
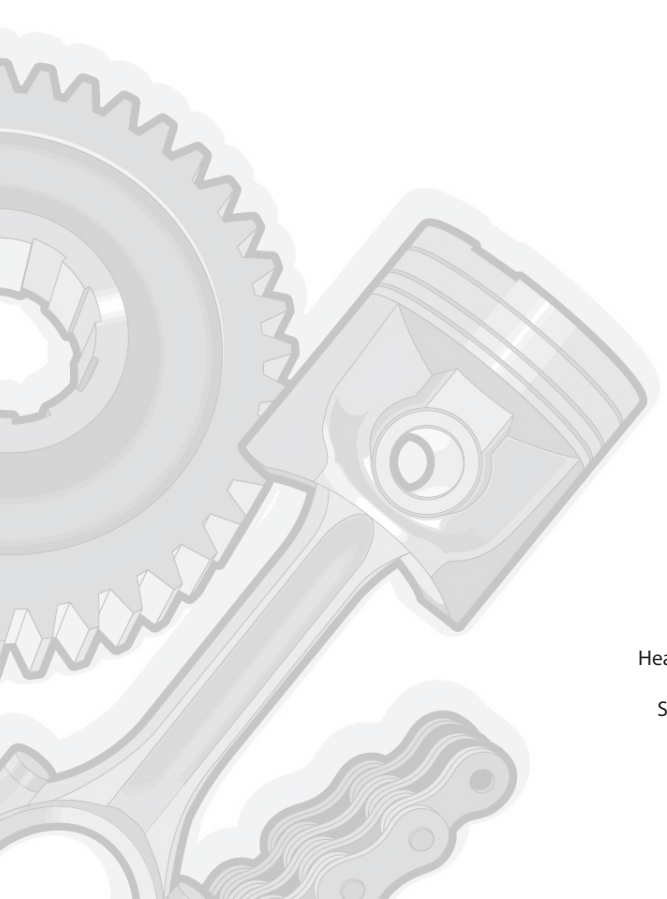




**REPAIR MANUAL
MANUEL DE RÉPARATION
REPARATURANLEITUNG
MANUAL DE REPARACIÓN
MANUALE RIPARAZIONE**

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FRONT TYRES

DIMENSIONS	PRESSURE	TYRE LOAD		PRESSURE ON THE CONTACT SURFACE		AREA OF THE CONTACT SURFACE	
				HARD GROUND	LIGHT GROUND	HARD GROUND	LIGHT GROUND
12.5R20 16PR MPT80 TUBELESS CONTINENTAL	BAR	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
12.5R20 22PR MPT80 TUBELESS CONTINENTAL	BAR	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
10.00-20 CSE SC10 CONTINENTAL	SOLID	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
16/70-20 14PR E91-E TUBELESS DUNLOP	BAR	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
315/70R22,5 RHS TUBELESS GOODYEAR	7,75 BAR	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
445/65R19,5 XZY 165K TUBELESS MICHELIN	BAR	FRONT UNLADEN FRONT LADEN	1700 KG 4850 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2

REAR TYRES

DIMENSIONS	PRESSURE	TYRE LOAD		PRESSURE ON THE CONTACT SURFACE		AREA OF THE CONTACT SURFACE	
				HARD GROUND	LIGHT GROUND	HARD GROUND	LIGHT GROUND
PPS 28X9.15 CSE SC10 CONTINENTAL	SOLID	REAR UNLADEN REAR LADEN	1850 KG 700 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2
225/75R15 XZM 149A5 TUBELESS MICHELIN	7 BAR	REAR UNLADEN REAR LADEN	1850 KG 700 KG	KG/CM2 KG/CM2	KG/CM2 KG/CM2	CM2 CM2	CM2 CM2

LUBRICANTS AND FUEL



USE THE RECOMMENDED LUBRICANTS AND FUEL :

- For topping up, oils may not be miscible.
- For oil changes, MANITOU oils are perfectly appropriate.

DIAGNOSTIC ANALYSIS OF OILS

If a service or maintenance contract has been organized with the dealer, a diagnostic analysis of engine, transmission and axle oils may be requested depending on the rate of use.

(*) FUEL CHARACTERISTICS

Use a high-quality fuel to obtain optimal performance of the I.C. engine.

CHARACTERISTICS OF RECOMMENDED FUEL :

- DERV à EN590
- BS2869 Class A2
- ASTM D975 - 91 Class 2D
- JIS K2204 (1992) Grades 1, 2, 3 and Special Grade 3.

I.C. ENGINE				
ORGANS TO BE LUBRICATED	CAPACITY	RECOMMENDATION	PACKAGING	PART NUMBER
I.C. ENGINE	8,5 Liters	MANITOU Oil API CH4	5 L.	661706
			20 L.	582357
			55 L.	582358
			209 L.	582359
COOLING CIRCUIT	12 Liters	Cooling liquid (protection - 30°)	2 L.	473076
			5 L.	470077
			20 L.	470078
		Cooling liquid (protection - 25°)	2 L.	554002
5 L.	554003			
20 L.	554004			
FUEL TANK	85 Liters	Diesel fuel (*)		

MAST			
ORGANS TO BE LUBRICATED	RECOMMENDATION	PACKAGING	PART NUMBER
MAST LIFTING CHAINS	MANITOU Lubricant Chain special (aerosol)	400 ml.	554271
GREASING OF THE MAST	MANITOU Grease Multipurpose NLGI 2	400 g.	545996
		1 Kg.	161590
		50 Kg.	499235

HYDRAULICS				
ORGANS TO BE LUBRICATED	CAPACITY	RECOMMENDATION	PACKAGING	PART NUMBER
HYDRAULIC OIL TANK	132 Liters	MANITOU Oil Hydraulic ISO 46	5 L.	545500
			20 L.	582297
			55 L.	546108
			209 L.	546109

BRAKE			
ORGANS TO BE LUBRICATED	RECOMMENDATION	PACKAGING	PART NUMBER
BRAKE CIRCUIT	MANITOU Oil Mineral brake fluid	1 L.	490408

CAB			
ORGANS TO BE LUBRICATED	RECOMMENDATION	PACKAGING	PART NUMBER
CAB DOOR	MANITOU Grease Multipurpose HD NLGI 2	400 g.	161589
		1 Kg.	554973
		5 Kg.	554974
		20 Kg.	499233
		50 Kg.	489670
WINDSCREEN WASHER TANK	Windscreen washer fluid	1 L.	490402
		5 L.	486424

Specifications Section

i01957588

Engine Design

Four Cylinder Engine

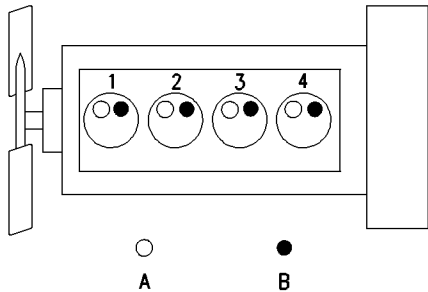


Illustration 1 g00984281

Cylinder and valve location

- (A) Inlet valve
- (B) Exhaust valve

Bore	105 mm (4.133 inch)
Stroke	127 mm (5.000 inch)
Displacement	4.4 L (269 in ³)
Cylinder arrangement	In-line
Type of combustion	Direct injection
Compression ratio	
Naturally aspirated engines	19.3:1
Turbocharged engines	18.2:1
Number of cylinders	4
Valves per cylinder	2
Valve lash	
Inlet valve	0.20 mm (0.008 inch)
Exhaust valve	0.45 mm (0.018 inch)
Firing order	1, 3, 4, 2

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction: Clockwise

When the camshaft is viewed from the front of the engine, the camshaft rotates in the following direction: Clockwise

The front of the engine is opposite the flywheel end. The left side and the right side of the engine are viewed from the flywheel end. The No. 1 cylinder is the front cylinder.

Three Cylinder Engine

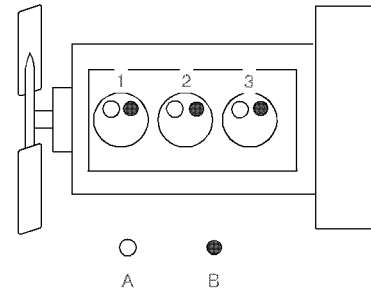


Illustration 2 g01014247

Cylinder and valve location

- (A) Inlet valve
- (B) Exhaust valve

Bore	105 mm (4.133 inch)
Stroke	127 mm (5.000 inch)
Displacement	3.3 L (201 in ³)
Cylinder arrangement	In-line
Type of combustion	Direct injection
Compression ratio	
Naturally aspirated engines	19.3:1
Turbocharged engines	18.2:1
Number of cylinders	3
Valves per cylinder	2
Valve lash	
Inlet valve	0.20 mm (0.008 inch)
Exhaust valve	0.45 mm (0.018 inch)
Firing order	1, 2, 3

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction: Clockwise

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i01956585

Exhaust Manifold

Four Cylinder Engine

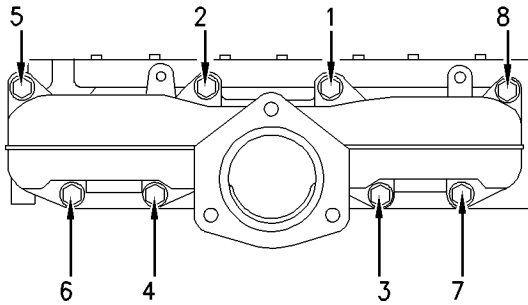


Illustration 25
Tightening sequence
g00907527

Note: The exhaust manifold must be aligned to the cylinder head. Refer to the Disassembly and Assembly manual.

Tighten the exhaust manifold bolts in the sequence that is shown in illustration 25 to the following torque. 33 N·m (24 lb ft)

Three Cylinder Engine

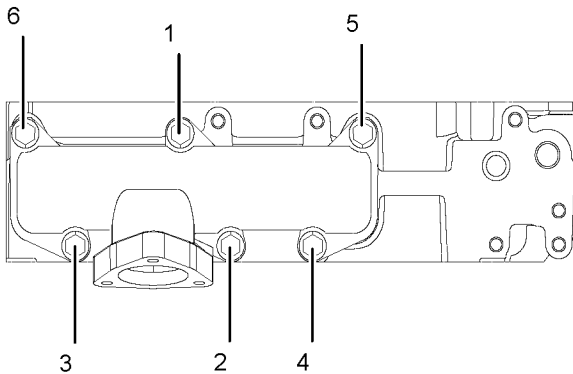


Illustration 26
g01017009

Note: The exhaust manifold must be aligned to the cylinder head. Refer to the Disassembly and Assembly manual.

Tighten the exhaust manifold bolts in the sequence that is shown illustration 26 to the following torque. 33 N·m (24 lb ft)

Camshaft

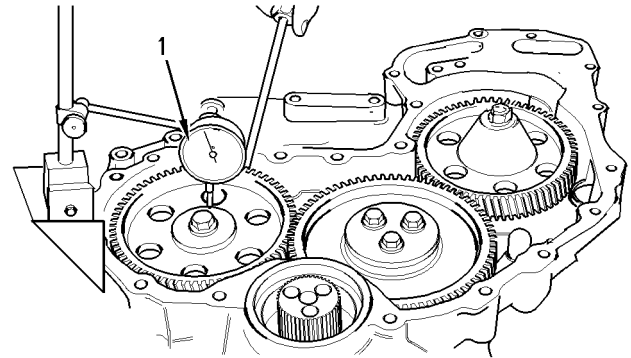


Illustration 27
Checking the end play of the camshaft
g00987750

(1) End play of a new camshaft 0.10 to 0.55 mm
(0.004 to 0.022 inch)

Maximum permissible end play of a worn camshaft 0.60 mm (0.023 inch)

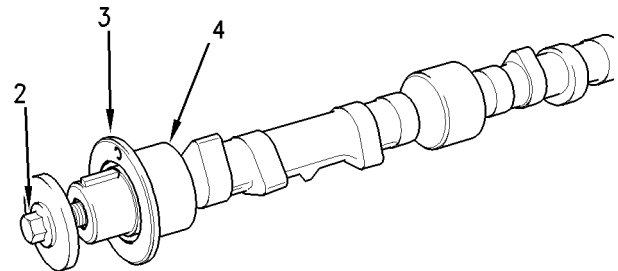


Illustration 28
Typical camshaft
g00976195

(2) Bolt
Tighten the bolt to the following torque. ... 95 N·m
(70 lb ft)

(3) Camshaft thrust washer
Thickness of the thrust washer .. 5.49 to 5.54 mm
(0.216 to 0.218 inch)
Depth of the recess in the cylinder block for the thrust washer 5.54 to 5.64 mm
(0.218 to 0.222 inch)

- (4) Main bearings for the four cylinder engine
 Bore in the cylinder block for the main bearings 80.416 to 80.442 mm
 (3.1660 to 3.1670 inch)

- (5) Main bearing cap bolts for the four cylinder engine

Use the following procedure in order to install the main bearing cap bolts:

1. Apply clean engine oil to the threads of the main bearing cap bolts.
2. Put the main bearing caps in the correct position that is indicated by a number on the top of the main bearing cap. Install the main bearing caps with the locating tabs in correct alignment with the recess in the cylinder block.
3. Evenly tighten the main bearing cap bolts.

Torque for the main bearing cap bolts. 245 N·m
 (180 lb ft)

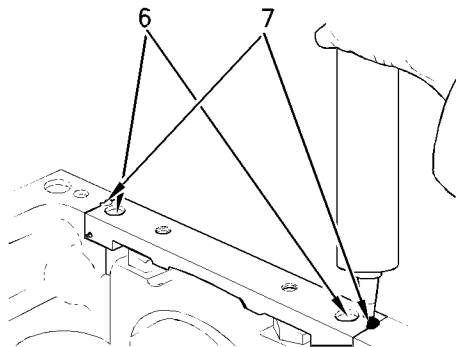


Illustration 57

g00938203

Use the following procedure in order to install the Allen head bolts for the bridge.

Note: Install the rear seal before sealant is applied.

1. Use a straight edge in order to ensure that the bridge is aligned with the rear face of the cylinder block.
2. Tighten the Allen head bolts (6) for the bridge.
 Torque for the Allen head bolts .. 16 N·m (12 lb ft)
3. When the bridge is installed on the cylinder block, apply 21826038 POWERPART Silicon Adhesive into groove (7) at each end of the bridge. Apply the sealant into the groove until the sealant is forced through the bottom end of the groove in the bridge.

Total height of the cylinder block between the top and the bottom faces. 441.173 to 441.274 mm
 (17.3689 to 17.3729 inch)

Three Cylinder Engine

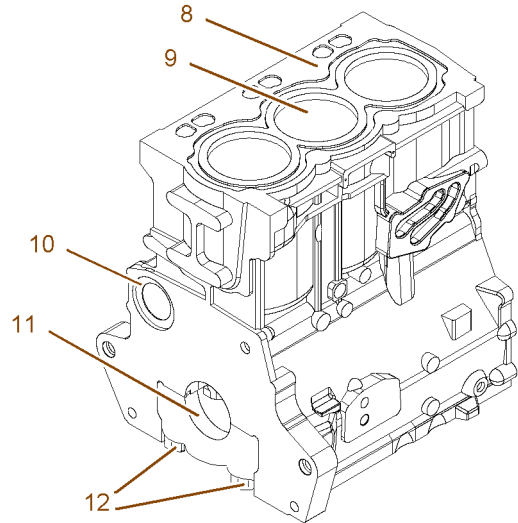


Illustration 58

g01018250

- (8) Cylinder block

(9) Cylinder bore 105.000 to 105.025 mm
 (4.1338 to 4.1348 inch)

The first oversize bore diameter 105.5 to 105.525 mm
 (4.1535 to 4.1545 inch)

The second oversize bore diameter 106.000 to 106.025 mm
 (4.1732 to 4.1742 inch)

The maximum permissible wear for the cylinder bore 0 to 0.15 mm (0 to 0.0059 inch)

- (10) Camshaft bearings for the four cylinder engine

Diameter of the bore in the cylinder block for the number 1 camshaft bearing 55.563 to 55.593 mm
 (2.1875 to 2.1887 inch)

Diameter of the bore in the cylinder block for the number 2 camshaft journal 50.546 to 50.597 mm
 (1.9900 to 1.9920 inch)

Diameter of the bore in the cylinder block for the number 3 camshaft journal 50.546 to 50.597 mm
 (1.9900 to 1.9920 inch)

Piston Cooling Jet Alignment

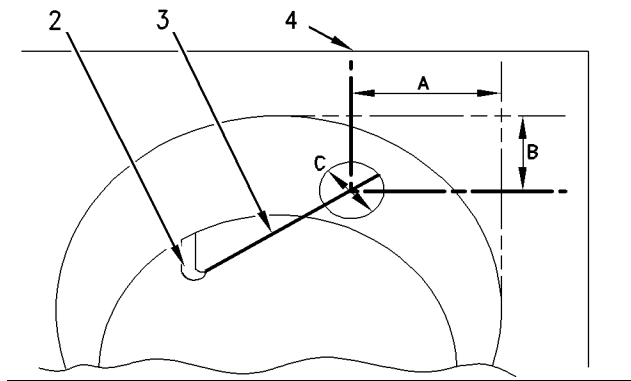


Illustration 71 g01006929

- (2) Piston cooling jet
- (3) Rod
- (4) Cylinder block

Use the following procedure in order to check the alignment of the piston cooling jet.

1. Insert rod (3) into the end of the piston cooling jet (2). Rod (3) has a diameter of 1.70 mm (0.067 inch). Rod (3) must protrude out of the top of the cylinder block.
2. Dimension (A) is 55.25 mm (2.1752 inch) and dimension (B) is 14 mm (0.5512 inch). Dimension (A) and dimension (B) are tangent to the cylinder bore (4).
3. The position of the rod (3) must be within dimension (C). Dimension (C) is 14 mm (0.5512 inch).

i01957083

Front Housing and Covers

The front housing must be aligned to the cylinder block face. + 0.05 to minus 0.05 mm
(+ 0.0020 to minus 0.0020 inch)

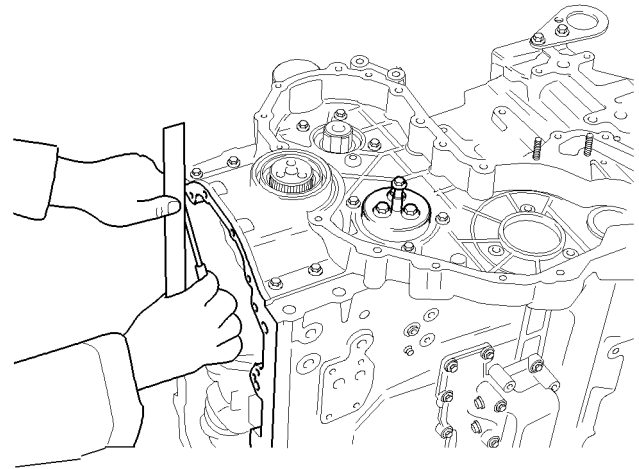


Illustration 72 g00995663
Alignment

- (1) Tighten the bolts that fasten the front cover to the front housing to the following torque. 22 N·m (16 lb ft)

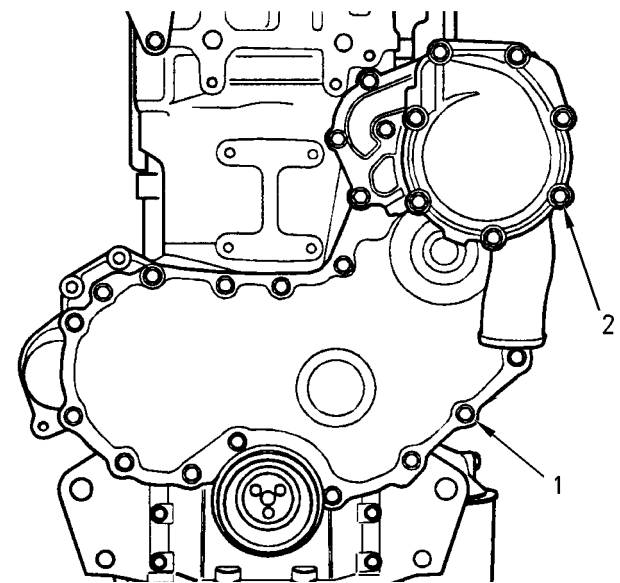


Illustration 73 g00918672
Front cover

- (2) Tighten the bolts that fasten the water pump to the front housing to the following torque. 22 N·m (16 lb ft)

Note: Refer to Specifications, "Water Pump" for the correct bolt tightening sequence for the water pump.

11. Remove the fuel injection pump from the front housing. Remove the O-ring (10) and discard the O-ring from the fuel injection pump.

i02075326

Fuel Injection Pump - Remove (Delphi STP)

Removal Procedure

Start By:

- a. Remove the fuel injection lines. Refer to this Disassembly and Assembly Manual, "Fuel Injection Lines - Remove".
- b. Remove the crankshaft pulley. Refer to this Disassembly and Assembly Manual, "Crankshaft Pulley - Remove and Install".
- c. Remove the front cover. Refer to this Disassembly and Assembly Manual, "Front Cover - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that the No. 1 cylinder is at top dead center on the compression stroke. Refer to the Testing and Adjusting Manual, "Finding Top Center Position for No. 1 Piston".

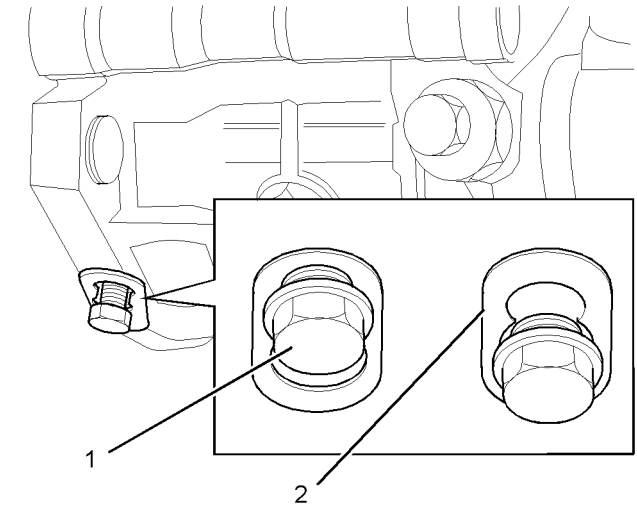


Illustration 14

g01061708

2. Loosen the locking screw (1). Rotate the spacer (2) in order to allow the locking screw (1) to tighten against the shaft of the fuel injection pump. Rotate the fuel injection pump gear in a counterclockwise direction in order to remove the backlash. Tighten the locking screw (1) to a torque of 13 N·m (9.6 lb ft).

Note: The locking screw (1) must be tightened in order to prevent the shaft of the fuel injection pump from rotating. The shaft of the fuel injection pump must not be rotated after the fuel injection pump has been removed from the engine.

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 with suitable plastic plugs. Also install dust caps on all of the connectors on the fuel injection pump. This helps prevent fluid loss, and this helps to keep contaminants from entering the system.

i01944022

Turbocharger - Remove

Removal Procedure

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.

1. Thoroughly clean the outer surfaces of the turbocharger (1).
2. Loosen the hose clamps and remove the air inlet hose at the turbocharger compressor housing.

Note: Exhaust elbows are only an option for the four cylinder engines.

3. Remove the exhaust pipe from the turbocharger outlet or remove the exhaust pipe from the exhaust elbow. Refer to the OEM provided information for the correct procedure in order to remove the exhaust pipe.

