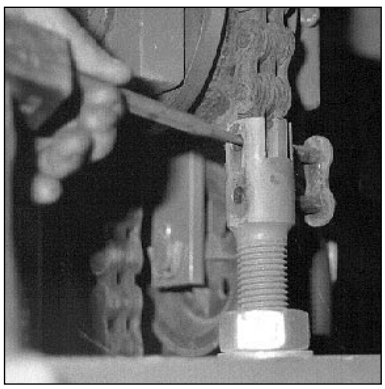


D3

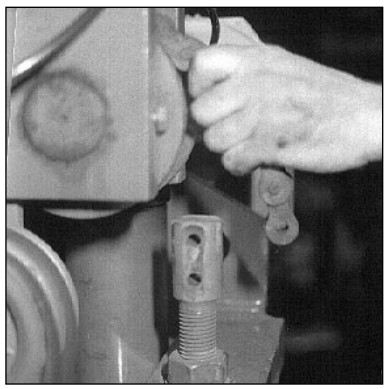
D5



D6



D7



G) MAST LINK PIN DISASSEMBLY

Check pins.
(excessive play, scratches, wear)
(Replace if necessary).

- Remove circlip and remove adjusting shim (Fig. G1).

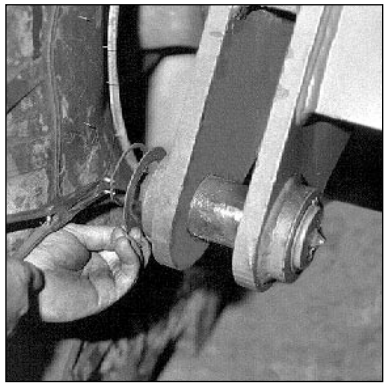
- Release pin (Fig. G2).

- Remove assembly (Fig. G3).

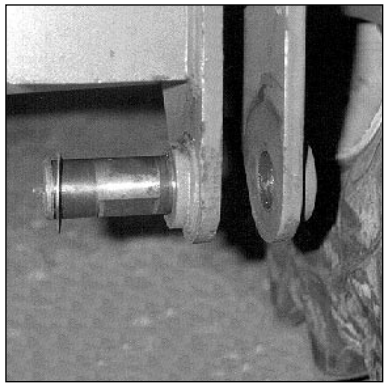
- Examine articulation rings (Fig. G4).
  (And replace if necessary).
  (Fitted 60H9 ring tolerance = 60 +74 / 0).

- While refitting rings, place groove at 45° (Fig. G5).

G1



G2

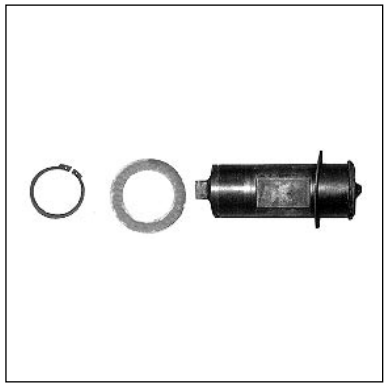


Refitting mast articulation pins

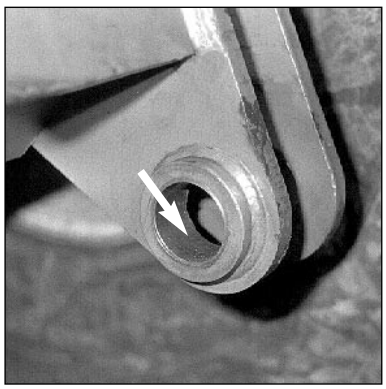
- Proceed in reverse order to removal (Fig. G6).

- Position pin flat spot at bottom
  (Pin is joined to mast and pivots on chassis rings).

