SERVICE MANUAL

Cursor 11
Tier 4B (final) and Stage IV
Engine

See the following page for engine model numbers

Part number 47608463
1st edition English
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SERVICE MANUAL

F3GFE613A*B001
F3GFE613B*B001

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INTRODUCTION

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INTRODUCTION

Foreword - Important notice regarding equipment servicing

All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The manufacturer reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at time of publication but are subject to change without notice.

In case of questions, refer to your CNH Sales and Service Networks.

Safety rules

Personal safety

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation that, if not avoided, could result in machine or property damage.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: *Note indicates additional information that clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Safety rules - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

NOTE: *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

Helpful hints

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Do not allow coolant mixtures to get into the soil Collect and dispose of coolant mixtures properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your CNH dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

Torque - Minimum tightening torques for normal assembly

METRIC NON-FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.2 N·m (19 lb in)	2.9 N·m (26 lb in)	3.2 N·m (28 lb in)	4.2 N·m (37 lb in)	2 N·m (18 lb in)	2.9 N·m (26 lb in)
M5	4.5 N·m (40 lb in)	5.9 N·m (52 lb in)	6.4 N·m (57 lb in)	8.5 N·m (75 lb in)	4 N·m (36 lb in)	5.8 N·m (51 lb in)
M6	7.5 N·m (66 lb in)	10 N·m (89 lb in)	11 N·m (96 lb in)	15 N·m (128 lb in)	6.8 N·m (60 lb in)	10 N·m (89 lb in)
M8	18 N·m (163 lb in)	25 N·m (217 lb in)	26 N·m (234 lb in)	35 N·m (311 lb in)	17 N·m (151 lb in)	24 N·m (212 lb in)
M10	37 N·m (27 lb ft)	49 N·m (36 lb ft)	52 N·m (38 lb ft)	70 N·m (51 lb ft)	33 N·m (25 lb ft)	48 N·m (35 lb ft)
M12	64 N·m (47 lb ft)	85 N·m (63 lb ft)	91 N·m (67 lb ft)	121 N·m (90 lb ft)	58 N·m (43 lb ft)	83 N·m (61 lb ft)
M16	158 N·m (116 lb ft)	210 N·m (155 lb ft)	225 N·m (166 lb ft)	301 N·m (222 lb ft)	143 N·m (106 lb ft)	205 N·m (151 lb ft)
M20	319 N·m (235 lb ft)	425 N·m (313 lb ft)	440 N·m (325 lb ft)	587 N·m (433 lb ft)	290 N·m (214 lb ft)	400 N·m (295 lb ft)
M24	551 N·m (410 lb ft)	735 N·m (500 lb ft)	762 N·m (560 lb ft)	1016 N·m (750 lb ft)	501 N·m (370 lb ft)	693 N·m (510 lb ft)

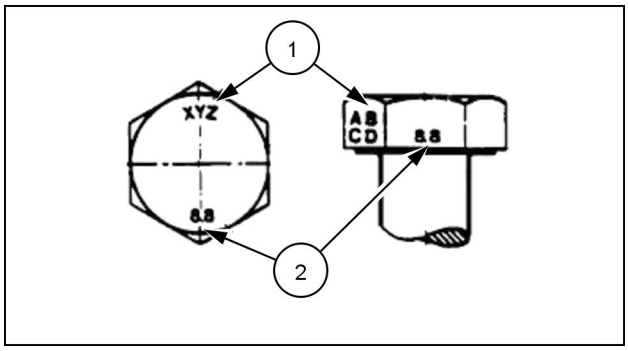
NOTE: *M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.*

METRIC FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.4 N·m (21 lb in)	3.2 N·m (28 lb in)	3.5 N·m (31 lb in)	4.6 N·m (41 lb in)	2.2 N·m (19 lb in)	3.1 N·m (27 lb in)
M5	4.9 N·m (43 lb in)	6.5 N·m (58 lb in)	7.0 N·m (62 lb in)	9.4 N·m (83 lb in)	4.4 N·m (39 lb in)	6.4 N·m (57 lb in)
M6	8.3 N·m (73 lb in)	11 N·m (96 lb in)	12 N·m (105 lb in)	16 N·m (141 lb in)	7.5 N·m (66 lb in)	11 N·m (96 lb in)
M8	20 N·m (179 lb in)	27 N·m (240 lb in)	29 N·m (257 lb in)	39 N·m (343 lb in)	18 N·m (163 lb in)	27 N·m (240 lb in)
M10	40 N·m (30 lb ft)	54 N·m (40 lb ft)	57 N·m (42 lb ft)	77 N·m (56 lb ft)	37 N·m (27 lb ft)	53 N·m (39 lb ft)
M12	70 N·m (52 lb ft)	93 N·m (69 lb ft)	100 N·m (74 lb ft)	134 N·m (98 lb ft)	63 N·m (47 lb ft)	91 N·m (67 lb ft)
M16	174 N·m (128 lb ft)	231 N·m (171 lb ft)	248 N·m (183 lb ft)	331 N·m (244 lb ft)	158 N·m (116 lb ft)	226 N·m (167 lb ft)
M20	350 N·m (259 lb ft)	467 N·m (345 lb ft)	484 N·m (357 lb ft)	645 N·m (476 lb ft)	318 N·m (235 lb ft)	440 N·m (325 lb ft)
M24	607 N·m (447 lb ft)	809 N·m (597 lb ft)	838 N·m (618 lb ft)	1118 N·m (824 lb ft)	552 N·m (407 lb ft)	