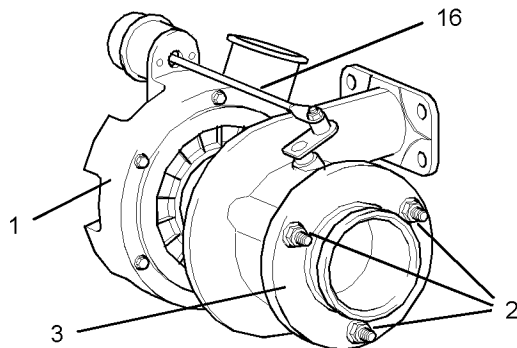


Illustration 38
Typical example

g01038600

4. If an exhaust elbow is installed, remove the exhaust elbow. Refer to this Disassembly and Assembly Manual, "Exhaust Elbow - Remove and Install".
5. Remove the nuts (2) and remove the exhaust adapter (3) from the turbocharger (1).
6. Place a suitable container below the turbocharger (1) in order to collect any spillage of oil.

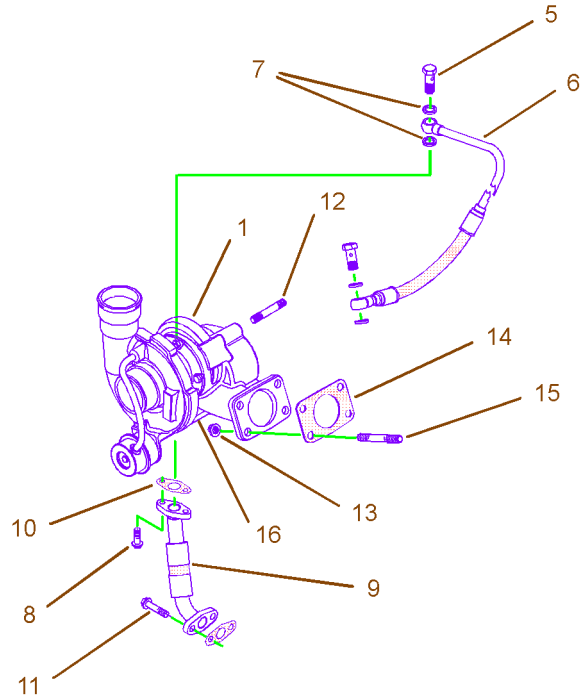


Illustration 39
Typical example

g01038396

7. Remove the banjo bolts (5). Remove the oil supply tube assembly (6) and the washers (7) from the turbocharger (1). Discard the washers (7). If necessary, remove the oil supply tube assembly (6) from the cylinder block and discard the washers.
8. Remove the setscrews (8). Remove the oil drain tube assembly (9) from the turbocharger (1). Remove the joint (10) and discard the joint. If necessary, remove the setscrews (11) and remove the oil drain tube assembly (9) from the cylinder block. Discard the joint.
9. If necessary, remove the studs (12) from the turbocharger housing.

Note: Do not use the actuator rod of the wastegate (16) to lift the turbocharger (1).

End By:

- a. Install the cylinder head assembly. Refer to this Disassembly and Assembly Manual, "Cylinder Head - Install".

i01947653

Inlet and Exhaust Valve Guides - Remove and Install

Removal Procedure

Table 5

Required Tools		
Part Number	Part Description	Qty
21825478	Valve Guide Remover/Replacer	1
21825479	Valve Guide Adapter	1

Start By:

- a. Remove the cylinder head. Refer to this Disassembly and Assembly Manual, "Cylinder Head - Remove".
- b. Remove the inlet valves and the exhaust valves. Refer to this Disassembly and Assembly Manual, "Inlet and Exhaust Valves - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

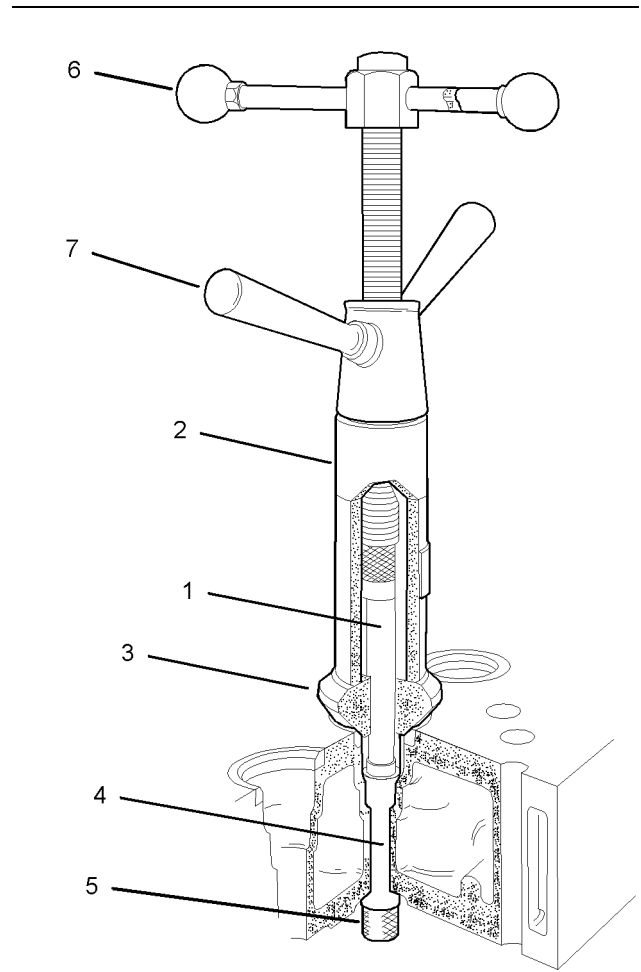


Illustration 56

g01016267

1. Install the 21825479 Valve Guide Adapter (1) into the 21825478 Valve Guide Remover/Replacer (2).
2. Place the spacer (3) into the appropriate valve seat.
3. Pass the adapter (1) through the valve guide (4) and install the valve guide remover/replacer (2) onto the spacer (3).
4. Install the attachment (5) in order to secure the adapter (1) to the valve guide (4).
5. Hold the top handle (6) and turn the bottom handle (7) counterclockwise in order to push the valve guide (4) from the cylinder head.
6. Repeat Step 2 to Step 5 in order to extract each appropriate valve guide (4).
7. Discard all of the valve guides (4) that were removed from the cylinder head.

i01958100

Engine Oil Cooler - Install

Installation Procedure for the Three Cylinder Engine

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

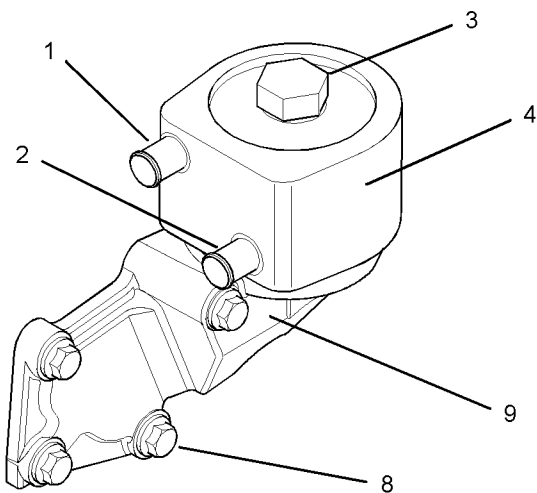


Illustration 72

g01041195

1. Clean the mating surfaces of the oil cooler base (9) and the oil cooler body (4). If the oil cooler base (9) was removed, clean the mating surfaces of the oil cooler base and the cylinder block.

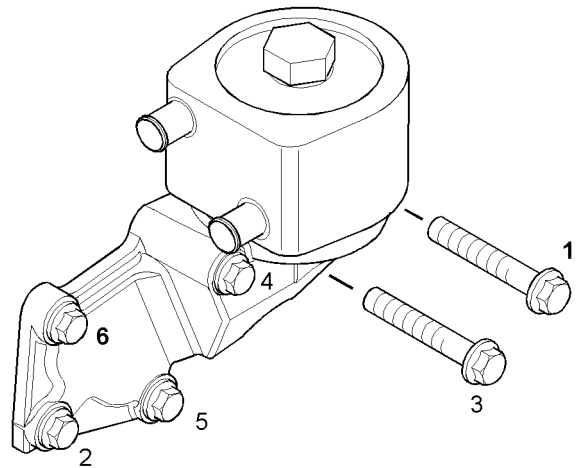


Illustration 73

g01041030

Tightening sequence

Note: Do not use sealant on the new joint between the cylinder block and the oil cooler base (9).

2. If the oil cooler base (9) was removed from the cylinder block, install setscrews into setscrew holes (1) and (6) in the oil cooler base. Install a new joint onto the two setscrews and secure the oil cooler base (9) to the cylinder block. Install the remainder of the setscrews (8). Tighten the setscrews (8) in the sequence 1, 2, 3, 4, 5, and 6 to a torque of 22 N·m (16 lb ft). Refer to the illustration 73.

8. Tighten the setscrews (3) in the sequence that is shown in the illustration 92 to a torque of 22 N·m (16 lb ft).
9. Install the hose to the water pump inlet. Tighten the hose clamps.
10. Fill the cooling system with coolant. Refer to the Operation and Maintenance Manual, "Refill Capacities" for the cooling system capacity.

End By:

- a. Install the fan. Refer to this Disassembly and Assembly Manual, "Fan - Remove and Install".

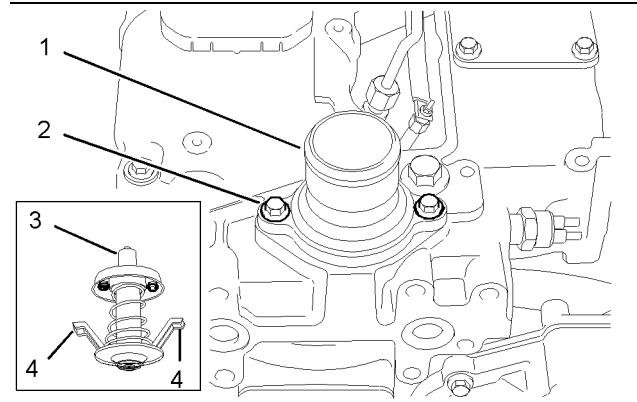


Illustration 93

g01019333

Water Temperature Regulator - Remove and Install

i01961880

Removal Procedure

Table 11

Required Tools		
Part Number	Part Description	Qty
27610226	Thermostat Tool	1

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. Drain the coolant from the cooling system to a level below the water temperature regulator into a suitable container for storage or disposal.

2. Loosen the hose clamps from the upper radiator hose and remove the upper radiator hose from the water temperature regulator housing (1).
3. Remove the setscrews (2) that hold water temperature regulator housing (1) in position on the cylinder head. Remove the water temperature regulator housing (1). Remove the O-ring from the water temperature regulator housing (1). Discard the O-ring.

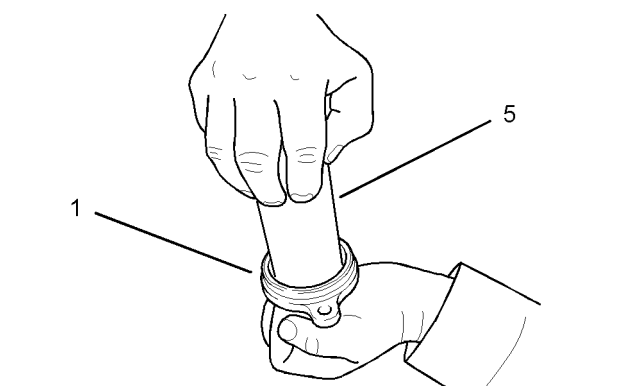


Illustration 94

g01019344

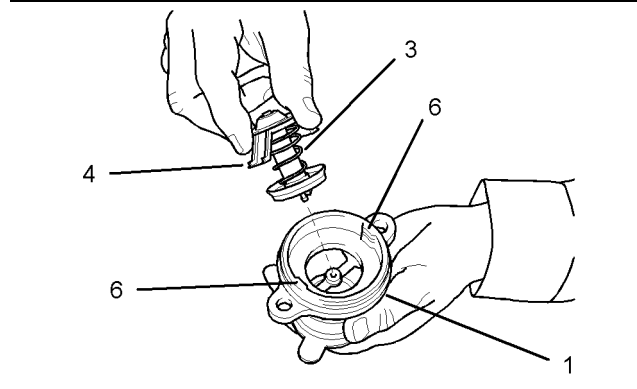


Illustration 95

g01019356

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: Do not remove the crankshaft front seal at this time if the housing (front) will also be removed. It is easier to remove the crankshaft front seal when the housing (front) has been removed from the engine. Refer to this Disassembly and Assembly Manual, "Housing (Front) - Remove".

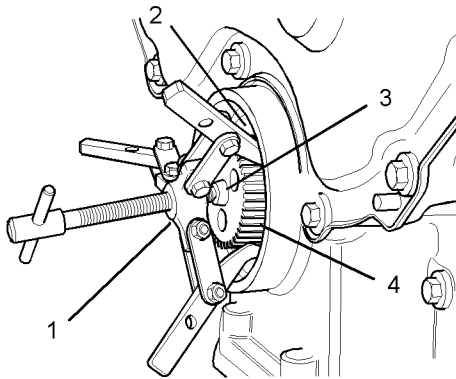


Illustration 120

g01020672

1. Install the legs of the puller (1) under the crankshaft front seal (2) and lock the legs into position.
2. Install a suitable adapter (3) between the crankshaft (4) and the puller (1).

NOTICE

Ensure that the main lip is used in order to remove the crankshaft front seal. Do not damage the edge of the housing for the crankshaft front seal.

3. Use the puller (1) in order to remove the crankshaft front seal (2). Discard the crankshaft front seal (2).

Crankshaft Front Seal - Install

Installation Procedure

Table 14

Required Tools		
Part Number	Part Description	Qty
21825577	Crankshaft Front Seal Replacer	1
21825580	Fastener Plate	1
21825578	Pressure Plate	1
27610217	Adapter	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: This procedure assumes that the housing (front) is still on the engine. Do not follow this procedure if the housing (front) has been removed from the engine. Refer to this Disassembly and Assembly Manual, "Housing (Front) - Install" if the housing (front) has been removed from the engine.

1. Clean the oil seal housing (8) and inspect the oil seal housing for damage. If necessary, replace the housing (front). Refer to this Disassembly and Assembly Manual, "Housing (Front) - Remove and Housing (Front) - Install".
2. Check the face on the pulley that contacts the crankshaft front seal for wear. If necessary, repair the crankshaft pulley. Refer to this Disassembly and Assembly Manual, "Crankshaft Wear Sleeve (Front) - Remove and Crankshaft Wear Sleeve (Front) - Install" for further details.

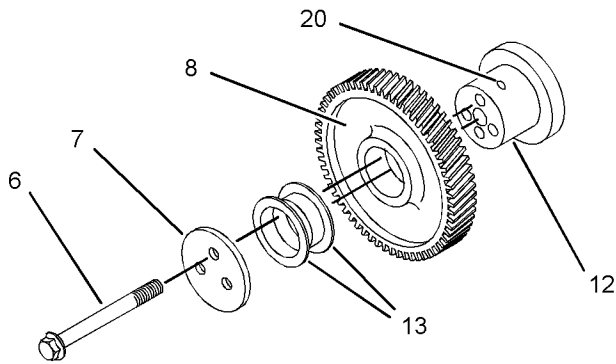


Illustration 145

g01024432

Standard idler gear assembly

3. Assemble the assembly (9) of the idler gear and the hub. In order to assemble the standard assembly, press new bushes (13) into the idler gear (8) if the bushes were previously removed. Lubricate the hub (12) with clean engine lubricating oil. Slide the hub (12) into the idler gear (8). Ensure that the oil hole (20) is to the top of the hub (12) and ensure that the marks (19) are to the front of the idler gear (8).

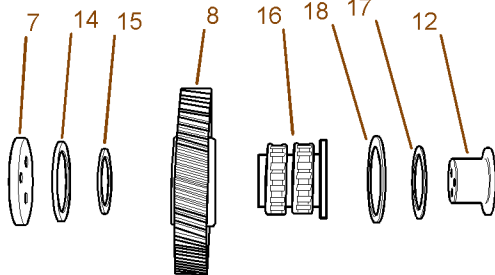


Illustration 146

g01023942

Heavy duty idler gear assembly

Note: The new bearing assembly (16) is supplied with a protective sleeve. Do not remove this protective sleeve. The protective sleeve prevents the rollers from falling out of the roller bearings.

4. In order to assemble the heavy duty idler gear, install the circlip (17) into the back face of the idler gear (8). Place the back face of the idler gear (8) onto a clean, flat surface. Insert the thrust washer (18) through the idler gear (8) and onto the circlip (17). Ensure that the flange face of the bearing assembly (16) is toward the bottom and that the protective sleeve is still in place. Insert the new bearing assembly (16) into the idler gear (8). Push the new bearing assembly (16) into the idler gear (8) until the bearing assembly comes into contact with the thrust washer (18). As the bearing assembly (16) is pushed into the idler gear (8) the protective sleeve will remain on the top face of the idler gear. Discard the protective sleeve. Install the thrust washer (15) and install the circlip (14). Lightly lubricate the hub (12) with clean engine lubricating oil. Press the hub (12) into the idler gear (8).

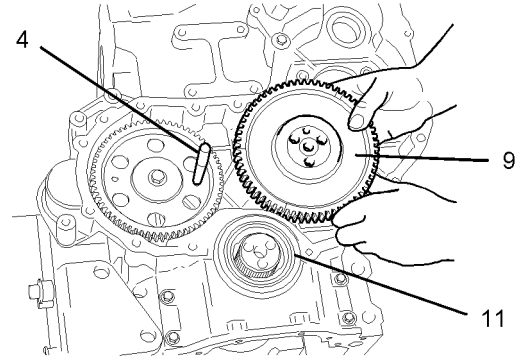


Illustration 147

g01023843

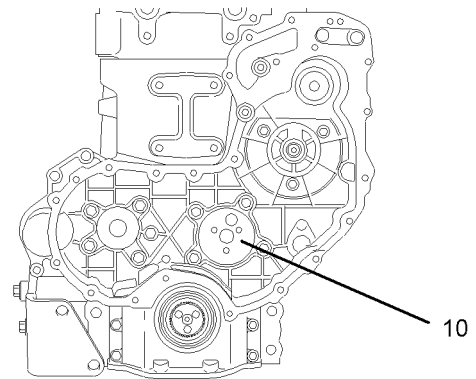


Illustration 148

g01038902

End By:

- a. Install the cover for the fuel injectors. Refer to this Disassembly and Assembly Manual, "Fuel Injector Cover - Remove and Install".
- b. If equipped, ensure that the heat shields are clean and free from dust, oil, and paint. Install the heat shields.

i01947657

Rocker Shaft and Pushrod - Remove

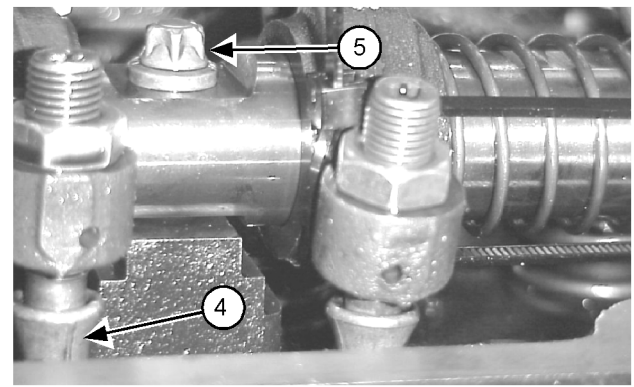


Illustration 173

g01013998

Removal Procedure

Table 20

Required Tools		
Part Number	Part Description	Qty
27610227	Rocker Assembly Tool	4

Start By:

- a. Remove the valve mechanism cover. Refer to this Disassembly and Assembly Manual, "Valve Mechanism Cover - Remove and Install".

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.

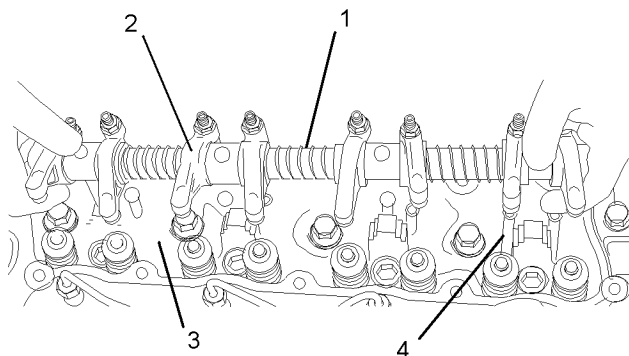


Illustration 172

g01014000

Typical example

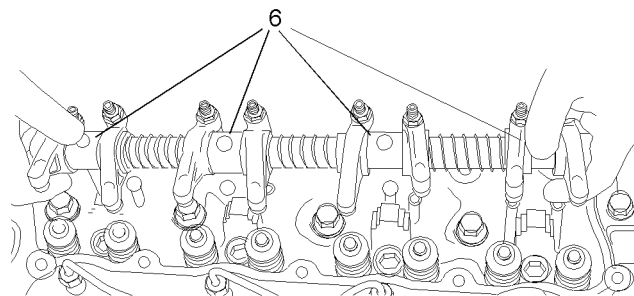


Illustration 174

g01015730

Typical example

1. If the rocker shaft will not be disassembled, install the rocker assembly tools (6) between each pair of rocker arms (2). The rocker arms (2) must be held away from the machined face of the cylinder head (3) during reassembly.
2. Start from the ends of the rocker shaft assembly (1) and work toward the center of the rocker shaft assembly in order to remove the torx screws (5). Evenly loosen the torx screws (5) in order to remove the rocker shaft assembly (1).
3. Remove the rocker shaft assembly (1) from the cylinder head (3).
4. Place an identification mark on the pushrods (4) for installation. Remove the pushrods (5) from the cylinder head (3).

i01977601

Camshaft Gear - Remove and Install

Removal Procedure

Start By:

- a. Remove the front cover if the front cover has not previously been removed. Refer to this Disassembly and Assembly Manual, "Front Cover - Remove and Install".
- b. Remove the idler gear if the idler gear has not previously been removed. Refer to this Disassembly and Assembly Manual, "Idler Gear - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

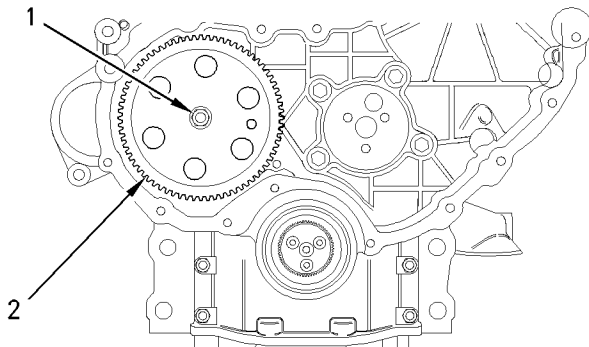


Illustration 197

g00954352

1. Remove the setscrew (1) and the washer from the camshaft gear (2).
2. Remove the camshaft gear (2) from the camshaft.

Note: Do not lose the key that is located in the camshaft for the camshaft gear (2).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Inspect the camshaft gear (2) and the key in the camshaft for wear or damage.

