SERVICE MANUAL

Cursor® 9
Tier 4A (interim) and Stage IIIB
Engine

See the following page for engine model numbers

Part number 48076828
1st edition English
November 2016
Replaces part numbers 84394558, 84394568, 84394551, 84394547

CNH INDUSTRIAL

SERVICE MANUAL

F2CFE613A*A, F2CFE613C*A, F2CFE613E*A, F2CFE613F*A, F2CFE613H*A, F2CFE613J*A, F2CFE613L*A026, F2CFE613L*A, F2CFE613N*A, F2CFE613P*A, F2CFE613R*A, F2CFE614A*A, F2CFE614B*A, F2CFE614C*A, F2CFE614D*A, F2CFE614E*A

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INTRODUCTION

Foreword

Soil, air, and water quality is important for all industries and life in general. When legislation does not yet rule the treatment of some of the substances that advanced technology requires, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

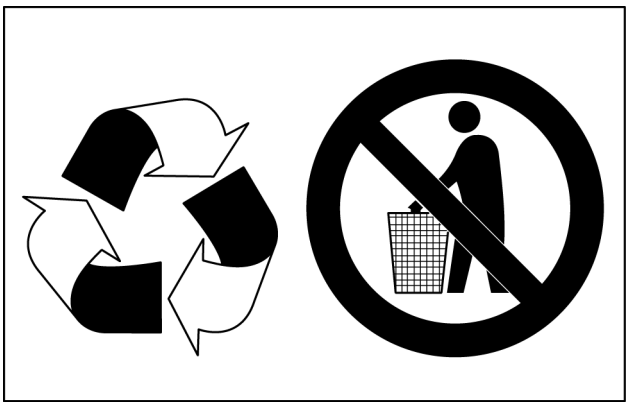
Familiarize yourself with the relative legislation applicable to your country, and make sure that you understand this legislation. Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti-freeze, cleaning agents, etc., with regard to the effect of these substances on man and nature and how to safely store, use, and dispose of these substances. Your CNH dealer can also provide assistance.

Helpful hints

- Avoid the use of cans or other inappropriate pressurized fuel delivery systems to fill tanks. Such delivery systems may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of these products 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 you drain fluids such as used engine coolant mixtures, engine oil, hydraulic fluid, brake fluid, etc. Do not mix drained brake fluids or fuels with lubricants. Store all drained fluids safely until you can dispose of the fluids in a proper way that complies with all 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 can recharge the system properly.
- Repair any leaks or defects in the engine cooling system or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.

Battery recycling

Batteries and electric accumulators contain several substances that can have a harmful effect on the environment if the batteries are not properly recycled after use. Improper disposal of batteries can contaminate the soil, groundwater, and waterways. CNH strongly recommends that you return all used batteries to a CNH dealer, who will dispose of the used batteries or recycle the used batteries properly. In some countries, this is a legal requirement.



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Mandatory battery recycling

NOTE: *The following requirements are mandatory in Brazil.*

Batteries are made of lead plates and a sulfuric acid solution. Because batteries contain heavy metals such as lead, CONAMA Resolution 401/2008 requires you to return all used batteries to the battery dealer when you replace any batteries. Do not dispose of batteries in your household garbage.

Points of sale are obliged to:

- Accept the return of your used batteries

- Store the returned batteries in a suitable location
- Send the returned batteries to the battery manufacturer for recycling

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 and on machine decals, 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 which, if not avoided, will result in death or serious injury. The color associated with DANGER is RED.

⚠ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with WARNING is ORANGE.

⚠ CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with CAUTION is YELLOW.

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

Machine safety

NOTICE: *Notice indicates a situation which, if not avoided, could result in machine or property damage. The color associated with Notice is BLUE.*

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 which 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.

Basic instructions - 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 information in this manual is up-to-date at the date of the publication. It is the policy of the manufacturer for continuous improvement. Some information could not be updated due to modifications of a technical or commercial type, or changes to the laws and regulations of different countries.

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

Basic instructions - Shop and Assembly

SHIMMING

For each adjustment operation, select adjusting shims and measure 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 indicated on each shim.