IDENTIFICATION

Metric Hex head and carriage bolts, classes 5.6 and up



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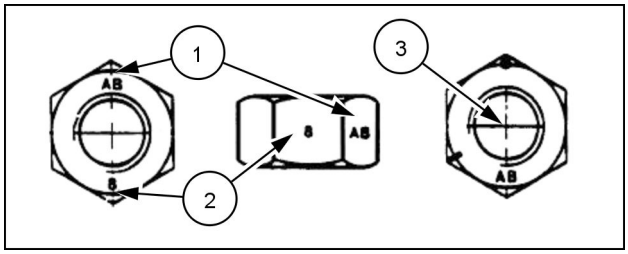
1. Manufacturer's Identification
2. Property Class

Metric Hex nuts and locknuts, classes 05 and up



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1. Manufacturer's Identification
2. Property Class
3. Clock Marking of Property Class and Manufacturer's Identification (Optional), i.e. marks **60 °** apart indicate Class 10 properties, and marks **120 °** apart indicate Class 8.

INCH NON-FLANGED HARDWARE

NOMINAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrB W/ Gr5 BOLT	LOCKNUT GrC W/ Gr8 BOLT
	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	**8 N·m (71 lb in)**	**11 N·m (97 lb in)**	**12 N·m (106 lb in)**	**16 N·m (142 lb in)**	**8.5 N·m (75 lb in)**	**12.2 N·m (109 lb in)**
5/16	**17 N·m (150 lb in)**	**23 N·m (204 lb in)**	**24 N·m (212 lb in)**	**32 N·m (283 lb in)**	**17.5 N·m (155 lb in)**	**25 N·m (220 lb in)**
3/8	**30 N·m (22 lb ft)**	**40 N·m (30 lb ft)**	**43 N·m (31 lb ft)**	**57 N·m (42 lb ft)**	**31 N·m (23 lb ft)**	**44 N·m (33 lb ft)**
7/16	**48 N·m (36 lb ft)**	**65 N·m (48 lb ft)**	**68 N·m (50 lb ft)**	**91 N·m (67 lb ft)**	**50 N·m (37 lb ft)**	**71 N·m (53 lb ft)**
1/2	**74 N·m (54 lb ft)**	**98 N·m (73 lb ft)**	**104 N·m (77 lb ft)**	**139 N·m (103 lb ft)**	**76 N·m (56 lb ft)**	**108 N·m (80 lb ft)**
9/16	**107 N·m (79 lb ft)**	**142 N·m (105 lb ft)**	**150 N·m (111 lb ft)**	**201 N·m (148 lb ft)**	**111 N·m (82 lb ft)**	**156 N·m (115 lb ft)**
5/8	**147 N·m (108 lb ft)**	**196 N·m (145 lb ft)**	**208 N·m (153 lb ft)**	**277 N·m (204 lb ft)**	**153 N·m (113 lb ft)**	**215 N·m (159 lb ft)**
3/4	**261 N·m (193 lb ft)**	**348 N·m (257 lb ft)**	**369 N·m (272 lb ft)**	**491 N·m (362 lb ft)**	**271 N·m (200 lb ft)**	**383 N·m (282 lb ft)**
7/8	**420 N·m (310 lb ft)**	**561 N·m (413 lb ft)**	**594 N·m (438 lb ft)**	**791 N·m (584 lb ft)**	**437 N·m (323 lb ft)**	**617 N·m (455 lb ft)**
1	**630 N·m (465 lb ft)**	**841 N·m (620 lb ft)**	**890 N·m (656 lb ft)**	**1187 N·m (875 lb ft)**	**654 N·m (483 lb ft)**	**924 N·m (681 lb ft)**

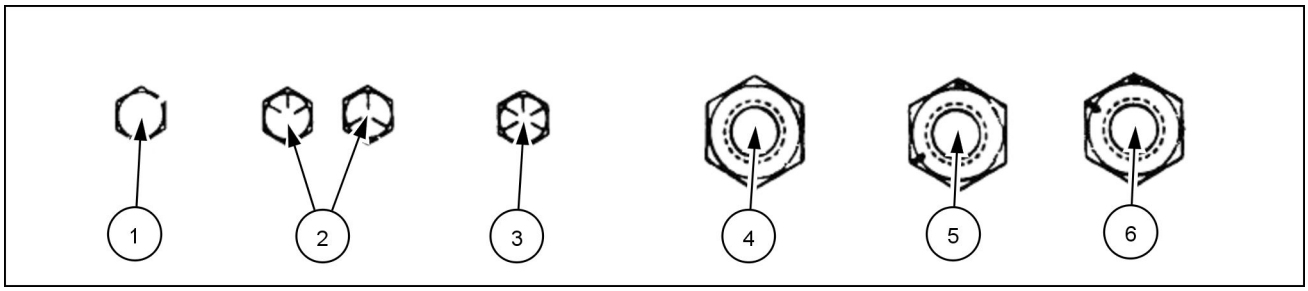
NOTE: *For Imperial Units,* ***1/4 in*** *and* ***5/16 in*** *hardware torque specifications are shown in pound-inches.* ***3/8 in*** *through* ***1 in*** *hardware torque specifications are shown in pound-feet.*