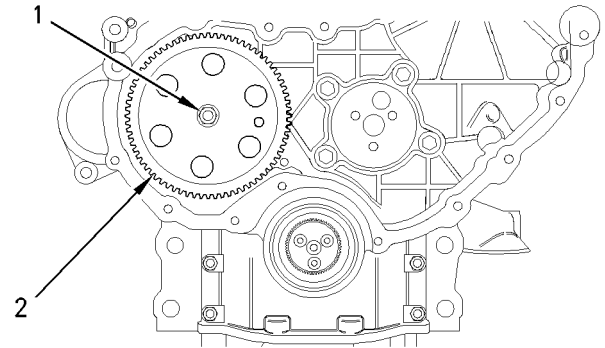


Illustration 198

g00954352

2. Ensure that the marked teeth on the camshaft gear (2) are facing toward the front and that the key is installed in the camshaft. Install the camshaft gear (2) onto the camshaft. If necessary, tap the camshaft gear (2) with a soft hammer in order to seat the key in the keyway.
3. Install the setscrew (1) and the washer onto the camshaft gear (2). Tighten the setscrew (1) to a torque of 95 N·m (70 lb ft).

End By:

- a. Install the idler gear if this is the appropriate time. Refer to this Disassembly and Assembly Manual, "Idler Gear - Remove and Install".
- b. Install the front cover if this is the appropriate time. Refer to this Disassembly and Assembly Manual, "Front Cover - Remove and Install".

i01977629

Camshaft Bearings - Remove and Install

Removal Procedure

Start By:

- a. Remove the camshaft. Refer to this Disassembly and Assembly Manual, "Camshaft - Remove and Install".

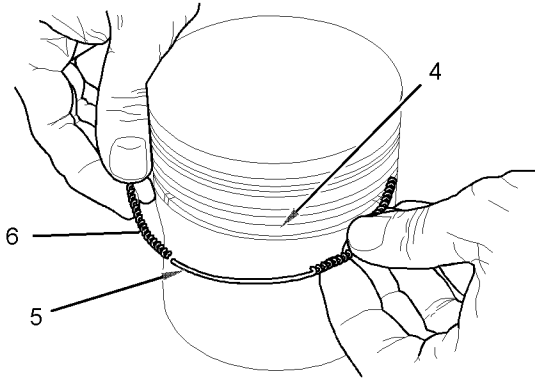


Illustration 220

g01010864

- a. Install the spring (6) for the oil control piston ring (7) in the groove (4) that is lowest on the piston. The latch pin (5) must be located inside the ends of the spring. Locate the oil control ring (7) over the internal spring (6).

Note: Ensure that the latch pin is 180 degrees from the oil control ring gap.

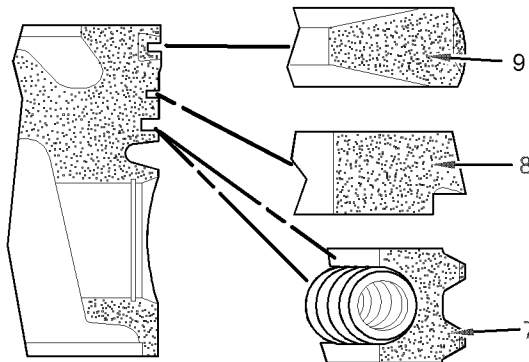


Illustration 221

g01010865

- b. Install the intermediate piston ring (8) with the tapered face into the second groove on the piston. The stamp "TOP" must be toward the top of the piston.

Note: Intermediate piston rings that are new have a green mark which must be on the left of the piston ring gap when the piston ring is installed.

- c. Install the top piston ring (9) with the barrel face and the molybdenum insert into the top groove on the piston. The top piston ring has a keystone ring. The stamp "TOP" must be toward the top of the piston.

Note: Top piston rings that are new have a red mark which must be on the left of the ring gap when the ring is installed.

- d. Position the piston ring gaps at 120 degrees away from each other.

End By:

- a. Install the pistons and the connecting rods. Refer to Disassembly and Assembly, "Piston and Connecting Rods - Install".

i01954465

Pistons and Connecting Rods - Install

Installation Procedure

Table 27

Required Tools		
Part Number	Part Description	Qty
21825615	Piston sleeve (installation tool)	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Thoroughly clean all of the components.
2. Lubricate the piston and the cylinder bore with clean engine oil.

Note: The piston and connecting rod are matched to a specific cylinder. Ensure that the connecting rod and pistons are installed in the correct cylinder.

3. Rotate the crankshaft until the connecting rod journal is at the bottom center. Lubricate the connecting rod journal with clean engine oil.
4. Ensure that the piston assembly is correctly marked to the cylinder.
5. Lubricate the bearing shells for the connecting rod with clean engine oil.

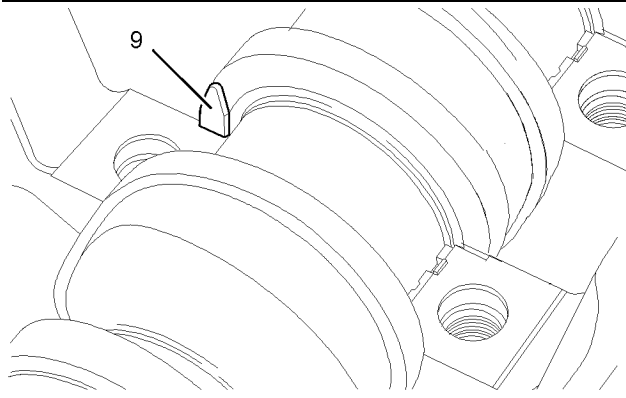


Illustration 246

g01026869

Typical example

- 9.** Clean the upper half of the thrust washers (9) and lubricate the upper half of thrust washers. Place the upper half of the thrust washers (9) into both side recesses in the cylinder block next to the housing for the appropriate main bearing shell. The grooves on the thrust washer (9) must be located against the crankshaft.

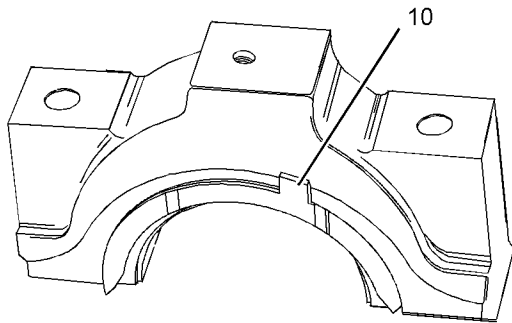


Illustration 247

g01026870

Typical example

- 10.** Clean the lower half of the thrust washers (10) and lubricate the lower half of thrust washers. Place the lower half of the thrust washers (10) on both sides of the appropriate main bearing cap. The grooves on the thrust washers (10) must be located against the crankshaft.
- 11.** Install the No. 3 main bearing cap onto the crankshaft of the three cylinder or the center main bearing cap onto the crankshaft of the four cylinder engine. Install the remaining setscrews (8).
- 12.** Tighten all of the setscrews (8) to a torque of 245 N·m (181 lb ft).

- 13.** If the piston assemblies were removed previously, install the piston assemblies. Refer to this Disassembly and Assembly Manual, "Pistons and Connecting Rods - Install". Go to Step 18.

- 14.** If the piston assemblies are still inside the cylinder bores, ensure that the upper bearing shells for the connecting rods are centered in the connecting rods. Ensure that the lower bearing shells for the connecting rods are centered in the connecting rod caps (11). Lubricate the faces of the bearing shell with clean engine oil.

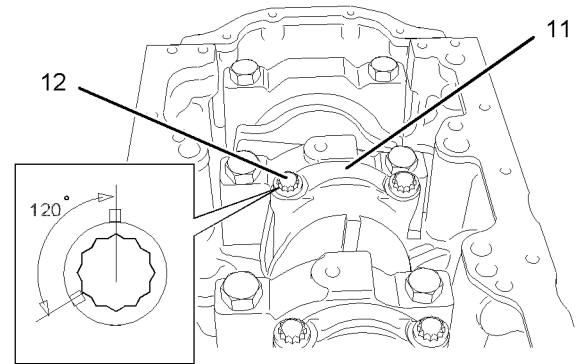


Illustration 248

g01027370

Typical example

- 15.** Install the connecting rod caps (11). Install new setscrews (12) into the connecting rods. Tighten the setscrews (12) evenly to an initial torque of 18 N·m (13 lb ft).

Note: Do not reuse the old setscrews (12) in order to secure the connecting rod caps (11).

Note: Ensure that the etched number on the connecting rod bearing cap matches the etched number on the connecting rod. Ensure that the etched numbers are on the same side.

- 16.** The setscrews must be tightened again to a higher torque. Tighten the setscrews (12) to a torque of 70 N·m (52 lb ft).
- 17.** Finally tighten the setscrews (12) for an additional 120 degrees. Refer to the insert in the Illustration 248 in order to achieve the correct final torque.
- 18.** Rotate the crankshaft in order to ensure that there is no binding.

- 2.** Lubricate a new O-ring with clean engine oil. Install the O-ring onto the front of the hydraulic steering pump.
- 3.** Install the hydraulic steering pump onto the front housing with the setscrews. Tighten the setscrews. Refer to the Torque Specifications Manual, "Standard Torque for Metric Fasteners".
- 4.** Remove the plastic caps from the hydraulic fluid lines and from the ports in the hydraulic steering pump. Install the hydraulic fluid lines to the hydraulic steering pump.

Systems Operation Section

Engine Design

i01958113

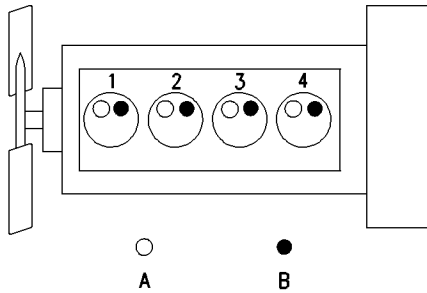


Illustration 1 g00984281

1104 example of the layout of the valves

- (A) Inlet valve
- (B) Exhaust valve

1104 Engine Specification

Type Four cylinder and four stroke
 Type of combustion Direct injection
 Bore 105 mm (4.133 inch)
 Stroke 127 mm (5.00 inch)
 Displacement 4.4 L (268 in³)
 Compression ratio
 Naturally aspirated 19.3:1
 Turbocharged 18.2:1
 Number of cylinders 4
 Cylinder arrangement In-line
 Firing order 1, 3, 4, 2

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction. Clockwise

The front of the engine is opposite the flywheel end of the engine. The left side of the engine and the right side of the engine are determined from the flywheel end. Number 1 cylinder is the front cylinder of the engine.

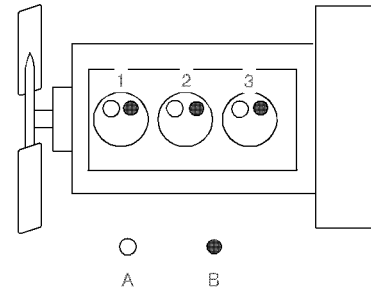


Illustration 2 g01014247

1103 example of the layout of the valves

- (A) Inlet valve
- (B) Exhaust valve

1103 Engine Specification

Type Three cylinder and four stroke
 Type of combustion Direct injection
 Bore 105 mm (4.133 inch)
 Stroke 127 mm (5.00 inch)
 Displacement 3.3 L (201 in³)
 Compression ratio
 Naturally aspirated 19.2:1
 Turbocharged 18.25:1
 Number of cylinders 3
 Cylinder arrangement In-line
 Firing order 1, 2, 3

When the crankshaft is viewed from the front of the engine, the crankshaft rotates in the following direction. Clockwise

The front of the engine is opposite the flywheel end of the engine. The left side of the engine and the right side of the engine are determined from the flywheel end. Number 1 cylinder is the front cylinder of the engine.

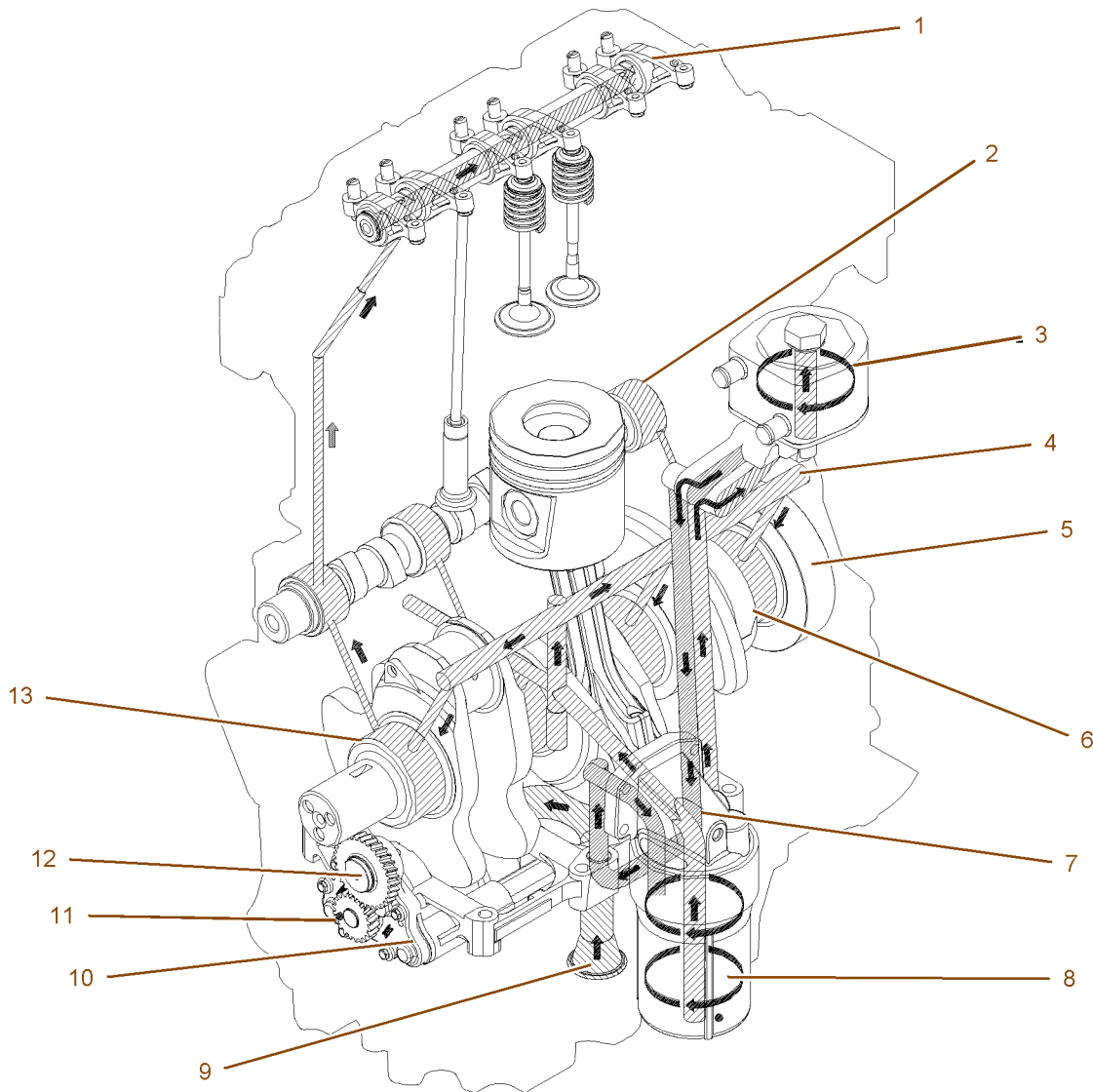


Illustration 10
Flow diagram of the lubrication system for the 1103 engine

g01016473

Pressure for the lubrication system is supplied by the oil pump (10). The crankshaft gear (13) drives a lower idler gear (12). The lower idler gear drives the oil pump gear (11). The pump has an inner rotor and an outer rotor. The axis of rotation of the rotors are off-center relative to each other. There is an interference fit between the inner rotor and the drive shaft.

The inner rotor has five lobes which mesh with the six lobes of the outer rotor. When the pump rotates, the distance increases between the lobes of the outer rotor and the lobes of the inner rotor in order to create suction. When the distance decreases between the lobes, pressure is created.

Lubricating oil from the oil pan flows through a strainer and a pipe (9) to the suction side of the engine oil pump. The lubricating oil flows from the outlet side of the pump through a passage to the oil filter head (7). The oil then flows from the filter head through a passage to a plate type oil cooler for the 1104 engine, or a modine oil cooler (3) for the 1103 engine. The integral oil cooler is located on the left side of the cylinder block. The modine oil cooler is located on the left side of the cylinder block.

From the oil cooler, the oil returns through a passage to the oil filter head. The oil then flows from the filter head to the bypass valve and from the bypass valve to the oil filter (8).

i02074847

Fuel Injection Pump Timing - Check

Delphi DP210 and the Delphi STP Fuel Injection Pumps

Note: The Delphi DP210 and the Delphi STP fuel injection pump timing cannot be checked. If you suspect that the fuel injection pump timing is incorrect, contact your Perkins dealer or your Perkins distributor for further information.

The Delphi DP210 and the Delphi STP fuel injection pumps must be serviced by an authorized Delphi technician. For repair information, contact your Perkins dealer or your Perkins distributor. The internal adjustment for the pump timing is tamper proof. High idle and low idle are factory set. Idle adjustments can not be made to the fuel pump.

Bosch EPVE Fuel Injection Pump

Note: The Bosch EPVE fuel injection pump is only installed on the 1104 engine.

Table 2

Required Tools		
Part Number	Part Description	Qty
27610248	Bosch EPVE fuel injection pump timing adapter	1

1. Set the number one piston at the top center piston on the compression stroke. Refer to Testing and Adjusting, "Finding Top Center Position for the No. 1 Piston" for the procedure.
2. Remove the high pressure fuel lines from the fuel injection pump.

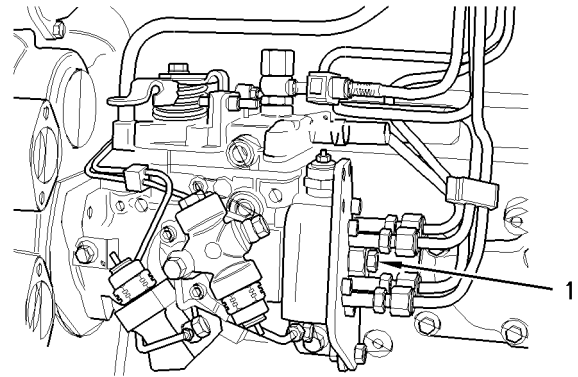


Illustration 18

g00988405

(1) Plug

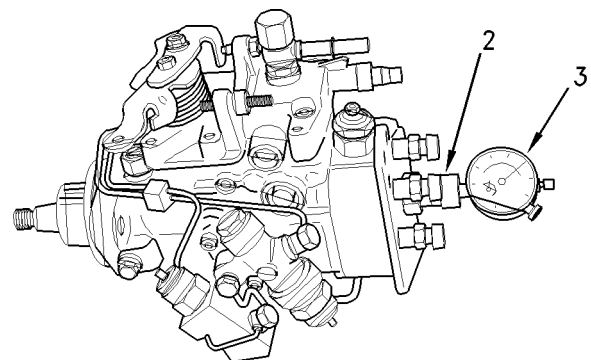
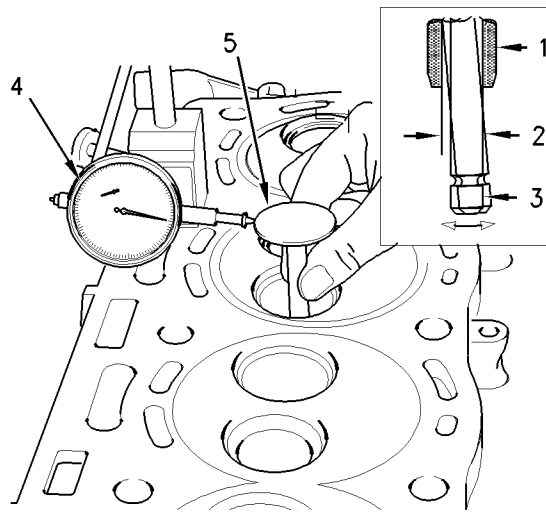


Illustration 19

g00988406

(2) Bosch EPVE fuel injection pump timing adapter
(3) Dial indicator

3. Remove the plug (1) and the washer from the rear of the fuel injection pump and install 27610248 fuel injection pump timing adapter (2). Install a suitable dial indicator (3) into 27610248 fuel injection pump timing adapter. Set the dial indicator to approximately 3 mm (0.1181 inch).
4. Rotate the crankshaft counterclockwise until the dial indicator (3) indicates that the plunger of the fuel injection pump is at the bottom of the stroke. Set the dial indicator (3) to zero.



Refer to Specifications, "Cylinder Head Valves" for the maximum clearance of the valve in the valve guide.

Illustration 30

g00986821

- (1) Valve guide
- (2) Radial movement of the valve in the valve guide
- (3) Valve stem
- (4) Dial indicator
- (5) Valve head

1. Place a new valve in the valve guide.
2. Place a suitable dial indicator with the magnetic base on the face of the cylinder head.
3. Lift the edge of the valve head to a distance of 15.0 mm (0.60 inch).
4. Move the valve in a radial direction away from the dial indicator. Make sure that the valve moves away from the dial indicator as far as possible. Position the contact point of the dial indicator on the edge of the valve head. Set the position of the needle of the dial indicator to zero.
5. Move the valve in a radial direction toward the dial indicator as far as possible. Note the distance of movement which is indicated on the dial indicator. If the distance is greater than the maximum clearance of the valve in the valve guide, replace the valve guide.

When new valve guides are installed, new valves and new valve seat inserts must be installed. Valve guides and valve seat inserts are supplied as an unfinished part. The unfinished valve guides and unfinished valve seat inserts are installed in the cylinder head. Then, the valve guides and valve inserts are cut and reamed in one operation with special tooling.

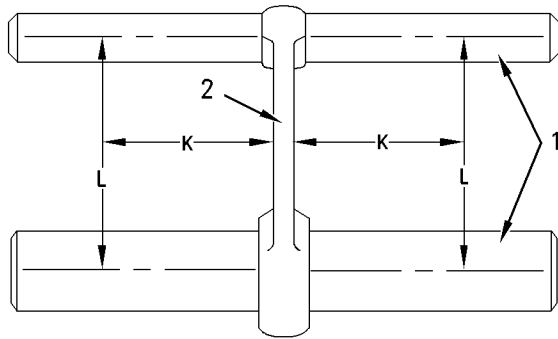


Illustration 38

g00927038

Inspection of the connecting rod parallel alignment.

- (1) Measuring pins
- (2) Connecting rod
- (L) Measure the distance between the center of the bore for the piston pin bearing and the center of the connecting rod bearing bore.
- (K) Measure the distance 127 mm (5.0 inch) from the connecting rod.

1. Use the appropriate tools in order to measure the distances for the connecting rod (2).

- Appropriate gauges for measuring distance
- Measuring pins (1)

Note: The connecting rod bearings should be removed before taking the measurements.

2. Measure the connecting rod for distortion and parallel alignment between the bores.

The measurements must be taken at distance (K). Distance (K) has a value of 127 mm (5.0 inch) from both sides of the connecting rod.

Measure length (L).

The total difference in measurements of length (L) from each side should not vary more than ± 0.25 mm (± 0.010 inch).

If the piston pin bearing is not removed, the limits are reduced to ± 0.06 mm (± 0.0025 inch).

3. Inspect the piston pin bearing and the piston pin for wear and other damage.
4. Measure the clearance of the piston pin in the piston pin bearing. Refer to Specifications, "Connecting Rod" for clearance dimensions.

i01748770

Connecting Rod Bearings - Inspect

Check the connecting rod bearings and the connecting rod bearing journal for wear or other damage.

