

WSM

WORKSHOP MANUAL **GASOLINE, LPG, NATURAL GAS ENGINE**

**WG3800-E3,
WG3800-E3C**

Kubota

KiSC issued 05, 2019 A

TO THE READER

This Workshop Manual tells the servicing personnel about the mechanism, servicing and maintenance of the WG3800-E3(C). It contains 4 parts: "**Information**", "**General**", "**Mechanism**" and "**Servicing**".

■ **Information**

This section contains information below.

- Safety First
- Specification
- Important Items of Exhaust Emission Regulation
- Performance Curve
- Dimension
- Wiring Diagram

■ **General**

This section contains information below.

- Engine Identification
- General Precautions
- Maintenance Check List
- Check and Maintenance
- Special Tools

■ **Mechanism**

This section contains information on the structure and the function of the unit. Before you continue with the subsequent sections, make sure that you read this section.

■ **Servicing**

This section contains information below.

- Troubleshooting
- Servicing Specifications
- Tightening Torques
- Checking, Disassembling and Servicing

All illustrations, photographs and specifications contained in this manual are of the newest information available at the time of publication.

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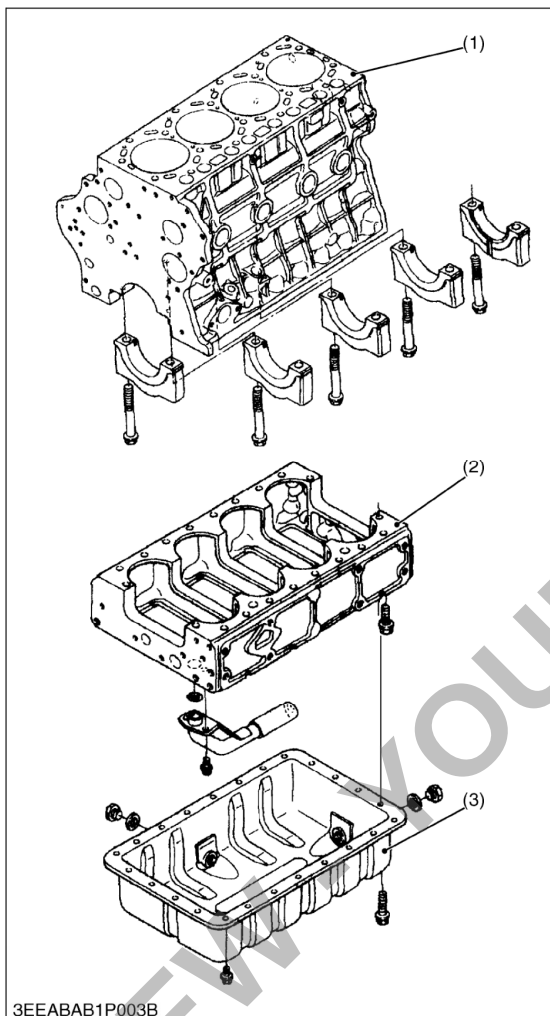
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1. ENGINE BODY

[1] CYLINDER BLOCK



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The engine utilizes a split crankcase to produce greater durability and operate more quietly; the crankcase is split into two parts, crankcase 1 (1), which houses the parts for combustion and crankcase 2 (2), which completes crankcase 1 and produces low-noise.

It uses a hanger type of crankshaft support which allows for easy dis/assembly and the lining of the cylinder is a linerless type, which offers good cooling performance and excellent resistance to wear as it is little affected by distortion.

- (1) Crankcase 1 (3) Oil Pan
(2) Crankcase 2

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[2] PCV VALVE



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The PCV valve consists of a spring and a valve, and it is installed in the head cover.

The PCV valve controls the inhalation volume of blow-by gas and the volume of fresh air according to the engine operation status.

- (1) PCV Valve

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[2] TIGHTENING TORQUES OF SCREWS, BOLTS AND NUTS FOR SPECIAL USE

■ NOTE

- For the screws, bolts and nuts with the mark "***", apply engine oil to their threads and seats before you tighten.
- The alphabet "M" in Dimension × Pitch shows that the screw, bolt or nut dimensions are in the metric system. The dimension is the nominal external diameter in mm of the threads. The pitch is the nominal distance in mm between 2 threads.