ROTATING SHAFT SEALS

For correct rotating shaft seal installation, proceed as follows:

- before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
- thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
- position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal.
- coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease.
- 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.
- whilst inserting the seal, check that it is perpendicular to the seat; once settled, make sure that it makes contact with the thrust element, if required.
- to prevent damaging the seal lip on the shaft, position a protective guard during installation operations.

O-RING SEALS

Lubricate the O-RING seals before inserting them in the seats, this will prevent them from overturning and twisting, which would jeopardise sealing efficiency.

SEALING COMPOUNDS

Apply one of the following sealing compounds on the mating surfaces when specified: SILMATE® RTV1473, or **LOCTITE RTV 598** or **LOCTITE® INSTANT GASKET 587 BLUE**. Before applying the sealing compound, prepare the surfaces as directed on product container or as follows:

- remove any incrustations using a metal brush.
- thoroughly de-grease the surfaces using a locally approved cleaning agent such as safety solvent or brake parts cleaner.

SPARE PARTS

Only use "CNH Original Parts" or " CNH 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 Parts" can offer this guarantee.
When ordering spare parts, always provide the following information:

- machine model (commercial name) and serial number
- part number of the ordered part, which can be found in the "Microfiches" or the "Service Parts Catalogue", used for order processing

PROTECTING THE ELECTRONIC/ ELECTRICAL SYSTEMS DURING CHARGING OR WELDING

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

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the combine or on any header attached to the combine.
   - position the welder ground clamp as close to the welding area as possible
   - if welding in close proximity to a computer module, then the module should be removed from the combine
   - never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress
4. Always disconnect the negative cable from the battery when charging the battery in the combine with a battery charger.

NOTICE: *If welding must be performed on the unit, either the combine or the header (if it is attached), the battery ground cable must be disconnected from the combine battery. The electronic monitoring system and charging system will be damaged if this is not done.*

Remove the battery ground cable. Reconnect the cable when welding is completed.

⚠ WARNING ⚠

Battery acid causes severe burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote - EXTERNAL: flush with water. INTERNAL: drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetables oil. Call physician immediately. EYES: flush with water for 15 minutes and get prompt medical attention.

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TOOLS

The tools that CNH suggests and illustrate in this manual have been:

- specifically researched and designed for use with CNH machines
- essential for reliable repair operations
- accurately built and rigorously tested so as 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

NOTE: *The terms "front", "rear", "right-hand" and "left-hand" (when referred to different parts) are determined from the rear, facing in the direction of travel of the machine during operation.*

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)

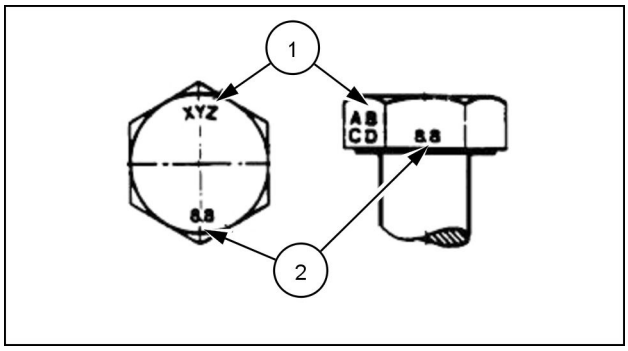
NOTE: *M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.*

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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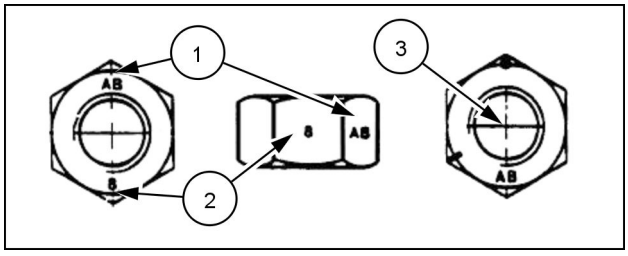
1. Manufacturer's Identification
2. Property Class