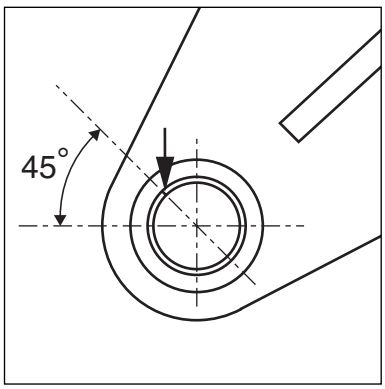
G3



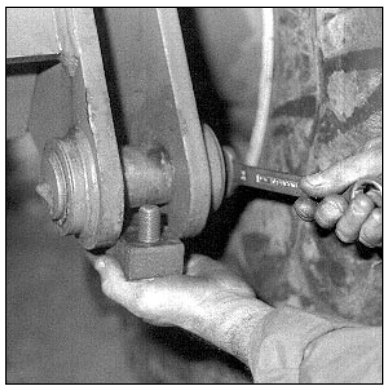
G4



G5



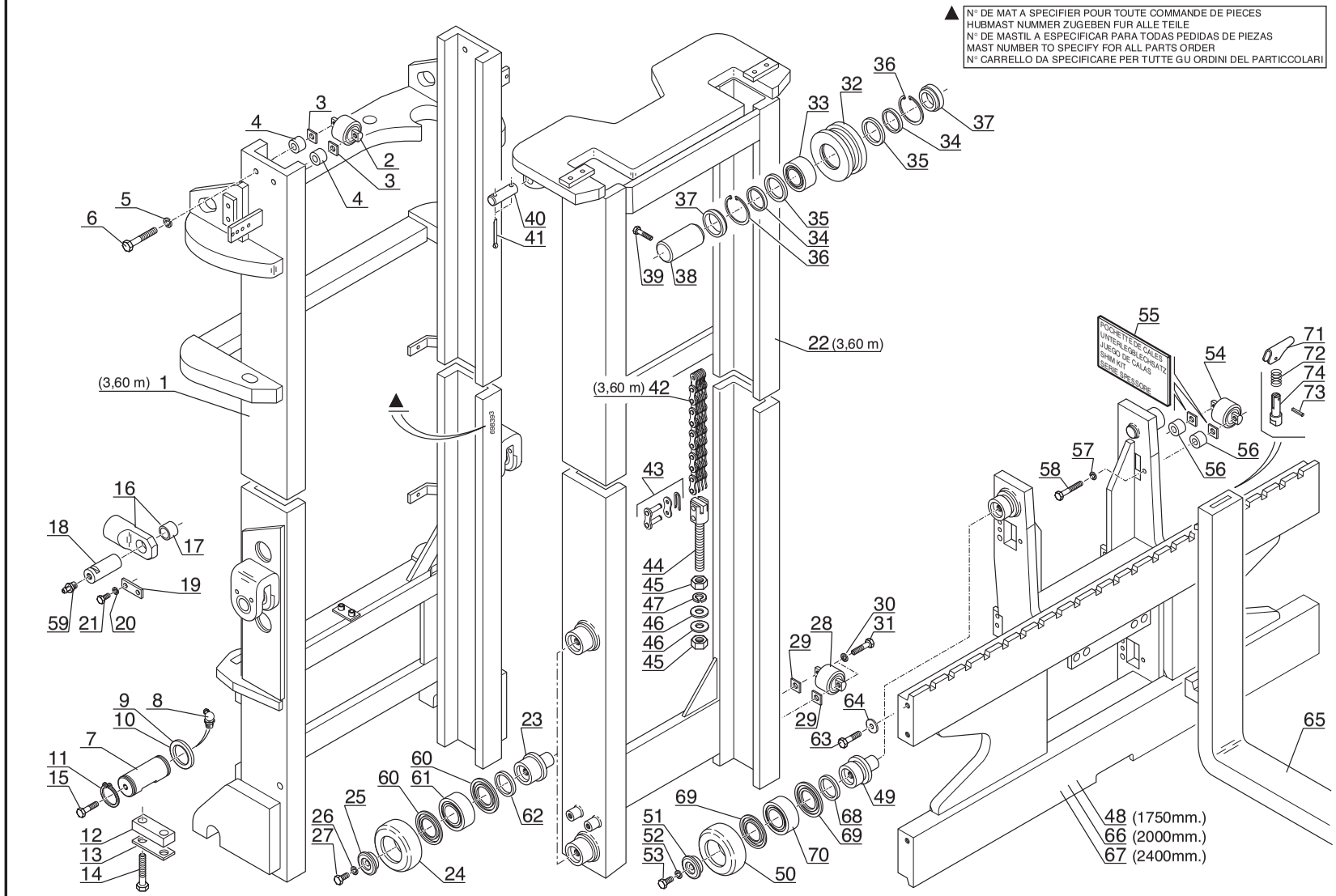
G6



5 AA 73

MAT DOUBLE (Hauteur de levée : 3,60m)(Inclinaison standard : 15°/15°)
DOPPELT HUBMAST (Hubhöhe : 3,60m)(Standard neigung : 15°/15°)
MASTIL DOBLE (Altura de levantamiento : 3,60m)(Inclinación estandard : 15°/15°)
DOUBLE MAST (Lift height : 3,60m)(Standard tilting : 15°/15°)
ALBERO DOPPIO (Altezza di sollevamento : 3,60m)(Inclinazione standard 15°/15°)