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Cylinder head screw	M12 × 1.25	98.1 to 107	10.0 to 11.0	72.4 to 79.5
*Connecting rod screw	M10 × 1.25	79 to 83	8.0 to 8.5	58 to 61
*Flywheel screw	M12 × 1.25	98.10 to 107.9	10.01 to 11.00	72.36 to 79.58
*Fan drive pulley mounting screw	M16 × 1.5	255 to 274	26.0 to 28.0	188 to 202
*Main bearing case screw 1	M14 × 1.5	138 to 147	14.0 to 15.0	102 to 108
*Cylinder head cover screw	M6 × 1.0	6.86 to 11.3	0.700 to 1.15	5.06 to 8.33
Bearing case cover mounting screw	M8 × 1.0	23.5 to 27.5	2.40 to 2.80	17.4 to 20.2
*Rocker arm bracket screw	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
*Idle gear shaft mounting screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Drain plug	M22 × 1.5	45 to 53	4.5 to 5.5	33 to 39
Oil cooler joint screw	M20 × 1.5	39 to 45	4.0 to 4.5	29 to 33
Exhaust manifold mounting nut	M8 × 1.25	30 to 34	3.0 to 3.5	22 to 25
Oil pump cover screw	M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8
PCV Valve	M16 × 1.5	9.81 to 11.2	1.00 to 1.15	7.24 to 8.33
Spark plug	M14 × 1.25	24.5 to 29.4	2.50 to 3.00	18.1 to 21.6
Ignition coil mounting screw	M6 × 1.0	9.81 to 11.7	1.00 to 1.20	7.24 to 8.67
Coolant temperature sensor	M12 × 1.5	16.7 to 19.6	1.7 to 2.0	12.4 to 14.4
Crankshaft position sensor mounting screw	M6 × 1.0	9.81 to 11.3	1.00 to 1.15	7.24 to 8.33
Camshaft position sensor mounting screw	M6 × 1.0	9.81 to 11.3	1.00 to 1.15	7.24 to 8.33
TMAP sensor mounting screw	M5 × 0.8	2.8 to 4.0	0.29 to 0.40	2.1 to 2.9
Knock sensor mounting screw	M6 × 1.0	15.0 to 25.0	1.53 to 2.54	11.1 to 18.4
Electronic Throttle Body mounting screw	M6 × 1.0	7.0 to 9.0	0.72 to 0.91	5.2 to 6.6
DEPR mounting screw	M5 × 0.8	2.8 to 4.0	0.29 to 0.41	0.63 to 0.89
Mixer assembly mounting screw	M6 × 1.0	7.0 to 9.0	0.72 to 0.91	5.2 to 6.6
ECU component mounting screw	M6 × 1.0	9.81 to 11.7	1.00 to 1.20	7.24 to 8.67
Starter B terminal nut	M8 × 1.25	9.8 to 12	1.0 to 1.2	7.2 to 8.8
Alternator's pulley nut	—	58.4 to 78.9	5.96 to 8.04	43.1 to 58.1
ECU stay	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Exhaust manifold cover mounting screw	M6 × 1.0	13.8 to 15.3	1.41 to 1.56	10.2 to 11.2
Flywheel housing mounting screw	M12 × 1.25	103 to 117	10.5 to 12.0	76.0 to 86.7
Crankcase 2 mounting screw	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Relief valve retaining screw	M22 × 1.5	69 to 78	7.1 to 7.9	51 to 57

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

1. Operate the engine for warming-up.
2. Stop the engine.
3. Disconnect DEPR connector or injector connectors, fuse box and all ignition coil connectors.
4. Remove the air cleaner, the muffler and all spark plugs.
5. Set a compression tester with the adaptor to the spark plug hole.
6. Crank the engine with the starter for 5 to 10 seconds keeping throttle valve fully open and measure the maximum compression pressure.
7. Do the steps 5 through 6 again for each cylinder.
8. If the measurement is below the allowable limit, examine the cylinder wall and piston rings.