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)**

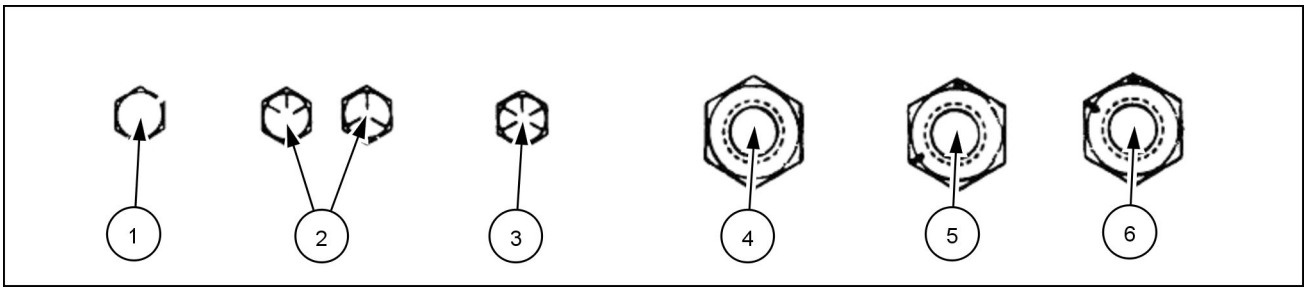
NOTE: *For Imperial Units,* ***1/4 in*** *and* ***5/16 in*** *hardware torque specifications are shown in pound-inches.* ***3/8 in*** *through* ***1 in*** *hardware torque specifications are shown in pound-feet.*

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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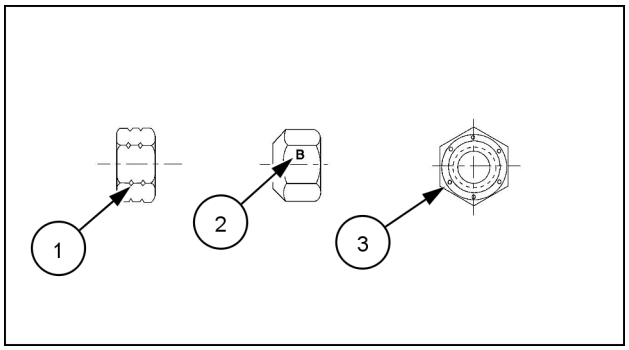
Grade Marking Examples