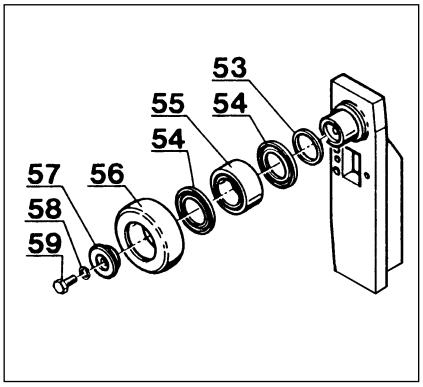
MI 60 H Série 1 - E2
MI 70 H Série 1 - E2



P.A.O.illus

04 / 03 / 05

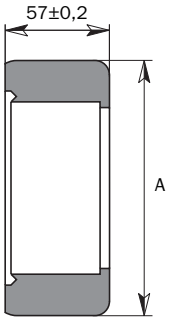
D16A



Removing carrier rollers

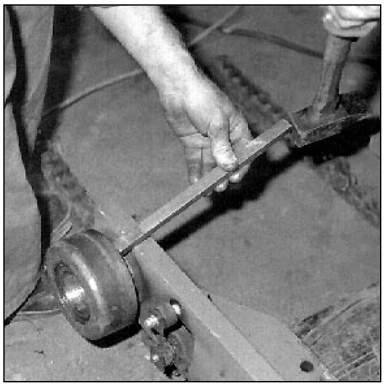
(and replacement if necessary - flat spots, seizing, wear, -2 mm compared to original dimension on external Ø)

Carrier roller reference (repair dimensions)



A	References	Roller
139±0,25	200780	Standard
140±0,25	200781	Repair dimensions
141±0,25	200782	Repair dimensions
142±0,25	200783	Repair dimensions

D17



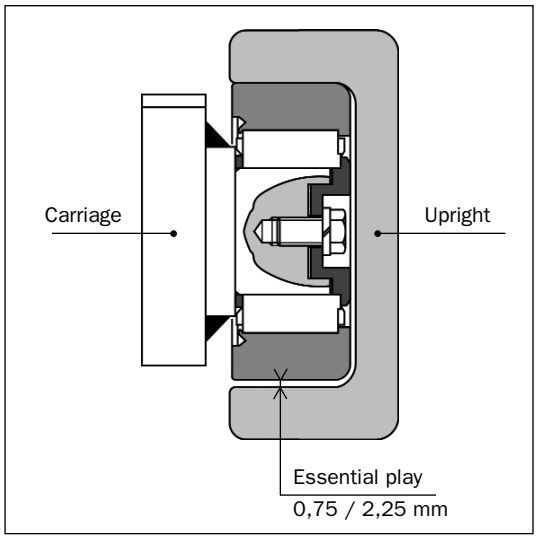
- Remove bolt and washer, Items 58, 59 (Fig. D16A).

- Using a drift (Fig. D17), push roller to release centring washer Item 57 (Fig. D16A and D18).

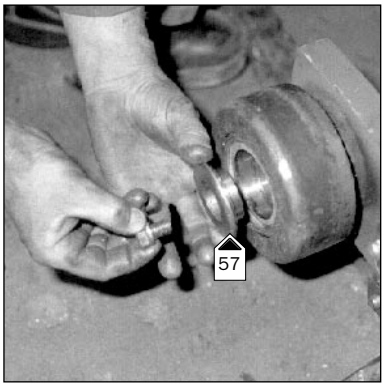
- Remove roller using a puller (Facom U.34) (Fig. D19).

- Examine and replace faulty parts (Fig. D20).

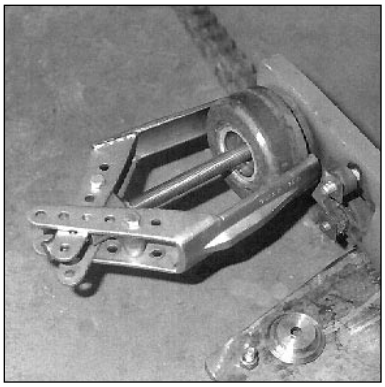
D16B



D18



D19



D20

I) REPLACING THE MAST

- Secure mast to hoist (Fig. I1).

