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Safety Information

This manual provides general and specific maintenance procedures essential for reliable engine operation and your safety. Since many variations in procedures, tools, and service parts are involved, advice for all possible safety conditions and hazards cannot be stated.

Read safety instructions before doing any service and test procedures for the engine or vehicle. See related application manuals for more information.

Disregard for Safety Instructions, Warnings, Cautions, and Notes in this manual can lead to injury, death or damage to the engine or vehicle.

Safety Terminology

Four terms are used to stress your safety and safe operation of the engine: Warning, Caution, Attention and Note.

Warning: A warning describes actions necessary to prevent or eliminate conditions, hazards, and unsafe practices that can cause personal injury or death.

Caution: A caution describes actions necessary to prevent or eliminate conditions that can cause damage to the engine or vehicle.

Attention: An attention describes actions that require a careful procedure necessary for correct and efficient engine operation.

NOTE: A note contains helpful information to determinate procedures or specifications.

Safety Instructions

Work Area

- Keep work area clean, dry and organized.
- Keep tools and parts off the floor.
- Make sure the work area is ventilated and well lit.
- Make sure a First Aid Kit is available.

Safety Equipment

- Use correct lifting devices.
- Use safety blocks and stands.

Protective Measures

- Wear protective safety glasses and shoes.
- Wear correct hearing protection.
- Wear cotton work clothing.
- Wear sleeved heat protective gloves.
- Do not wear rings, watches or other jewelry.
- Restrain long hair..

Vehicle

- Make sure the vehicle is in neutral, the parking brake is set, and the wheels are blocked before servicing engine.
- Clear the area before starting the engine.

Engine

- The engine should be operated or serviced only by qualified individuals.
- Provide necessary ventilation when operating engine in a closed area.
- Keep combustible material away from engine exhaust system and exhaust manifolds.
- Install all shields, guards, and access covers before operating engine.
- Do not run engine with unprotected air inlets or exhaust openings. If unavoidable for service reasons, put protective screens over all openings before servicing engine.
- Shut engine off and relieve all pressure in the system before removing panels, housing covers, and caps.
- If an engine is not safe to operate, tag the engine and ignition key.

Fire Prevention

- Make sure charged fire extinguishers are in the work area.

NOTE: Check the classification of each fire extinguisher to ensure that the following fire types can be extinguished.

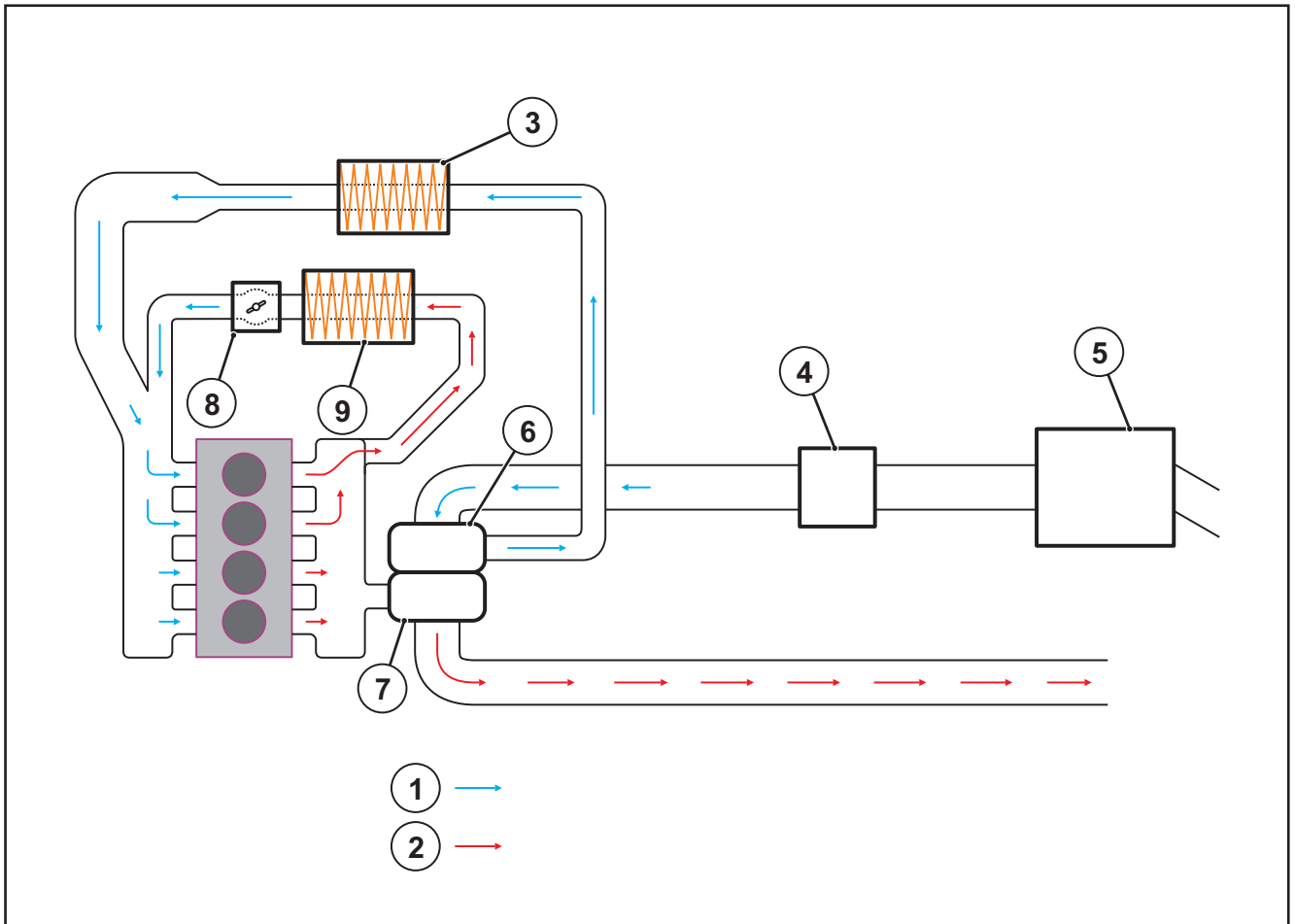
1. Type A — Wood, paper, textiles, and rubbish.
 2. Type B — Flammable liquids.
 3. Type C — Electrical equipment.
-

Air Management System

EGR System View

Air Management Components and Air Flow.

Air Management System (AMS).



- | | | |
|---------------|----------------------|---------------|
| 1. Intake | 5. Intake Air Filter | 8. EGR Valve |
| 2. Exhaust | 6. Compressor | 9. EGR Cooler |
| 3. Air Cooler | 7. Turbine | |
| 4. MAF | | |

Coolant and Additive

Level Check

Caution:

- Do not open the coolant reservoir cap while engine is hot.
- Check level when the engine is cold.
- Check coolant level daily.
- If coolant level is not correct, top up the cooling system with the additive amount as recommended in the chart.
- Carefully start turning the cap to relieve the vapor pressure.
- Check for leakages on cooling system hoses.

Topping Up of the System

Top up the cooling system with the additive amount as recommended in the chart.

Total System Capacity

- MaxxFoCe 3.2H – 5 liters (without radiator).

Turn the engine on and wait until the normal operating temperature is reached. Top up with MWM INTERNATIONAL additive. After filling up the system, turn the engine on to check for any leakage.