INCH FLANGED HARDWARE

NOM-INAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrF W/ Gr5 BOLT	LOCKNUT GrG W/ Gr8 BOLT
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	**9 N·m (80 lb in)**	**12 N·m (106 lb in)**	**13 N·m (115 lb in)**	**17 N·m (150 lb in)**	**8 N·m (71 lb in)**	**12 N·m (106 lb in)**
5/16	**19 N·m (168 lb in)**	**25 N·m (221 lb in)**	**26 N·m (230 lb in)**	**35 N·m (310 lb in)**	**17 N·m (150 lb in)**	**24 N·m (212 lb in)**
3/8	**33 N·m (25 lb ft)**	**44 N·m (33 lb ft)**	**47 N·m (35 lb ft)**	**63 N·m (46 lb ft)**	**30 N·m (22 lb ft)**	**43 N·m (32 lb ft)**
7/16	**53 N·m (39 lb ft)**	**71 N·m (52 lb ft)**	**75 N·m (55 lb ft)**	**100 N·m (74 lb ft)**	**48 N·m (35 lb ft)**	**68 N·m (50 lb ft)**
1/2	**81 N·m (60 lb ft)**	**108 N·m (80 lb ft)**	**115 N·m (85 lb ft)**	**153 N·m (113 lb ft)**	**74 N·m (55 lb ft)**	**104 N·m (77 lb ft)**
9/16	**117 N·m (86 lb ft)**	**156 N·m (115 lb ft)**	**165 N·m (122 lb ft)**	**221 N·m (163 lb ft)**	**106 N·m (78 lb ft)**	**157 N·m (116 lb ft)**
5/8	**162 N·m (119 lb ft)**	**216 N·m (159 lb ft)**	**228 N·m (168 lb ft)**	**304 N·m (225 lb ft)**	**147 N·m (108 lb ft)**	**207 N·m (153 lb ft)**
3/4	**287 N·m (212 lb ft)**	**383 N·m (282 lb ft)**	**405 N·m (299 lb ft)**	**541 N·m (399 lb ft)**	**261 N·m (193 lb ft)**	**369 N·m (272 lb ft)**
7/8	**462 N·m (341 lb ft)**	**617 N·m (455 lb ft)**	**653 N·m (482 lb ft)**	**871 N·m (642 lb ft)**	**421 N·m (311 lb ft)**	**594 N·m (438 lb ft)**
1	**693 N·m (512 lb ft)**	**925 N·m (682 lb ft)**	**979 N·m (722 lb ft)**	**1305 N·m (963 lb ft)**	**631 N·m (465 lb ft)**	**890 N·m (656 lb ft)**

IDENTIFICATION

Inch Bolts and free-spinning nuts



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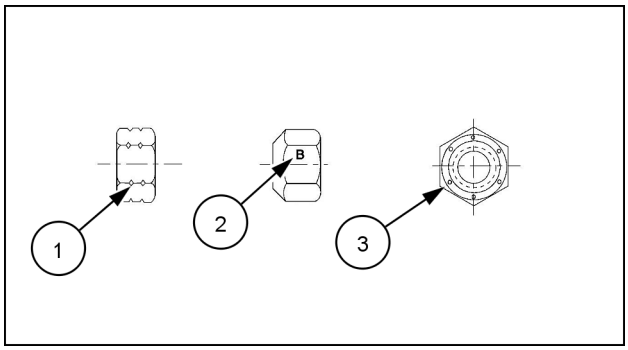
Grade Marking Examples

SAE Grade Identification			
1	Grade 2 - No Marks	4	Grade 2 Nut - No Marks
2	Grade 5 - Three Marks	5	Grade 5 Nut - Marks **120 °** Apart
3	Grade 8 - Five Marks	6	Grade 8 Nut - Marks **60 °** Apart

Inch Lock Nuts, All Metal (Three optional methods)



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Grade Identification

Grade	Corner Marking Method (1)	Flats Marking Method (2)	Clock Marking Method (3)
Grade A	No Notches	No Mark	No Marks
Grade B	One Circumferential Notch	Letter B	Three Marks
Grade C	Two Circumferential Notches	Letter C	Six Marks

Basic instructions - Shop and assembly

Shimming

For each adjustment operation, select adjusting shims and measure the adjusting shims individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value shown on each shim.

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

1. Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
2. Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
3. Position the sealing lip facing the fluid.

   NOTE: *With hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will move the fluid towards the inner side of the seal.*
4. Coat the sealing lip with a thin layer of lubricant (use oil rather than grease). Fill the gap between the sealing lip and the dust lip on double lip seals with grease.
5. Insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
6. While you insert the seal, check that the seal is perpendicular to the seat. When the seal settles, make sure that the seal makes contact with the thrust element, if required.
7. To prevent damage to the seal lip on the shaft, position a protective guard during installation operations.

O-ring seals

Lubricate the O-ring seals before you insert them in the seats. This will prevent the O-ring seals from overturning and twisting, which would jeopardize sealing efficiency.

Sealing compounds

Apply a sealing compound on the mating surfaces when specified by the procedure. Before you apply the sealing compound, prepare the surfaces as directed by the product container.

Spare parts

Only use CNH Original Parts or CNH Original Parts.

Only genuine spare parts guarantee the same quality, duration, and safety as original parts, as they are the same parts that are assembled during standard production. Only CNH Original Parts or CNH Original Parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and Product Identification Number (PIN)
- Part number of the ordered part, which can be found in the parts catalog

Protecting the electronic and/or electrical systems during charging and welding

To avoid damage to the electronic and/or electrical systems, always observe the following practices:

1. Never make or break any of the charging circuit connections when the engine is running, including the battery connections.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the machine or on any machine attachment.
   - Position the welder ground clamp as close to the welding area as possible.
   - If you weld in close proximity to a computer module, then you should remove the module from the machine.
   - Never allow welding cables to lie on, near, or across any electrical wiring or electronic component while you weld.
4. Always disconnect the negative cable from the battery when charging the battery in the machine with a battery charger.