Connecting rod bearings are available with a smaller inside diameter than the original size bearings. These bearings are for crankshafts that have been ground.

i01748792

Main Bearings - Inspect

Check the main bearings for wear or other damage. Replace both halves of the bearings and check the condition of the other bearings if a main bearing is worn or damaged.

Main bearings are available with a smaller inside diameter than the original size bearings. These bearings are for main bearing journals that have been ground.

i01946424

Cylinder Block - Inspect

1. Clean all of the coolant passages and the oil passages.
2. Check the cylinder block for cracks and damage.
3. The top deck of the cylinder block must not be machined. This will affect the piston height above the cylinder block.
4. Check the camshaft bearing for wear. If a new bearing is needed, use a suitable adapter to press the bearing out of the bore. Ensure that the oil hole in the new bearing faces the front of the block. The oil hole in the bearing must be aligned with the oil hole in the cylinder block. The bearing must be aligned with the face of the recess. Refer to Disassembly and Assembly, "Camshaft Bearings - Remove and Install".

M

Main Bearings - Inspect..... 44

P

Piston Height - Inspect 45
Piston Ring Groove - Inspect..... 43
 Inspect the Clearance of the Piston Ring..... 43
 Inspect the Piston and the Piston Rings 43
 Inspect the Piston Ring End Gap..... 43

S

Systems Operation Section 4

T

Table of Contents..... 3
Testing and Adjusting Section 22

V

V-Belt - Test..... 52
Valve Depth - Inspect 33
Valve Guide - Inspect 33

W

Wastegate - Test..... 29
Water Temperature Regulator - Test 42

MAINTENANCE INTERVALS - INTERVALLI DI MANUTENZIONE - WARTUNGSINTERVALLE - INTERVALOS DE MANUTENCIÓN - INTERVALLE DE SERVICE

OPERATION - OPERAZIONE - ARBEITSVORGANG - OPERACION - OPERATION		FREQUENCY - PERIODICITÀ - ZEITABSTAND - FRECUENCIA - PERIODICITE	LUBRICANTS - LUBRIFICANTI - SCHMIERSTOFFE - LUBRICANTES - LUBRIFIANTS
<ul style="list-style-type: none"> ● Check levels: ● Controllo livelli: ● Ölstandkontrolle: ● Control niveles: ● Contrôle niveaux: 	Differential Differenziale Im differential Diferencial Différentiel	monthly mensile monatlich cada mes mensuel	<ul style="list-style-type: none"> ● SAE85W90 (API GL4 - MIL L-2105) With additives for oil-bath brakes Con additivi per freni a bagno d'olio Mit Zusatzmittel für Bremsen in Ölbad Con aditivos para frenos de baño de aceite Avec adjuvants pour freins en bain d'huile ● SAE85W90 (API GL5 - MIL 2105-B) With additives for oil-bath brakes, for units presenting hypoid crown wheel and pinion and /or self-locking differential gear Per esecuzioni con coppia conica ipoide e/o con differenziale autobloccante, con additivi per freni a bagno d'olio Bei Ausführungen mit Kegel- und Telleradpaar und/oder Selbstsperrdifferential, mit Zusatzmitteln für Bremsen in Ölbad Para ejecuciones con par cónico hipoide y/o con diferencial autobloqueante con aditivos para frenos de baño de aceite. Pour exécutions avec couple conique hypoïde et/ou différentiel autobloquant, avec adjuvants pour freins en bain d'huile
	Planetary reduction Riduzione epicicloidale Planetengetrieb Reducción epicicloidial Reduction epicycloidale	every 200 hours ogni 200 ore alle 200 Std. cada 200 horas toutes les 200 heures	
Differential Differenziale Im differential Diferencial Différentiel	every 800 hours * ogni 800 ore alle 800 Std. cada 800 horas toutes les 800 heures		
<ul style="list-style-type: none"> ● Oil change: ● Cambio olio: ● Ölwechsel: ● Cambio aceite: ● Vidange huile: 	Planetary reduction Riduzione epicicloidale Planetengetrieb Reducción epicicloidial Reduction epicycloidale	every 1000 hours * ogni 1000 ore alle 1000 Std. cada 1000 horas toutes les 1000 heures	
	Self-locking differential gear Differenziale autobloccante Selbstsperrdifferential Diferencial autobloqueante Différentiel autobloquant	every 700 hours * <input type="checkbox"/> ogni 700 ore alle 700 Std. cada 700 horas toutes les 700 heures	

* Initially after 100 working hours - Inizialmente dopo 100 ore di lavoro - Erstmals nach 100 Betriebsstunden - Al principio, después de 100 horas de trabajo - Initialement après 100 heures de travail
 When it starts sounding noisy - Anche ai primi cenni di rumorosità - Auch falls ungewöhnliche Geräusche zu bemerken sind - También al primer indicio de ruido - Même aux premiers signaux de bruit

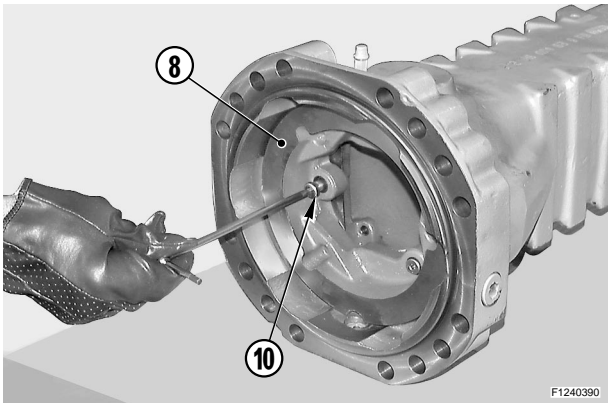
OPERATION - OPERAZIONE - ARBEITSVORGANG - OPERACION - OPERATION	MEMBER - ORGANO - ELEMENT - ORGANO - ORGANE	CONDITIONS - CONDIZIONI - BEDINGUNG - CONDICIONES - CONDITIONS	FREQUENCY - PERIODICITÀ - ZEITABSTAND - FRECUENCIA - PERIODICITE	LUBRICANTS - LUBRIFICANTI - SCHMIERSTOFFE - LUBRICANTES - LUBRIFIANTS
Greasing Ingrassaggio Schmierien Engrase Graissage	Articulations Snodi Gelenk Rótula Articulations	Normal work Lavori normali Normale Arbeit Trabajos normales Tâches ordinaires	monthly mensile monatlich cada mes mensuel	MOLIKOTE
		Awkward work Lavori gravosi Schwere Arbeit Trabajos pesados Tâches extraordinaires	Weekly Settimanale Wöchentlich Semanal Hebdomadaire	

ADJUSTMENT AND CHECKS - REGISTRAZIONE E CONTROLLI - EINSTELLUNGEN UND KONTROLLEN - AJUSTE Y CONTROLES - REGLAGES ET CONTROLES

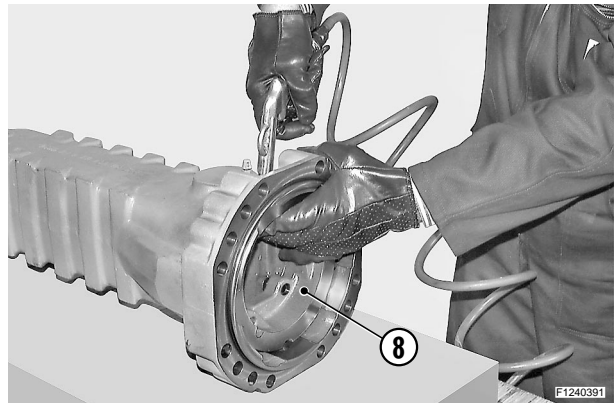
UNIT - GRUPPO - AGGREGAT - GRUPO - GROUPE	OPERATION - OPERAZIONE - ARBEITSVORGANG - OPERACION - OPERATION	FREQUENCY - PERIODICITÀ - ZEITABSTAND - FRECUENCIA - PERIODICITE	SERVICE BRAKE CIRCUIT - CIRCUITO COMANDO FRENI - BREMSKREISLAUF - CIRCUITO MANDOS FRENOS - CIRCUIT DE COMMANDE DES FREINS
Negative brake Freno negativo Federspeicherbremse Freno negativo Frein négatif	Adjustment Registrazione Einstellen Ajuste Réglage	every 1000 hours * ogni 1000 ore alle 1000 Std. cada 1000 horas toutes les 1000 heures	<p>Only for mineral oil use e.g. ATF Dexron II. Make sure that master cylinder seals are suitable for mineral oil. Usare esclusivamente olio minerale ATF Dexron II. Accertarsi che le guarnizioni del cilindro master siano adatte a questo olio. Nur mineralisches Öl verwenden, z.B.: ATF Dexron II. Achtung: Dichtringe des Hauptbremszylinders müssen für dieses Öl geeignet sein. Usar exclusivamente aceite mineral ATF Dexron II. Asegurarse de que las juntas del cilindro principal son adecuadas para este aceite. Utiliser exclusivement huile minérale ATF Dexron II. Vérifier que les joints du maître-cylindre, soient compatibles avec cette huile.</p>
Service brake Freni di servizio Hilfsbremse Frenos de ejercicio Freins de service	Adjustment Registrazione Einstellen Ajuste Réglage	every 500 hours ogni 500 ore alle 500 Std. cada 500 horas toutes les 500 heures	
Wheel nuts Dadi ruota Radmuttern Tuercas rueda Ecrous de roue	Tightening Serraggio - Festziehen Apriete Serrage	every 200 hours ogni 200 ore alle 200 Std. cada 200 horas toutes les 200 heures	

* Initially after 100 working hours - Inizialmente dopo 100 ore di lavoro - Erstmals nach 100 Betriebsstunden - Al principio, después de 100 horas de trabajo - Initialement après 100 heures de travail

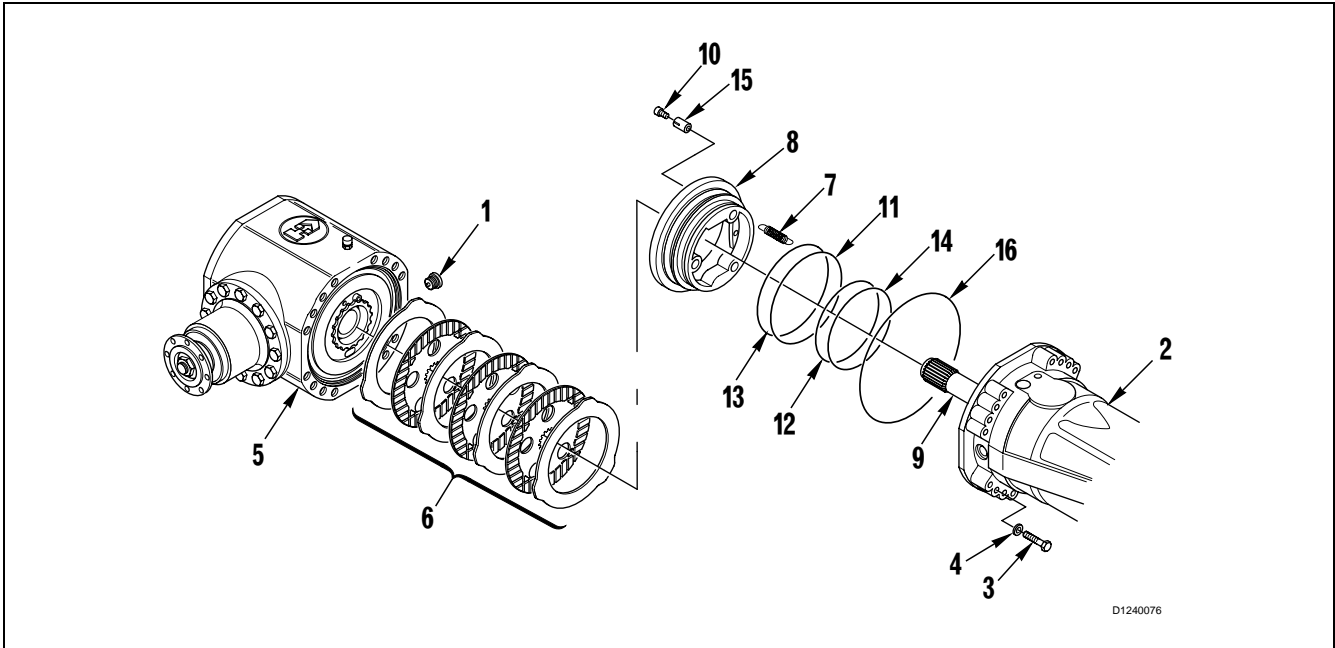
CHECKING WEAR AND REPLACING THE BRAKING DISKS - CONTROLLO USURA E SOSTITUZIONE DISCHI FRENO - VERSCHLEISS KONTROLLIEREN UND BREMSSCHEIBEN AUSWECHSELN - CONTROL DEL DESGASTE Y SUSTITUCION DE LOS DISCOS DEL FRENO - CONTROLE D'USURE ET SUBSTITUTION DES DISQUES DE FREINAGE



Remove the pin screws (10) guiding the piston (8).
CAUTION! If the screws are to be replaced, note down the different colours for the different brake gaps.
 (See «HOW TO ASSEMBLE THE BRAKING UNITS»)



Slowly introduce compressed air through the connection of the braking circuit in order to extract the entire piston.
CAUTION! Hold on to the piston as it may be suddenly ejected and damaged.



CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

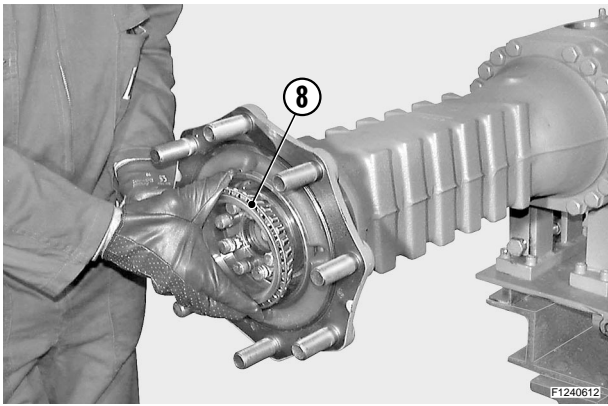
- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

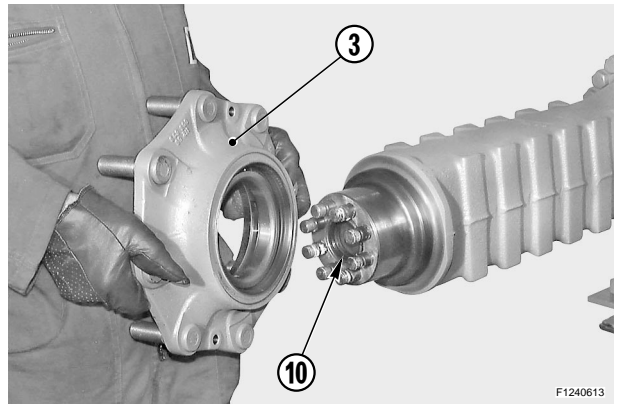
HOW TO DISASSEMBLE THE PLANETARY REDUCTION AND AXLE SHAFT - SMONTAGGIO RIDUTTORE EPICICLOIDALE E SEMIASSE - PLANETENGETRIEB UND HALBACHSEN ABMONTIEREN - DESMONTAJE REDUCTOR EPICICLOIDAL Y SEMIEJES - DESASSEMBLAGE DU REDUCTEUR EPICYCLOIDAL ET DU DEMI-ESSIEUX



GB

a

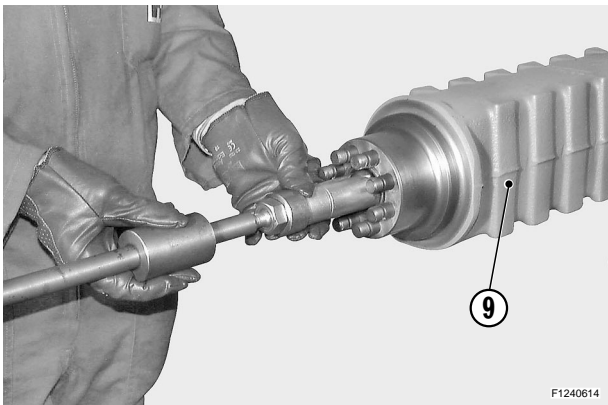
Remove the external bearing (8).



GB

b

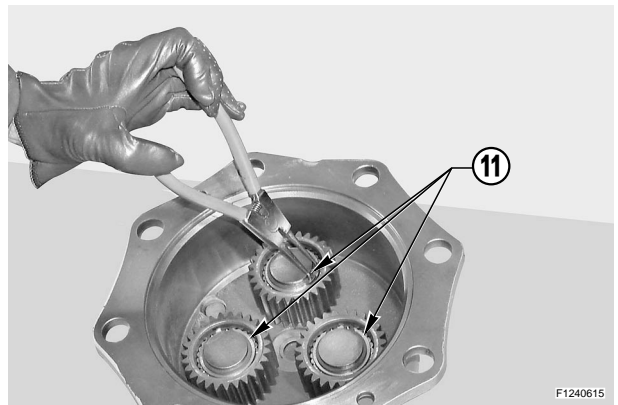
Extract the hub (3).



GB

c

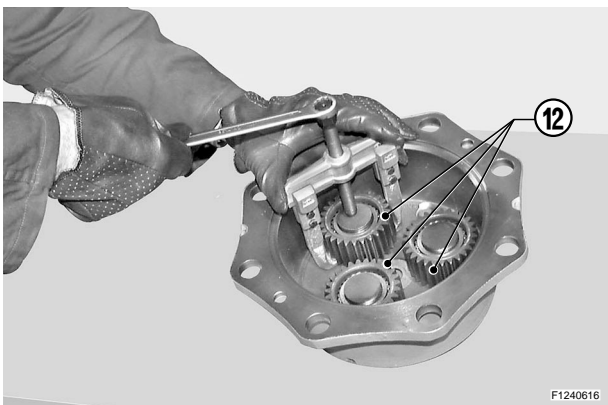
Remove snap ring (10) from the arm (9).



GB

d

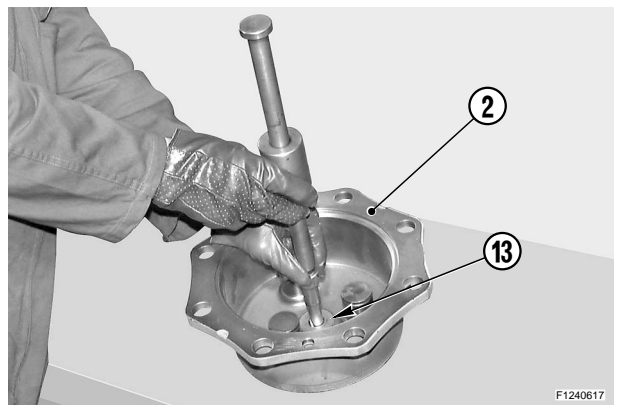
Remove the snap rings (11).



GB

e

With the help of a puller, remove the planet wheel gears (12).
NOTE. Note down the assembly side of planet wheels.

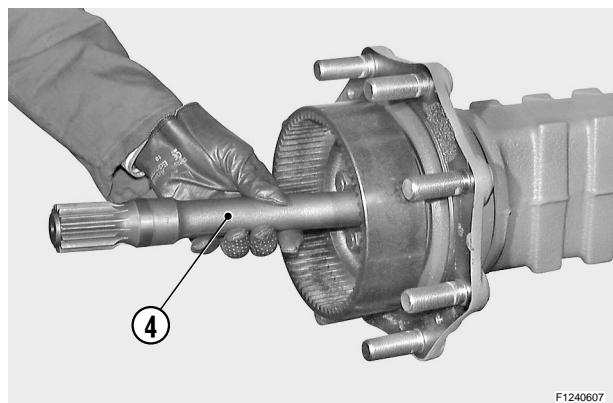


GB

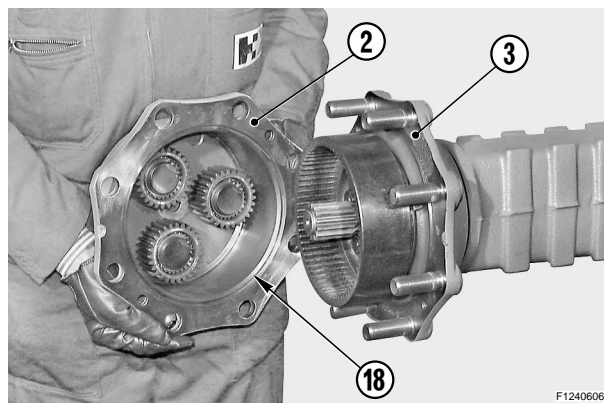
f

Using a puller for inner parts, remove shim washer (13) from planetary cover (2).

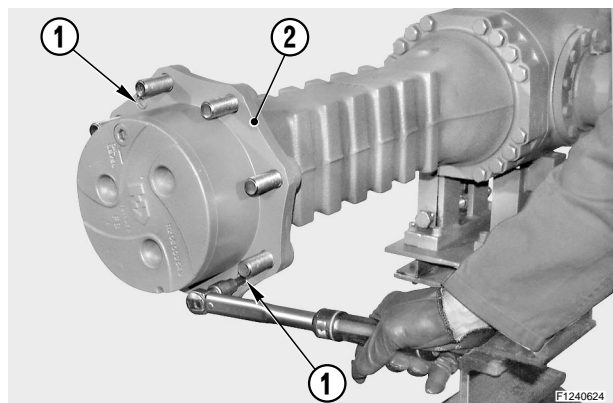
ASSEMBLING THE PLANETARY REDUCTION AND AXLE SHAFT - ASSEMBLAGGIO RIDUTTORE EPICICLOIDALE E SEMIASSE - PLANETENGETRIEB UND HALBACHSEN MONTIEREN - MONTAJE REDUCTOR EPICICLOIDAL Y SEMIEJES - ASSEMBLAGE DU REDUCTEUR EPICYCLOIDAL ET DU DEMI-ESSIEUX



Grease snap ring (10) and sealing face of axle-shaft (4).
Install the axle shaft (4) making sure it is properly engaged in the braking disks and in the differential unit.
NOTE. Be very careful not to damage the snap ring (10).

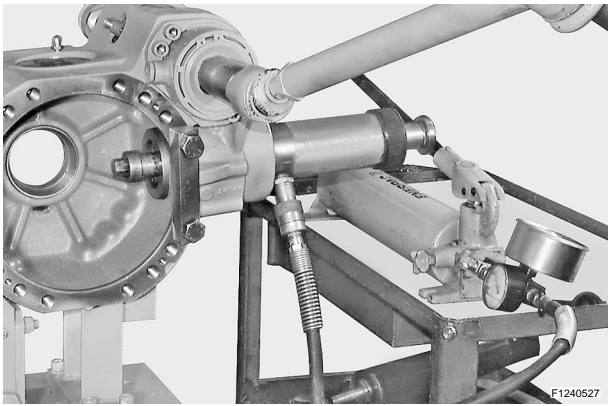


Fit the planetary carrier cover (2) onto the hub (3).
CAUTION! Check that the O-ring (18) is in good condition and in position.