■ NOTE

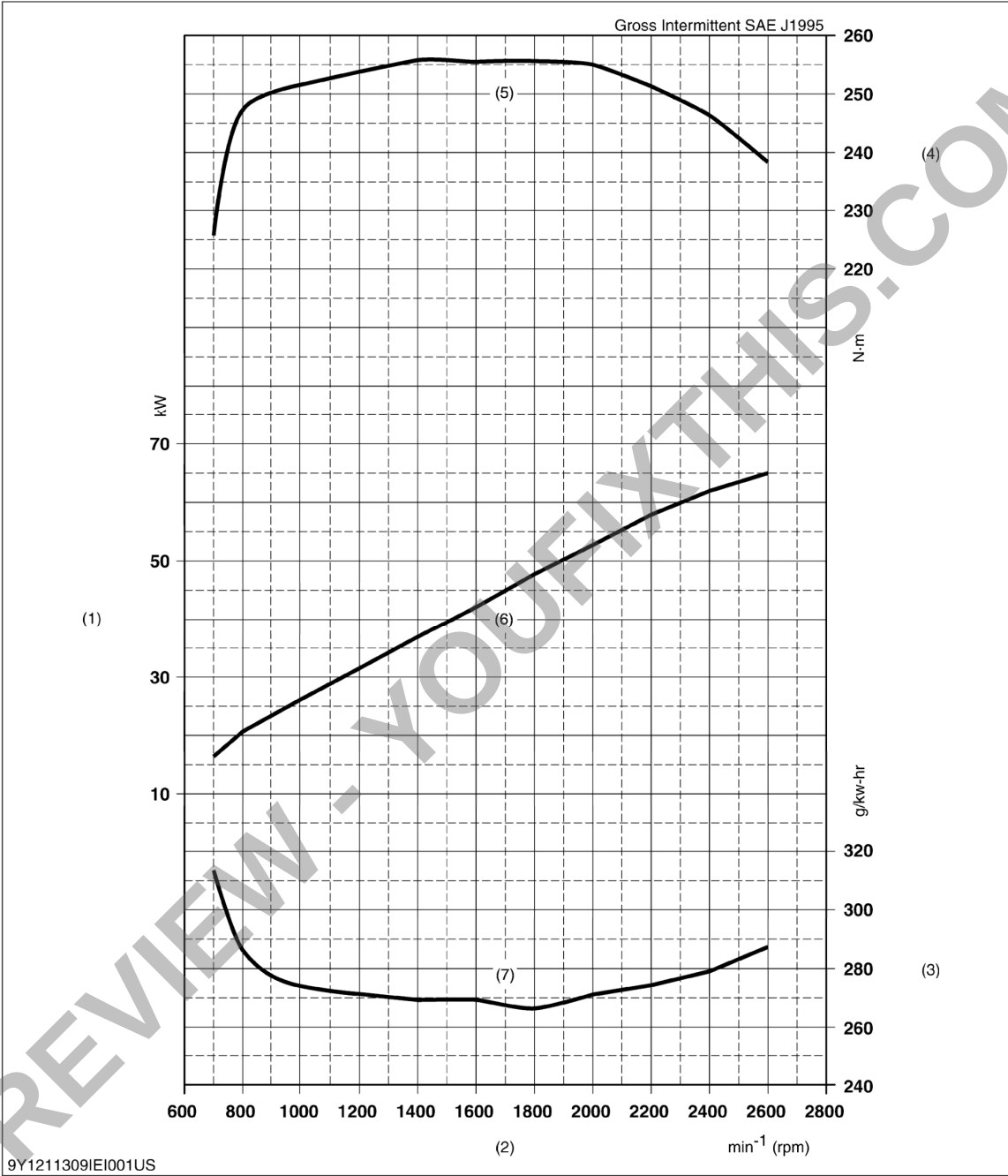
- Examine the compression pressure with the specified valve clearance.
- Always use a fully charged battery for you do this test.
- Variances in cylinder compression values must be less than 10 %.

Compression pressure	Factory specification	1.75 MPa 17.8 kgf/cm ² 253 psi
	Allowable limit	1.40 MPa 14.3 kgf/cm ² 203 psi

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4. PERFORMANCE CURVES

WG3800-G-E3(C), WG3800-GL-E3 (gasoline)



- | | | | |
|----------------------|-------------------------------|---|--|
| (1) Brake Horsepower | (3) Specific Fuel Consumption | (5) Gross Intermittent Torque | (7) Gross Intermittent Specific Fuel Consumption |
| (2) Engine Speed | (4) Torque | (6) Gross Intermittent Brake Horsepower | |