   NOTICE: *If you must weld on the unit, you must disconnect the battery ground cable from the machine battery. The electronic monitoring system and charging system will be damaged if this is not done.*
5. Remove the battery ground cable. Reconnect the cable when you complete welding.

⚠ WARNING

Battery acid causes burns. Batteries contain sulfuric acid.
Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.
Failure to comply could result in death or serious injury.

W0111A

Special tools

The special tools that CNH suggests and illustrate in this manual have been specifically researched and designed for use with CNH machines. The special tools are essential for reliable repair operations. The special tools are accurately built and rigorously tested to offer efficient and long-lasting operation.

By using these tools, repair personnel will benefit from:

- Operating in optimal technical conditions
- Obtaining the best results
- Saving time and effort
- Working in safe conditions

SERVICE MANUAL

Engine

F3GFE613A*B001
F3GFE613B*B001

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Engine - 10

Engine and crankcase - 001

F3GFE613A*B001
F3GFE613B*B001

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Engine - Technical Data

Engine	Power	RPM @ speed	Torque	RPM @ speed1
F3GFE613A*B001	**365 kW** (**496 Hp**)	**2100 RPM**	**2000 N·m** (**1475 lb ft**)	**1500 RPM**
F3GFE613B*B001	**345 kW** (**469 Hp**)	**2100 RPM**	**2082 N·m** (**1536 lb ft**)	**1500 RPM**

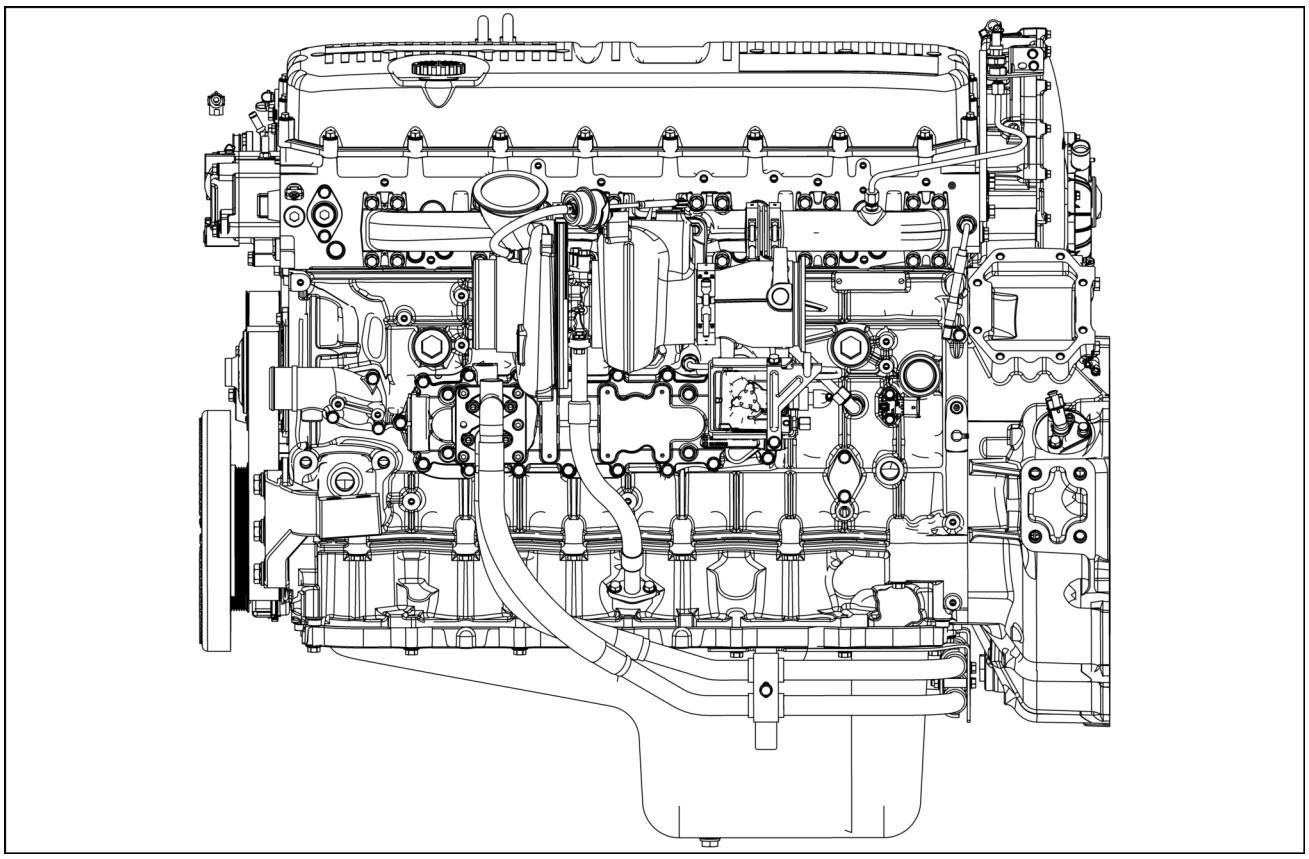
Engine specifications	
Compression ratio	16.5 : 1
Bore	**128 mm** (**5 in**)
Stroke	**144 mm** (**6 in**)
Displacement	**11120 cm³**
Turbocharging	Inter-cooled, Direct injection
Turbocharger type	Honeywell
Lubrication	Forced by gear pump, relief valve single action
Oil pressure (Warm engine) - Idling - Peak RPM	 **3 bar** (**43.5 psi**) **4.5 bar** (**65.3 psi**)
Cooling	Liquid cooled
Water pump control	Belt driven
Thermostat (Start of opening)	**81 °C** (**177.8 °F**)
Intake valve timing - Opens before TDC - Closes after BDC Exhaust valve timing - Opens before BDC - Closes after TDC	 **17 °** **32 °** **50 °** **9 °**
Valve lash setting (when engine is cold) - Intake - Exhaust	 **0.35 - 0.45 mm** (**0.01 - 0.02 in**) **0.55 - 0.65 mm** (**0.02 - 0.03 in**)
Firing order	1 - 4 - 2 - 6 - 3 - 5
Injection pressure	**2000 bar** (**29000 psi**)
Injector calibration	
Cylinder block and piston	
Bores for cylinder liners Cylinder liners external diameter: Cylinder liner protrusion	**128.000 - 128.020 mm** (**5.039 - 5.040 in**) **142.085 - 142.110 mm** (**5.594 - 5.595 in**) **0.080 - 0.140 mm** (**0.003 - 0.006 in**)
Pistons - Measuring dimension - External diameter - Pin bore	 **23 mm** (**1 in**) **127.930 mm** (**5.037 in**) **58.070 mm** (**2.286 in**)
OD of piston - ID of cylinder liner	**0.050 mm** (**0.002 in**)
Piston protrusion	**0.045 - 0.075 mm** (**0.002 - 0.003 in**)
Piston pin diameter	**57.994 - 58.000 mm** (**2.283 - 2.283 in**)
Piston pin OD - pin bore	**0.070 - 0.086 mm** (**0.003 - 0.003 in**)
Piston ring grooves - Top - Middle - Bottom	 **2.460 mm** (**0.097 in**) **2.580 - 2.600 mm** (**0.102 - 0.102 in**) **4.030 - 4.050 mm** (**0.159 - 0.159 in**)
Piston rings - Combustion ring - Intermediate ring - Oil control ring	 **2.296 - 2.340 mm** (**0.090 - 0.092 in**) **2.470 - 2.500 mm** (**0.097 - 0.098 in**) **3.970 - 3.990 mm** (**0.156 - 0.157 in**)
Clearance between piston rings and grooves - Combustion ring - Intermediate ring	 **0.120 - 0.164 mm** (**0.005 - 0.006 in**) **0.080 - 0.130 mm** (**0.003 - 0.005 in**)