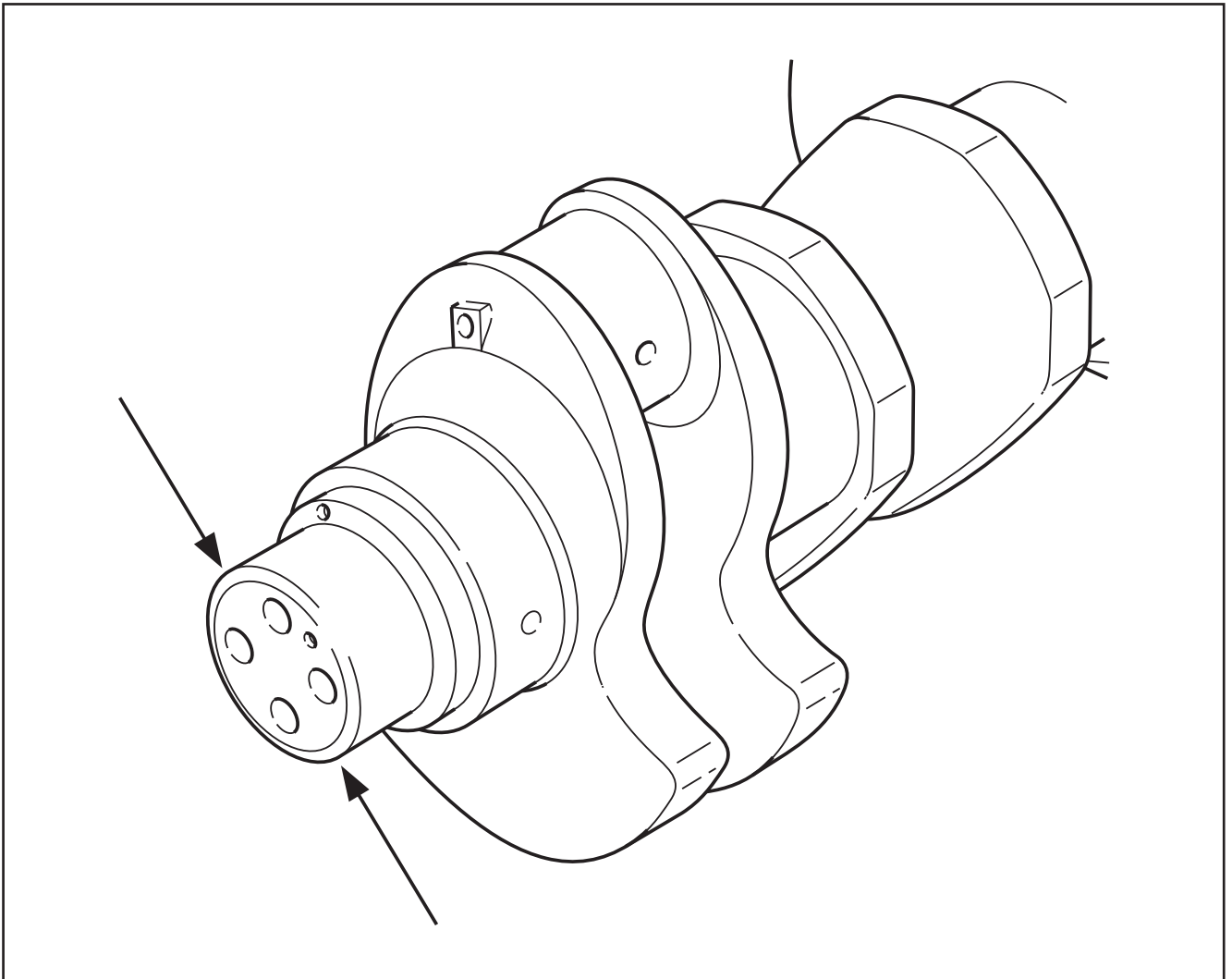
MWM INTERNATIONAL Additive



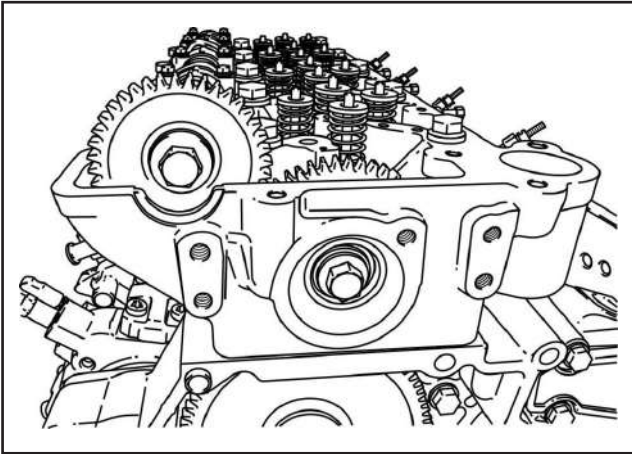
MWMI No.	9.0193.05.6.0802	9.0193.05.6.0801
Name	COOLING SYSTEM PROTECTOR – Environment-friendly	COOLING SYSTEM PROTECTOR – Environment-friendly
Proprieties	Anti-corrosion / Anti-boiling / Antifreeze	Anti-corrosion / Anti-boiling / Antifreeze
Application	Diesel / Gasoline / Ethanol / LPG	Diesel / Gasoline / Ethanol / LPG
Color	Fluorescent Red	Fluorescent Red
Proportion	READY TO USE	READY TO USE
Replacement period	12 months or according to the maintenance schedule	12 months or according to the maintenance schedule
Composition	See package	See package
Validity	See package	See package
Volume	1 l	5 l

Specifications

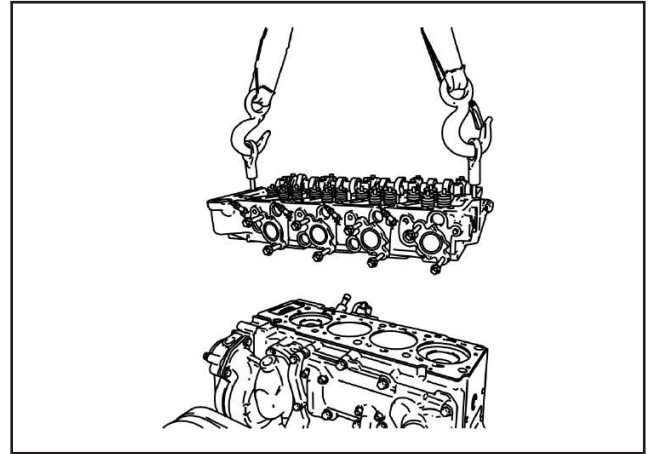
Crankshaft



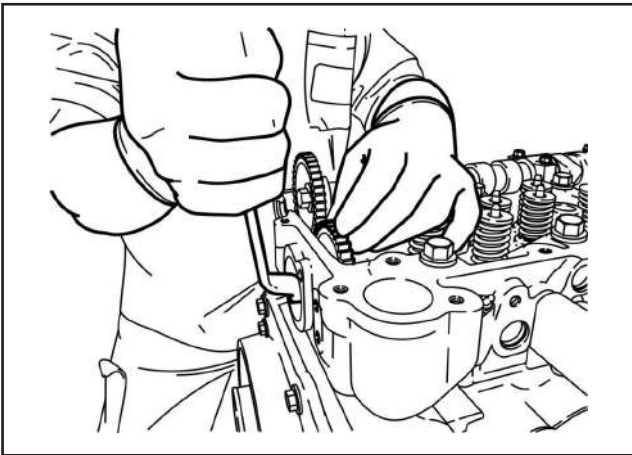
Gear	
Diameter	mm
Seat	80.032 - 80.051



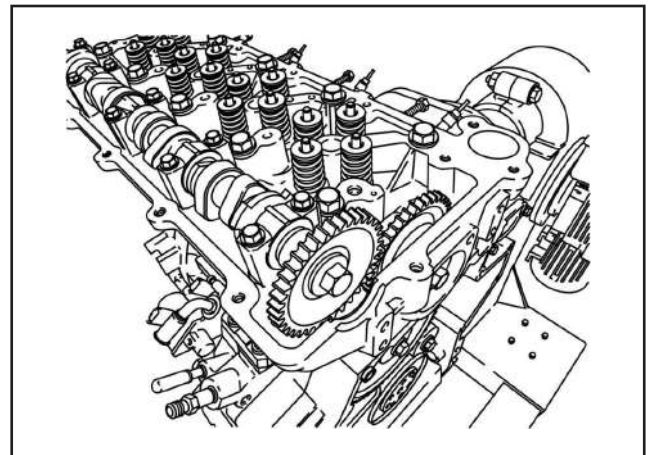
Remove the inspection cover.