Lock the planetary carrier cover (2) by tightening the screws (1).
Torque wrench setting for screws: 40–50 Nm

HOW TO INSTALL AND ADJUST THE BEVEL PINION - INSTALLAZIONE E REGISTRAZIONE PIGNONE CONICO - KEGELRAD INSTALLIEREN UND EINSTELLEN - INSTALACION Y AJUSTE DEL PIÑÓN CONICO - INSTALLATION ET REGLAGE DU PIGNON CONIQUE

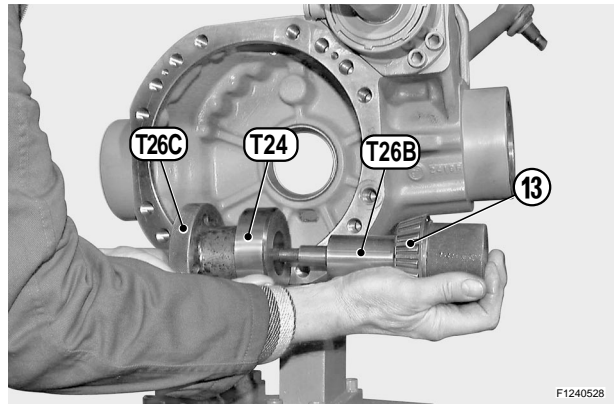


F1240527



Connect the tension rod to the press and move the thrust block of the external bearing (13) into its seat. Disconnect the press and remove the tension rod.

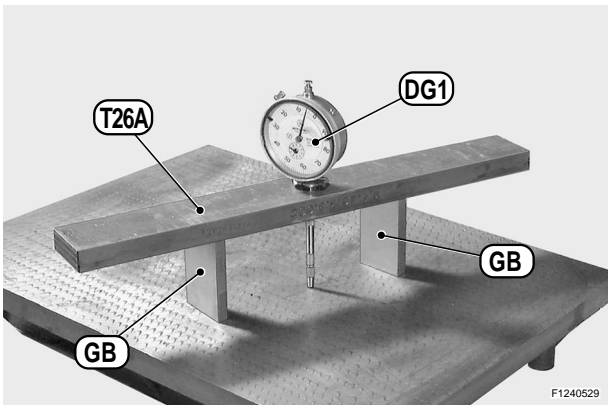
NOTE. Before starting the next stage, make sure that the thrust block has been completely inserted into its seat.



F1240528



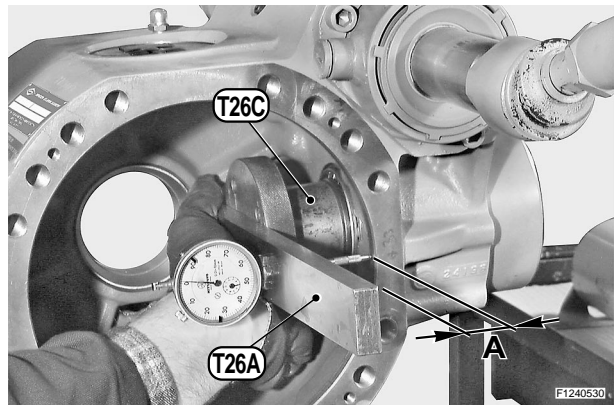
Insert tool **T26B** complete with external bearing (13), measurement ring **T24** and gauged ring nut **T26C**. Manually tighten.



F1240529



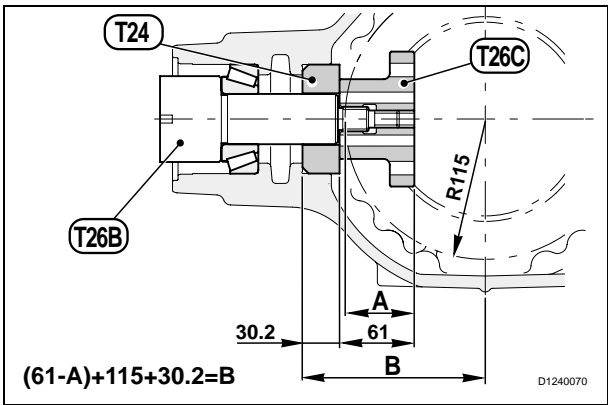
Fit a centesimal comparator "**DG1**" with long stem into bar **T26A**; when the bar rests on two size- blocks "**GB**" of 57 mm, reset the comparator. Preset the comparator to approx. 2 mm and reset.



F1240530



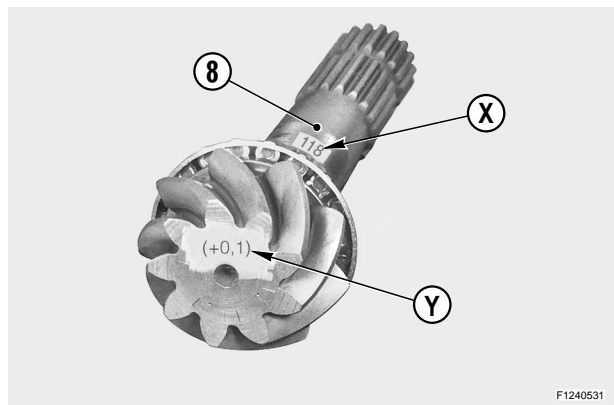
Lay bar **T26A** on gauged nut **T26C** and take the size "**A**" at about 57 mm corresponding to the maximum diameter of arms centring.



D1240070



Calculate size "**B**" which will be the first useful value for calculating the size of the shims (14) that are to be inserted under the thrust block of the internal bearing (9).



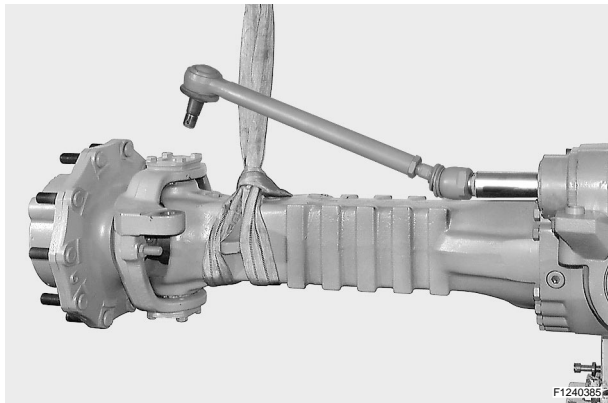
F1240531



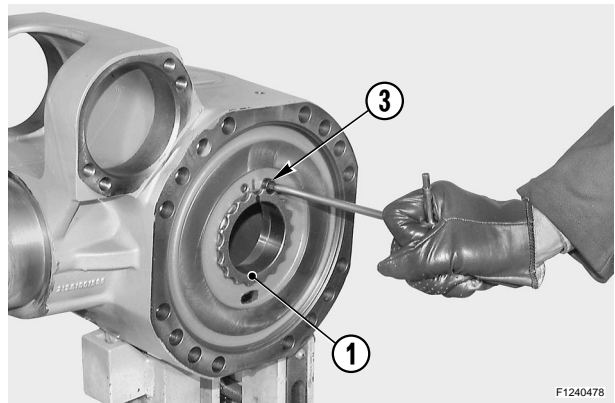
Check the nominal size (**X**) marked on the pinion and add or subtract the indicated variation (**Y**) so as to obtain size "**Z**".
e.g.: $Z = 118 + 0.1 = 118.1$
 $Z = 118 - 0.2 = 117.8$

HOW TO REMOVE AND DISASSEMBLE THE DIFFERENTIAL UNIT - RIMOZIONE E SMONTAGGIO GRUPPO DIFFERENZIALE - DIFFERENTIAL
 ABMONTIEREN UND ZERLEGEN - REMOCION Y DESMONTAJE GRUPO DIFERENCIAL - DEPOSE ET DEMONTAGE DU GROUPE DIFFERENTIEL

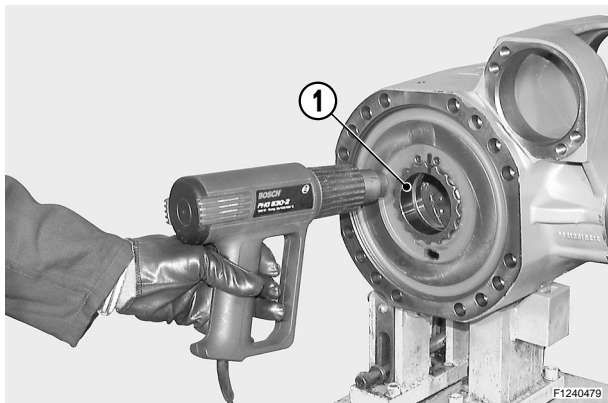
REMOVING - RIMOZIONE - ABMONTIEREN - REMOCION - DEPOSE



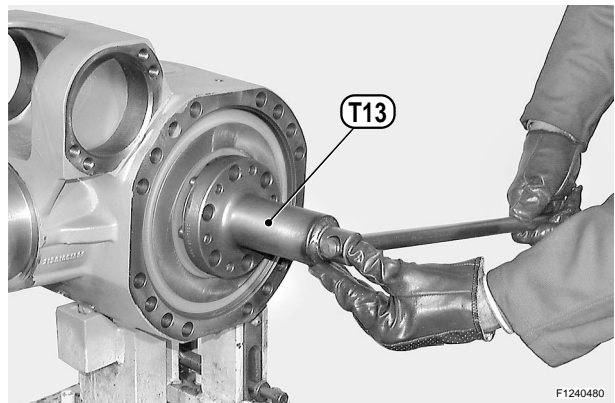
Remove the complete arms.
 For details, see «CHECKING WEAR AND REPLACING THE BRAKING DISKS».



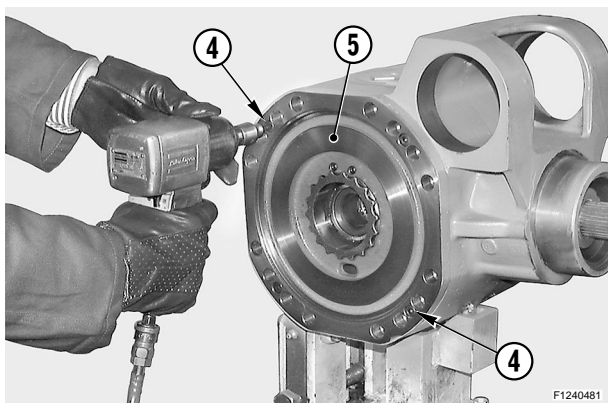
Mark the position of the ring nuts (1). Remove the fitting screws (3) from the ring nuts (1).



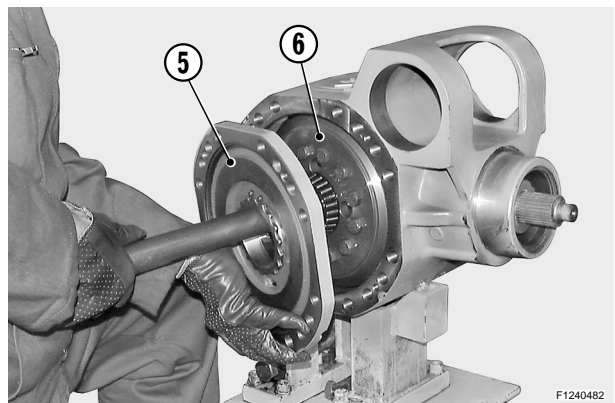
Uniformly heat the ring nuts (1) up to a temperature of 80° C.



Apply tool T13 and remove the ring nuts.
NOTE. Accurately clean the threaded portions on ring nuts of body and cover.

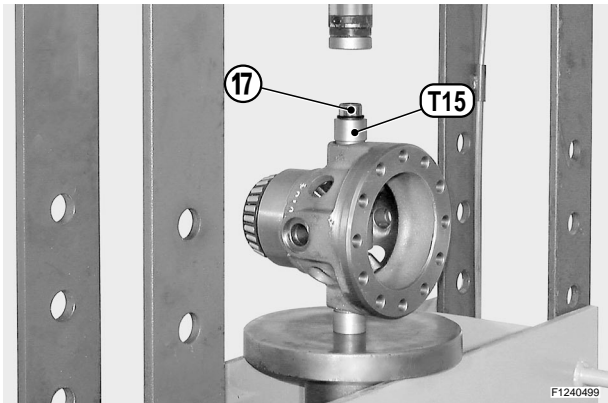


Remove the fitting screws (4) from the middle cover (5).



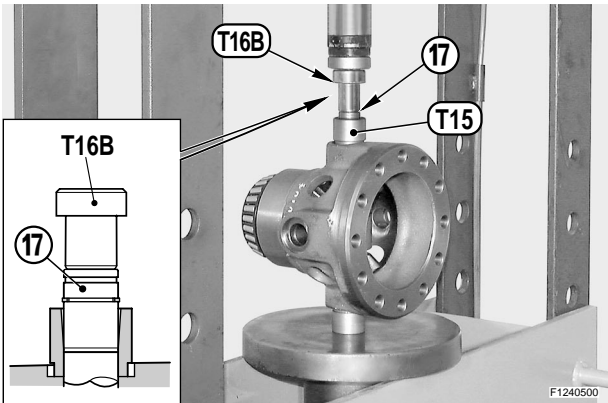
Insert a screw-driver in the opposing slots then force and remove the middle cover (5) and the complete differential unit (6).
NOTE. Support the pieces using a rod.

HOW TO ASSEMBLE AND INSTALL THE DIFFERENTIAL UNIT - ASSEMBLAGGIO ED INSTALLAZIONE GRUPPO DIFFERENZIALE -
 DIFFERENTIALAGGREGAT MONTIEREN UND INSTALLIEREN - MONTAJE E INSTALACION DEL GRUPO DIFERENCIAL -
 ASSEMBLAGE ET INSTALLATION DU GROUPE DIFFERENTIEL



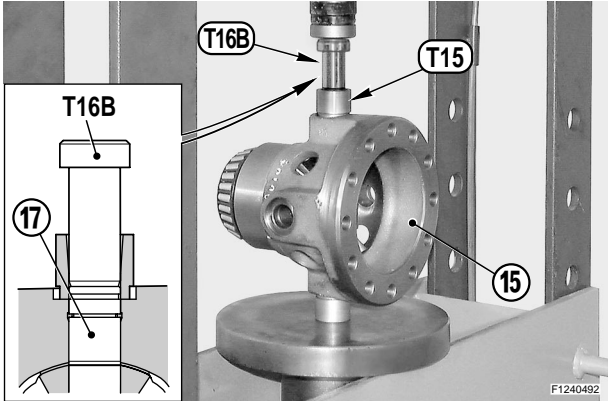
GB **a**

Place the differential carrier (15) under the press, position bush T15 and insert the planet wheel pin (17).



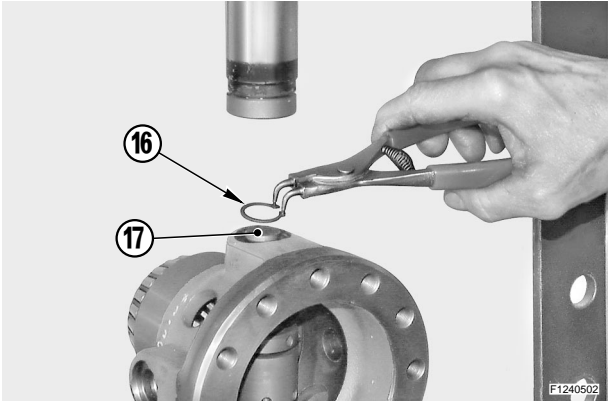
GB **b**

Put gudgeon T16B on top of the planet wheel pin (17).



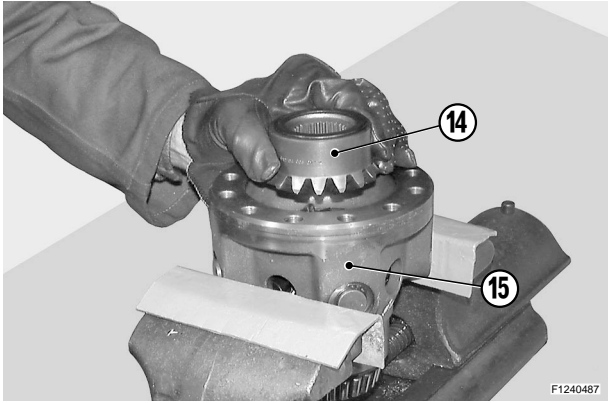
GB **c**

Press T16B pin all the way down.



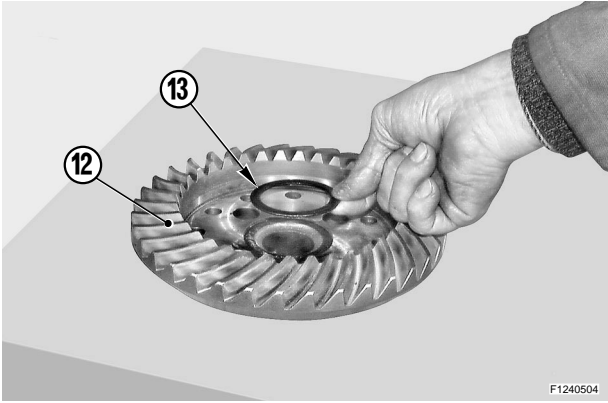
GB **d**

Remove gudgeon T16B, bush T15 and fit the snap ring (16) on the pin (17).
CAUTION! Make sure that the snap ring centres the seat and that it rests on the surface of the differential carrier.
 Repeat the operations on the other planet wheel pin or planet wheel axle.



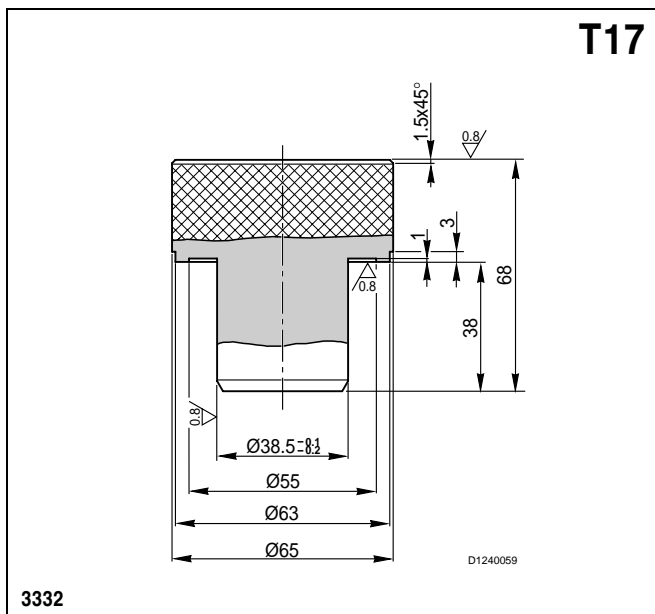
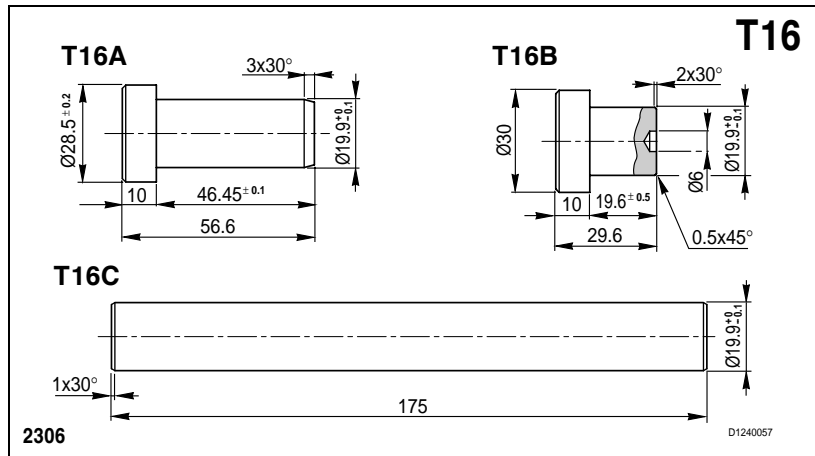
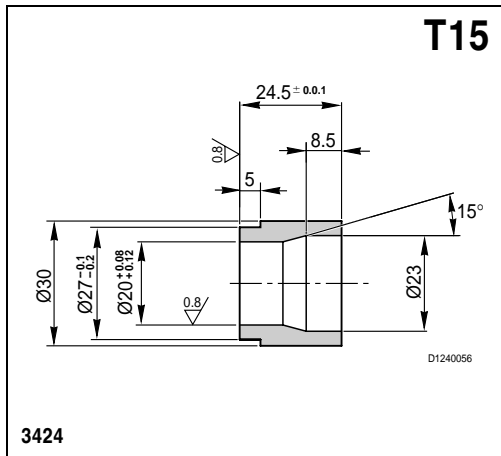
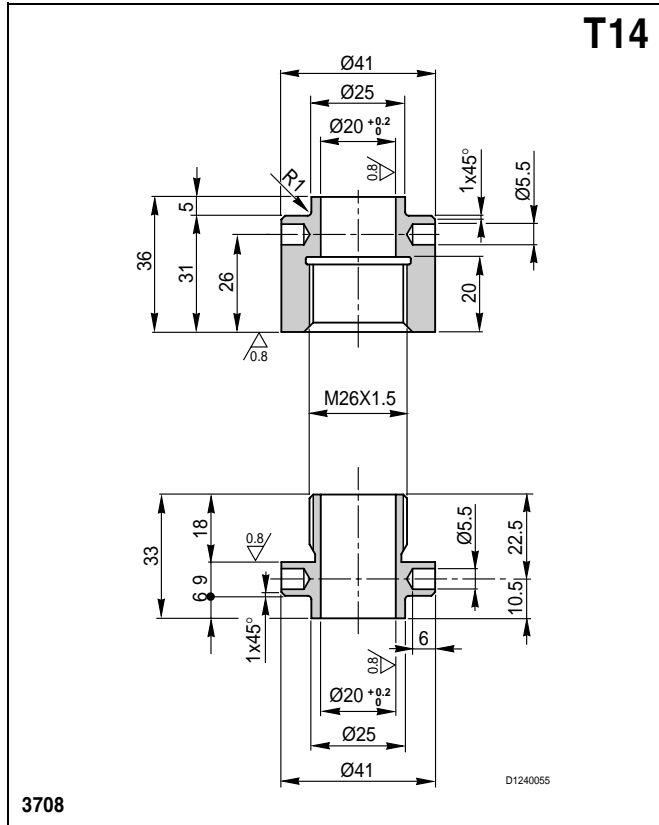
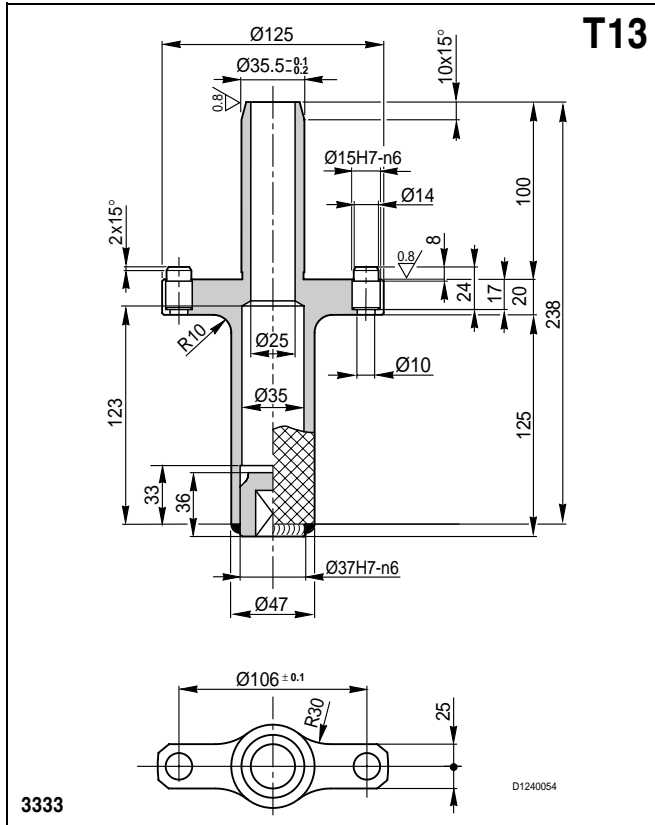
GB **e**

Position the second planetary gear (14) in the differential carrier (15).



