CASE CONSTRUCTION

SERVICE MANUAL

ENGINES NEF

Tier 3
F4CE9484, F4CE9684, F4DE9484, F4DE9684, F4DE9687, F4GE9484, F4GE9684, F4HE9484, F4HE9684

84250518

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Foreword

Engine Overhaul

Part of the operations illustrated within this manual can be partially executed while the engine is assembled on the vehicle, depending on the room available for access to the engine and on the equipment application as well.

NOTE: *With regard to the engine disassembly operations, please apply for information consulting the specific manual.*

The following information relates to the engine overhaul operations only for what concerns the different components customizing the engine, according to its specific duties.
In section "General Overhaul", all the operations of engine block overhaul have been contemplated. Therefore the above mentioned section is to be considered as following the part hereby described.

Safety rules

Standard safety prescriptions

Particular attention shall be drawn on some precautions that must be followed absolutely in a standard working area and whose non fulfillment will make any other measure useless or not sufficient to ensure safety to the personnel in charge of maintenance.
Be informed and inform personnel as well of the laws in force regulating safety, providing information documentation available for consultation.

- Keep working areas as clean as possible, ensuring adequate aeration.
- Ensure that working areas are provided with emergency boxes, that must be clearly visible and always provided with adequate sanitary equipment.
- Provide for adequate fire extinguishing means, properly indicated and always having free access. Their efficiency must be checked on a regular basis and the personnel must be trained on interventon methods and priorities.
- Organize and identify specific exit points to evacuate the areas in case of an emergency, providing for adequate indications of the emergency indications of the emergency exit lines.
- Smoking in working areas subject to fire danger must be strictly prohibited.
- Provide warnings throughout adequate boards signaling danger, prohibitions and indications to ensure easy comprehension of the instructions even in case of an emergency.

Prevention of injury

- Do not wear unsuitable clothes for work, with fluttering ends, nor jewels such as and chains when working close to engines and equipment in motion.
- Wear safety gloves and goggles when performing the following operations:
- - filling inhibitors or anti-frost
  - lubrication oil topping or replacement
  - utilization of compressed air or liquids under pressure (pressure allowed < **2 bar** (**29 psi**)).
- Wear safety helmet when working close to hanging loads or equipment working at head height level.
- Always wear safety shoes and clothes adhering to the body, better if provided with elastics at the ends.
- Use protection cream for hands.
- Change wet clothes as soon as possible.
- In presence of electrical current exceeding **48 - 60 V** verify efficiency of earth and mass electrical connections. Ensure that hands and feet are dry and execute working operations utilizing isolating foot boards. Do not carry out working operations if not trained for.
- Do not smoke nor light up flames close to batteries and to any fuel material.
- Put the dirty rags with oil, diesel fuel or solvents in anti-fire specially provided containers.
- Do not execute any intervention if not provided with necessary instructions.
- Do not use any tool or equipment for any different operation from the ones they’ve been designed and provided for. Serious injury may occur.
- In case of test or calibration operations requiring engine running, ensure that the area is sufficiently ventilated or utilize specific vacuum equipment to eliminate exhaust gas. Danger: poisoning or death.

During maintenance

- Never open filler cap of cooling system when the engine is hot. Operating pressure would provoke high temperature with serious danger and risk of burn. Wait until the temperature decreases under **50 °C** (**122 °F**).
- Never top up an overheated engine with cooler and utilize only appropriate liquids.
- Always operate when the engine is tuned off; when particular circumstances require maintenance intervention on running engine, be aware of all risks involved with such operation.
- Be equipped with adequate and safe containers for drainage operation of engine liquids and exhaust oil.