- Oil control ring	**0.040 - 0.080 mm** (**0.002 - 0.003 in**)
Piston ring end gap in cylinder liners	
- Combustion ring	**0.30 - 0.40 mm** (**0.01 - 0.02 in**)
- Intermediate ring	**0.65 - 0.80 mm** (**0.026 - 0.031 in**)
- Oil control ring	**0.40 - 0.75 mm** (**0.016 - 0.030 in**)
Connecting rod	
Small end bush housing	
- Nominal	**62 mm** (**2 in**)
Big end bearing housing	
- Nominal	**98.000 - 98.030 mm** (**3.858 - 3.859 in**)
- Class 1	**98.000 - 98.010 mm** (**3.858 - 3.859 in**)
- Class 2	**98.011 - 98.020 mm** (**3.859 - 3.859 in**)
- Class 3	**98.021 - 98.030 mm** (**3.859 - 3.859 in**)
Small end bush diameter	
- Outside	**62.360 - 62.976 mm** (**2.455 - 2.479 in**)
- Inside	**58.060 - 58.076 mm** (**2.286 - 2.286 in**)
Big end bearing shell thickness	
- Red	**2.465 - 2.475 mm** (**0.097 - 0.097 in**)
- Green	**2.475 - 2.485 mm** (**0.097 - 0.098 in**)
- Yellow	**2.485 - 2.495 mm** (**0.098 - 0.098 in**)
Clearance between piston pin and bush	**0.060 - 0.082 mm** (**0.002 - 0.003 in**)
Connecting rod weight	
- Class A	**5000 - 5033 g** (**176 - 178 oz**)
- Class B	**5034 - 5067 g** (**178 - 179 oz**)
- Class C	**5068 - 5100 g** (**179 - 180 oz**)
Maximum connecting rod axis misalignment tolerance	**0.08 mm** (**0.003 in**)
Crankshaft	
Main journals	
- Class 1	**99.970 - 99.977 mm** (**3.936 - 3.936 in**)
- Class 2	**99.978 - 99.985 mm** (**3.936 - 3.936 in**)
- Class 3	**99.986 - 99.993 mm** (**3.936 - 3.937 in**)
- Class 4	**99.994 - 100.000 mm** (**3.937 - 3.937 in**)
Crankpins	
- Class 1	**92.970 - 92.979 mm** (**3.660 - 3.661 in**)
- Class 2	**92.980 - 92.989 mm** (**3.661 - 3.661 in**)
- Class 3	**92.990 - 93.000 mm** (**3.661 - 3.661 in**)
Main bearing shells	
- Red	**3.115 - 3.122 mm** (**0.123 - 0.123 in**)
- Green	**3.123 - 3.130 mm** (**0.123 - 0.123 in**)
- Yellow	**3.131 - 3.138 mm** (**0.123 - 0.124 in**)
Main bearing housings	
- Rated value	**106.300 - 106.330 mm** (**4.185 - 4.186 in**)
- Class 1	**106.300 - 106.307 mm** (**4.185 - 4.185 in**)
- Class 2	**106.308 - 106.315 mm** (**4.185 - 4.186 in**)
- Class 3	**106.316 - 106.323 mm** (**4.186 - 4.186 in**)
Clearance between bearing shells and main journals	**0.020 - 0.140 mm** (**0.001 - 0.006 in**)
Clearance between bearing shells and big ends	**0.060 - 0.100 mm** (**0.002 - 0.004 in**)
Main journal, thrust bearing	**45.95 - 46.00 mm** (**1.81 - 1.81 in**)
Main bearing housing, thrust bearing	**38.94 - 38.99 mm** (**1.53 - 1.54 in**)
Thrust bearing thickness	**3.350 - 3.400 mm** (**0.132 - 0.134 in**)
Crankshaft end play	**0.10 - 0.30 mm** (**0.0039 - 0.0118 in**)
Main journals and crankpins	
- Alignment	Less than or equal to **0.025 mm** (**0.0010 in**)
- Ovalization	**0.012 mm** (**0.00047 in**)