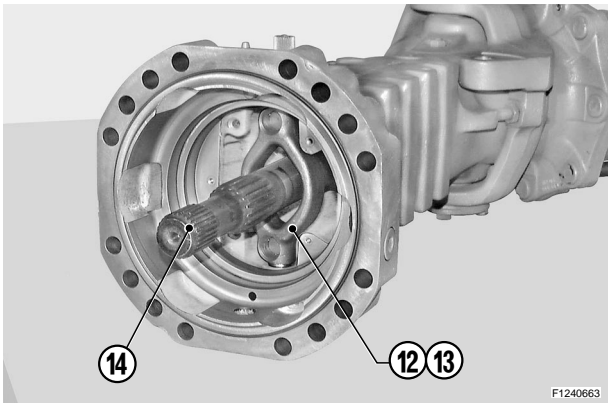
GB **f**

Position the shim washer (13) on the crown (12).
NOTE. In order to hold the shim washer (13) in position, apply grease to it.



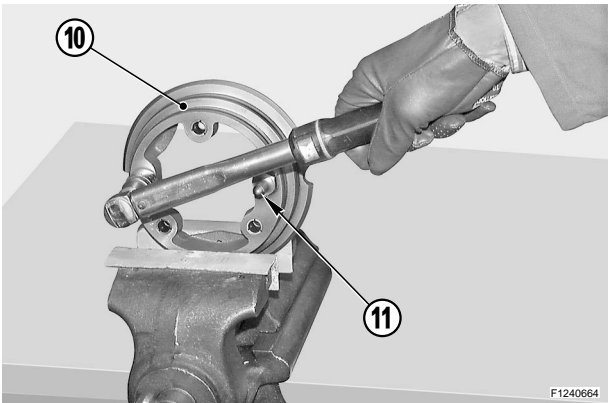
PROBLEM - PROBLEMA - PROBLEM - PROBLEMA - PROBLEME	CAUSE - CAUSE - URSACHE - CAUSAS - CAUSE	CORRECTION - RIMEDI - ABHILFE - REMEDIOS - REMEDE
<p>Diff-lock inoperative <i>Il blocco differenziale non funziona</i> Differentialsperre ohne Wirkung <i>El bloque del diferencial no funciona</i> Mauvais fonctionnement du blocage du différentiel</p>	<p>17. If manual control, loose or misadjusted linkage <i>17. Se il comando è manuale: comando scollegato o registrato male</i> 17. Bei mechanisch betätigter Sperre, loser oder schlecht eingestellter Hebel <i>17. Si el mando es manual: mando desconectado o mal ajustado</i> 17. Si la commande est manuel: commande déconnectée ou mal réglée</p>	<p>Inspect and correct linkage and readjust as indicated in vehicle's service manual. <i>Controllare, riparare e registrare il comando indicato nel manuale del veicolo.</i> Hebel überprüfen und gemäß Anweisungen im Handbuch des Fahrzeuges einstellen. <i>Controlar, reparar y ajustar el mando indicado en el manual del vehículo.</i> Inspecter, réparer et régler la commande selon le manuel du véhicule.</p>
	<p>18. If hydraulic control, problems in the hydraulic or electrical circuits of the vehicle <i>18. Se il comando è idraulico: problemi nel circuito elettrico del veicolo</i> 18. Bei hydraulisch betätigter Sperre, Probleme in der hydraulischen oder elektrischen Anlage des Fahrzeuges <i>18. Si el mando es hidráulico: problemas en el circuito eléctrico del vehículo</i> 18. Si la commande est hydraulique: problème dans le circuit électrique dans le véhicule</p>	<p>Refer to the service manual for the vehicle. <i>Fare riferimento alle istruzioni nel manuale del veicolo.</i> Siehe Anweisungen im Handbuch des Fahrzeuges. <i>Consultar las instrucciones del manual del vehículo.</i> Voir instructions dans manuel du véhicule.</p>
	<p>19. If hydraulic control: problems in actuating cylinder (noteable through loss of hydraulic oil or increase of the oillevel in axle) <i>19. Se il comando è idraulico: problemi nell'attuatore (caratterizzati da perdite del fluido idraulico o da aumento del livello d'olio nel ponte)</i> 19. Bei hydraulisch betätigter Sperre, Ölverlust im Betätigungszylinder (erkentlich durch Verlust von hydraulisch Flüssigkeit oder Anstieg des Oelniveaus in der Achse) <i>19. Si el mando es hidráulico: problemas en el actuador (caracterizados por pérdidas del fluido hidráulico o por un aumento del nivel del aceite en el puente)</i> 19. Si la commande est hydraulique: problèmes dans le vérin (caractérisés par des fuites de fluide hydraulique ou augmentation du niveau d'huile dans le pont)</p>	<p>Rebuilt cylinder. <i>Controllare e riparare il cilindro.</i> Überprüfen und Zylinder reparieren. <i>Controlar y reparar el cilindro.</i> Inspecter et réparer le cylindre.</p>
	<p>20. If with lim. slip differential, worn discs <i>20. Se il differenziale è del tipo autobloccante, dischi usurati</i> 20. Wenn mit Selbstsperrdifferential, Scheiben verschlissen <i>20. Si el diferencial es del tipo autobloqueante: discos gastados</i> 20. Si avec différentiel à glissement limité, usure sur les disques</p>	<p>Replace discs. <i>Sostituire i dischi.</i> Scheiben ersetzen. <i>Sustituir los discos.</i> Remplacer les disques.</p>

HOW TO ASSEMBLE THE MECHANIC PARKING BRAKE UNIT - ASSEMBLAGGIO GRUPPO FRENO DI STAZIONAMENTO A COMANDO MECCANICO - MECHANISQUE HANDBREMSE MONTIEREN - ASEMBLAJE GRUPO FRENO ESTACIONAMIENTO MECANICO - ASSEMBLAGE DU FREIN DE STATIONNEMENT MECANIQUE



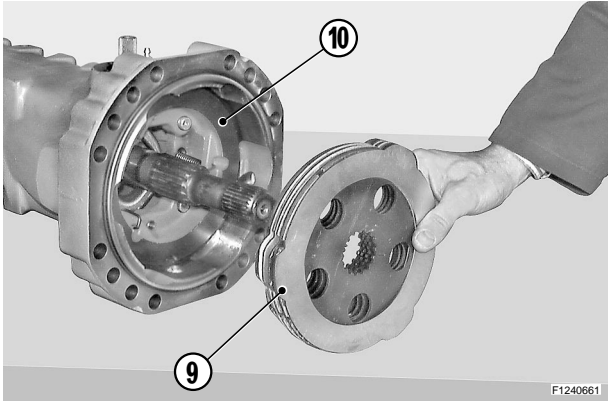
GB **a**

Install thrust levers (12) and (13), then install the axle shaft (14). For details, see «HOW TO INSTALL THE AXLE SHAFT».



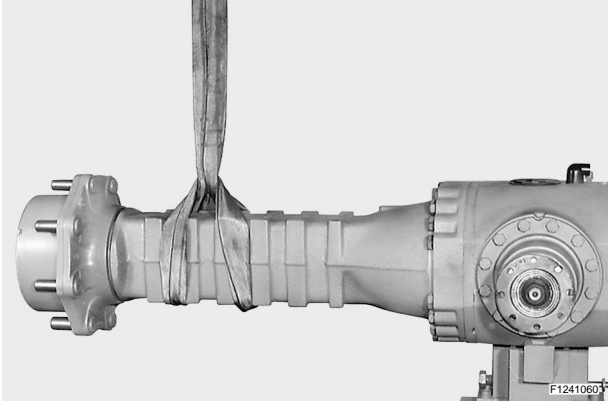
GB **b**

Apply Loctite 270 to the threaded portion of the pins (11) and fit them onto the piston (10). Block them: torque wrench setting 30–35 Nm.



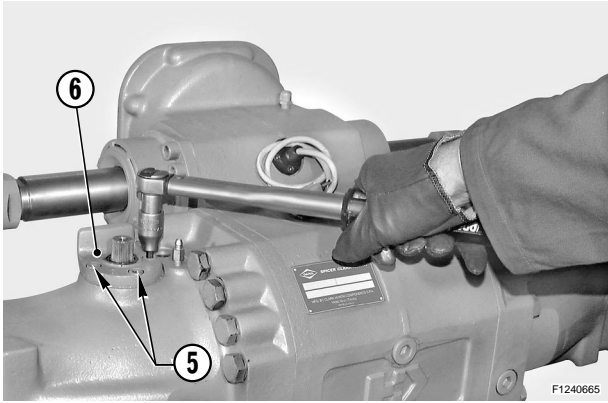
GB **c**

Re-install the piston (10) and the braking disks (9). For details, see «HOW TO ASSEMBLE THE BRAKING UNITS».



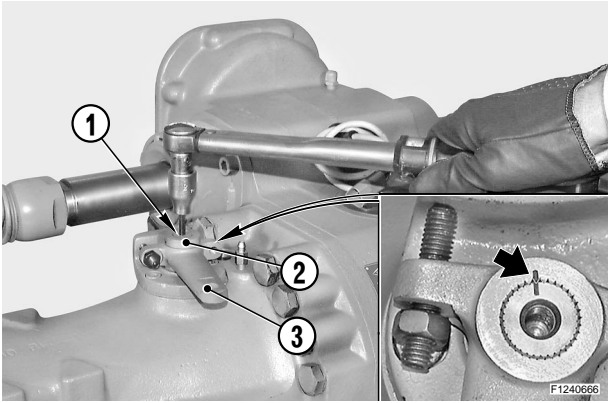
GB **d**

Install the arms (8) into the main body; check flatness and block arms following the appropriate procedures illustrated in section «HOW TO ASSEMBLE THE BRAKING UNITS».



GB **e**

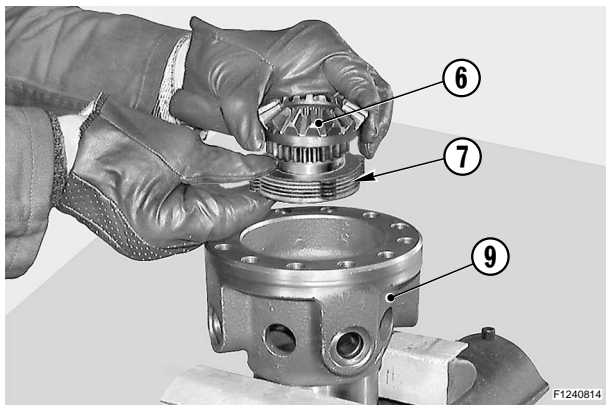
Install the bush (6) complete with O-ring (7) and block it with screws (5). Tighten screws with a torque wrench setting of 23.8–26.2 Nm.



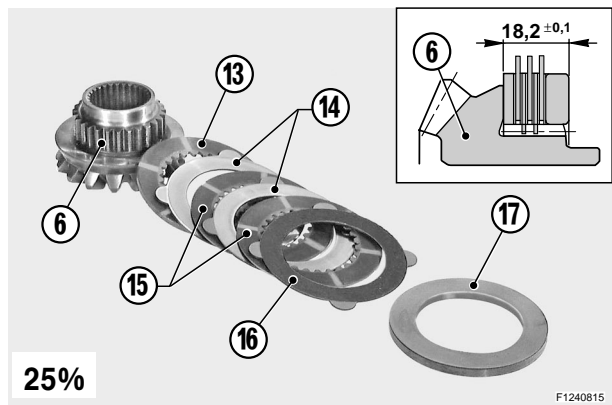
GB **f**

Install in sequence the lower O-ring (4), the lever (3) and the washer (2) with the relative O-ring (4). Block with screw (1) and tighten using a torque wrench setting of 23.8–26.2 Nm. **CAUTION!** Refer and keep to the positions marked during disassembly.

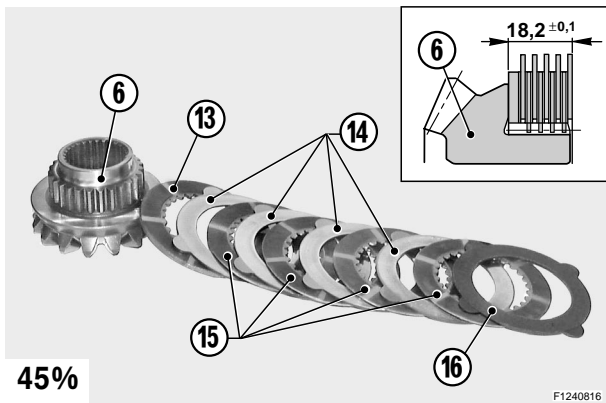
HOW TO ASSEMBLE THE LIMITED SLIP DIFFERENTIAL UNIT (25% AND 45%) - ASSEMBLAGGIO DIFFERENZIALE A SLITTAMENTO LIMITATO (25% E 45%) - DIFFERENTIAL MIT BEGRENZTEM GLEITVERMÖGEN (25% UND 45%) MONTIEREN - ASEMBLAJE DIFERENCIAL A DESLIZAMIENTO LIMITADO (25% Y 45%) - MONTAJE DIFFERENCIAL A GLISSEMENT REDUIT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



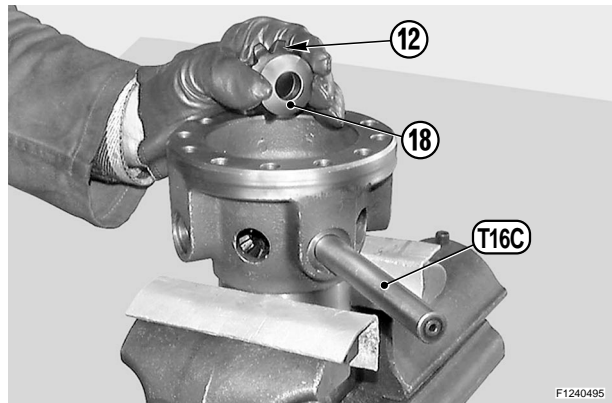
Place a friction unit (7) - suitable for the specific type of slipping - and planetary gear (6) into the differential unit (9).
The composition of the unit is illustrated in the points below.



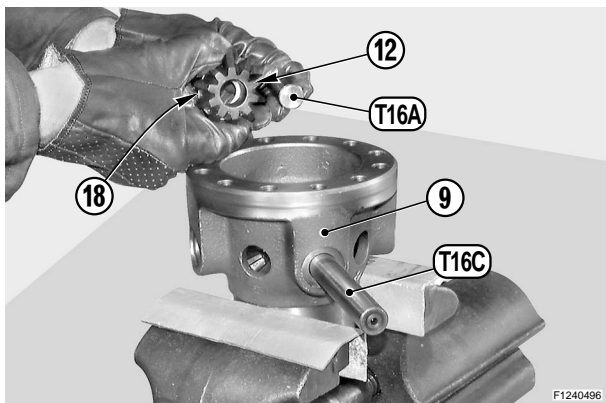
25% FRICTION UNIT COMPOSITION
Friction ring with increased shim (13), steel rings (14) and friction rings (15) alternated, end ring (16) and distance piece (17).
CAUTION! As to rings (13) and (16), the side without notches must face outwards.



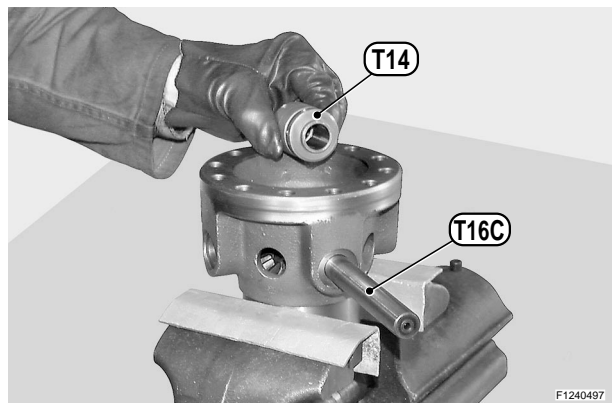
45% FRICTION UNIT COMPOSITION
Friction ring with increased shim (13), steel rings (14) and friction rings (15) alternated, end ring (16) and distance piece (17).
CAUTION! As to rings (13) and (16), the side without notches must face outwards.



Position shim washer (18) and the first planet gear (12).
Hold them in position with bar T16C.

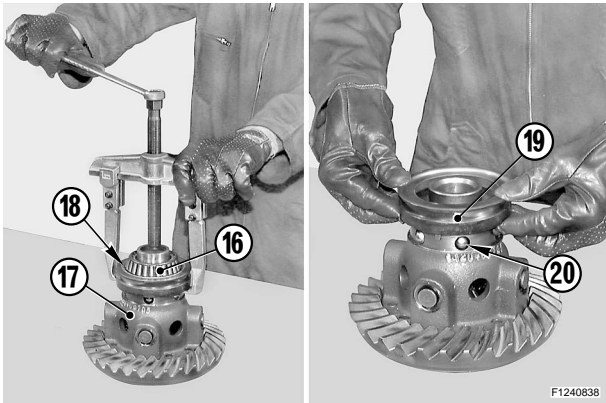


Using gudgeon T16A, position the second planet gear (12) and relative shim washer (18).



Insert tool T14 in-between the two planet gears (12). Align the whole unit, pushing bar T16C in as far as it will go, until gudgeon T16A is expelled.

HOW TO DISASSEMBLE THE HYDRAULIC DIFFERENTIAL LOCK - SMONTAGGIO BLOCCAGGIO DIFFERENZIALE A COMANDO IDRAULICO - DIFFERENTIALBLOCKIERUNG MIT HYDRAULISCHER STEUERUNG ABMONTIEREN - DESMONTAJE BLOQUEO DIFERENCIAL A MANDO HYDRAULICO - DESMONTAJE BLOCAGE DIFFERENTIEL A COMMANDE HYDRAULIQUE



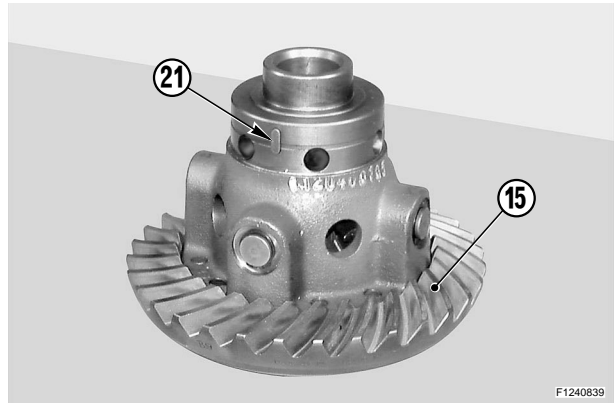
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GB

a

Remove bearing (16) from the differential carrier (17) as well as the stop ring (18), the coupling (19) and the spheres (20).
NOTE. Note down the direction of assembly of the stop ring (18).



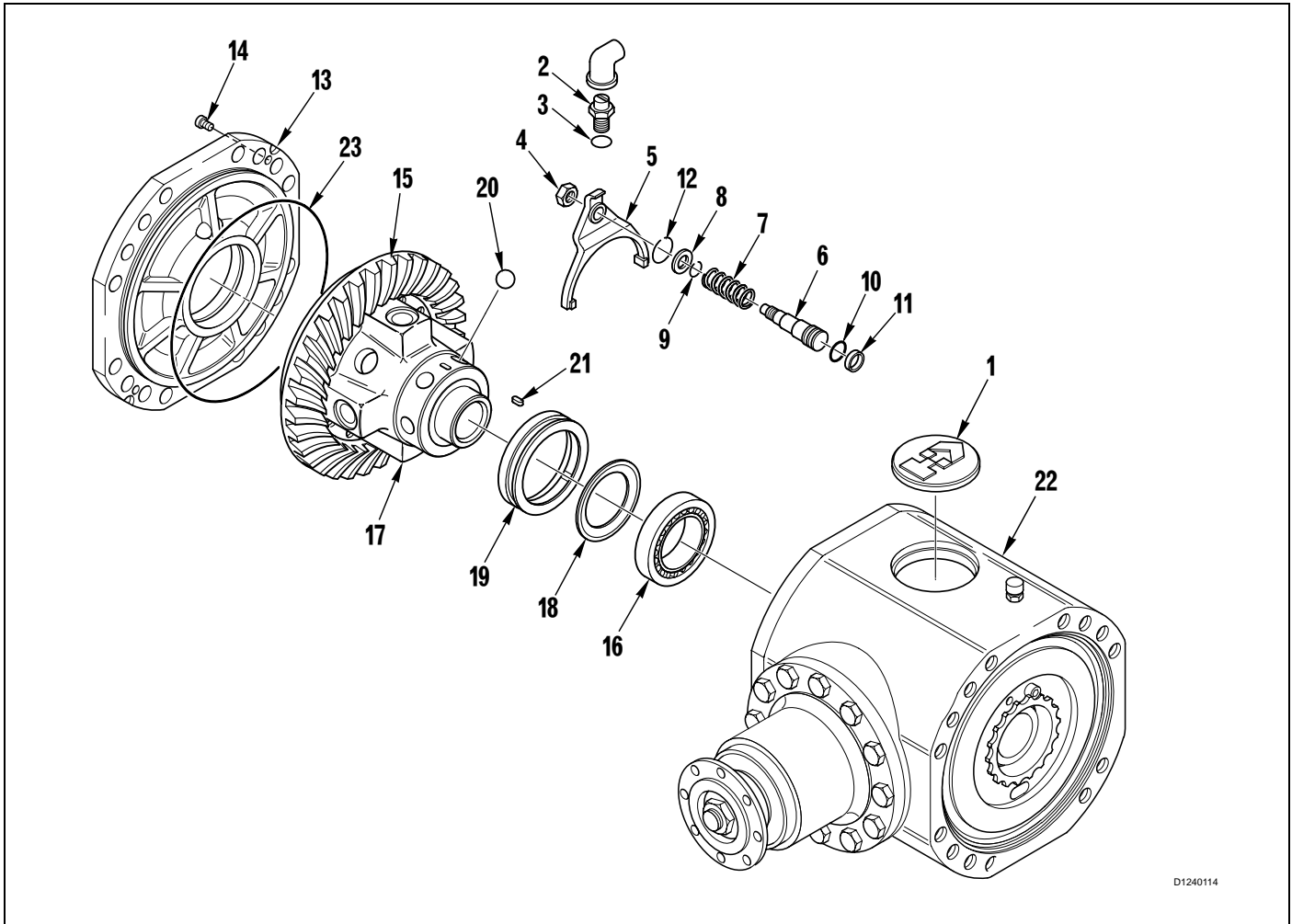
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GB

b

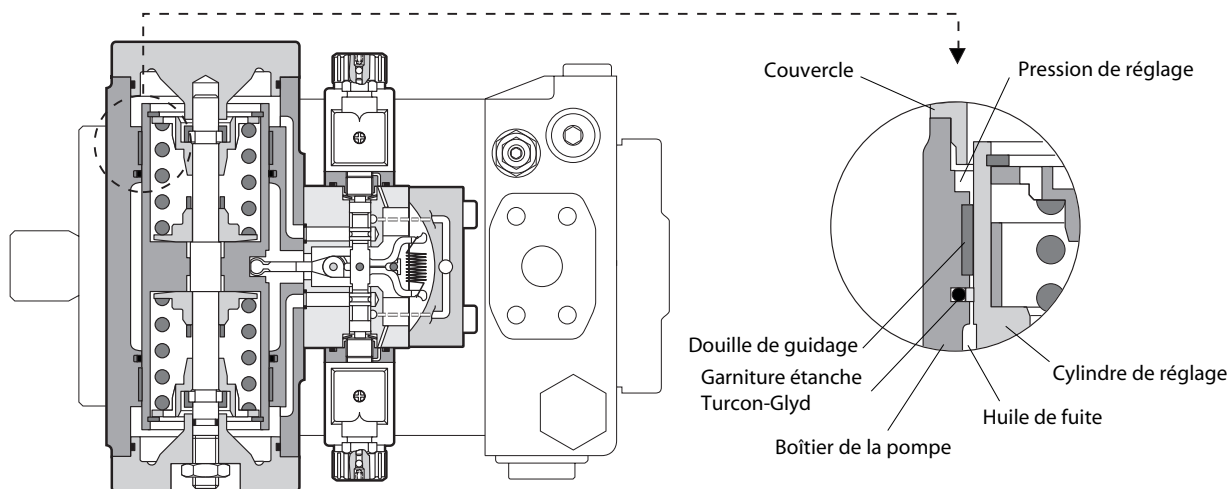
ONLY IF NECESSARY
 Remove the coupling guide key (21) and disassemble the differential unit (15).
 (For details, see «HOW TO DISASSEMBLE THE DIFFERENTIAL UNIT».)



