WSM

WORKSHOP MANUAL
DIESEL ENGINE

V3300-B,V3300-TB

Kubota

KiSC issued 04, 2006 A

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SERVICING

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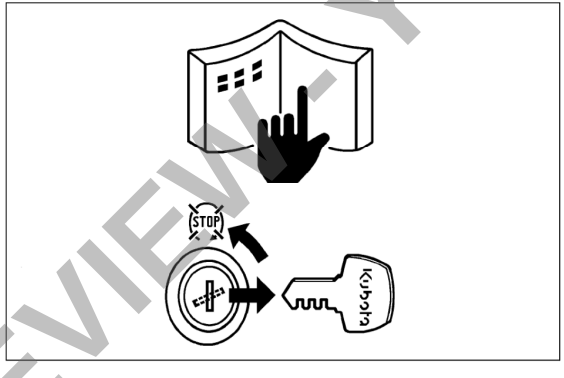
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SAFETY FIRST

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 attempt 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, may result in minor or moderate injury.**
IMPORTANT	**: Indicates that equipment or property damage could result if instructions are not followed.**
NOTE	**: Gives helpful information.**



BEFORE SERVICING AND REPAIRING

- 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 firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.

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SPECIFICATIONS

Model		V3300-B	V3300-TB
Number of Cylinder		4	
Type		Vertical, water-cooled, 4-cycle diesel engine	
Bore × Stroke		98 × 110 mm (3.86 × 4.33 in.)	
Total Displacement		3318 cm^3 (202.48 cu.in.)	
Engine	SAE Net Cont.	44.1 kW / 2600 min^{-1} (rpm) (59.1 HP / 2600 min^{-1} (rpm))	53.8 kW / 2600 min^{-1} (rpm) (72.1 HP / 2600 min^{-1} (rpm))
	SAE Net Intermittent	50.7 kW / 2600 min^{-1} (rpm) (68.0 HP / 2600 min^{-1} (rpm))	61.9 kW / 2600 min^{-1} (rpm) (83.0 HP / 2600 min^{-1} (rpm))
	SAE Gross Intermittent	54.5 kW / 2600 min^{-1} (rpm) (73.0 HP / 2600 min^{-1} (rpm))	65.2 kW / 2600 min^{-1} (rpm) (87.4 HP / 2600 min^{-1} (rpm))
	DIN6271-NA	44.6 kW / 2600 min^{-1} (rpm) (59.8 ps / 2600 min^{-1} (rpm))	53.8 kW / 2600 min^{-1} (rpm) (73.1 ps / 2600 min^{-1} (rpm))
	DIN6271-NB	48.9 kW / 2600 min^{-1} (rpm) (66.5 ps / 2600 min^{-1} (rpm))	59.7 kW / 2600 min^{-1} (rpm) (81.2 ps / 2600 min^{-1} (rpm))
	DIN70020	52.7 kW / 2600 min^{-1} (rpm) (71.7 ps / 2600 min^{-1} (rpm))	64.4 kW / 2600 min^{-1} (rpm) (87.6 ps / 2600 min^{-1} (rpm))
Maximum Bare Speed		2800 min^{-1} (rpm)	
Minimum Idling Speed		700 to 750 min^{-1} (rpm)	
Combustion Chamber		Spherical Type (E-TVCS)	
Fuel Injection Pump		Bosch Type Mini Pump	
Direction of Rotation		Counter-clockwise (Viewed from flywheel side)	
Injection Nozzle		BOSCH Throttle-Type	
Injection Timing		0.279 rad. (16 °) before T.D.C.	
Firing Order		1-3-4-2	
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)	
Compression Ratio		22.6	21.8
Lubricating System		Forced Lubrication by Pump	
Oil Pressure Indicating		Electrical Type Switch	
Lubricating Filter		Full Flow Paper Filter (Cartridge Type)	
Cooling System		Pressurized radiation, forced Circulation with Water Pump	
Starting System		Electric Starting with Starter	
		12 V, 2.5 kW	
Starting Support Device		By Glow Plug in Combustion Chamber	
Battery		12 V, 112 AH	
Dynamo for Charging		12 V, 540 W	
Fuel		Diesel Fuel No. 2-D (ASTM D975)	
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page S-16, 17, 18, 20.	
Lubricating Oil Capacity		13.2 L (3.49 U.S.gal, 2.90 Imp.gal)	
Weight (Dry)		241 kg (531 lbs)	250 kg (551 lbs)