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

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Engine and crankcase - 001

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Engine and crankcase - 001

Engine - Service limits

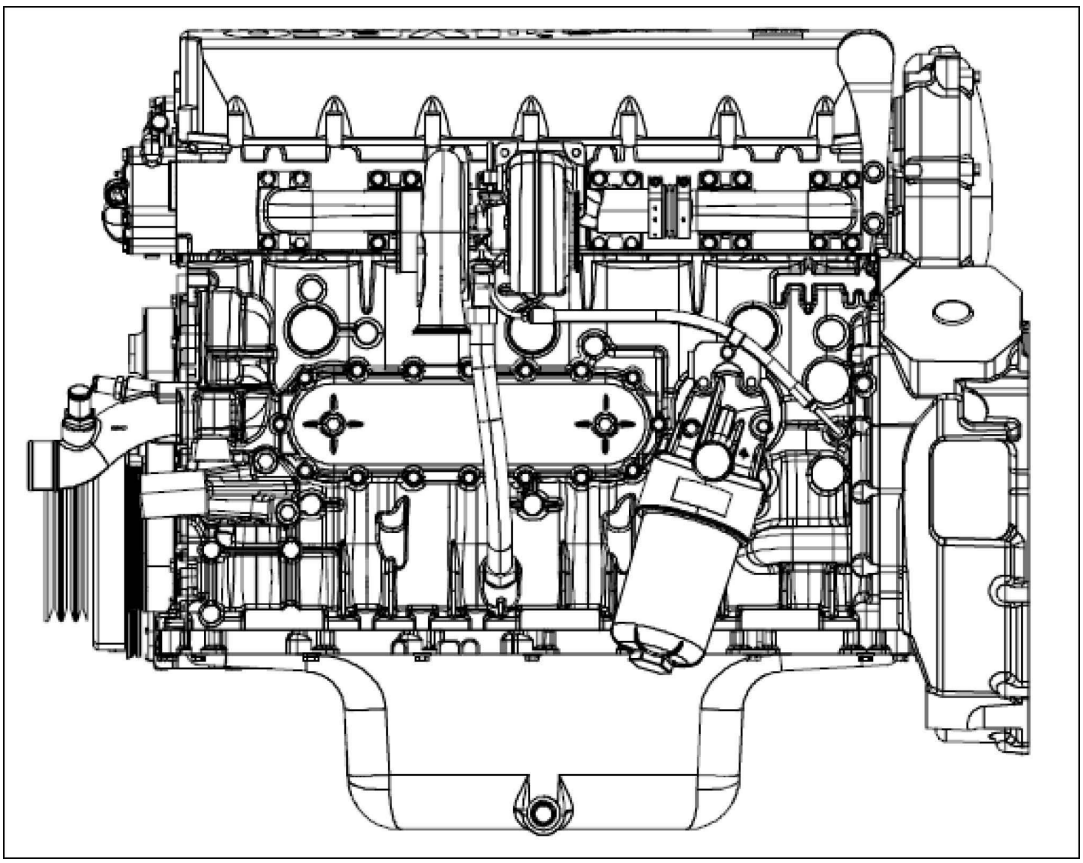
Engine specifications	
Compression ratio	15.9:1
Bore	**117 mm** (**4.6 in**)
Stroke	**135 mm** (**5.3 in**)
Cylinder spacing	**138 mm** (**5.4 in**)
Displacement	**8710 cm³**
Turbocharging	Inter-cooled, Direct injection
Lubrication	Forced by gear pump, relief valve single action oil filter
Oil pressure (Warm engine) - Idling - Peak RPM	 **4 bar** (**58 psi**) **5 bar** (**73 psi**)
Cooling	Liquid cooled
Water pump control	Belt driven
Thermostat (Start of opening)	**83.5 - 86.5 °C** (**182.3 - 187.7 °F**)
Intake valve timing - Opens before TDC - Closes after BDC Exhaust valve timing - Opens before BDC - Closes after TDC	 **17 °** **31 °** **48 °** **9 °**
Valve lash setting (when engine is cold) - Intake - Exhaust (with brake and/or camshaft 504326209) - Exhaust (without brake)	 **0.4 mm** (**0.016 in**) **0.4 mm** (**0.016 in**) **0.6 mm** (**0.024 in**)
Firing Order	1 - 4 - 2 - 6 - 3 - 5
Injection pressure	**1800 bar** (**26100 psi**)
Injector calibration	**290 - 302 bar** (**4205 - 4379 psi**)
Cylinder block and piston	
Cylinder liner bore - Upper - Lower	 **130.500 - 130.525 mm** (**5.138 - 5.139 in**) **129.510 - 129.535 mm** (**5.099 - 5.100 in**)
Cylinder liner external diameter - Upper - Lower	 **130.461 - 130.486 mm** (**5.136 - 5.137 in**) **129.475 - 129.500 mm** (**5.097 - 5.098 in**)
Clearance between the OD of liners and ID of bores - Upper - Lower	 **0.014 - 0.064 mm** (**0.001 - 0.003 in**) **0.010 - 0.060 mm** (**0.0004 - 0.0024 in**)
Cylinder liner - ID A* - ID B* * Selection class - Protrusion	 **117.000 - 117.012 mm** (**4.606 - 4.607 in**) **117.010 - 117.022 mm** (**4.607 - 4.607 in**) **0.035 - 0.065 mm** (**0.001 - 0.003 in**)
Pistons - Measuring dimension - External diameter (supplied as spares) - External diameter (production only) - Pin bore	 **15 mm** (**0.591 in**) **116.894 - 116.906 mm** (**4.602 - 4.603 in**) **116.904 - 116.916 mm** (**4.603 - 4.603 in**) **52.016 - 52.022 mm** (**2.048 - 2.048 in**)
OD of piston - ID of cylinder liner	**0.094 - 0.118 mm** (**0.004 - 0.005 in**)
Piston protrusion	**0.873 - 1.117 mm** (**0.034 - 0.044 in**)
Piston pin diameter	**51.994 - 52.000 mm** (**2.047 - 2.047 in**)