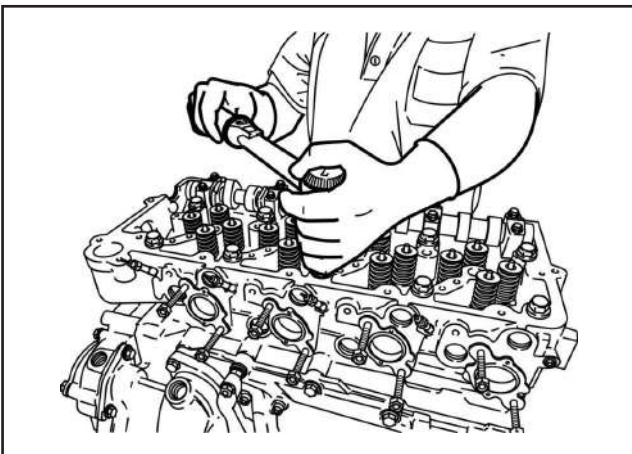
Using lifting straps, carefully remove the head with a winch.



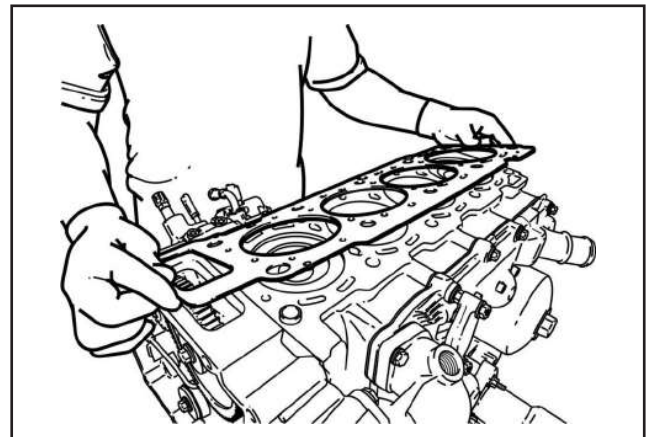
Loosen the idle gear bolt.



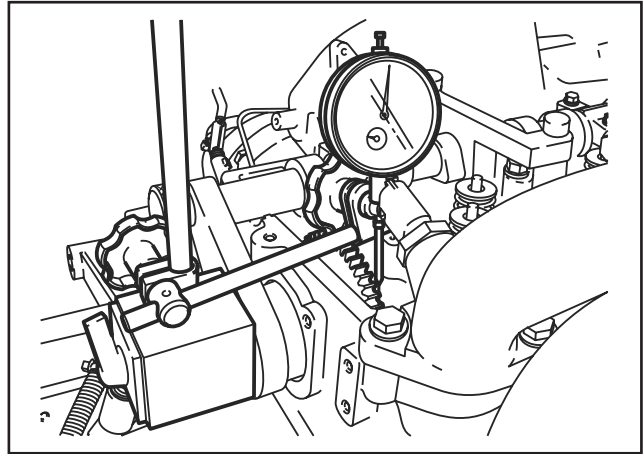
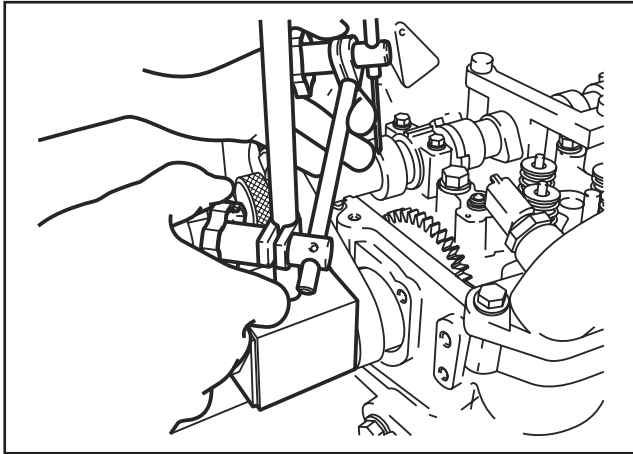
Attention: Assure that the glow plugs have been removed because, the glow plugs are salient with regard to the cylinder head.



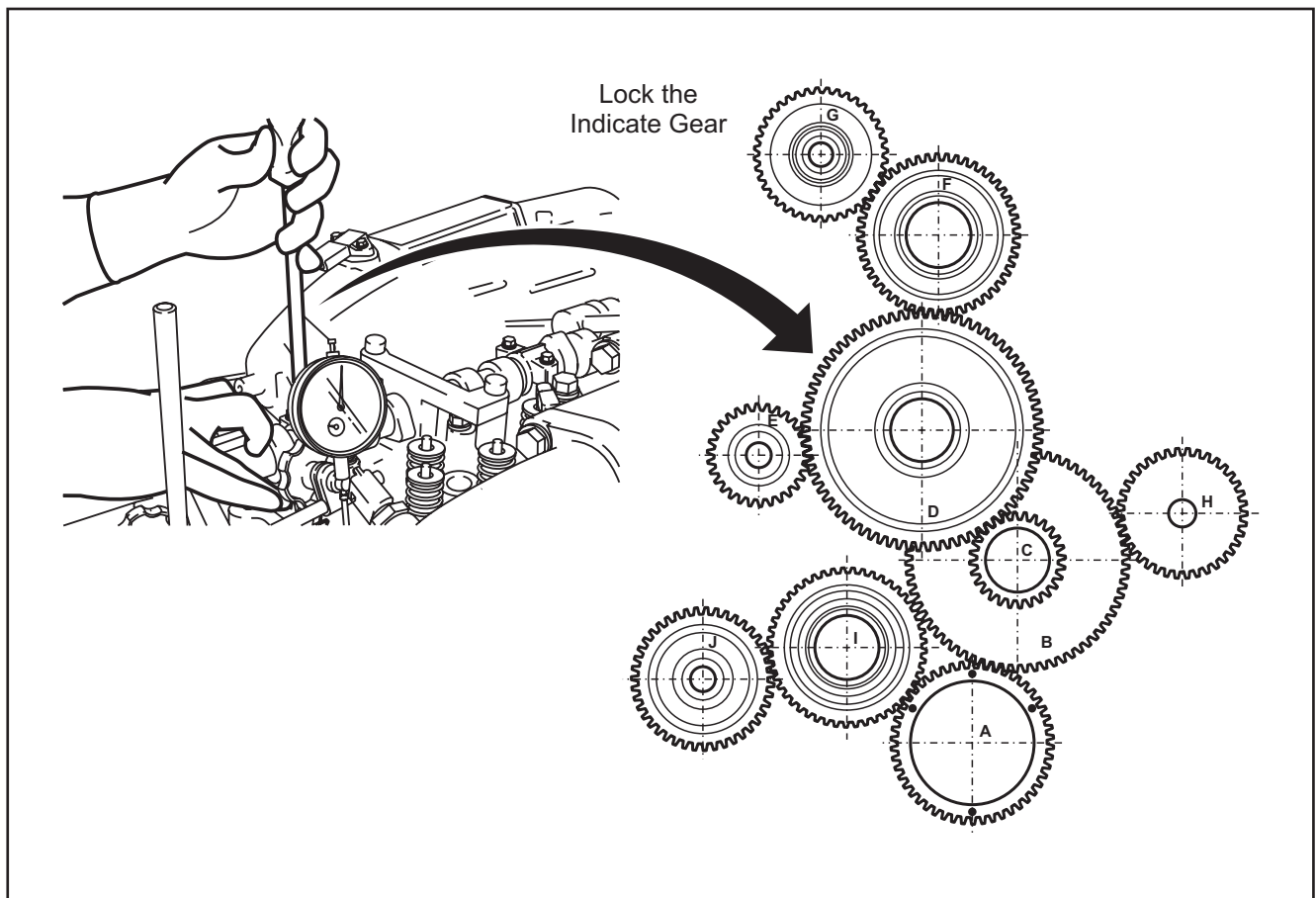
Loosen and remove the cylinder head attaching bolts.
 Untightening sequence starts on outer ends to the center.
 It is advisable to use a long socket wrench.