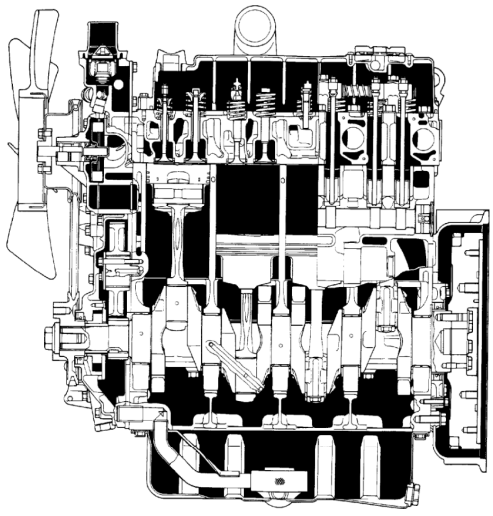
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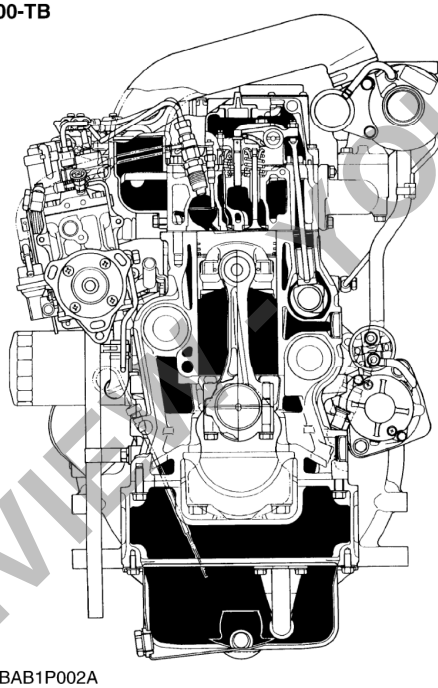
1. FEATURE

V3300-B



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V3300-TB



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The V3300 engine is the vertical type 4-cycle diesel engine featuring the advanced performances shown below.

This is a small sized, high power and environment conscious engine, which employs the three valve system, two inlet valves and double ports, and one exhaust valve and the new E-TVCS VERSION-II. Thus, this engine achieves high combustion efficiency and complies with various regulations of exhaust gas.

Based upon the conventional model, Kubota developed a unique governor system and various new mechanisms which reduces exhaust emission, noise and vibration and realize durability and high torque.

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[4] TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	S-19
	• Air in the fuel system	Vent air	S-19
	• Water in the fuel system	Change fuel and repair or replace fuel system	– S-19
	• Fuel pipe clogged	Clean	S-19
	• Fuel filter clogged	Clean or change	S-21, 22
	• Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	4, S-20
	• Fuel with low cetane number	Use specified fuel	4
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-4
	• Incorrect injection timing	Adjust	S-92
	• Injection nozzle clogged	Repair or replace	S-28
	• Injection pump malfunctioning	Repair or replace	S-59, 60, 61
	• Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	• Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	S-44, 46 to 50
	• Improper valve timing	Correct or replace timing gear	S-63, 64
	• Piston ring and cylinder worn	Replace	S-80, 81, 86, 87
	• Stop solenoid malfunctioning	Replace	–
	• Excessive valve clearance	Adjust	S-23
(Starter Does Not Run)	• Battery discharged	Charge	S-26, 27
	• Starter malfunctioning	Repair or replace	S-95
	• Key switch malfunctioning	Repair or replace	–
	• Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	• Fuel filter clogged or dirty	Clean or change	S-21, 22
	• Air cleaner clogged	Clean or change	S-20
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-4
	• Injection pump malfunctioning	Repair or replace	S-59, 60, 61
	• Incorrect nozzle opening pressure	Adjust or replace	S-28
	• Injection nozzle stuck or clogged	Repair or replace	S-28
	• Governor malfunctioning	Replace	S-54, 55
	• Turbocharger bearing worn out	Replace the turbocharger assembly	S-103, 104
	• Turbocharger shaft bent		S-103, 104
	• Turbocharger fin or other part damaged due to foreign matters		S-102 to 104
Either White or Blue Exhaust Gas Is Observed	• Excessive engine oil	Reduce to specified level	S-18
	• Piston ring and liner worn or stuck	Repair or replace	S-80, 81, 86, 87
	• Incorrect injection timing	Adjust	S-92