Piston pin OD - pin bore	**0.016 - 0.028 mm** (**0.0006 - 0.0011 in**)
Piston ring grooves	
- Top	**2.582 - 2.716 mm** (**0.102 - 0.107 in**)
- Middle	**2.550 - 2.570 mm** (**0.100 - 0.101 in**)
- Bottom	**4.02 - 4.04 mm** (**0.158 - 0.159 in**)
Piston rings	
- Combustion ring	**2.429 - 2.473 mm** (**0.096 - 0.097 in**)
- Intermediate ring	**2.470 - 2.500 mm** (**0.097 - 0.098 in**)
- Oil control ring	**3.970 - 3.990 mm** (**0.156 - 0.157 in**)
Clearance between piston rings and grooves	
- Combustion ring	**0.109 - 0.287 mm** (**0.004 - 0.011 in**)
- Intermediate ring	**0.050 - 0.100 mm** (**0.002 - 0.004 in**)
- Oil control ring	**0.030 - 0.070 mm** (**0.001 - 0.003 in**)
Piston ring end gap in cylinder liners	
- Combustion ring	**0.3 - 0.4 mm** (**0.012 - 0.016 in**)
- Intermediate ring	**0.60 - 0.75 mm** (**0.024 - 0.030 in**)
- Oil control ring	**0.35 - 0.65 mm** (**0.014 - 0.026 in**)
Connecting rod	
Small end bush housing	
- Nominal	**55.700 - 55.730 mm** (**2.193 - 2.194 in**)
Big end bearing housing	
- Nominal	**85.987 - 86.013 mm** (**3.385 - 3.386 in**)
- Class 1	**85.987 - 85.996 mm** (**3.385 - 3.386 in**)
- Class 2	**85.997 - 86.005 mm** (**3.386 - 3.386 in**)
- Class 3	**86.006 - 86.013 mm** (**3.386 - 3.386 in**)
Small end bushing diameter	
- Outside	**55.780 - 55.820 mm** (**2.196 - 2.198 in**)
- Inside	**52.015 - 52.030 mm** (**2.048 - 2.048 in**)
Big end bearing shell thickness	
- Red	**1.994 - 2.002 mm** (**0.079 - 0.079 in**)
- Green	**2.002 - 2.010 mm** (**0.079 - 0.079 in**)
- Yellow	**2.010 - 2.018 mm** (**0.079 - 0.079 in**)
Clearance between small end bush and housing	**0.05 - 0.12 mm** (**0.002 - 0.005 in**)
Clearance between piston pin and bushing	**0.015 - 0.036 mm** (**0.001 - 0.001 in**)
Connecting rod weight	
- Class A	**3308 - 3338 g** (**116.7 - 117.7 oz**)
- Class B	**3339 - 3368 g** (**117.8 - 118.8 oz**)
- Class C	**3369 - 3398 g** (**118.8 - 119.9 oz**)
Maximum connecting rod axis misalignment tolerance	**0.08 mm** (**0.003 in**)
Crankshaft	
Main journals	
- Rated value	**92.970 - 93.000 mm** (**3.6602 - 3.6614 in**)
- Class 1	**92.970 - 92.979 mm** (**3.6602 - 3.6606 in**)
- Class 2	**92.980 - 92.989 mm** (**3.6606 - 3.6610 in**)
- Class 3	**92.990 - 93.000 mm** (**3.6610 - 3.6614 in**)
Crankpins	
- Rated value	**81.915 - 81.945 mm** (**3.225 - 3.226 in**)
- Class 1	**81.915 - 81.924 mm** (**3.225 - 3.225 in**)
- Class 2	**81.925 - 81.934 mm** (**3.225 - 3.226 in**)
- Class 3	**81.935 - 81.945 mm** (**3.226 - 3.226 in**)
Main bearing shells	
- Red	**2.968 - 2.978 mm** (**0.117 - 0.117 in**)
- Green	**2.978 - 2.988 mm** (**0.117 - 0.118 in**)
- Yellow	**2.988 - 2.998 mm** (**0.118 - 0.118 in**)