- Taper	**0.011 mm** (**0.00043 in**)
Cylinder head and valve train	
Valve guide housing in cylinder head	**12.980 - 12.997 mm** (**0.511 - 0.512 in**)
Valve guide - Inside diameter - Outside diameter	 **9.015 - 9.030 mm** (**0.355 - 0.356 in**) **15.012 - 15.025 mm** (**0.591 - 0.592 in**)
Valve guides - housings in the cylinder head	**0.015 - 0.045 mm** (**0.0006 - 0.0018 in**)
Intake valves - Valve stem diameter - Valve face angle	 **8.960 - 8.975 mm** (**0.392 - 0.393 in**) **60 °**
Exhaust valves - Valve stem diameter - Valve face angle	 **8.960 - 8.975 mm** (**0.392 - 0.393 in**) **45 °**
Clearance between valve guide and valve stem	**0.040 - 0.070 mm** (**0.0016 - 0.0028 in**)
Valve seat in cylinder head. Intake Exhaust	 **44.185 - 44.220 mm** (**1.740 - 1.741 in**) **42.985 - 43.020 mm** (**1.692 - 1.694 in**)
Outside diameter of valve seat - Intake - Exhaust	 **44.260 - 44.275 mm** (**1.743 - 1.743 in**) **43.060 - 43.075 mm** (**1.695 - 1.696 in**)
Valve seat angle - Intake - Exhaust	 **60 °** **45 °**
Recessing of the valves - Intake - Exhaust	 **0.59 - 0.91 mm** (**0.02 - 0.04 in**) **1.79 - 2.11 mm** (**0.07 - 0.08 in**)
Clearance between valve seat and cylinder head - Intake - Exhaust	 **0.040 - 0.090 mm** (**0.0016 - 0.0035 in**) **0.040 - 0.090 mm** (**0.0016 - 0.0035 in**)
Valve spring height No load **547 - 603 N** (**123.0 - 135.6 lb**) load **1041 - 1149 N** (**234.0 - 258.3 lb**) load	 **80.00 mm** (**3.15 in**) **62 mm** (**2 in**) **48 mm** (**2 in**)
Injector protrusion	**0.53 - 1.34 mm** (**0.021 - 0.053 in**)
Camshaft bushing housing in the cylinder head	**88.000 - 88.030 mm** (**3.465 - 3.466 in**)
Camshaft bearing journals	**82.950 - 82.968 mm** (**3.2657 - 3.2665 in**)
O.D. of the camshaft bushings	**88.153 - 88.183 mm** (**3.4706 - 3.4718 in**)
I.D. of the camshaft bushings	**83.018 - 83.085 mm** (**3.2684 - 3.2711 in**)
Clearance between bushings and housings in the cylinder head	**0.103 - 0.163 mm** (**0.004 - 0.006 in**)
Clearance between bushings and bearing journals	**0.050 - 0.135 mm** (**0.0020 - 0.0053 in**)
Cam lift - Intake lobe - Exhaust lobe Diameter of the rocker shaft	 **9.30 mm** (**0.366 in**) **9.30 mm** (**0.366 in**) **41.984 - 42.000 mm** (**1.6529 - 1.6535 in**)
Rocker arm internal diameter - Intake - Exhaust Bushing outside diameter for rocker arms - Intake - Exhaust Bushing inside diameter for rocker arms - Intake - Exhaust Clearance between bushings and housings - Intake	 **42.045 - 42.061 mm** (**1.655 - 1.656 in**) **59.000 - 59.019 mm** (**2.3228 - 2.3236 in**) Not applicable **59.070 - 59.110 mm** (**2.326 - 2.327 in**) Not applicable **59.000 - 56.049 mm** (**2.323 - 2.2067 in**) Not applicable

- Exhaust	**0.051 - 0.110 mm** (**0.002 - 0.004 in**)
Clearance between rocker arm and shaft	
- Intake	**0.045 - 0.077 mm** (**0.002 - 0.003 in**)
- Exhaust	Not applicable