- Keep the engine clean from oil spills, diesel fuel and or chemical solvents.
- Use of solvents or detergents during maintenance may originate toxic vapors. Always keep working areas ventilated. Whenever necessary wear safety mask.
- Do not leave rags impregnated with flammable substances close to the engine.
- Upon engine start after maintenance, undertake proper preventing actions to stop air suction in case of a runaway speed rate.
- Do not utilize fast screw tightening tools.
- Never disconnect batteries when the engine is running.
- Disconnect batteries before any intervention on the electrical system.
- Disconnect batteries from system before applying a load to them with the battery loader.
- After every intervention, verify that battery clamp polarity is correct and that the clamps are tight and safe from accidental short circuit and oxidation.
- Do not disconnect and connect electrical connections in presence of electrical feed.
- Before proceeding with pipelines disassembly (pneumatic, hydraulic, fuel pipes) verify presence of liquid or air under pressure. Take all necessary precautions bleeding and draining residual pressure or closing dump valves. Always wear adequate safety mask or goggles. Non fulfillment of these precautions may cause serious injury and poisoning.
- Avoid incorrect tightening or out of sequence. Danger: incorrect tightening may seriously damage engine's components, affecting engine's duration.
- Avoid priming from fuel tanks made out of copper alloys and/or with ducts not being provided with filters.
- Do not modify cable wires: their lengths shall not be changed.
- Do not connect to the engine electrical equipment unless specifically approved by Iveco.
- Do not modify fuel systems or hydraulic system unless Iveco specific approval has been released. Any unauthorized modification will compromise warranty assistance and furthermore may affect engine correct working and duration.

For engines equipped with electronic controller:

- Do not execute electric arc welding without having previously removed electronic controller.
- Remove electronic controller in case of any intervention requiring heating over **80 °C** (**176 °F**) temperature.
- Do not paint the components and the electronic connections.
- Do not vary or alter any data filed in the electronic controller driving the engine. Any manipulation or alteration of electronic components shall totally compromise engine assistance warranty and furthermore may affect engine correct working and duration.

Respect of the Environment

- Respect of the Environment shall be of primary importance: all necessary precautions to ensure personnel's safety and health shall be adopted.
- Be informed and inform personnel as well of the laws in force regulating use and exhaust of liquids and engine drain oil. Provide for adequate board indications and organic specific training courses to ensure that personnel is fully aware of such law prescriptions and of basic preventative safety measures.
- Collect drain oils in adequate specially provided containers with hermetic sealing ensuring that storage is made in specific, properly identified areas that shall be ventilated far from heat sources and not exposed to fire danger,
- Handle the batteries with care, storing them in ventilated environment and within anti-acid containers. Warning: Battery exhalation represent serious danger of intoxication and environment contamination.

Torque

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

Component	Size	Specification
Cylinder Head and Components		
Plug	¼"	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
	½"	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
	¾"	**31 - 41 Nm** (**22.9 - 30.2 lb ft**)
Grid Heater	M6 Nut	**6 - 10 Nm** (**4.4 - 7.4 lb ft**)
Intake Manifold	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Engine Lifting Bracket		
Rear	M12	**65 - 89 Nm** (**47.9 - 65.6 lb ft**)
Front	M8	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Cylinder Head	**M12x1.75x130 mm**	
First Phase		**30 - 40 Nm** (**22.1 - 29.5 lb ft**)
Second Phase		**85 - 95 °**
Third Phase		**85 - 95 °**
Cylinder Head	**M12x1.75x150 mm**	
First Phase		**50 - 60 Nm** (**36.9 - 44.3 lb ft**)
Second Phase		**85 - 95 °**
Third Phase		**85 - 95 °**
Rocker Bracket		**31 - 41 Nm** (**22.9 - 30.2 lb ft**)
Rocker Arm Jam Nuts		**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Exhaust Manifold		**48 - 58 Nm** (**35.4 - 42.8 lb ft**)
Valve Cover	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Turbocharger		
6 Cylinder	M8 Screw	**6 - 8 Nm** (**4.4 - 5.9 lb ft**)
	M8 Nut	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
4 Cylinder	M8 Screw	**6 - 8 Nm** (**4.4 - 5.9 lb ft**)
	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Front Case		
Front Cover	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Rear Case		
Gear Case	M12 Screw	**65 - 89 Nm** (**47.9 - 65.6 lb ft**)
	M10 Screw	**42 - 52 Nm** (**31.0 - 38.4 lb ft**)
	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Flywheel Housing	M10	**75 - 95 Nm** (**55.3 - 70.1 lb ft**)
	M12	**44 - 54 Nm** (**32.5 - 39.8 lb ft**)
Cylinder Block and Crankshaft Components		