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)		0.18 to 0.22 mm 0.0071 to 0.0086 in.	—
Compression Pressure	—	1.75 MPa 17.8 kgf/cm ² 253 psi	1.40 MPa 14.3 kgf/cm ² 203 psi
	Variance Among Cylinder	—	10 % or less
Top Clearance		1.43 to 1.65 mm 0.0563 to 0.0649 in.	—
Cylinder Head Surface	Flatness	—	0.05 mm 0.002 in.
Valve Recessing (Intake and Exhaust)		−0.050 to 0.25 mm −0.0020 to 0.0098 in.	0.40 mm 0.016 in.
Valve Stem to Valve Guide	Clearance	0.040 to 0.070 mm 0.0016 to 0.0027 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D.	7.960 to 7.975 mm 0.3134 to 0.3139 in.	—
• Valve Guide	I.D.	8.015 to 8.030 mm 0.3156 to 0.3161 in.	—
Valve Face	Angle (Intake)	1.0 rad 60°	—
	Angle (Exhaust)	1.0 rad 60°	—
Valve Seat	Angle (Intake)	1.0 rad 60°	—
	Angle (Exhaust)	1.0 rad 60°	—
	Width (Intake)	2.15 mm 0.0846 in.	—
	Width (Exhaust)	2.50 mm 0.0984 in.	—
Valve Timing (Intake Valve)	Open	0.24 rad 14° before T.D.C.	—
	Close	0.63 rad 36° after B.D.C.	—
Valve Timing (Exhaust Valve)	Open	0.70 rad 40° before B.D.C.	—
	Close	0.21 rad 12° after T.D.C.	—

3. MAINTENANCE CHECK LIST

To make sure that the engine operates safely for a long time, refer to the table below to do regular inspections.
(The schedule applies to an engine in use under normal conditions.)

Item	Service Interval										
	Every 8 hrs (Daily)	Every 50 hrs (Weekly)	Every 100 hrs	Every 200 hrs	Every 400 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 2000 hrs	Every 1 year	Every 2 years
Check of engine oil level	☆										
Check of Coolant Level and Replenishment	☆										
Check of air cleaner element	if necessary										
Cleaning of air cleaner element	if necessary		☆								
Check of LPG / Natural gas tank setting condition	if necessary										
Check of LPG / Natural gas fuel connector	☆										
Change of engine oil		★			☆						
Replacement of oil filter cartridge		★			☆						
Check of gasoline fuel hose and clamp bands		☆									
Check of LPG / Natural gas fuel hose and clamp bands		☆									
Cleaning of spark plug			☆								
Check of fuel filter			☆								
Check of fan belt tension and damage			☆								
Replacement of fuel filter			if necessary							☆	
Check of LPG / Natural gas tank setting condition				☆						Natural gas only	
Check of radiator hoses and clamp bands				☆							
Replacement of fan belt						☆					
Check of PCV valve							☆				
Check of coolant hose of LPG / Natural gas vaporizer							☆				
Check of LPG Lock off valve							☆				
Check of valve clearance							☆				
Replacement of oil separator element								☆			
Replacement of spark plug									☆		
* Replacement of air cleaner element										☆	
Replacement of gasoline fuel hose, clampbands and fuel filter										☆	
Cleaning of fuel tank inside (for gasoline fuel)										☆	
Replacement of intake pipe clamp bands										☆	
Cleaning of water jacket and radiator interior										☆	
Replacement of oil separator rubber hose											☆
Replacement of intake air line											☆
Replacement of breather hose											☆
Replacement of LPG / Natural gas fuel hose and clamp bands											☆
Replacement of coolant hose of LPG / Natural gas vaporizer											☆
** Check of LPG / Natural gas vaporizer											☆

1. SAFETY FIRST

SAFETY FIRST

- This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.
- It is essential that you read the instructions and safety regulations before you try to repair or use this unit.

DANGER

- Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

- Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

- Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

■ IMPORTANT

- Indicates that equipment or property damage could result if instructions are not followed.

■ NOTE

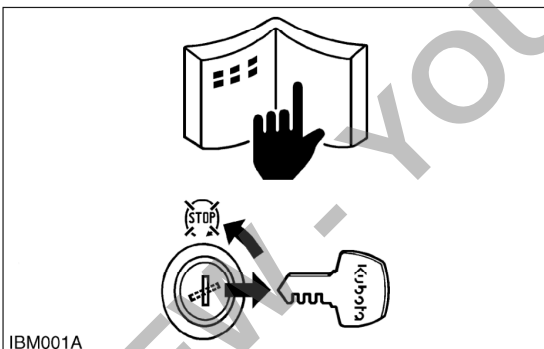
- Gives helpful information.