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[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

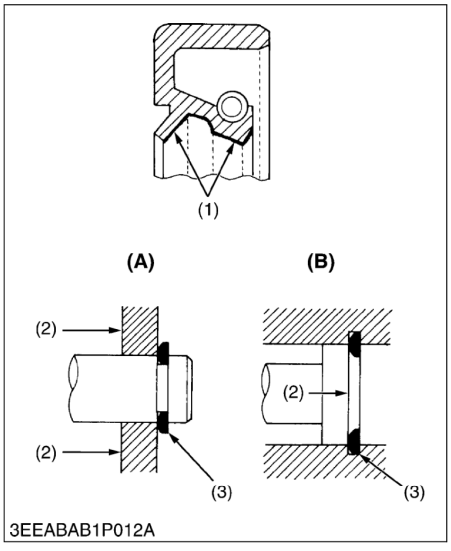
Item	Service Interval								
	Initial 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1 or 2 months	Every 1500 hrs	Every 3000 hrs	Every 1 year	Every 2 years
*Changing engine oil									
Changing oil filter cartridge									
*Checking fuel pipes and clamps									
*Cleaning air filter element									
*Cleaning fuel filter									
Checking battery electrolyte level									
Checking radiator hoses and clamps									
*Checking intake air line									
Checking fan belt tension and damage									
Checking electrical lines and damage									
*Changing fuel filter cartridge									
Changing fan belt									
Cleaning radiator interior									
Checking valve clearance									
Recharging battery									
*Checking nozzle injection pressure									
*Checking turbocharger									
Checking fuel injection pump									
*Checking injection timing (spill timing)									
*Changing air filter element									
Changing radiator coolant (L.L.C.)									
Changing radiator hoses and clamps									
*Changing fuel hoses and clamps									
*Changing intake air line									
Changing battery									

* The items listed above (* marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA nonroad emission regulation.
As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

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[2] GENERAL PRECAUTION



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- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be replaced in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used should be made according to the drawings provided.
- Before disassembling or servicing live wires, make sure to always disconnect the grounding cable from the battery first.
- Remove oil and dirt from parts before measuring.
- Use only KUBOTA genuine parts for parts replacement to maintain engine performance and to ensure safety.
- Gaskets and O-rings must be replaced during reassembly. Apply grease to new O-rings or oil seals before assembling.
- When reassembling external or internal snap rings, position them so that the sharp edge faces against the direction from which force is applied.
- Be sure to perform run-in the serviced or reassembled engine. Do not attempt to give heavy load at once, or serious damage may result to the engine.

(1) Grease
(2) Force
(3) Place the Sharp Edge against the Direction of Force

(A) External Snap Ring
(B) Internal Snap Ring

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[3] TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench, several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and the proper torque.