Component	Size	Specification
Camshaft Retaining Plate	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Camshaft Gear	M8 Screw	**32 - 40 Nm (23.6 - 29.5 lb ft)**
Crankcase Plate	M10 Screw	**38 - 48 Nm (28.0 - 35.4 lb ft)**
Vibration Damper and Adapter	M12	
First Phase		**45 - 55 Nm (33.2 - 40.6 lb ft)**
Second Phase		**90 °**
Drive Pulley	M10	**61 - 75 Nm (45.0 - 55.3 lb ft)**
Engine Flywheel	M12	
First Phase		**26 - 34 Nm (19.2 - 25.1 lb ft)**
Second Phase		**55 - 65 °**
Main Caps	M12	
First Phase		**44 - 56 Nm (32.5 - 41.3 lb ft)**
Second Phase		**74 - 86 Nm (54.6 - 63.4 lb ft)**
Third Phase		**85 - 95 °**
Connecting Rod Caps		
First Phase		**55 - 65 Nm (40.6 - 47.9 lb ft)**
Second Phase		**55 - 65 °**
Lubrication System and Components		
Oil Pump		
First Phase	M8	**7 - 9 Nm (5.2 - 6.6 lb ft)**
Second Phase	M8	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Oil Pressure Relief Valve	M22	**72 - 88 Nm (53.1 - 64.9 lb ft)**
Oil Cooler and Oil Filter Base	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Oil Filter		Contact + ¾ Turn
Connection on Filter Base for Turbo Oil Supply	1 ⅛"	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Turbo Lubrication Pipe	M12 Nut	**8 - 12 Nm (5.9 - 8.9 lb ft)**
Turbo Lubrication Pipe Adapter	M12	**30 - 40 Nm (22.1 - 29.5 lb ft)**
Oil Pan		**20 - 28 Nm (14.8 - 20.7 lb ft)**
Piston Spray Nozzles	M8	**12 - 18 Nm (8.9 - 13.3 lb ft)**
Electrical Components		
Camshaft Sensor	M6 Studs	**6 - 10 Nm (4.4 - 7.4 lb ft)**
	M6 Nut	**8 - 12 Nm (5.9 - 8.9 lb ft)**
	M6 Screw	**6 - 10 Nm (4.4 - 7.4 lb ft)**
Wiring Bulkhead	M6 Screw	**8 - 12 Nm (5.9 - 8.9 lb ft)**
Support Bracket for Injector Wiring	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Injector Wiring		**1.25 - 1.75 Nm (0.92 - 1.29 lb ft)**
ECU Cooling Plate	M6 Screw	**8 - 12 Nm (5.9 - 8.9 lb ft)**
	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Fuel Outlet	M12	**10 - 14 Nm (7.4 - 10.3 lb ft)**
Fuel Inlet	M12	**10 - 14 Nm (7.4 - 10.3 lb ft)**
Crankshaft Speed Sensor	M6 Screw	**6 - 10 Nm (4.4 - 7.4 lb ft)**
Coolant Temperature Sensor	M14 Screw	**17 - 23 Nm (12.5 - 17.0 lb ft)**
Oil Pressure / Temperature Sensor	M5 Screw	**5 - 7 Nm (3.7 - 5.2 lb ft)**
Fuel Pressure Sensor		**30 - 40 Nm (22.1 - 29.5 lb ft)**
Fuel Temperature Sensor	M14	**17 - 23 Nm (12.5 - 17.0 lb ft)**
Air Pressure / Temperature Sensor		**5 - 7 Nm (3.7 - 5.2 lb ft)**
Engine Oil Level Sensor	M12	**10 - 14 Nm (7.4 - 10.3 lb ft)**
Alternator Support Bracket	M10 Screw	**37 - 49 Nm (27.3 - 36.1 lb ft)**
Alternator Tension Bracket	M10 Screw	**37 - 49 Nm (27.3 - 36.1 lb ft)**
Starter		**37 - 49 Nm (27.3 - 36.1 lb ft)**