- Raise mast (Fig. I2).

- Check position of articulation pins with flat spot at bottom. If necessary adjust using a spanner (Fig. I3).

- Fit mast on articulation pins.

- Fit limit plates (Fig. I4).

  - 2 H, M 20-60 bolts (C. 12,9). Tightening torque 64.4 mdaN.
  - 1 key plate (remove edges on bolt heads).

- Fit tilt cylinder pins (Fig. I6).

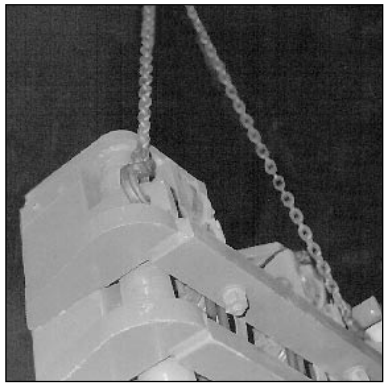
  - Pin.
  - Key plate.
  - 2 W 10 washers.
  - 2 H, M 10 - 20 bolts (tightening torque 4.77 mdaN)

- Connect elevation cylinders (Fig. I7).

- Release mast from hoist.

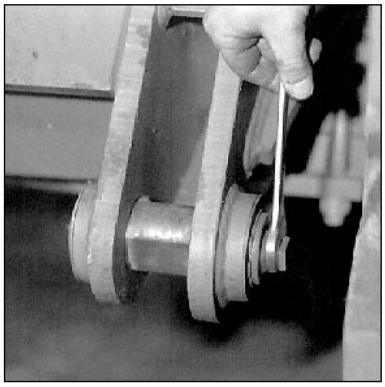
- Check that attachment hoses are correctly positioned on pulleys.

I1



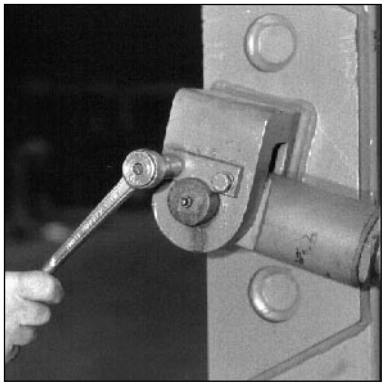
I2

I3



I4

I6



I7

ELECTRIC COMPONENT REGISTER (MI 60 / 70 H S1 E2)

Item	Designation	Component position on machines (drawing)	Electric diagram	Position on electric diagram	Position on principle beam plan
J	Control panel module	2	1	I 30	M 36
JA	Hour recorder	2	1	I 25	-
JB	Fuel level	2	1	I 29	-
JC	Red light hydraulic return filter clogging	2	1	G 24	-
JD	Red light brake oil level	2	1	G 22	-
JE	Red light engine water temperature	2	1	G 19	-
JF	Red light parking brake	2	1	G 16	-
JG	Red light alternator excitation	2	1	G 15	-
JH	Red light engine oil pressure	2	1	G 17	-
JI	Red light air filter clogging	2	1	G 21	-
JJ	Blue light main beam	2	1	G 27	-
JK	Green light indicators	2	1	G 28	-
K 1	Starting safety relay	3	3	O 27	C 29
K 1	Starting safety relay	3	1	I 8	C 29
K 2	Preheating relay	4	1	K 9	M 3
K 3	Lifting cab relay	4	5	M 6	K 3
K 3	Lifting cab relay	4	1	K 12	K 3
K 4	Flashing unit (Option)	3	1	E 28	E 27
K 6	Reverse lights and buzzer relay (Option)	3	3	E 37	E 31
K 6	Reverse lights and buzzer relay (Option)	3	3	O 33	E 31
K 7	Transmission cut-off relay	3	3	O 42	C 31
K 7	Transmission cut-off relay	3	3	E 24	C 31
K 8	Movements cut-off relay (Option)	3	3	O 40	C 31
K 8	Movements cut-off relay (Option)	3	3	I 38	C 31
K 9	Compressor relay (Option)	3	5	I 24	E 32
K10	Fans/condensor relay (Option)	3	5	I 22	C 32
M 1	Starter motor	1 - 5	1	M 4	K 40
M 2	Cab lifting pump	1	1	M 11	O 36
M 3	Fuel pump	4	3	O 21	K 3
M 4	Horn	1	2	M 11	O 41
M 5	Roof windscreen washer tank pump	5	4	M 20	I 2
M 6	Front windscreen washer tank pump	5	4	M 5	I 2
M 7	Front windscreen wiper motor	2	4	M 10	M 32
M 8	Rear windscreen wiper motor	2	4	M 24	B 38
M 9	Roof windscreen wiper motor	2	4	M 18	A 32
MC	Mass - control box carcase	3	3	K 25	G 35
MCT	Transmission cut-off module	3	3	A 39	E 36
MD1	2 mini relay support module	3	-	-	C 27
MD2	Maxi relay and mini fuses support module	3	-	-	C 28
MD3	20 mini fuses support module	3	-	-	C 30
MD4	6 microrelays support module	3	-	-	C 31
MO1	Mass	4 - 5	1	K 2	O 4
MO2	Mass	4 - 5	1	M 32	O 4
MP inv	Reversing handler connection	2	3	G 14	K 14
MP on/off	5th element order (Option)	2	3	G 12	K 17
MP roller	3rd and 4th element order (Option)	2	3	G 10	K 15
OPTION	Options connection	3	3	E 8	E 25