Big end bearing shells	
- Red	**1.994 - 2.002 mm** (**0.079 - 0.079 in**)
- Green	**2.002 - 2.010 mm** (**0.079 - 0.079 in**)
- Yellow	**2.010 - 2.018 mm** (**0.079 - 0.079 in**)
Main bearing housings	
- Rated value	**99.000 - 99.030 mm** (**3.8976 - 3.8988 in**)
- Class 1	**99.000 - 99.009 mm** (**3.8976 - 3.8980 in**)
- Class 2	**99.010 - 99.019 mm** (**3.8980 - 3.8984 in**)
- Class 3	**99.020 - 99.030 mm** (**3.8984 - 3.8988 in**)
Clearance between bearing shells and main journals	**0.050 - 0.090 mm** (**0.0020 - 0.0035 in**)
Clearance between bearing shells and big ends	**0.040 - 0.080 mm** (**0.0016 - 0.0031 in**)
Main journal, thrust bearing	**32.94 - 32.99 mm** (**1.297 - 1.299 in**)
Main bearing housing, thrust bearing	**38.94 - 38.99 mm** (**1.533 - 1.535 in**)
Thrust bearing thickness	**3.38 - 3.43 mm** (**0.133 - 0.135 in**)
Crankshaft end play	**0.09 - 0.34 mm** (**0.004 - 0.013 in**)
Main journals and Crankpins	
- Alignment	-
- Ovalization	**0.04 mm** (**0.002 in**)
- Taper	-
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	**8.023 - 8.038 mm** (**0.316 - 0.316 in**)
- Outside diameter	**13.012 - 13.025 mm** (**0.512 - 0.513 in**)
Valve guides - housings in the cylinder head	**0.015 - 0.045 mm** (**0.0006 - 0.0018 in**)
Intake valves	
- Valve stem diameter	**7.970 - 7.985 mm** (**0.314 - 0.314 in**)
- Valve face angle	**60 °**
Exhaust valves	
- Valve stem diameter	**7.970 - 7.985 mm** (**0.314 - 0.314 in**)
- Valve face angle	**45 °**
Clearance between valve guide and valve stem	**0.040 - 0.070 mm** (**0.0016 - 0.0028 in**)
Valve seat in cylinder head	
- Intake	**41.985 - 42.020 mm** (**1.653 - 1.654 in**)
- Exhaust	**40.985 - 41.020 mm** (**1.614 - 1.615 in**)
Outside diameter of valve seat	
- Intake	**42.060 - 42.075 mm** (**1.656 - 1.656 in**)
- Exhaust	**42.060 - 42.075 mm** (**1.656 - 1.656 in**)
Valve seat angle	
- Intake	**60 °**
- Exhaust	**45 °**
Recessing of the valves	
- Intake	**0.5 - 0.8 mm** (**0.020 - 0.031 in**)
- Exhaust	**1.6 - 1.9 mm** (**0.063 - 0.075 in**)
Clearance between valve seat and cylinder head	
- Intake	**0.040 - 0.090 mm** (**0.0016 - 0.0035 in**)
- Exhaust	**0.040 - 0.090 mm** (**0.0016 - 0.0035 in**)
Valve spring height at	
No load	**70.77 mm** (**2.786 in**)
437 - 483 N (**98 - 109 lb**) load	**51.00 mm** (**2.008 in**)
707 - 773 N (**159 - 174 lb**) load	**39.00 mm** (**1.535 in**)
Injector protrusion	**1.2 - 1.5 mm** (**0.047 - 0.059 in**)
Camshaft bushing housing in the cylinder head	**69.000 - 69.030 mm** (**2.717 - 2.718 in**)