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BEFORE YOU START SERVICE

- Read all instructions and safety instructions in this manual and on your engine safety decals.
- Clean the work area and engine.
- Park the machine on a stable and level ground.
- Let the temperature of the engine decrease before you start a job.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a "DO NOT OPERATE" tag in the operator station.

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START SAFELY

- Do not do the procedures below when you start the engine.
 - short across starter terminals
 - bypass the safety start switch
- Do not make unauthorized modifications to the engine. This can cause damage and decrease the engine life.

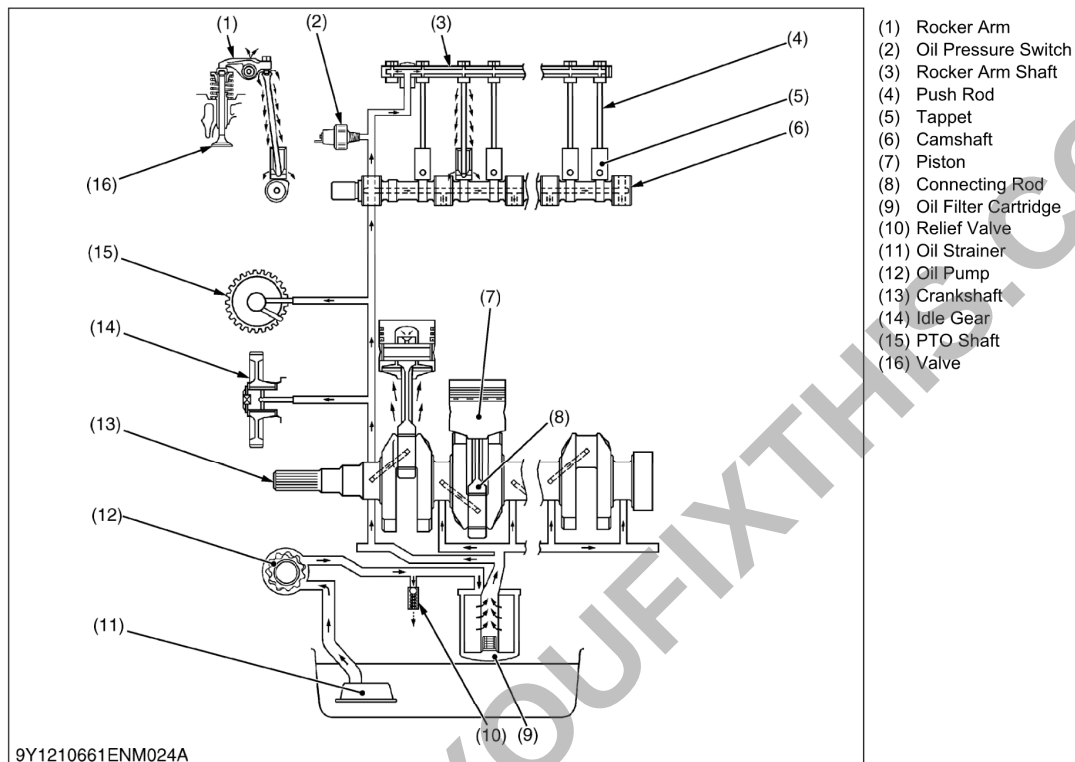
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2. LUBRICATING SYSTEM

[1] GENERAL



Engine lubricating system may be classified as:

- Full pressure feed type
- Pressure feed and splash type

KUBOTA engines have lubricating system of full pressure feed type.

This system consists of an oil strainer (11), oil pump (12), relief valve (10), oil filter cartridge (9) and oil pressure switch (2).

The oil pump sucks lubricating oil from the oil pan through the oil strainer and the oil flows down to the oil filter, cartridge where it is further filtered. Then the oil is forced to crankshaft (13), connecting rods (8), idle gear (14), PTO shaft (15), camshaft (6) and rocker arm shaft (3) to lubricate each part through the oil gallery.

Some part of oil, splashed by the crankshaft or leaking and dropping from gaps of each part, lubricates following parts.