ELECTRIC DIAGRAM 1 LEGEND

Item	Designation	Position on electric diagram	Position on principle beam plan	Component position on machines (drawing)
A 1	Antitheft with keyboard (digicode) (Option)	G 8	C 35	3
B 1	Fault buzzer	G 13	C 27	3
B-Fu-P	Power fuses box	G 4	K 2	4 - 5
DG	Diesel decongealant (Option)	O 15	M 3	4
E21	Control panel lighting (Option)	G 30	-	2
G 1	Battery	K 2	-	5
G 2	Alternator	M 14	G 38	1
J	Control panel module	I 30	M 36	2
JA	Hour recorder	I 25	-	2
JB	Fuel level	I 29	-	2
JC	Red light hydraulic return filter clogging	G 24	-	2
JD	Red light brake oil level	G 22	-	2
JE	Red light engine water temperature	G 19	-	2
JF	Red light parking brake	G 16	-	2
JG	Red light alternator excitation	G 15	-	2
JH	Red light engine oil pressure	G 17	-	2
JI	Red light air filter clogging	G 21	-	2
JJ	Blue light main beam	G 27	-	2
JK	Green light indicators	G 28	-	2
K 1	Starting safety relay	I 8	C 29	3
K 2	Preheating relay	K 9	M 3	4
K 3	Lifting cab relay	K 12	K 3	4
K 4	Flashing unit (Option)	E 28	E 27	3
M 1	Starter motor	M 4	K 40	1 - 5
M 2	Cab lifting pump	M 11	O 36	1
MO1	Mass	K 2	O 4	4 - 5
MO2	Mass	M 32	O 4	4 - 5
R 1	Heating plug	M 9	G 3	4
R 2	Fuel sensor	M 29	G 4	5
S 1	Key switch	C 9	I 30	2
S 1	Key switch	C 6	I 30	2
S 3	Engine oil low pressure	M 17	I 7	4
S 4	Engine water low pressure	M 19	I 38	1
S 5	Air filter low pressure	M 20	G 2	5
S 6	Brake oil level sensor	M 22	O 40	1
S 7	Oil filter low pressure	M 23	G 40	1
S23	Warning lights switch	C 37	I 30	2

ELECTRIC DIAGRAM 1 FUSES

Item	Designation	Position on electric diagram	Position on principle beam plan	Component position on machines (drawing)
B-Fu-P	Power fuses box	G 4	K 2	4
F1	Control panel indicator light (7,5A)	C 13	E 28	3
F11	Starter (20A)	E 8	C 30	3
F32	I.C. Engine preheating (80A)	G 4	K 2	4
F33	Raising cab (50A)	G 4	K 2	4
F34	Alternator (80A)	E 4	M 2	4
F35	Lift truck electrical equipment (80A)	E 4	M 2	4

SPICES SHOWN ON ELECTRIC DIAGRAM 1

Ep. 1	Ep. 28	Ep. 102 (x2)	Ep. 111	Ep. 115	Ep. 120	Ep. 124	Ep. C
Ep. 2	Ep. 30	Ep. 107	Ep. 112	Ep. 116	Ep. 121 (x2)	Ep. 125 (x2)	
Ep. 25	Ep. 100 (x2)	Ep. 108	Ep. 113 (x2)	Ep. 118	Ep. 122 (x2)	Ep. A	
Ep. 27	Ep. 101	Ep. 110	Ep. 114 (x2)	Ep. 119	Ep. 123 (x3)	Ep. B	