Remove the head gasket.



Install the dial indicator magnetic base.

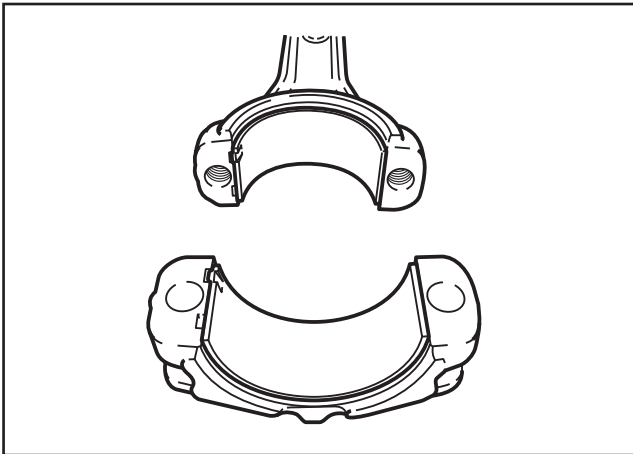


Lock the indicated gear with screwdriver.

NOTE: Lock the indicated gear is a very important point to do the backlash adjustment.

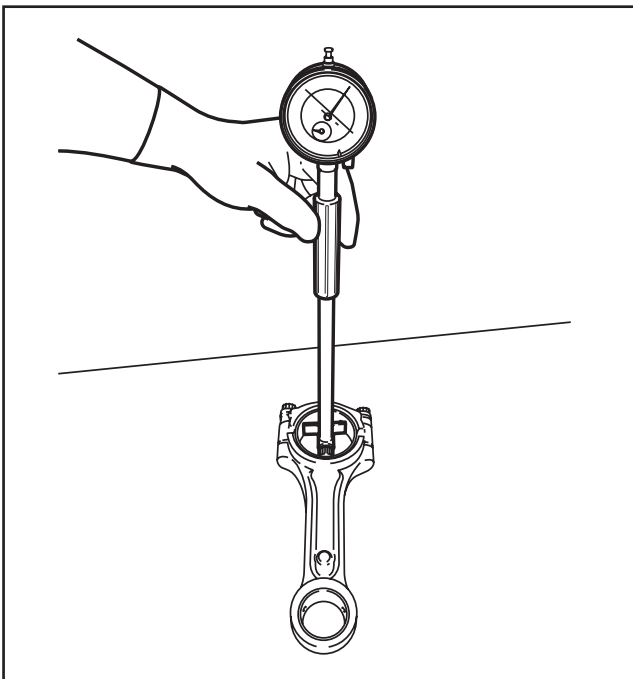
Connecting Rod Out-of-roundness

Loosen the connecting rod bolts and disassemble the connecting rod and cap.



Assemble the connecting rod cap without the bearing to specified torque. Measure the inner diameter of the bearing housing at two points, checking out-of-roundness:

- At 30° and at 30° + 90° from the connecting rod partition.

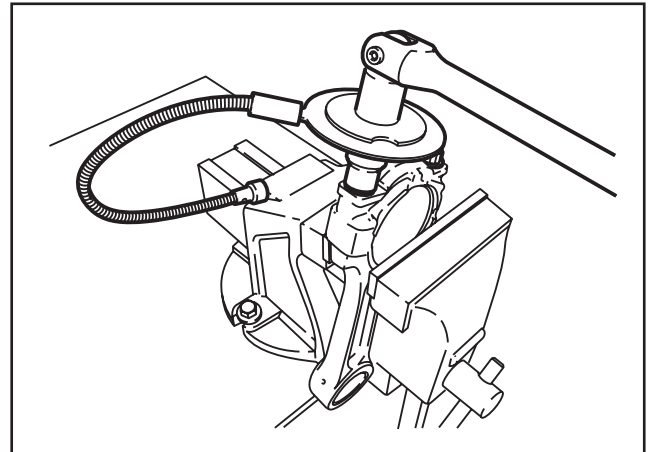


Remove connecting rod cap, install the bearing and assemble the bearing cap again to the specified torque.

Measure the inner diameter of the installed bearing in two positions:

- 30° and at 30° + 90° from the connecting rod partition.

Connecting Rod Pre-tension



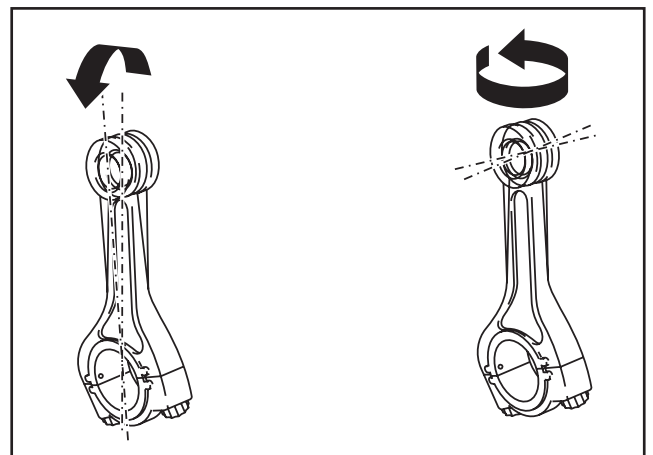
Loosen the connecting rod cap, position the bearings, assemble the cap again and tighten the connecting rod to specified torque.

1 st step	26 - 2N.m
2 nd step	84° - 4°

Place the micrometer caliper at 90° from the connecting rod partition and set comparator gauge to null. Loosen one of the bolts and check the new micrometer caliper reading. The difference is the pre-tension.

Pre-tension: 0.06 – 0.12.

Warpage and Torsion



Check warpage of the connecting rod.