Engine - Overview



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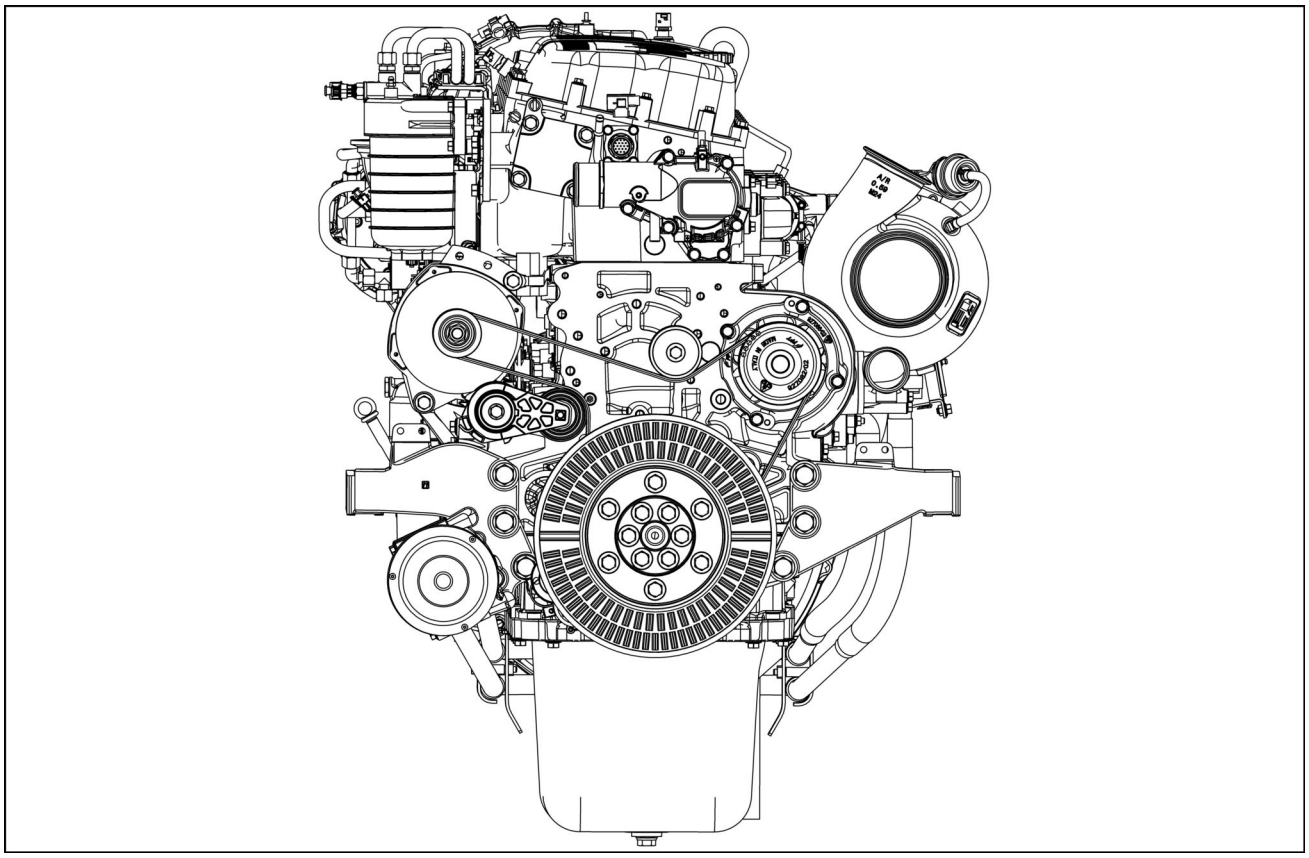
Left-hand view



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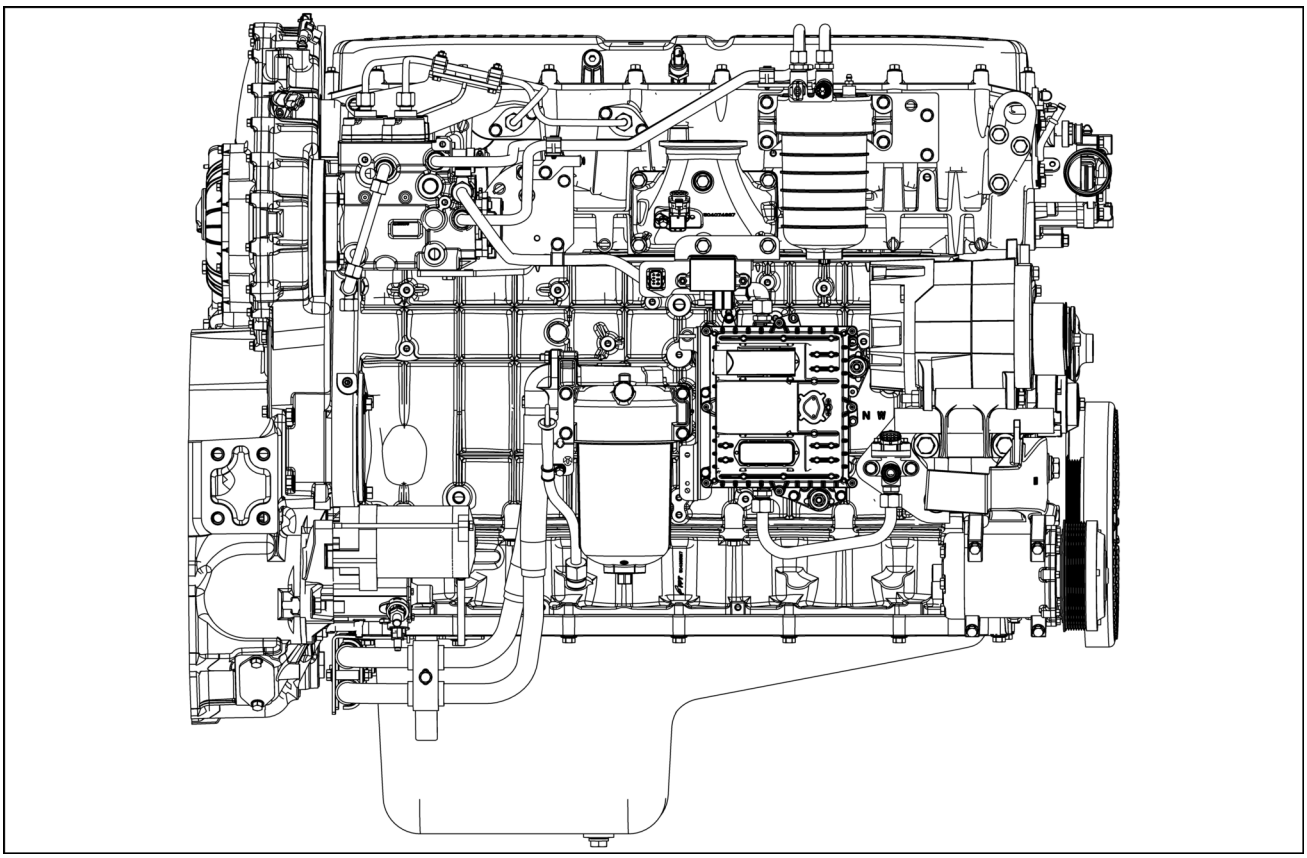
Front view