ELECTRIC DIAGRAM 5 LEGEND

Item	Designation	Position on electric diagram	Position on principle beam plan	Component position on machines (drawing)
A 1	Antitheft with keyboard (digicode) (Option)	I 32	C 35	3
AC	Cigar lighter	K 27	E 39	3
ALIM-AUTO	Autoradio power-supply	M 36	C 39	2 - 3
C 6a	Connection evaporator/heating unit (Option)	I 13	-	-
C 6b	Connection evaporator/heating unit (Option)	I 13	-	-
C 9	Connection condenser unit (Option)	K 18	-	-
C10	Connection condenser unit (Option)	M 18	-	-
CH	Connection heating unit	E 16	K 27	2
CLIM	Clim option outlet	I 24	E 29	3
EC	Compressor (Option)	M 24	-	-
HP-AUTO	Connection loud speakers	M 39	C 39	2 - 3
HPD	Right loud speaker	E 41	A 35	2
HPG	Left loud speaker	G 41	A 38	2
K 3	Lifting cab relay	M 6	K 3	4
K 9	Compressor relay (Option)	I 24	E 32	3
K10	Fans/condenser relay (Option)	I 22	C 32	3
P 1	Low pressure BP (Option)	G 12	-	-
P 2	Low pressure switch (HP and BP) (Option)	M 18	-	-
RT	Temporised relay (Option)	G 21	-	-
S	Evaporator ventilator	I 18	-	-
S12	Air conditionning controls (Option)	E 9	-	2
S20	Raising cab switch	G 5	K 39	1
T	Low pressure (Option)	G 13	-	-
V 1	Condenser ventilator 1 (Option)	M 19	-	-
V 2	Condenser ventilator 2 (Option)	M 20	-	-
Y 4	Cab descent electrovalve	K 8	O 37	1

ELECTRIC DIAGRAM 5 FUSES

Item	Designation	Position on electric diagram	Position on principle beam plan	Component position on machines (drawing)
F3	Air conditionning-Heating (30A)	C 16	E 28	3
F8	Compressor-Differential locking (7,5A)	C 25	E 29	3
F9	Digicode power supply (10A)	C 31	E 29	3
F18	Air conditionning condenser (20A)	C 22	C 30	3
F22	Raising cab (7,5A)	C 3	C 30	3
F23	Cigar lighter (10A)	C 27	C 30	3

SPICES SHOWN ON ELECTRIC DIAGRAM 5

Ep. 41	Ep. 47	Ep. 100	Ep. 115 (x2)	Ep. 121
Ep. 42	Ep. 48	Ep. 110	Ep. 116 (x3)	

CONNECTOR REGISTER

(MCT) TRANSMISSION CUT-OFF MODULE

Pos	Vers	Pos	Sect	N° fil
B1				
B2	K7	1	1mm2	600/40
B3	Ep112		1mm2	31/49
B4	Ep44		1mm2	600/47
B5	Ep26		1mm2	600/78
B6	Ep43		1mm2	600/41
B7	S2	2	1mm2	600/66
B8				

(M01) MASS

Pos	Vers	Pos	Sect	N° fil
a	Ep107		4mm2	31/1
b	MPinv	5	1mm2	31/2
c	Ep102		2mm2	31/3
d	Ep101		3mm2	31/4
e	Ep100		3mm2	31/5
f	M1	-	7mm2	31/6

(M02) CAB MASS

Pos	Vers	Pos	Sect	N° fil
a	Ep108		2mm2	31/16
b	Ep110		4mm2	31/17
c	Ep113		3mm2	31/18
d	Ep116		3mm2	31/19
e	Ep118		3mm2	31/20
f	Ep121		7mm2	31/21
g	Ep123		3mm2	31/22

(MPinv) REVERSING HANDLER CONNECTION

Pos	Vers	Pos	Sect	N° fil
1	Ep13		1mm2	600/3
2	Ep26		1mm2	600/32
3	Ep14		1mm2	600/39
4	Ep16		1mm2	600/28
5	M01	b	1mm2	31/2
6				

(MPon/off) 5TH ELEMENT ORDER

Pos	Vers	Pos	Sect	N° fil
1	CED	A4	1mm2	600/54
2				

(MProller) 3RD AND 4TH ELEMENT ORDER

Pos	Vers	Pos	Sect	N° fil
1	CED	A2	1mm2	600/52
2	CED	A3	1mm2	600/53
3	Ep13		1mm2	600/25
4				