Maximum warpage:

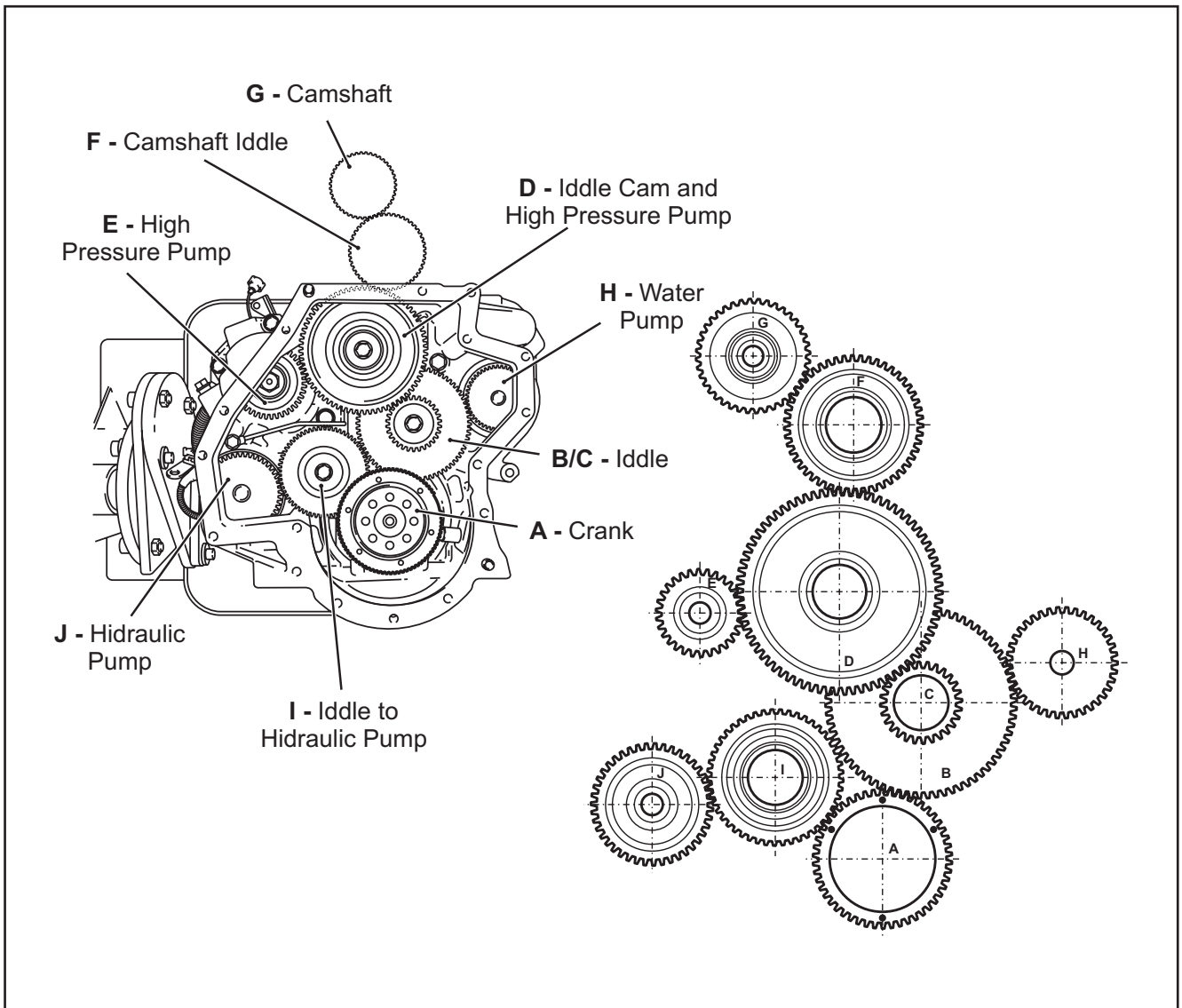
0.03 mm

Check the torsion of the connecting Rod.

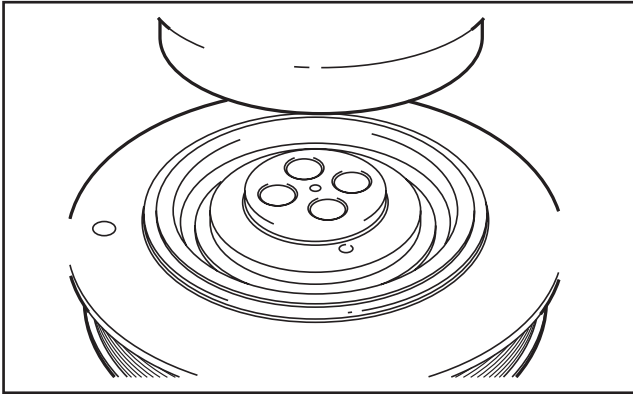
Maximum torsion:

0.40 mm

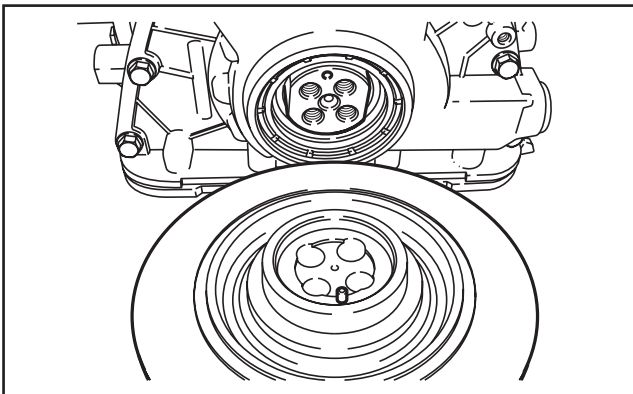
Spur Gear Train



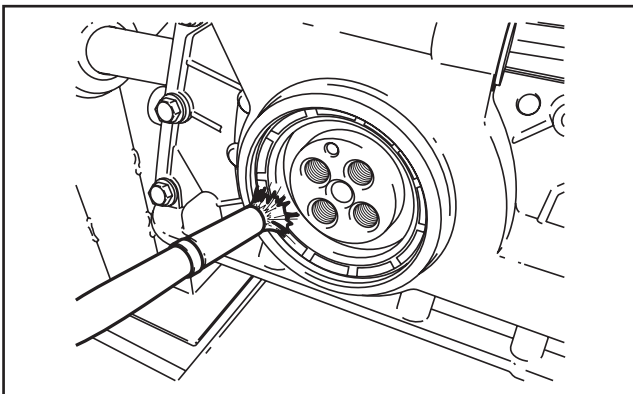
ID	Name	Radial Clearance (mm)	Axial Play (mm)
A	Crankshaft	-	-
B	Water Pump Idle	0.020 to 0.066	0.10 to 0.60
C	High Pressure Idle Drive	0.020 to 0.066	0.10 to 0.60
D	Camshaft Idle / High Pressure Pump Drive	0.020 to 0.066	0.10 to 0.60
E	High Pressure Pump	-	-
F	Camshaft Idle	0.020 to 0.066	0.10 to 0.50
G	Camshaft	-	-
H	Water Pump	-	-
I	Hydraulic Pump Idle	0.020 to 0.066	0.10 to 0.60
J	Hydraulic Pump	-	-



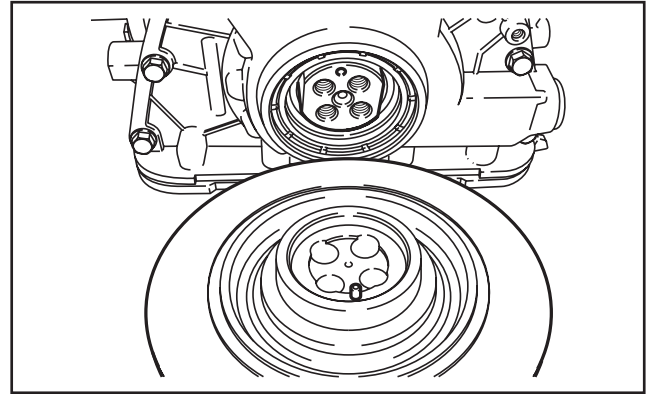
Assemble the bushing on the pulley using a press.



Check if the bushing was pressed up to the final stop on the bushing surface. Remove any excess of gasket maker.