(1) Tightening Torques for General Use Screws, Bolts and Nuts

Grade / Nominal Diameter / Unit	Standard Screw and Bolt ⟨4⟩			Special Screw and Bolt ⟨7⟩		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

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Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

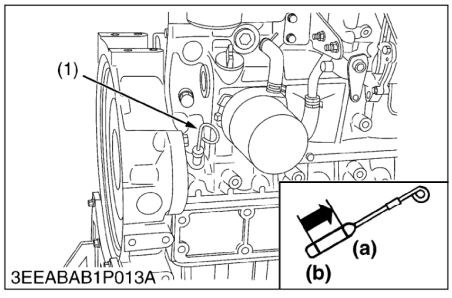
Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS400, S20C
7	Special screw and bolt S43C, S48C (Refined)

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[7] CHECK AND MAINTENANCE

(1) Daily Check Points



Checking Engine Oil Level

1. Level the engine.
2. To check the oil level, draw out the dipstick, wipe it clean, reinsert it, and draw it out again.
3. If the level is too low, add new oil to the specified maximum level **(a)**.

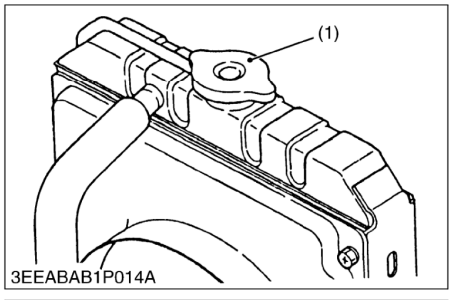
IMPORTANT

- **When using an oil of different maker or viscosity from the previous one, drain old oil. Never mix two different types of oil.**

(1) Dipstick

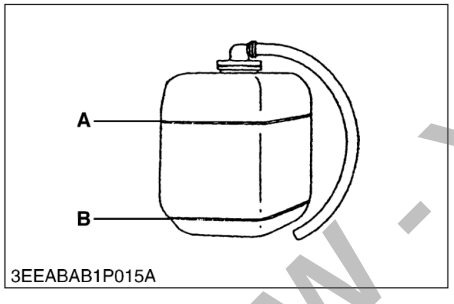
(a) Maximum
(b) Minimum

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Checking and Replenish Coolant

1. Without recovery tank ;
   Remove the radiator cap (1) and check to see that the coolant level is just below the port.
   With recovery tank :
   Check to see that the coolant level lies between **FULL** (**A**) and **LOW** (**B**).
2. If coolant level is too low, check the reason for decreasing coolant.
   Case 1) If coolant is decreasing by evaporation, replenish only fresh, soft water.
   Case 2) If coolant is decreasing by leak, replenish coolant of the same manufacture and type in the specified mixture ratio (fresh, soft water and L.L.C.).
   If the coolant brand cannot be identified, drain out all of the remaining coolant refill with a totally new brand of coolant mix.



CAUTION

- **Do not remove the radiator cap until coolant temperature is below its boiling point. Then loosen the cap slightly to relieve any excess pressure before removing the cap completely.**

IMPORTANT

- **During filling the coolant, air must be vented from the engine coolant passages. The air vents by jiggling the radiator upper and lower hoses.**
- **Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and the engine could overheat.**
- **Do not use an antifreeze and scale inhibitor at the same time.**
- **Never mix the different type or brand of L.L.C..**

(1) Radiator Cap

(A) FULL
(B) LOW

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[5] SERVICING SPECIFICATIONS

(1) Engine Body

Cylinder Head

Item		Factory Specification	Allowable Limit
Cylinder Head Surface Flatness		–	0.05 mm 0.0019 in.
Top Clearance	V3300-B	0.72 to 0.90 mm 0.0283 to 0.0354 in.	–
	V3300-TB	0.92 to 1.10 mm 0.0362 to 0.0433 in.	–
Compression Pressure	V3300-B	4.32 MPa / 250 min^{-1} (rpm) 44 kgf/cm^2 / 250 min^{-1} (rpm) 626 psi / 250 min^{-1} (rpm)	3.26 MPa / 250 min^{-1} (rpm) 33.2 kgf/cm^2 / 250 min^{-1} (rpm) 472 psi / 250 min^{-1} (rpm)
	V3300-TB	3.92 MPa / 250 min^{-1} (rpm) 40 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)	2.99 MPa / 250 min^{-1} (rpm) 30.5 kgf/cm^2 / 250 min^{-1} (rpm) 434 psi / 250 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less