(OPTION) OPTIONS CONNECTION

Pos	Vers	Pos	Sect	N° fil
1	F15	B	1mm2	sta
2	F16	B	1mm2	siège
3	F17	B	2mm2	opt1
4	K8	5	2mm2	600/50
5	F19	B	2mm2	opt3
6	F20	B	2mm2	opt4

(PF) RC4 BOX PROTECTION FUSES

Pos	Vers	Pos	Sect	N° fil
-	Ep18		1mm2	600/10
-	Ep3		1mm2	600/15

(PT1) ACCELERATOR

Pos	Vers	Pos	Sect	N° fil
1	RC4	38	0,75mm2	600/20
2	RC4	36	0,75mm2	600/22
3	RC4	8	0,75mm2	600/21

(PT2) INCHING

Pos	Vers	Pos	Sect	N° fil
1	RC4	49	0,75mm2	600/70
2	RC4	47	0,75mm2	600/24
3	RC4	46	0,75mm2	600/23

(R1) HEATING PLUG

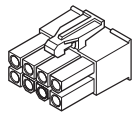
Pos	Vers	Pos	Sect	N° fil
-	K2	5	7mm2	19/2

(R1) HEATING PLUG

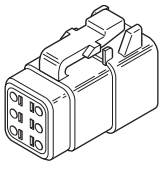
Pos	Vers	Pos	Sect	N° fil
-	J	4	1mm2	100/90