D1240114

Piston de positionnement - Garniture étanche Turcon-Glyd

Positioning piston - Turcon-Glyd-ring seal



Pour l'instant, la commande de l' A4VG a été équipée d'un joint Turcon.

Un nouveau numéro d'identification va être attribué à la liste des pièces de toute l'unité.

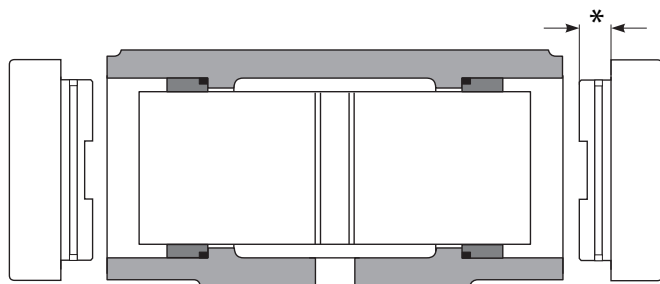
La référence du modèle et les dimensions extérieures restent inchangées (Le boîtier de la pompe va changer dans la zone du piston de positionnement. Le piston de positionnement va passer à nue version chanfrein).

At present the change of the control into Turcon seal is made for A4VG.

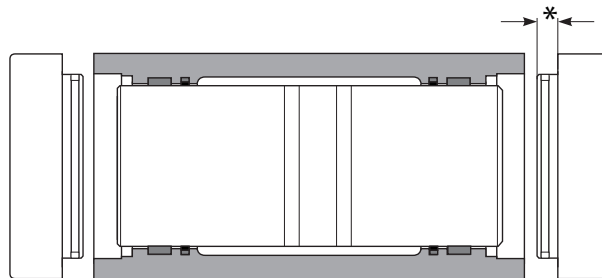
The parts list of the complete unit will receive a new identification number.

Type reference and outside dimensions remain unchanged (pump housing will change at the area of the positioning piston. Positioning piston will change into chamfering design).

Boîtier de la pompe / Pump housing
Avec coussinet / with bush Ancien / OLD



Boîtier de la pompe / Pump housing
Avec joint Turcon / with Turcon seal Nouveau / NEW



Globalement, le passage de la commande au joint Turcon améliore le fonctionnement (comportement DA, moindre influence de la température sur les temps de commande).



The change of the control into Turcon seal design improves in general the function (DA-behaviour, lower temperature-influence on control times).

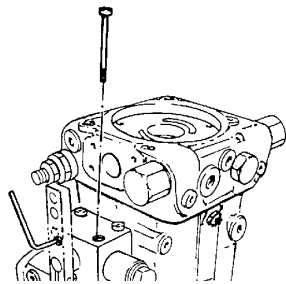
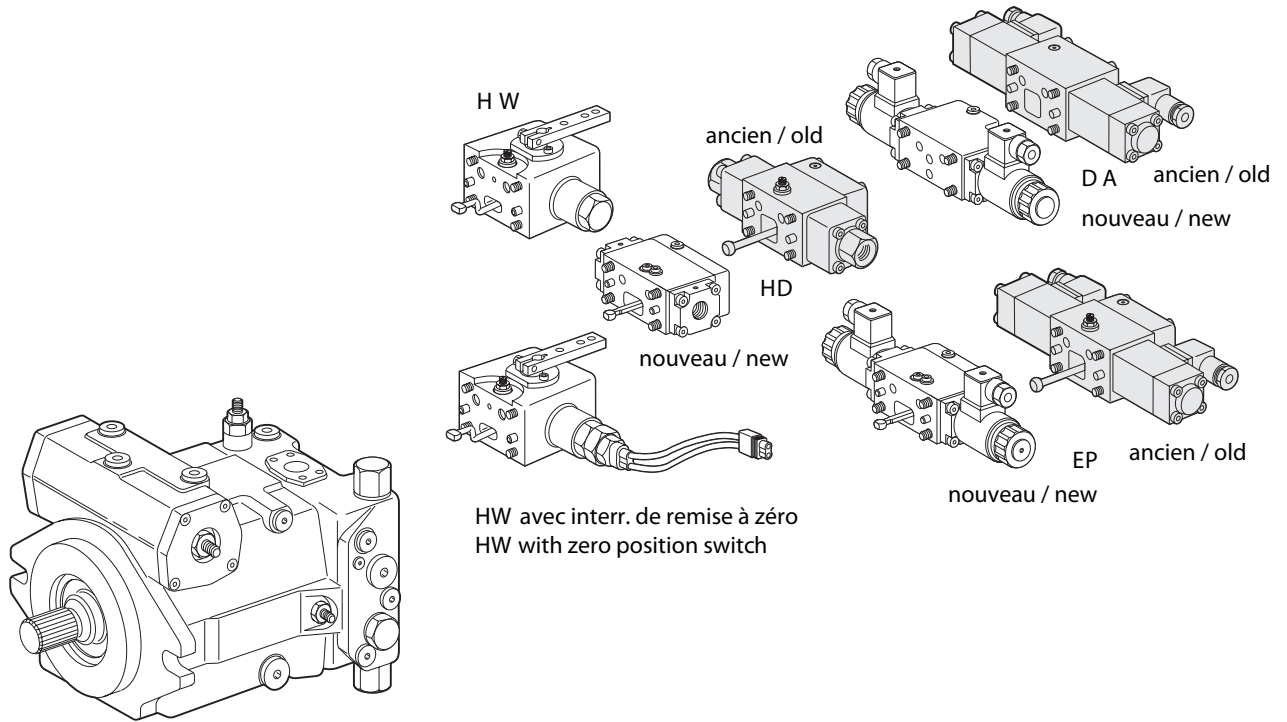


Les temps de commande changent légèrement alors que les mêmes sections de papillon d'étranglement sont conservées. Nos clients doivent par conséquent être informés de ce changement.

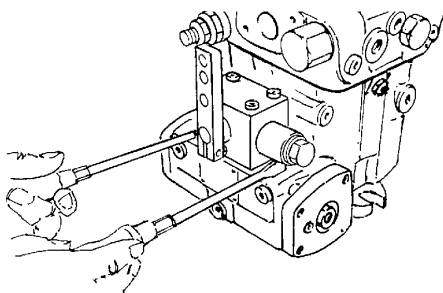


The control times will slightly change with the same throttle sections. Therefore our customers have to be informed about this change.

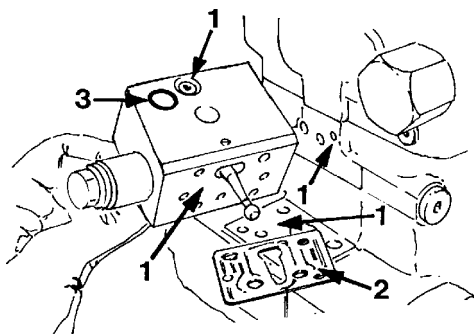
Dépose de l'appareil de commande
 Removing of the control module



Démonter les vis de fixation.
 Remove fixing screws.



Soulever l'appareil de commande.
 Pry-off the control module.

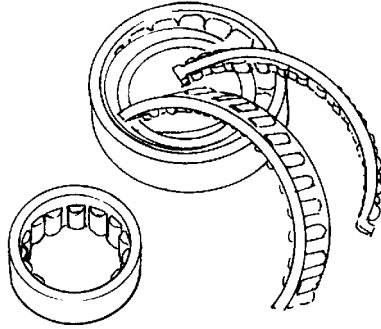


Vérifier :
 la surface d'étanchéité (1), le joint plat (2), les joints toriques (3).

Check :
 Sealing surface (1), gasket (2), o-rings (3).

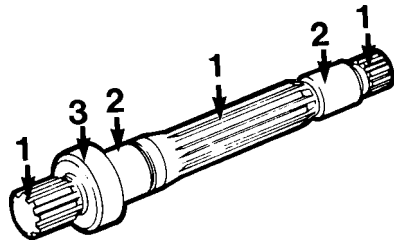
Conseils pour la vérification des pièces

Inspection notes



Remplacer tous les roulements.

Replace all bearings.

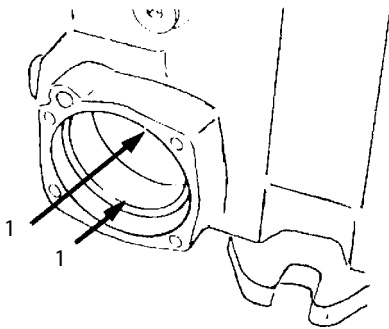


Vérifier !

1. les cannelures : usure, présence de rouilles.
2. les zones recevant les roulements.
3. le présence d'une usure due au joint d'arbre.

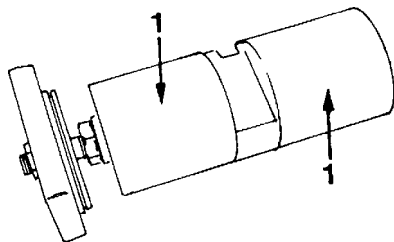
Check !

1. Splines, wear steps, corrosion.
2. Running surfaces.
3. Grooves made by the shaft seal.



S'assurer que le manchon de guidage (1) du vérin de commande de cylindrée est dépourvu de rayures et n'est pas détérioré par l'usure.

Check that the control piston guide bush (1) is free of grooves and is free of wear.



Vérifier !

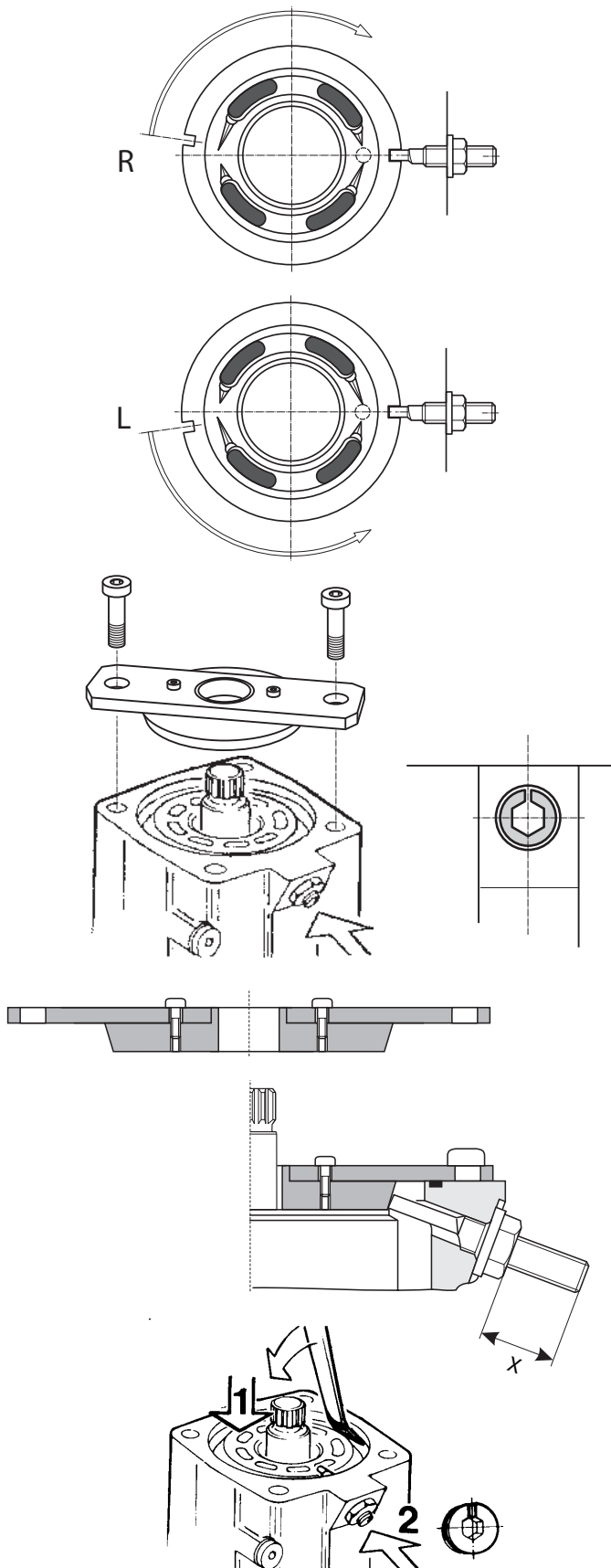
l'absence de rayures sur le vérin de commande de cylindrée (1)

Check !

Control piston (1) is not scored.

Mise en place du rotor

Installation of the rotary group DA



Glace de distribution en rotation droite - orientée dans le sens de la rotation.

Avertissement ! les encoches d'amortissement du bruit sont usinées en fonction du sens de rotation.

Control plate clockwise rotation - indexed in the direction of rotation.

Note! Noise grooves are machined - in based on direction of rotation.

Glace de distribution en rotation gauche - orientée dans le sens de la rotation.

Avertissement ! les encoches d'amortissement du bruit sont usinées en fonction du sens de rotation

Control plate counter clockwise rotation - indexed in the direction of rotation.

Note! Noise grooves are machined - in based on direction of rotation.

Pour le modèle à vis excentrique: enfoncez le cylindre - vissez la vis excentrique jusqu'à l'obtention de la valeur x.

* rainure en position de montage.

For the version with eccentric screw:
Push the cylinder down - screw in the eccentric screw in the eccentric screw until dimension x is reached.

* groove in assembled position.

- ⚠ Vérifiez à nouveau la valeur X avec le dispositif de mesure.
Enfoncez le cylindre avec dispositif.
Vissez la vis excentrique jusqu'à la butée - dimension X.
Tournez la rainure en position de montage.

- ⚠ Re-identify dimension X with device.
Push cylinder down with device.
Screw in eccentric screw till stop - Dimension X -
Turn groove in assembly position.

Hilfsvorrichtung: / A4VG40 I: 277 5 086
Auxiliary device: A4VG56 I: 277 5 087

Enfoncez le cylindre jusqu'au bout (1).
Vissez la vis d'indexage (2).
Rainure en position de montage.

Press the cylinder to the bottom (1).
Screw in the indexing screw (2).
Groove in mounting position.

Règles de sécurité

Safety regulations

Démarrage

- Au moment du démarrage tous les leviers de commande doivent être en "position neutre".
- Ne démarrer le véhicule qu'à partir du poste de conduite.
- Après le démarrage vérifier les instruments d'indication afin de s'assurer que tout fonctionne correctement.
- Ne pas laisser le véhicule sans surveillance, pendant que le moteur tourne.
- En cas de démarrage à l'aide de fils de liaison batterie, relier les plus avec plus et moins avec moins. Toujours brancher le fil de mise à la masse (moins) en dernier et le débrancher en premier.

Attention

- Les gaz d'échappement peuvent être mortels. En cas de démarrage dans un local fermé veiller à ce que la ventilation soit suffisante.

La centrale hydraulique

1. La centrale hydraulique est sous haute pression !



Des fluides haute pression (carburant, huile hydraulique) sortant sous une haute pression peuvent traverser la peau et causer de très sérieuses blessures. Dans ce cas consulter immédiatement un médecin, sous peine de graves infections !

2. Pendant la recherche des points de fuite utiliser des moyens appropriés pour la protection contre les risques de blessures !
3. Avant d'effectuer des travaux sur la centrale hydraulique il est impératif de mettre celle-ci hors pression et d'abaisser l'outillage du véhicule.
4. Lors de travaux sur la centrale hydraulique il est impératif d'arrêter le moteur et d'empêcher le véhicule de se déplacer (frein de parc, cale) !
5. Lors du raccordement des vérins et moteurs hydrauliques, raccorder les flexibles hydrauliques conformément aux prescriptions !
6. Si le raccordements sont inversés, les fonctions sont également inversées (par ex. levage/descente) - risque d'accident !
7. Contrôler régulièrement les flexibles hydrauliques et les changer s'ils sont endommagés ou usés ! Les flexibles de remplacement doivent répondre aux exigences techniques du fabricant de l'appareil !



Evacuer et recycler les huiles, les carburants et les filtres dans les règles de l'art !

Start

- When starting all operating levers must be in "neutral position".
- Only start the machine from the driver's seat.
- Check the indicating instruments after start to assure that all functions are in order.
- Do not leave the machine unobserved when the motor is running.
- When starting with battery connection cables connect plus with plus and minus with minus. Always connect mass cable (minus) at last and cut off at first.

Attention

- Exhaust gas is dangerous. Assure sufficient fresh air when starting in closed rooms!

Hydraulic equipment

1. Hydraulic equipment is standing under high pressure.

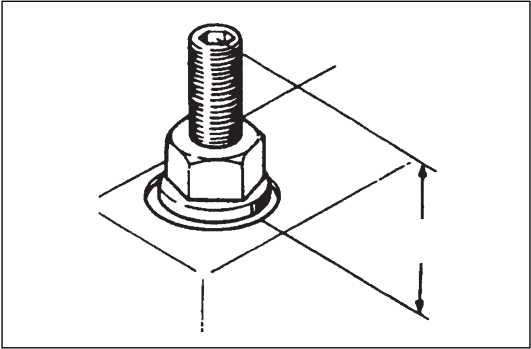


High pressure fluids (fuel, hydraulic oil) which escape under high pressure can penetrate the skin and cause heavy injuries. Therefore immediately consult a doctor as otherwise heavy infections can be caused.

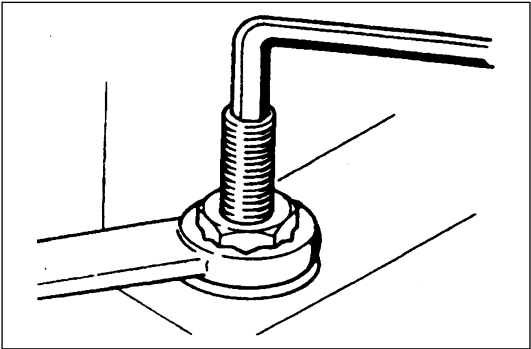
2. When searching leakages use appropriate auxiliary devices because of the danger of accidents.
3. Before working at the hydraulic equipment, lower pressure to zero and lower working arms of the machine.
4. When working at the hydraulic equipment, absolutely stop motor and secure tractor against rolling away (parking brake, shim)!
5. When connecting hydraulic cylinders and motor pay attention to correct connection of hydraulic flexible hoses.
6. In case of exchanging the ports, the functions are vice versa (f. ex. lift-up/lower) - danger of accidents!
7. Check hydraulic flexible hoses regularly and replace them in case of damage or wear! The new hose pipes must comply with the technical requirements of the machine manufacturer!



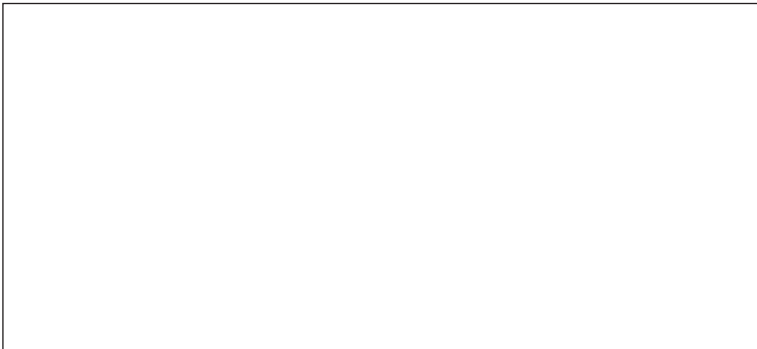
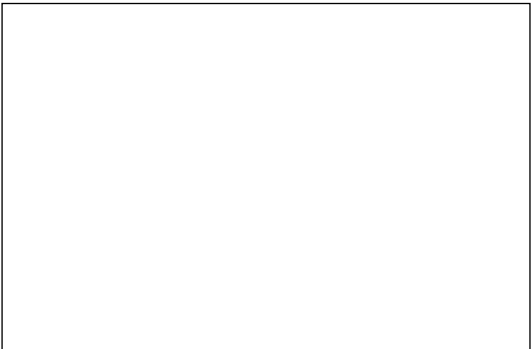
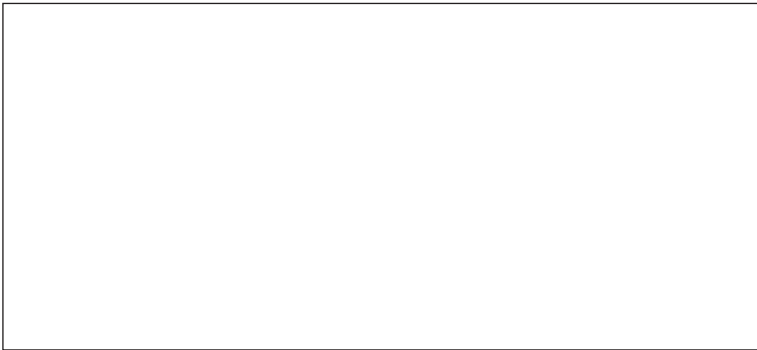
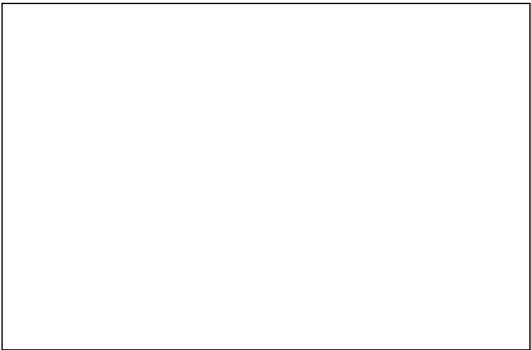
Orderly disposal or recycling of oil, fuel and filters!