Component	Size	Specification
Fuel System and Components		
Feed Pump	M8 Studs	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
High Pressure Pump Gear	M18 Nut	**100 - 110 Nm** (**73.8 - 81.1 lb ft**)
Fuel Pump	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Injector		
First Phase	M6 Screw	**8.15 - 8.85 Nm** (**6.0 - 6.5 lb ft**)
Second Phase	M6 Screw	**70 - 80 °**
Injector Feed Connector		**45 - 55 Nm** (**33.2 - 40.6 lb ft**)
Common Rail	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
High Pressure Fuel Line	M14 Fitting	**18 - 22 Nm** (**13.3 - 16.2 lb ft**)
High Pressure Pipe Connector	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Fuel Filter Bracket	M12 Screw	**71 - 85 Nm** (**52.4 - 62.7 lb ft**)
Fuel Filter Holder	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Fuel Filter		Contact + ¾ Turn
Cooling System and Components		
Engine Coolant Inlet	M10 Screw	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Fitting on Coolant Inlet	**90 °** Elbow	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Compressor Cooling Pipe		**20 - 24 Nm** (**14.8 - 17.7 lb ft**)
Engine Coolant Drain Collector	M6 Screw	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
Water Pump	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Belt Tensioner	M10	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Idler Pulleys	M10	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)

Torque

F4CE9484, F4GE9484, F4CE9684, F4GE9684

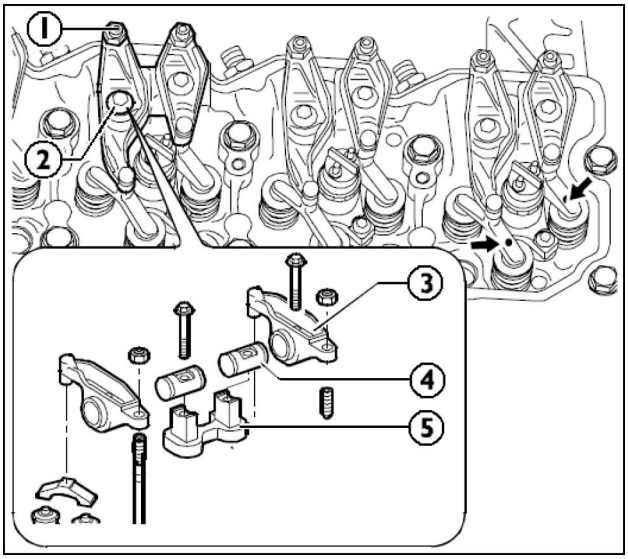
Component	Size	Specification
Cylinder Head and Components		
Rocker Assembly	M8	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Cylinder Head	M12x70	
Phase 1		**50 Nm (36.9 lb ft)**
Phase 2		**90 °**
Cylinder Head	M12x140	
Phase 1		**40 Nm (29.5 lb ft)**
Phase 2		**180 °**
Cylinder Head	M12x180	
Phase 1		**70 Nm (51.6 lb ft)**
Phase 2		**180 °**
Valve Cover	M8x1.25x25	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Intake manifold	M8x1.25	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Air intake elbow	M8x1.25	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Exhaust manifold	M10x1.5x65	**37 - 49 Nm (27.3 - 36.1 lb ft)**
Rear lifting bracket	M12x1.75x30	**65 - 89 Nm (47.9 - 65.6 lb ft)**
Turbocharger	M10	**37 - 49 Nm (27.3 - 36.1 lb ft)**
Front Case		
Front cover assembly	M8x1.25x45	**20 - 28 Nm (14.8 - 20.7 lb ft)**
	M8x1.25x30	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Rear Case		
Gear Case	M8x1.25x40	**20 - 28 Nm (14.8 - 20.7 lb ft)**
	M8x1.25x25	**20 - 28 Nm (14.8 - 20.7 lb ft)**
	M10x1.5	**44 - 54 Nm (32.5 - 39.8 lb ft)**
Flywheel housing	M12x120	**75 - 95 Nm (55.3 - 70.1 lb ft)**
	M12x80	**75 - 95 Nm (55.3 - 70.1 lb ft)**
	M10x80	**44 - 54 Nm (32.5 - 39.8 lb ft)**
	M10x40	**44 - 54 Nm (32.5 - 39.8 lb ft)**
Phase 1	M12x1.25	**26 - 34 Nm (19.2 - 25.1 lb ft)**
Phase 2	M12x1.25	**55 - 65 °**
Cylinder Block and Crankshaft Components		
Main bearing cap		
Phase 1		**44 - 56 Nm (32.5 - 41.3 lb ft)**
Phase 2		**74 - 86 Nm (54.6 - 63.4 lb ft)**
Phase 3		**85 - 95 °**
Connecting rod	M11x1.25	
Phase 1		**27 - 33 Nm (19.9 - 24.3 lb ft)**
Phase 2		**55 - 65 Nm (40.6 - 47.9 lb ft)**
Phase 3		**55 - 65 °**
Timing Pin		**4 - 6 Nm (3.0 - 4.4 lb ft)**
Crankshaft pulley	M12x1.75	**105 - 115 Nm (77.4 - 84.8 lb ft)**
Camshaft retaining plate	M8	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Camshaft gear	M8	**32 - 40 Nm (23.6 - 29.5 lb ft)**
Lubrication System and Components		