DRAWING

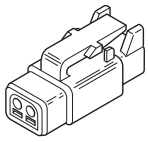
(MCT) TRANSMISSION CUT-OFF MODULE



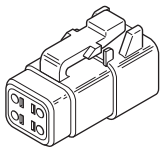
(MPinv) REVERSING HANDLER CONNECTION



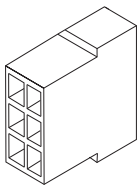
(MPon/off) 5TH ELEMENT ORDER



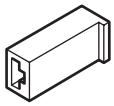
(MProller) 3RD AND 4TH ELEMENT ORDER



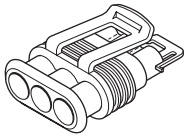
(OPTION) OPTIONS CONNECTION



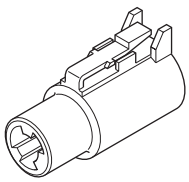
(PF) RC4 BOX PROTECTION FUSES



(PT1) ACCELERATOR
(PT2) INCHING



(R1) HEATING PLUG



ELECTRONIC REGULATION OF PUMP A4VG90 DE 1 D1/32R

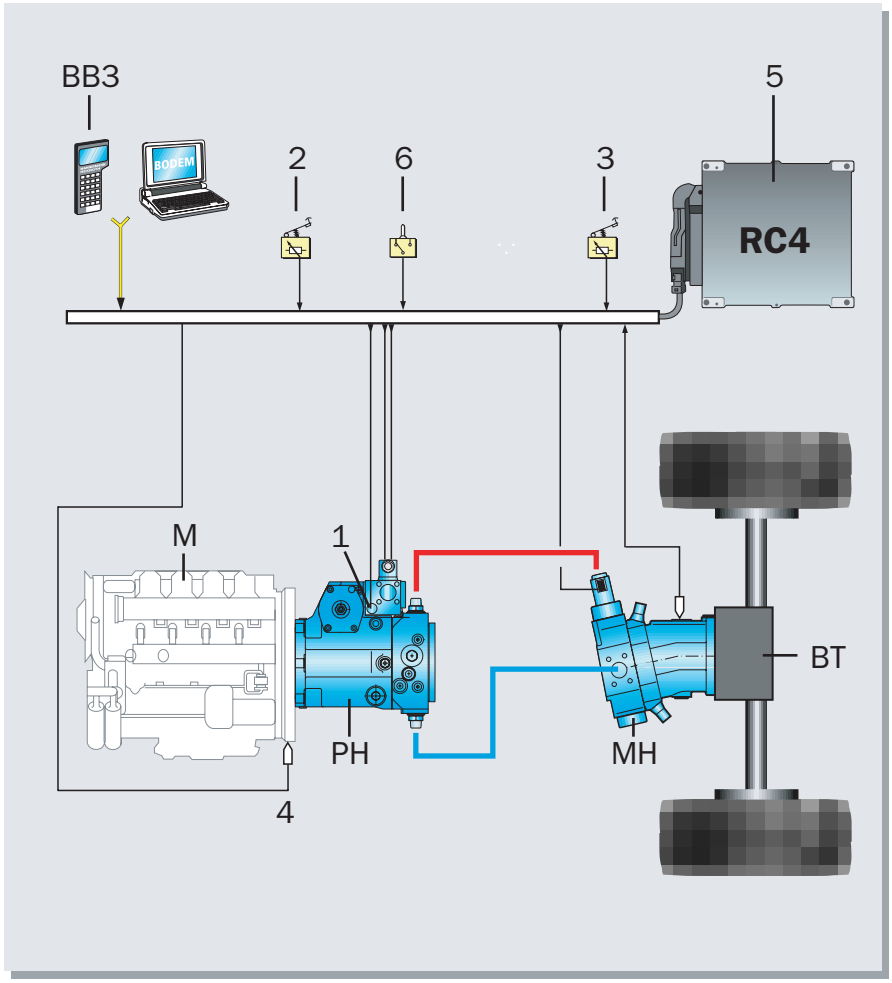
1 - GENERAL

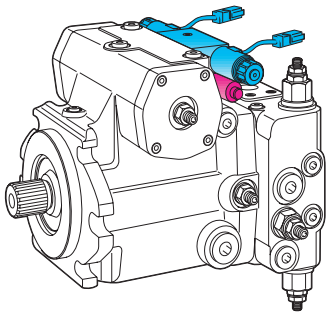
The A4VG90 pump is run by a microcontroller (RC4) that adjusts transmission capacity so as to avoid any engine overload.

2 - DESCRIPTION OF ELEMENTS

1 - Transmission pump proporcional solenoid (adjusting capacity)
2 - Accelerator pedal (sensor under pedal block)
3 - Inching pedal (sensor under pedal block)
4 - Engine speed sensor (under engine flywheel)
5 - Electronic unit (RC4) (main control unit) (in the cab to right of driver's seat)
6 - Reverser (movement direction) on joystick (JSM)

BB3 - Calibrator
BT - Transfer box
M - I.C. Engine
MH - Hydrostatic motor
PH - Hydrostatic pump





N°	ACTION DESCRIPTION	KEY	SCREEN DISPLAY	OBSERVATIONS
3	**Inching/brake pedal angular sensor parameters - Check handbrake is off**			
3,1	- Key in →	F1 →	1__Calibration 2__Currents 3__Time ramps 4_____	
3,2	- Key in →	1 →	1__Begin Learnc. 2__Brake Poti 3__Brake Poti mid 4__Teeth Diesel	
3,3	- Key in →	2 →	2 Brake Poti Mininal Position 0,6 V	Note minimum (pedal at rest), and maximum (pedal on floor) voltage readings given by the sensor. The unit indicates sensor voltage. Using the sensor lights, turn the sensor around on itself, so as to get a **voltage higher than or equal to 0,6V when the pedal is at rest, and lower than or equal to 4,4V when the pedal is depressed to the floor.**
3,4	Pedal at rest if the voltage > 0,6 V, key in →	ENTER →	2 Brake Poti Maximum Position 0,6 V	(Indicative value)
3,5	Push brake pedal down and maintain position. **Caution :** **Handbrake off**	- →	2 Brake Poti Maximum Position 3,6 V	(Indicative value)
3,6	Pedal on the floor if the voltage < 4,4 V, key in →	ENTER →	1__Begin Learnc. 2__Brake Poti 3__Brake Poti mid 4__Teeth Diesel	Release inching/brake pedal.
3,7	- Key in →	3 →	3 Brake Poti mid 0,6 V	Note the sensor voltage at the end of inching (pedal in intermediate position).
3,8	Put template under pedal. Push pedal down to template, maintain position.	- →	3 Brake Poti mid 1,1 V	(Indicative value)
3,9	- Key in →	ENTER →	1__Begin Learnc. 2__Brake Poti 3__Brake Poti mid 4__Teeth Diesel	Release inching/brake pedal. Take out template.
3,10	- Key in →	MENU →	1__Calibration 2__Currents 3__Time ramps 4_____	Return to initial menu.
3,11	- Key in →	MENU →	F1 _____Config/Cal F2 _____Diagnostic PROC _____Status TEACH ____Storage	Return to initial menu.