Camshaft bearing journals	**64.924 - 64.940 mm** (**2.556 - 2.557 in**)
O.D. of the camshaft bushings	**69.090 - 69.130 mm** (**2.720 - 2.722 in**)
I.D. of the camshaft bushings	**65.080 - 65.116 mm** (**2.562 - 2.564 in**)
Clearance between bushings and housings in the cylinder head	**0.060 - 0.115 mm** (**0.002 - 0.005 in**)
Clearance between bushings and bearing journals	**0.050 - 0.122 mm** (**0.002 - 0.005 in**)
Cam lift - Intake lobe - Exhaust lobe	 **7.4034 mm** (**0.2915 in**) **8.2108 mm** (**0.3233 in**)
Diameter of the rocker shaft	**31.964 - 31.980 mm** (**1.258 - 1.259 in**)
Bushing housing in the rocker arms - Intake - Exhaust	 **32.025 - 32.041 mm** (**1.261 - 1.261 in**) **32.025 - 32.041 mm** (**1.261 - 1.261 in**)
Clearance between bushings and housings - Intake - Exhaust - Injector	 **0.074 - 0.130 mm** (**0.0029 - 0.0051 in**) **0.081 - 0.140 mm** (**0.0032 - 0.0055 in**) **0.050 - 0.091 mm** (**0.0020 - 0.0036 in**)
Clearance between bushings of rocker arms and shaft - Intake - Exhaust	 **0.045 - 0.077 mm** (**0.002 - 0.003 in**) **0.045 - 0.077 mm** (**0.002 - 0.003 in**)

Engine - Detailed view



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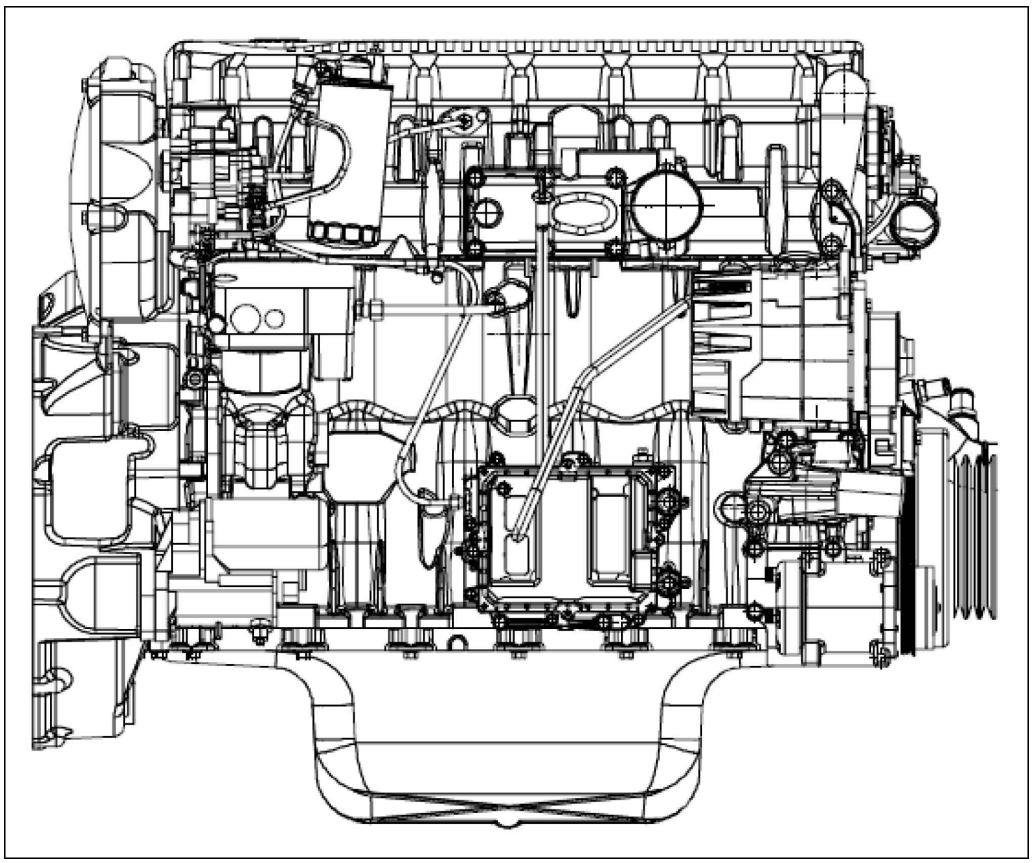
Left-hand side view



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Right-hand side view