Valve drive Rocker assembly - Install

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

Prior operation:
Valve drive Camshaft - Install (B.10.A)

1. Check that the tappet adjusters **(1)** are loose to prevent their binding on the rods when fitting the rocker assembly
2. Install the rocker assembly consisting of:
   - Bracket **(2)**.
   - rockers **(4)**.
   - shafts **(3)**.
3. Secure them to the cylinder head by tightening the fastening screws **(2)** to a torque of **36 Nm** (**27 lb ft**).



ROCKERASSEMDH 1

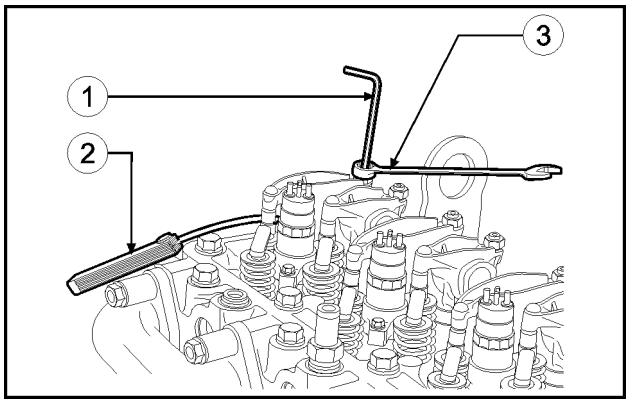
Next operation:
Valve drive Rocker assembly - Adjust (B.10.A)

Rocker assembly Rocker arm - Adjust

Prior operation:
Valve drive Rocker assembly - Install (B.10.A)

1. Adjust the clearance between the rockers and valves using a set screw wrench **(1)**, box wrench **(3)**, and feeler gauge **(2)**.
2. Set the clearance to the following specifications.
   - Intake Valves - **0.20 - 0.30 mm** (**0.008 - 0.012 in**)
   - Exhaust Valves - **0.45 - 0.55 mm** (**0.018 - 0.022 in**)

NOTICE: *On TIER 3 engines, due to the additional lobe on the camshaft for INTERNAL E.G.R., it is not possible to use the valve clearance adjustment procedure that requires adjusting the clearance of all the valves by positioning the crankshaft two times only.*
Each cylinder must be checked by taking it to TDC (top dead center) at the end of the compression stroke and adjusting the clearance of both valve on the cylinder in question.



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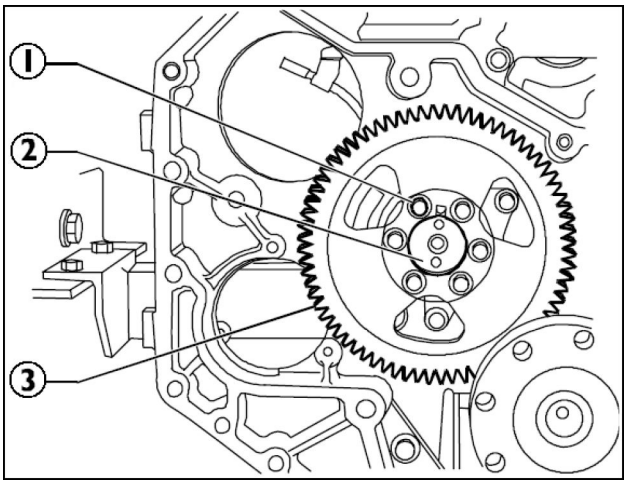
Next operation:
Valve cover - Install (B.10.A)

Camshaft Gear - Remove

Prior operation:
Rear cover - Remove (B.10.A)

1. Remove the screws **(1)** securing the camshaft gear **(3)** to the camshaft **(2)**.
2. Withdrawal the camshaft gear **(3)**.