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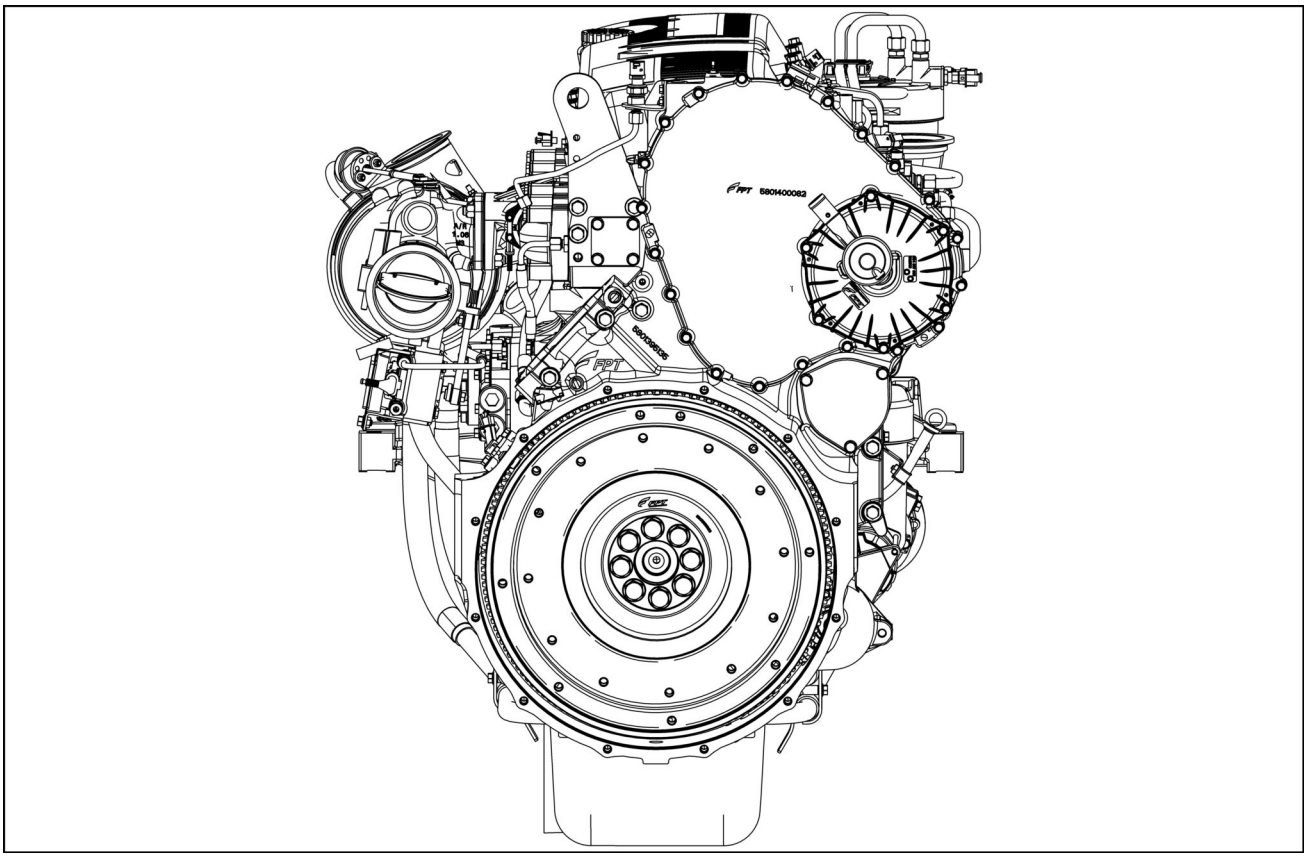
Right-hand view



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Rear view

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