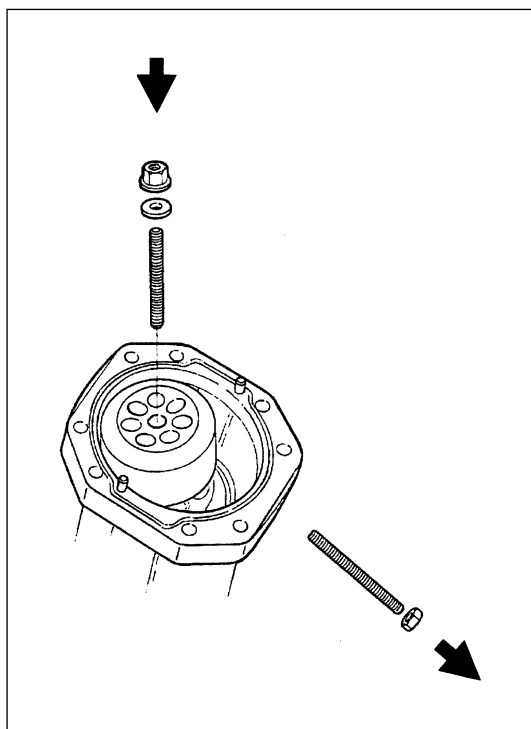
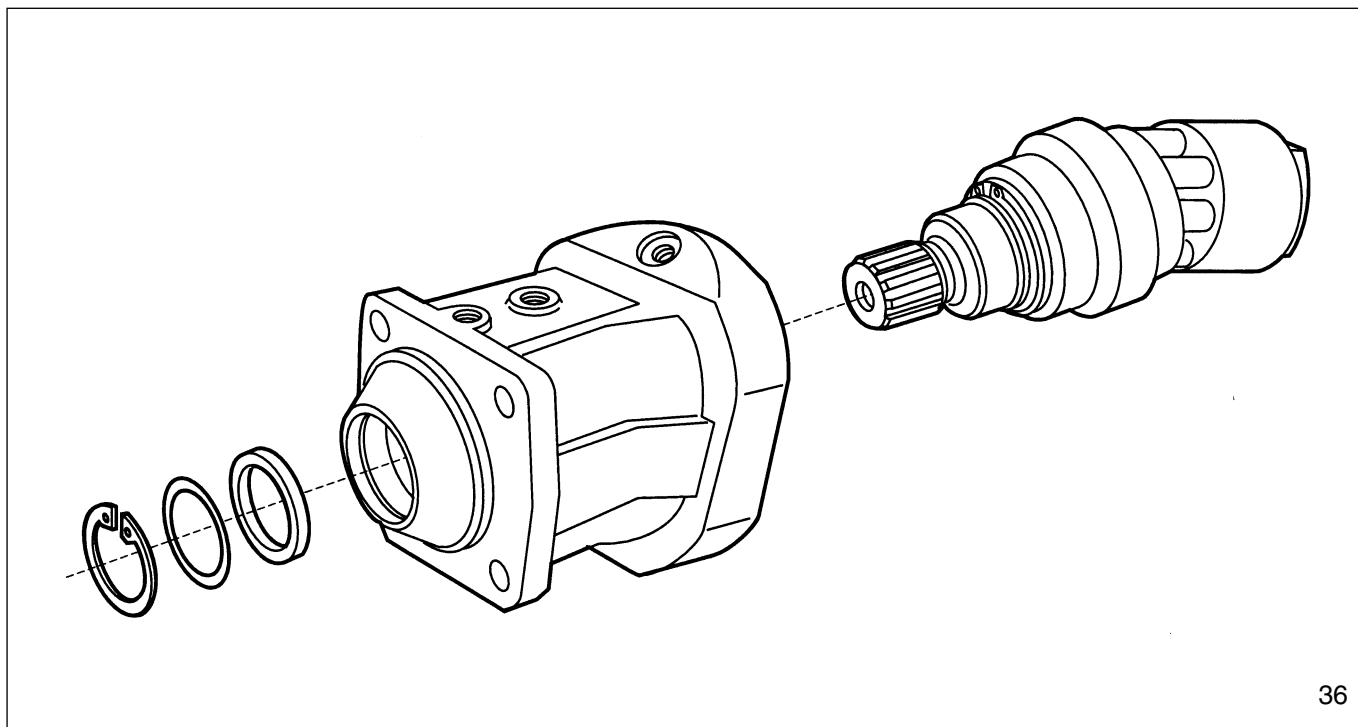


10 Replace seal nut.
First measure and record setting height.



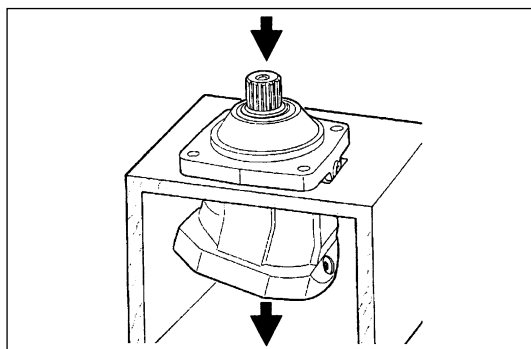
11 When tightening counterhold setting screw, then check setting height.





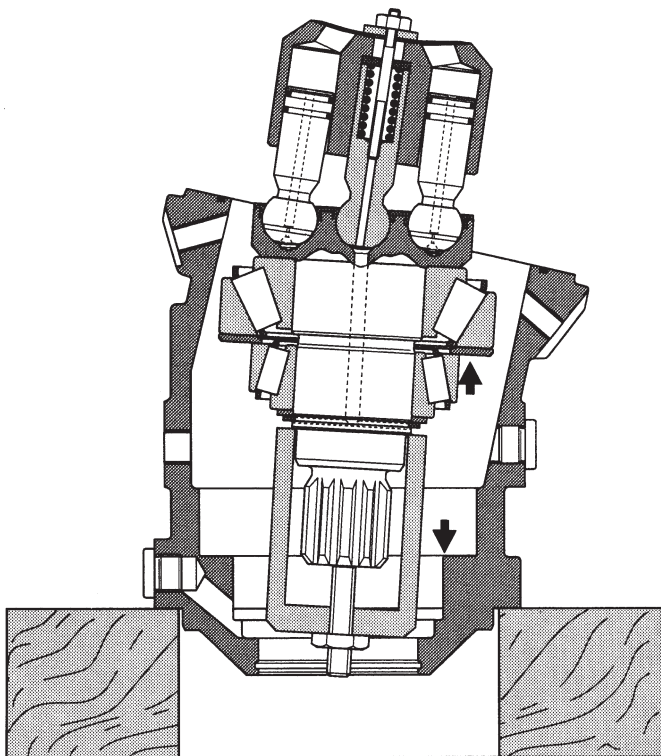
37 Screw in threaded pin into center pin.
Fix the cylinder with disc and locknut.
Remove Q_{max} - stop screw.

- | | |
|------|-------------------|
| Size | 28 : M4 x 58 mm |
| | 55 : M5 x 71 mm |
| | 80 : M6 x 82 mm |
| | 107 : M6 x 92 mm |
| | 140 : M8 x 105 mm |
| | 160 : M8 x 105 mm |
| | 200 : M8 x 109 mm |

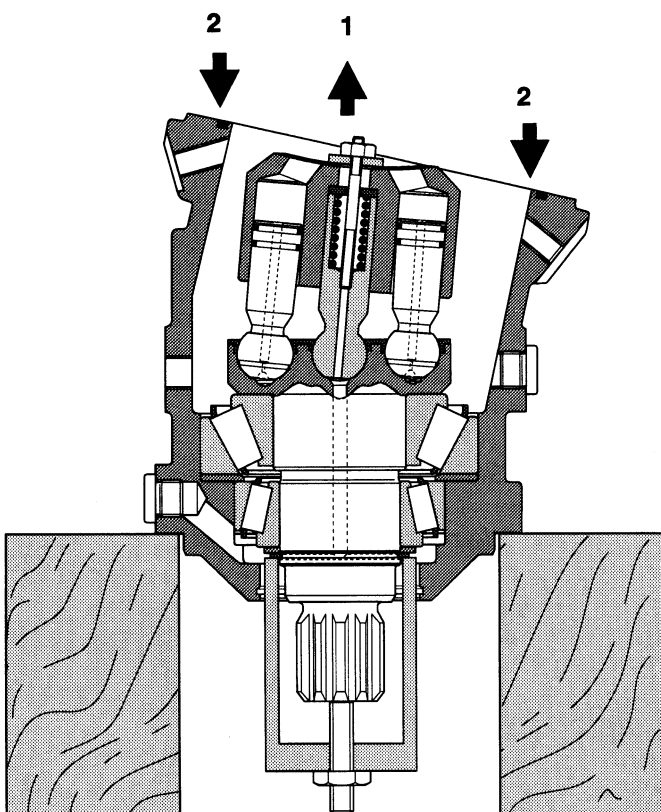


38 Press out rotary group !

! If the bearings are used again do not hit on the drive shaft.



Insert rotary group into housing to seat position.

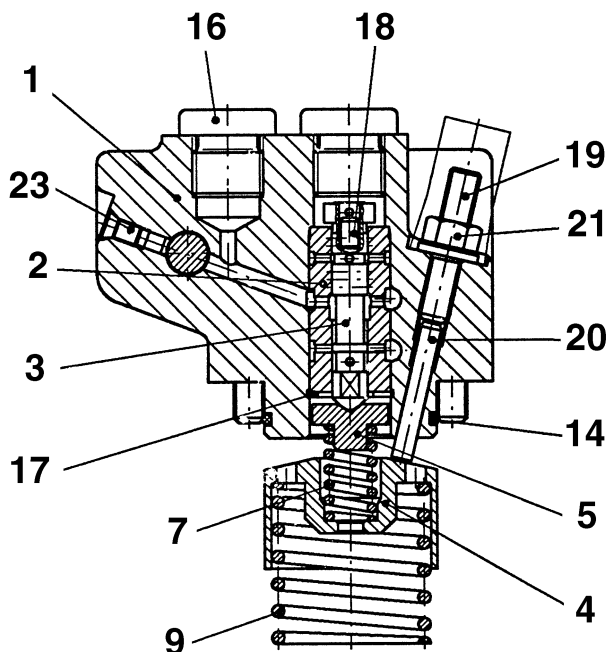
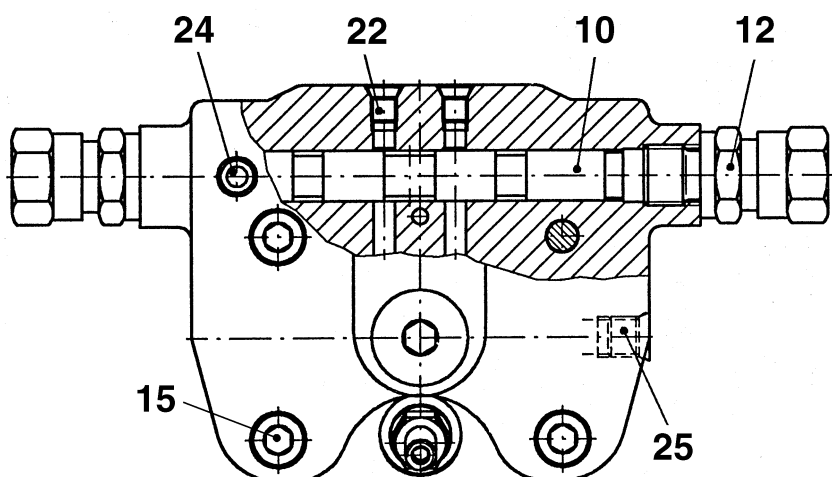
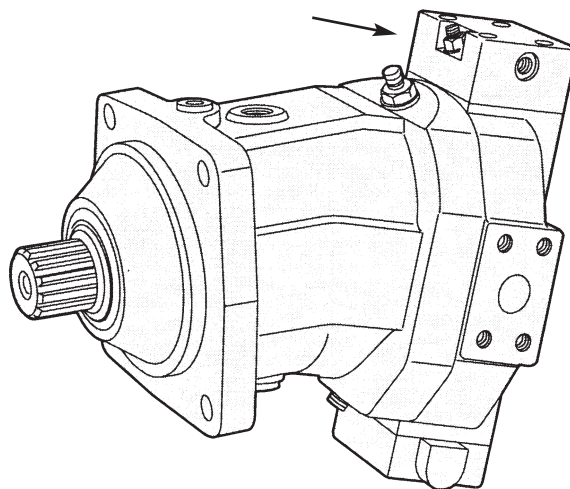


Fix zero position of cylinder with Q_{max} -screw.

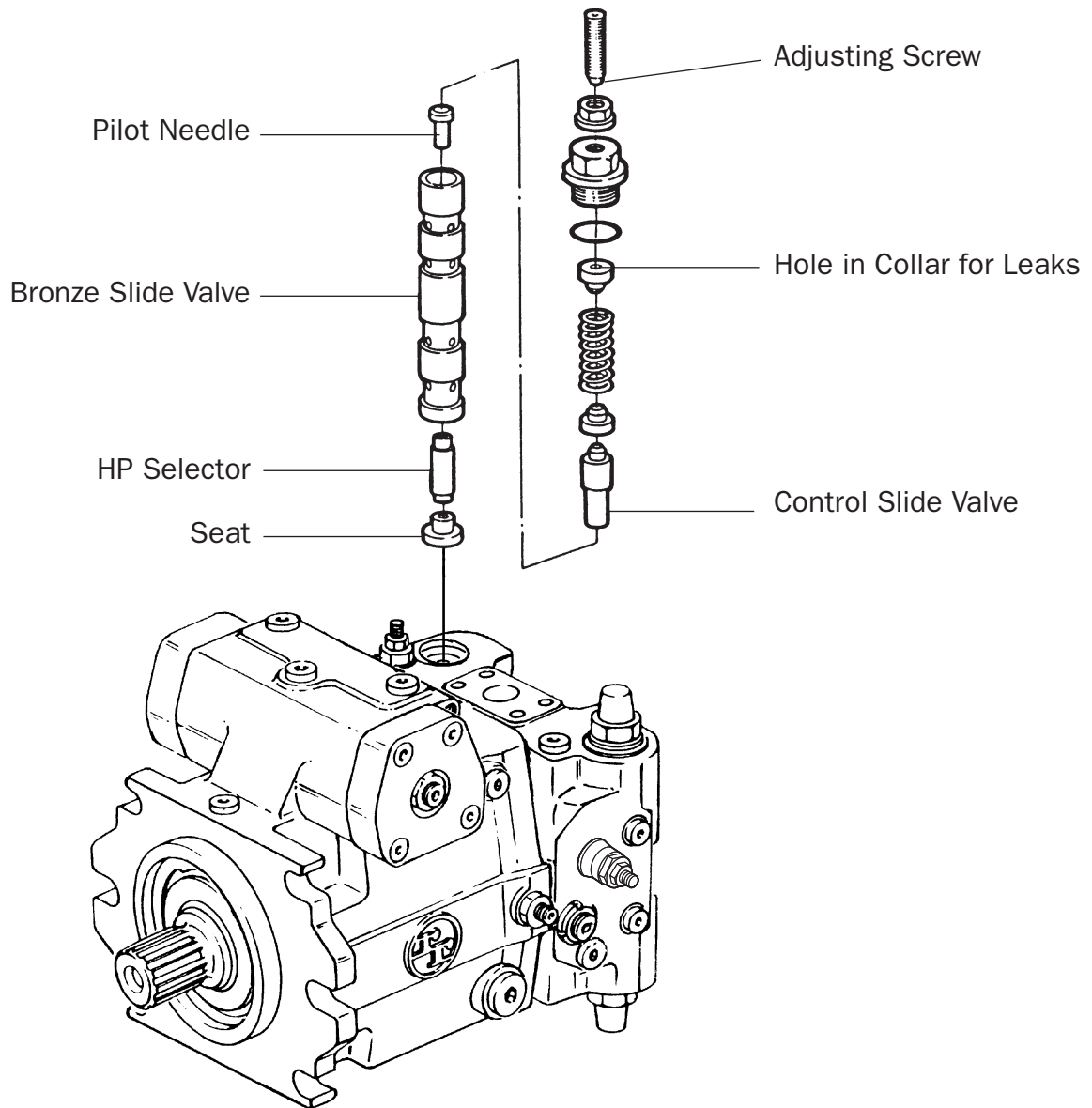
- 1. Disassemble cylinder fixing screw.
- 2. Insert O-ring.

**MOTOR A 6 VM / DA
SERIE 63**

ORDER ELEMENT



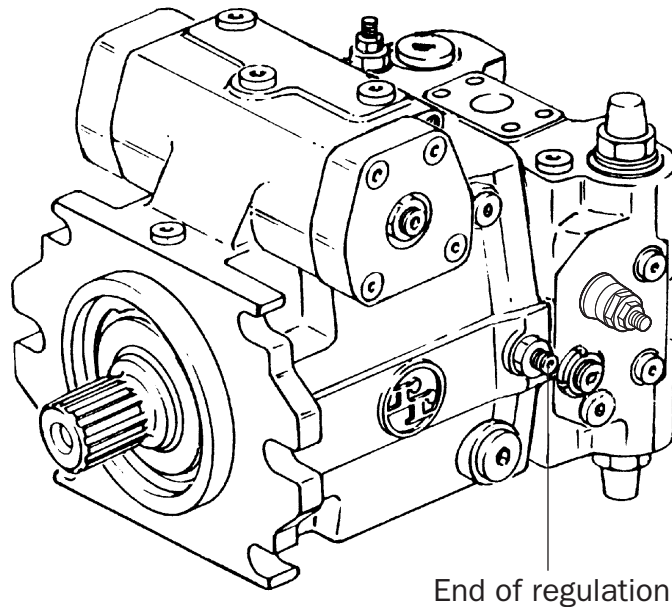
- 1 - Housing
- 2 - Sleeve
- 3 - Piston
- 4 - Adjustment socket
- 5 - Spring plate
- 7 - Pressure spring
- 9 - Pressure spring
- 10 - Slide valve
- 12 - Connection
- 14 - O-ring
- 15 - Screw
- 16 - Plug
- 17 - Circlip
- 18 - Set screw
- 19 - Set screw
- 20 - Cylindrical pin
- 21 - Flange nut
- 22 - Plug
- 23 - Plug
- 24 - Plug
- 25 - Plug



IMPORTANT

In the event of a considerable drop in the IC engine speed, check that the pilot needle has not become stuck in the slide valve.

3 B. CHECK AND ADJUST END OF REGULATION



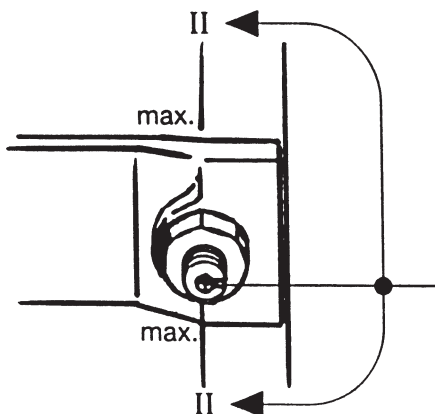
CHECK :

- The truck must be blocked, against a bay with a load on the fork arms for instance.
- Drive reverser in forward drive.
- With idle engine, check the i.c. motor rotational speed.
- Gradually increase the engine speed until the forward HP reading is 410 barr.

END OF REGULATION :

- The adjustment of the pump end of regulation at 1650 rpm is obtained using an eccentric screw which restricts the pump flow creating back pressure against the swash plate..

This adjustment can only be set using a test bench.



IMPORTANT

The slot in the eccentric screw should point towards the boost pump (opposite to A4V pump where slot pointed to drive shaft). The adjustment must not go beyond 90 to the left or right - Do not exceed or damage may occur.

FUSES

Item	Designation	Component position on machines (drawing)	Electric diagram	Position on electric diagram	Position on principle beam plan
B-Fu-P	Power fuses box	4	1	G 4	K 2
F1	Control panel indicator light (7,5A)	3	1	C 14	E 26
F2	Horn / Stop lights (10A)	3	2	C 9	E 26
F3	Air-conditioning - Heating (20A)	3	5	C 14	E 26
F4	Front windscreen wiper (15A)	3	4	C 8	E 26
F5	Engine stop - KSB system - Fuel pump (10A)	3	3	C 4	E 26
F6	F/R - Reverse lights - Reverse horn (15A)	3	3	C 25	E 27
F7	Rear windscreen wiper + roof (10A)	3	4	C 16	E 27
F8	Compressor - Differential locking (7,5A)	3	5	C 25	E 27
F9	Digicode power supply (10A)	3	5	C 32	E 27
F10	Flashing unit (7,5A)	3	4	C 30	E 27
F11	Starter (20A)	3	1	E 8	C 28
F12	Speed sensor - Diagnostic connector (10A)	3	4	C 24	C 28
F13	Working tail lights (10A)	3	4	C 27	C 28
F14	Option	3	4	C 29	C 28
F15	Option 1	3	3	C 14	C 28
F16	Pneumatic seat (15A)	3	3	C 15	C 28
F17	JSM (15A)	3	3	C 16	
F18	Air conditioning condenser (20A)	3	5	C 20	C 28
F19	Option 2 - Option 3	3	3	C 18	C 28
F20	Option 4	3	3	C 20	C 28
F21	Roof light - Warning light - Digicode (15A)	3	4	C 37	C 28
F22	Cab lifting (7,5A)	3	5	C 3	C 28
F23	Cigar lighter (10A)	3	5	C 28	C 28
F24	Comodo (lighting option) (25A)	3	2	C 14	C 28
F25	Left sidelights (3A) (option)	3	2	G 26	C 28
F26	Right sidelights (3A) + Control panel lighting (Option)	3	2	G 27	C 28
F27	Dipped headlights (15A)	3	2	G 35	C 28
F28	Main beam (15A)	3	2	G 32	C 28
F29	Right indicators (15A)	3	2	G 19	C 28
F30	Left indicators (15A)	3	2	G 21	C 28
F31	I. C. Engine preheating (80A)	4	1	G 4	K 2
F32	Raising cab (50A)	4	1	G 4	K 2
F33	Alternator (80A)	4	1	E 4	M 2
F34	Lift truck electrical equipment (80A)	4	1	E 4	M 2

ELECTRIC DIAGRAM 3 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 38	C 32	3
A 1	Antitheft with keyboard (digicode) (Option)	G 4	C 32	3
B 2	Running backward horn	O 38	E 4	5
D 2	LED 9A	K 35	M 5	
E 20	Reverse lights	M 36	E 4	5
K 1	Starting safety relay	O 30	C 26	3
K 5	Forward relay	E 23	E 29	3
K 5	Forward relay	O 26	E 29	3
K 6	Reverse relay (Option)	O 33	C 29	3
K 6	Reverse relay (Option)	G 35	C 29	3
K 7	Transmission cut-off relay	O 23	C 29	3
K 7	Transmission cut-off relay	O 41	C 29	3
M 3	Fuel pump	M 7	K 2	4
MCT	Transmission cut-off module	C 38	E 31	3
OPTION	Options connection	E 17	G 23	3
S 2	Parking brake sensor	I 39	K 37	1
S 9	Cold start system low pressure	K 6	G 2	4
S 11	Distributor handler inverter switch	G 30	M 27	2
S 25	Seat switch	G 40	E 34	2 - 3
Y 1	Engine stop electrovalve	O 4	I 4	4
Y 2	Forward electrovalve	K 23	M 9	4
Y 3	Reverse electrovalve	M 35	M 9	4
Y 6	KSB system	O 16	-	4

ELECTRIC DIAGRAM 3 FUSES

Item	Designation	Position on electric diagram	Position on principle beam plan	Component position on machines (drawing)
F 5	Engine stop - KSB system - Fuel pump (10A)	C 4	E 26	3
F 6	F/R - Reverse lights - Reverse horn (15A)	C 25	E 27	3
F 15	Option 1	C 14	C 28	3
F 16	Pneumatic seat (15A)	C 15	C 28	3
F 17	JSM	C 16	C 28	3
F 19	Option 2 - Option 3	C 18	C 28	3
F 20	Option 4	C 20	C 28	3

SPICES SHOWN ON ELECTRIC DIAGRAM 3

Ep. 13	Ep. 26	Ep. 45	Ep. 113
Ep. 15	Ep. 32	Ep. 101	Ep. 114 (x4)
Ep. 16	Ep. 33	Ep. 102	Ep. 116
Ep. 17	Ep. 44	Ep. 110	Ep. 122

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