CAMGEARH 1

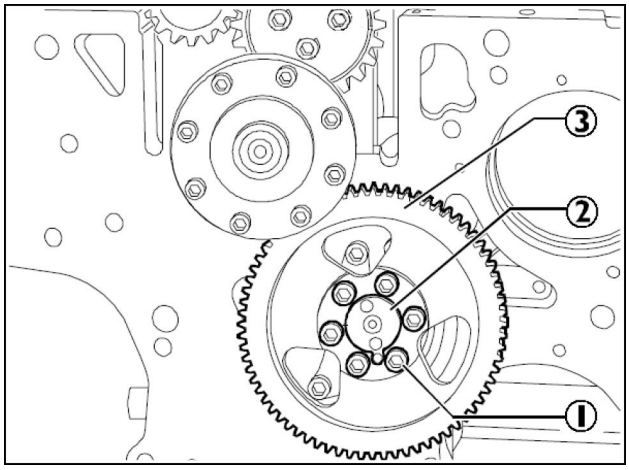
Next operation:
Camshaft Gear - Install (B.10.A)

Camshaft Gear - Remove

F4DE9484, F4DE9684, F4DE9687

Prior operation:
Rear cover - Remove (B.10.A)

1. Undo the screws **(1)** and remove the gear **(3)** from the camshaft **(2)**.



CAMGEARD 1

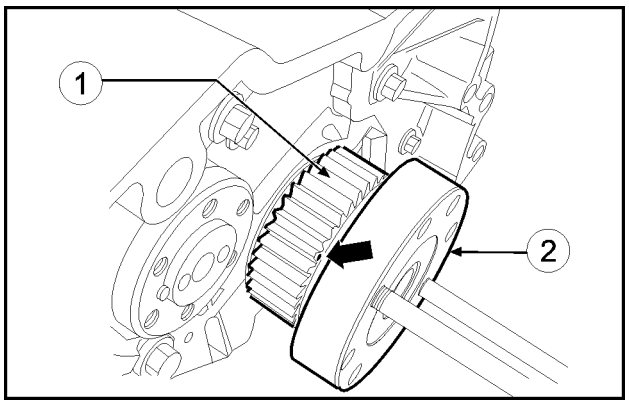
Next operation:
Camshaft Gear - Install (B.10.A)

Camshaft Gear - Install

Prior operation:
Camshaft Gear - Remove (B.10.A)

NOTE: *For ease of crankshaft rotation, install two pins in the end of the crankshaft.*

1. Highlight the timing mark on the crankshaft gear **(1)** with a felt tip pen so it's easier to see.



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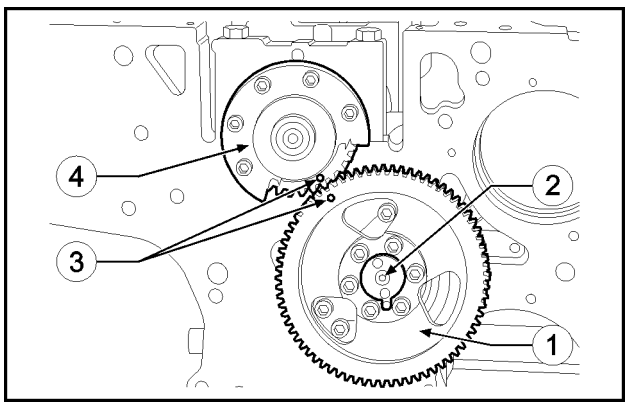
2. Turn the crankshaft **(4)** and the camshaft **(2)** so that by mounting the drive gear **(1)** on the camshaft **(2)**, both timing marks **(3)** will align properly.