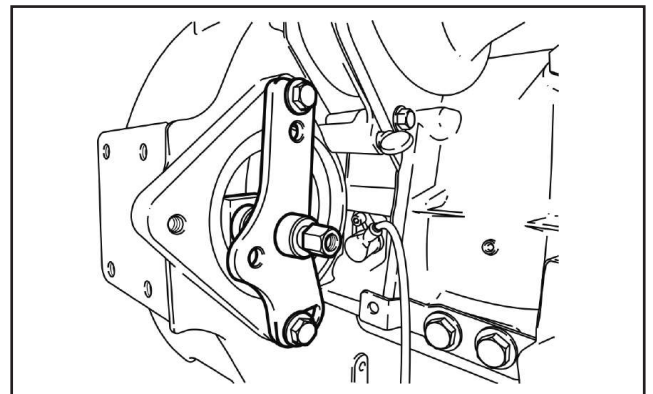


Apply petrolatum.

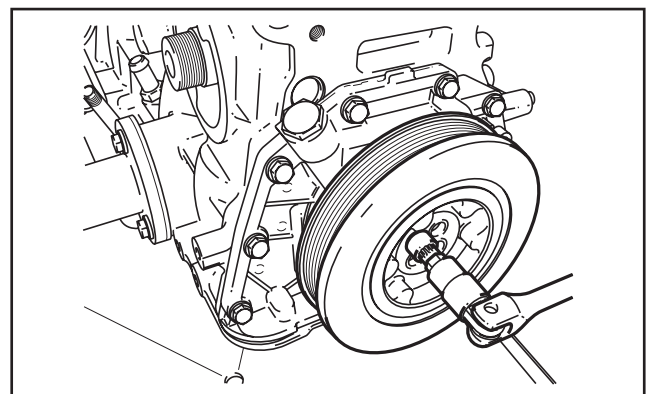


Be sure that the oil pump front retainer has no damages or seepage. Otherwise, it must be replaced by a new one. Assemble the crankshaft retainer bushing and pulley. Carefully assemble the vibration damper as to not damage the retainer. Check if the bushing is correctly fitted and the cylindrical pin which serves as a guide is in its correct position.

NOTE: Always use a new retainer for the assembly.



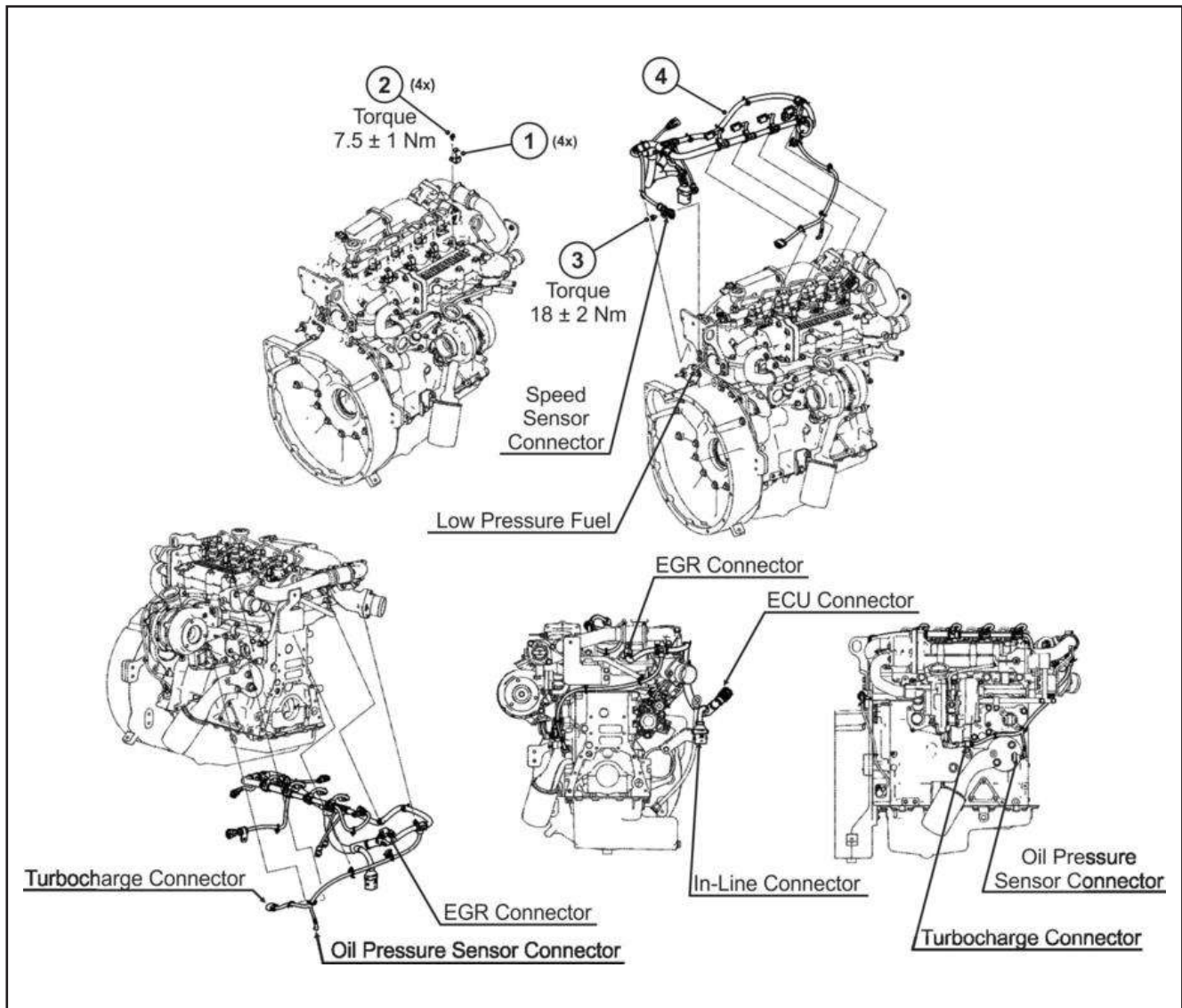
Install the **MWM No. D7000600C1** special tool to lock the flywheel.



Tighten the pulley bolts to the indicated torque.