- Pistons (7)
- Cylinder walls
- Small ends of connecting rods
- Tappets (5)
- Push rods (4)
- Intake and exhaust valves (16)
- Timing gears

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2. SPECIFICATIONS

Model	WG3800-G-E3(C)	WG3800-GL-E3		WG3800-L-E3(C)	WG3800-N-E3C
	Gasoline	Gasoline	LPG	LPG	NG
Number of Cylinder	4				
Type	Vertical, water cooled, 4-cycle gasoline engine		Vertical, water cooled, 4-cycle LPG engine	Vertical, water cooled, 4-cycle LPG engine	Vertical, water cooled, 4-cycle natural engine
Bore × Stroke	100.0 × 120.0 mm (3.937 × 4.724 in.)				
Total Displacement	3.769 L (230.0 cu.in.)				
SAE Gross Intermittent	65.0 kW (87.2 HP) / 2600 min ⁻¹ (rpm)	68.0 kW (91.2 HP) / 2600 min ⁻¹ (rpm)	70.0 kW (93.8 HP) / 2600 min ⁻¹ (rpm)	65.0 kW (87.2 HP) / 2600 min ⁻¹ (rpm)	
ISO / SAE Net Intermittent	57.8 kW (77.5 HP) / 2600 min ⁻¹ (rpm)	60.4 kW (81.0 HP) / 2600 min ⁻¹ (rpm)	62.2 kW (83.4 HP) / 2600 min ⁻¹ (rpm)	57.8 kW (77.5 HP) / 2600 min ⁻¹ (rpm)	
ISO Net Continuous	49.5 kW (66.4 HP) / 2600 min ⁻¹ (rpm)	51.4 kW (68.9 HP) / 2600 min ⁻¹ (rpm)	53.0 kW (71.0 HP) / 2600 min ⁻¹ (rpm)	49.1 kW (65.8 HP) / 2600 min ⁻¹ (rpm)	
Maximum Bare Speed	2600 min ⁻¹ (rpm)				
Minimum Bare Idling Speed	700 min ⁻¹ (rpm)				
Cylinder Head	Overhead-Valve				
Ignition System	Full Transistor Battery Ignition Type				
Governor	Electronic Governor				
Direction of Rotation	Counter-Clockwise (Viewed from Flywheel Side)				
Spark Plug Type / Spark Plug Gap	NGK IFR6F8DN / 0.70 to 0.80 mm (0.028 to 0.031 in.)				
Ignition Timing	0.52 rad (30°) before T.D.C. / 2600 min ⁻¹ (rpm) 0.26 rad (15°) before T.D.C. / 700 min ⁻¹ (rpm)	0.61 rad (35°) before T.D.C. / 2600 min ⁻¹ (rpm) 0.26 rad (15°) before T.D.C. / 700 min ⁻¹ (rpm)	0.52 rad (30°) before T.D.C. / 2600 min ⁻¹ (rpm) 0.26 rad (15°) before T.D.C. / 700 min ⁻¹ (rpm)	0.66 rad (38°) before T.D.C. / 2600 min ⁻¹ (rpm) 0.26 rad (15°) before T.D.C. / 700 min ⁻¹ (rpm)	
Firing Order	1-3-4-2				
Compression Ratio	8.9 : 1			10.0 : 1	
Lubricating System	Forced Lubrication by Trochoid Pump				
Oil Pressure Indication	Electrical Type Switch				
Lubricating Filter	Full Flow Paper Filter (Cartridge Type)				
Cooling System	Pressurized Radiator, Forced Circulation with Water Pump				
Starting System	Electric Starting with Starter				
Starting Motor	12 V, 2.5 kW				
Battery	12 V, 55 AH or Equivalent				
Charging Alternator	12 V, 1200 W				
Fuel	Gasoline	Gasoline	LPG	LPG	Natural Gas
Lubricating Oil	API classification SL or higher SAE 10W-30				
Lubricating Oil Capacity	12.2 L (3.22 U.S.gals)				
Weight (Dry)	286 kg (631 lbs)	288 kg (635 lbs)		268 kg (591 lbs)	268 kg (591 lbs)
Application	General Power Source				

*The specification described above is of the standard engine of each model.

*Conversion Formula: HP = 0.746 kW, PS = 0.7355 kW

*KUBOTA RECOMMENDED LPG FUEL SPECIFICATIONS

- Commercial Propane gas only.
- Equivalent to Propanes H-D-5 of GPA* standards.

(vol %)

C ₃ H ₈	C ₃ H ₆	C ₄ H ₁₀	Others
≥ 90 %	≤ 5 %	≤ 2.5 %	—

*GPA means Gas Processors Association (U.S.A.)

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