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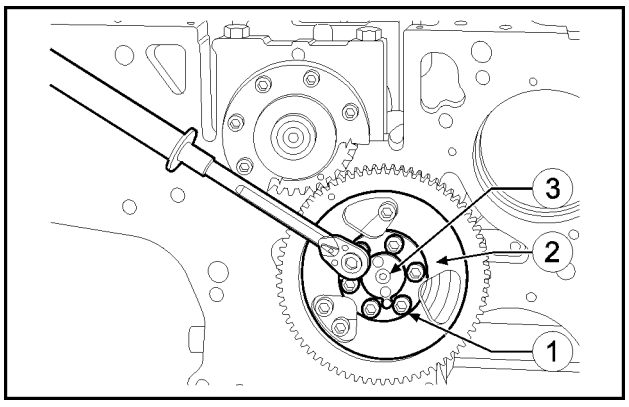
3. Tighten the bolts **(1)** that secure the gear **(2)** to camshaft **(3)** to the specified torque.



BACD04APH066ASA 3

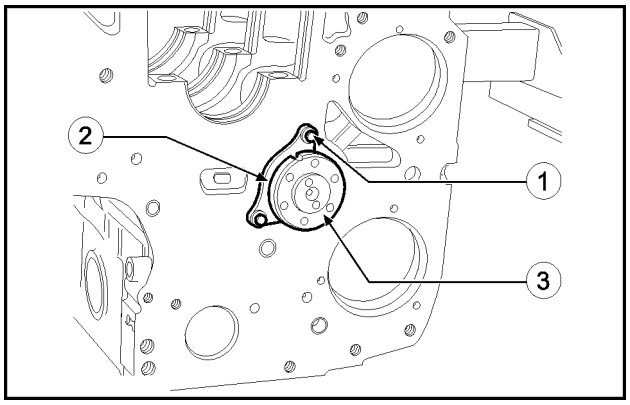
Next operation:
Rear cover - Cleaning (B.10.A)

Valve drive Camshaft - Remove

Prior operation:
Camshaft Gear - Remove (B.10.A)

1. Remove the bolts **(1)**and disconnect camshaft **(3)**retaining plate **(2)**.

NOTE: *Take note of the retaining plate **(2)** assembly position.*



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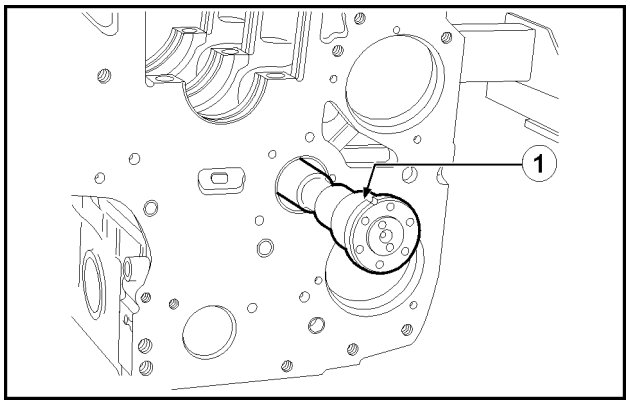
2. Carefully extract the camshaft **(1)** from the cylinder block.



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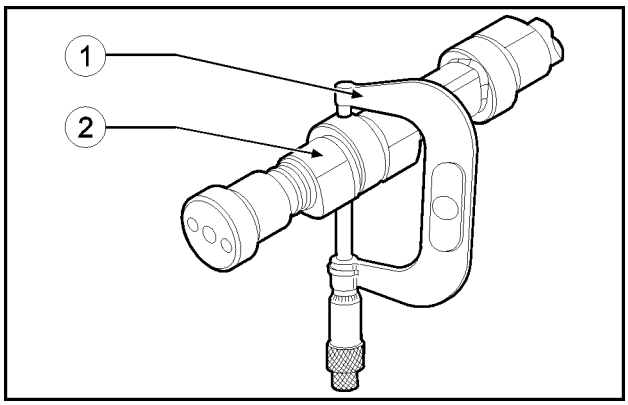
Next operation:
Valve drive Camshaft - Measure (B.10.A)

Valve drive Camshaft - Measure

Prior operation:
Valve drive Camshaft - Remove (B.10.A)

Checking cam lift and pin alignment

Set the camshaft on the tailstock using a 1/100 gauge set on the central support, check whether the alignment error is not exceeding **0.04 mm** (**0.002 in**), otherwise replace the camshaft. Check cam lift; found values shall be: **6.045 mm** (**0.238 in**) for exhaust cams and **7.582 mm** (**0.299 in**) for intake cams, in case of different values replace the camshaft.
Check the camshaft **(2)** pin diameter using micrometer **(1)** on two perpendicular axes.