1 st Step	27 to 33 Nm
2 nd Step	100° + 10°
3 rd Step	25° + 5°

Common Rail Electrical System

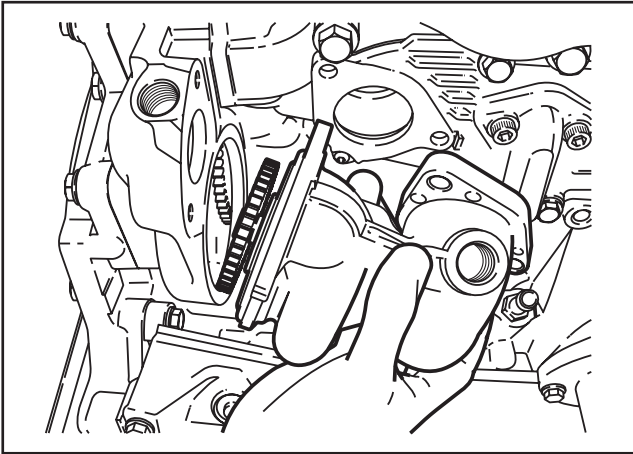


1. Bracket Wiring Harness

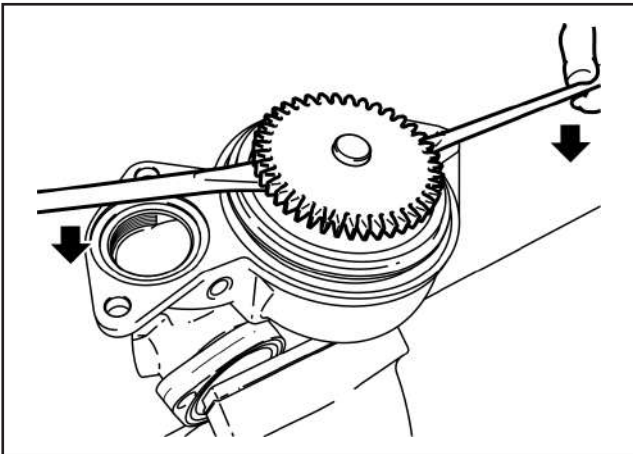
3. Hex. Flanged Bolt M8x12 8.8

4. Wiring Harness, Engine

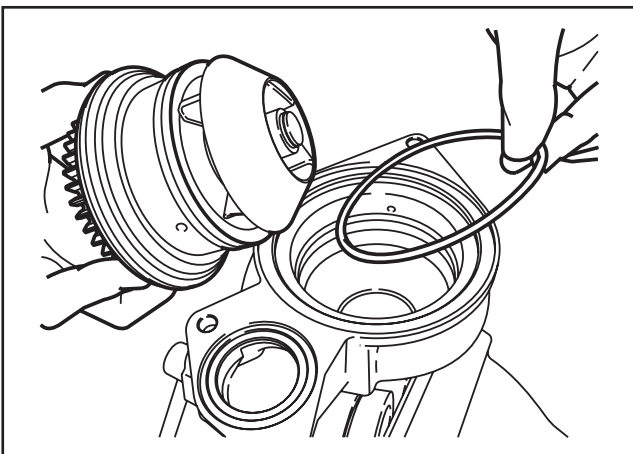
2. Hex. Flanged Bolt M6x12 8.8



Remove the pump and housing assembly together with the sealing rings.



Disassemble the water pump assembly (rotor) from the housing.

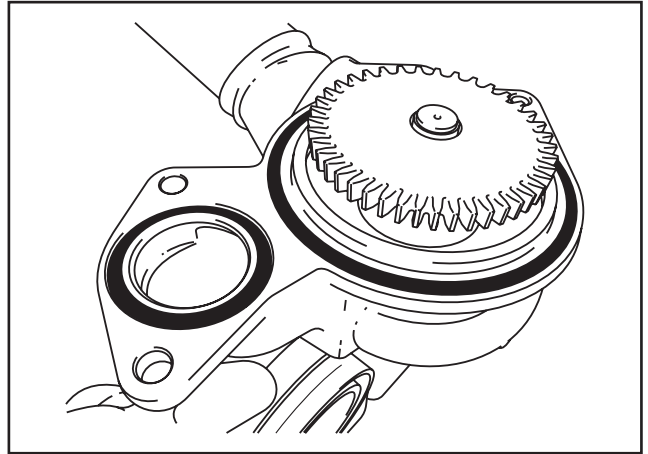


Disassemble the pump rotor, remove and discard the sealing rings.

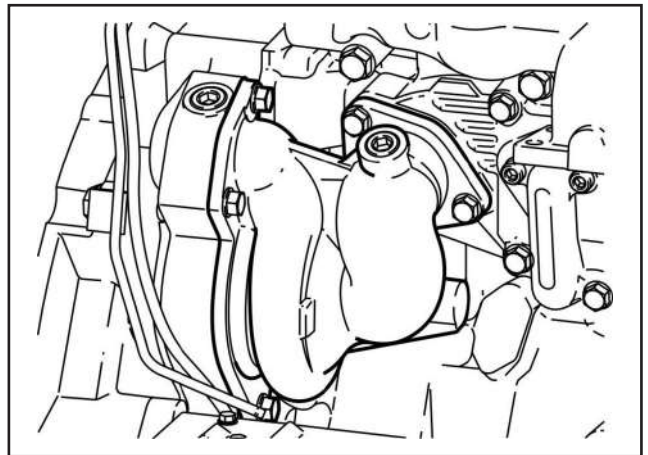
NOTE: Before installing the water pump, check the housing condition for erosion or cavitation. Clean it throughout and replace the sealing rings.

NOTE: The water pump is not serviceable, the assembly must be replaced as a unit and, if the housing is in good condition, the pump may be replaced keeping the old housing.

Installation



Replace the 3 pump sealing O-rings and apply petrolatum to the silicone base of new rings before installing them on the housing.

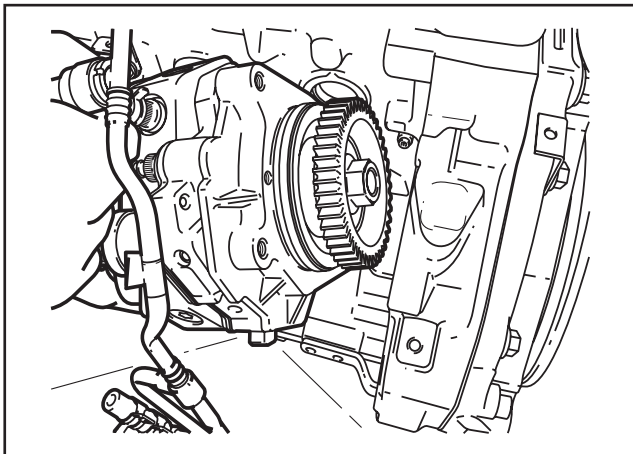
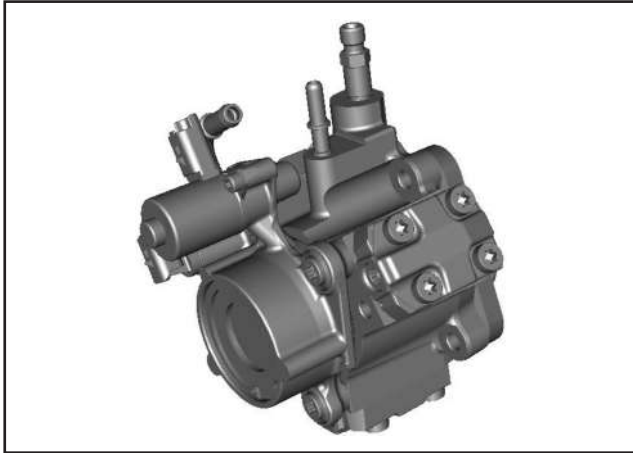


Install the pump with attaching the mounting bolts with 17 to 23 Nm torque.

High Pressure Fuel Pump

Removal

The pump can be removed together with the gear.



After loosening and removing the tubes, unscrew the bolts of the high pressure pump attaching bolts from the gear housing.

The removal must be done carefully. Friction between the O-Ring and the pump housing may hinder its removal. Since it is a component that requires extreme care, the fuel inlet and outlet holes must be covered and the component stored in a safe place, away from accidents.

To remove the pump gear, loosen and remove the attaching nut. Remove the gear with a suitable puller.

Caution:

- High pressure pumps shall never be disassembled.
- Any violation will void warranty.
- If a pump repair is required, it must be sent to an authorized Continental dealer.

Installation

Install a new sealing ring (O-ring) on the high pressure pump.



Clean the surface and apply a coat of petrolatum over the O-Ring contact area with the intermediate part housing.

Install the high pressure pump in the gear housing. Tighten bolts in a cross pattern as to not damage the O-Rings (cuts) on the side of the pump.

Position the pump with bolts up to the back wall in the gear housing and apply 24 to 30 Nm torque.

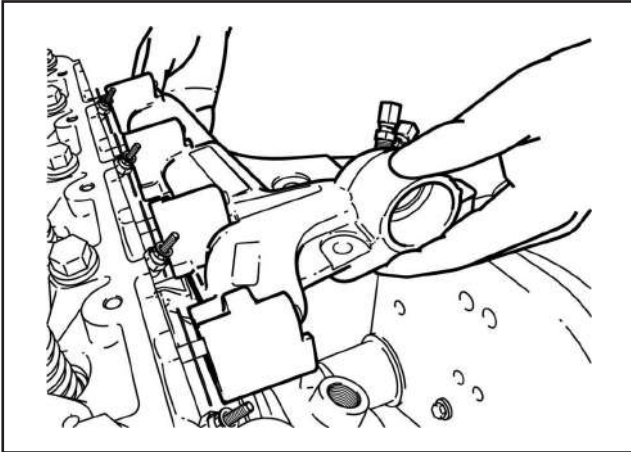
Be sure that the pump sits properly in the gear housing.