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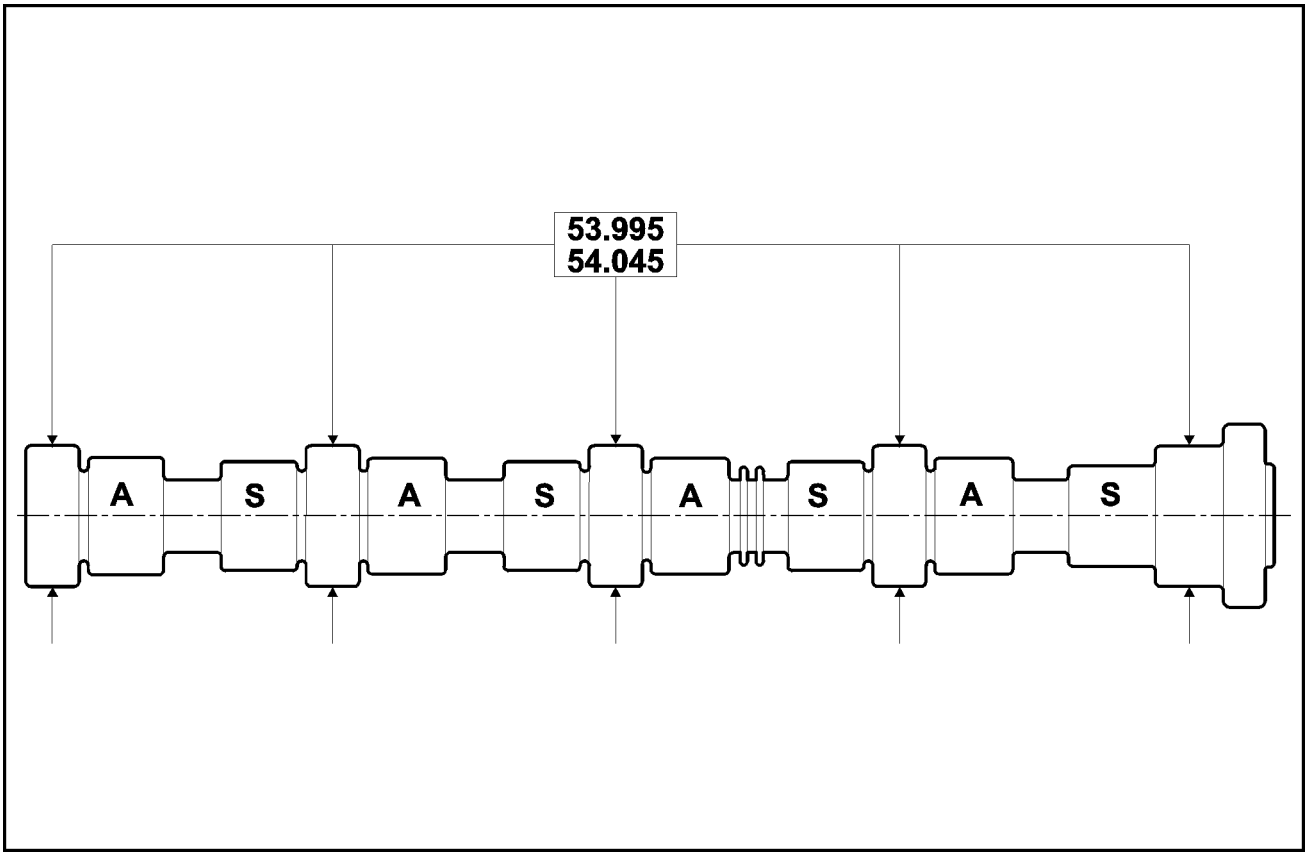
CAMSHAFT MAIN DATA (4 cyl.)



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