Exhaust Manifold

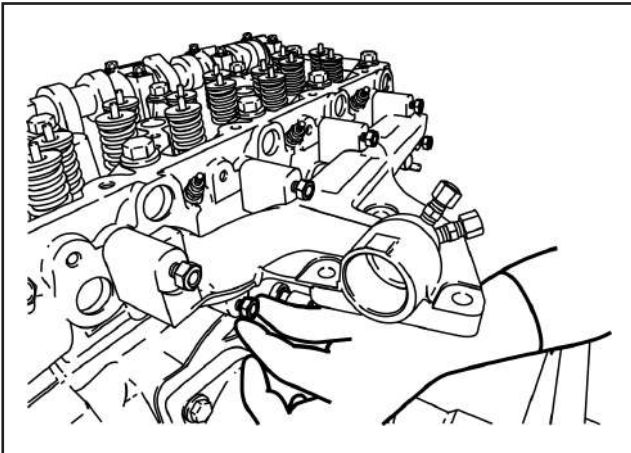
Warning: To avoid serious personal injuries or damages to the engine or vehicle, be sure that the engine has cooled down enough before removing any component.

Removal

Untighten the bolts, remove the exhaust tube and gaskets.



Loosen and remove the manifold attaching bolts.



Remove the exhaust manifold and metallic gaskets.

Cleaning

Remove gasket residues from the manifold holes and carefully clean the exhaust manifold.

Scrap excesses of carbon and rust from the manifold surfaces.

After cleaning, dry the parts with filtered compressed air.

Inspection

Check the exhaust manifold for cracks and damages.

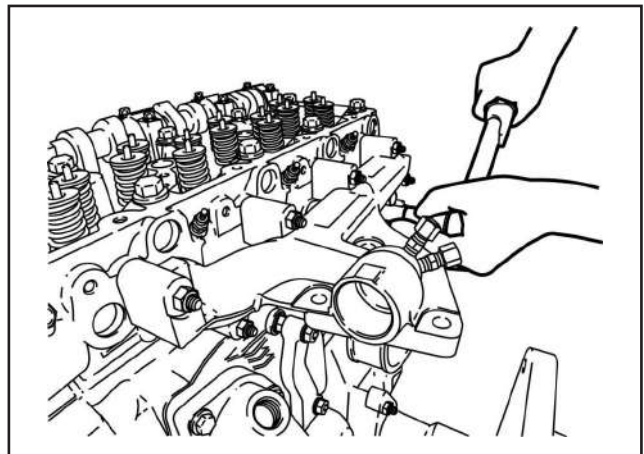
Replace the part if necessary.

Check for warpage.

Installation

Attention: After the manifold cleaning and inspection procedures, assemble new gaskets to the manifold.

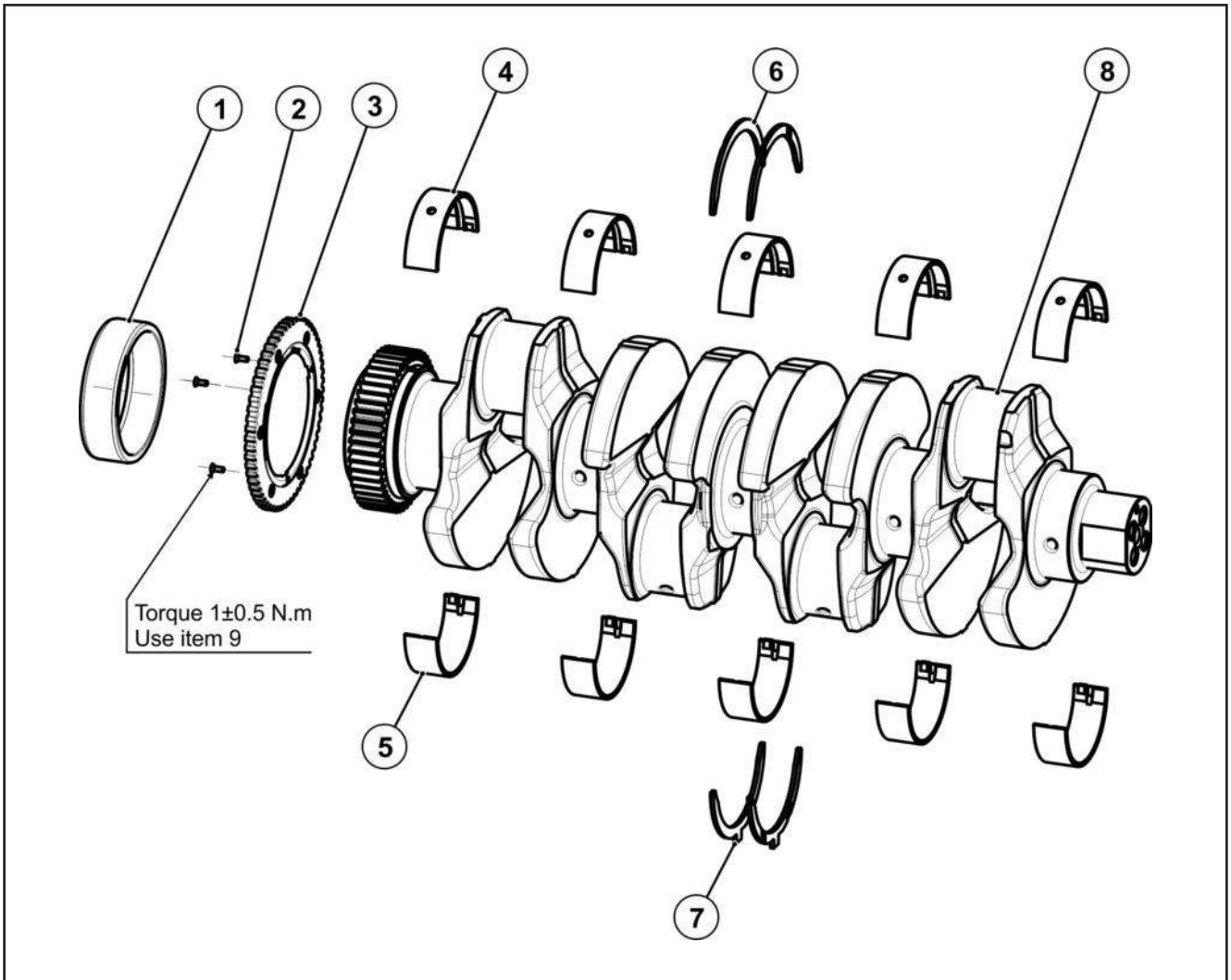
Replace the attaching bolts.



Tighten the nuts and studs of the exhaust manifold.

The bolts must be tightened to torque from the center to ends in a cross pattern.

Crankshaft



- | | | |
|----------------------------------|-------------------------------------|------------------------------|
| 1. Bushing, Rear Crankshaft | 4. Upper Bearing Shells, Crankshaft | 7. Washer Lower, Thrust |
| 2. Hexagon Socket Head Cap Screw | 5. Lower Bearing Shells, Crankshaft | 8. Crankshaft Assy |
| 3. Pulse Wheel | 6. Washer Upper, Thrust | 9. Chemical Lock Loctite 242 |

NOTE: The contact faces of the parts must be oiled with lubricant oil.

Item	Clearance		
	4	Crankshaft / Bering Shells	Radial
5			
6	Crankshaft / Bering Shells	Axial	0.080 to 0.251