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Valves

Valve Clearance (Cold)		0.23 to 0.27 mm 0.0091 to 0.0106 in.	–
Valve Seat Width	IN.	2.12 mm 0.0835 in.	–
	EX.	2.12 mm 0.0835 in.	
Valve Seat Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Face Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Recessing	IN.	–0.2 to 0 mm –0.079 to 0 in.	0.4 mm 0.0157 mm
	EX.	–0.05 to 0.15 mm –0.0019 to 0.0059 in.	0.4 mm 0.0157 mm

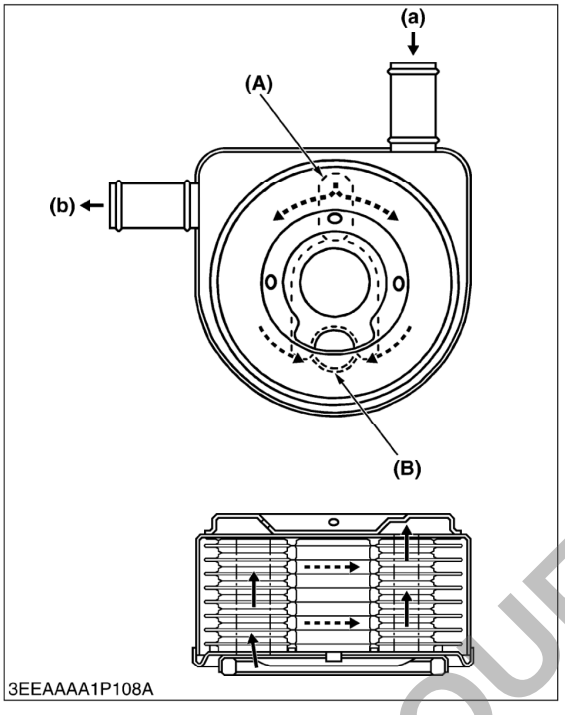
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3. LUBRICATING SYSTEM

[1] OIL COOLER



V3300-B and V3300-TB have a water-cooled oil cooler that keeps the oil against overheat and also warms it up just after the engine gets started.

As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down the oil.

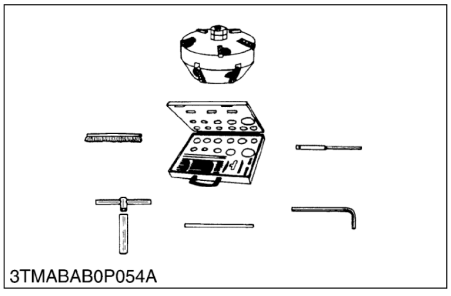
(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

W10344770

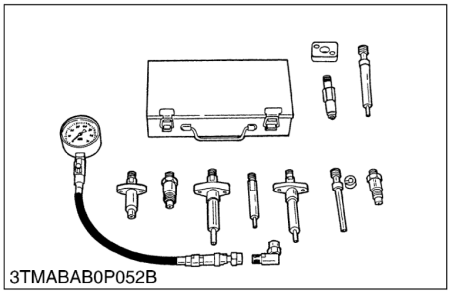
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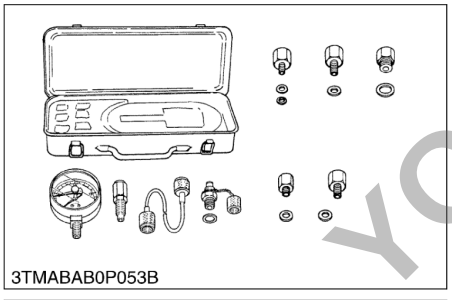
[8] SPECIAL TOOLS


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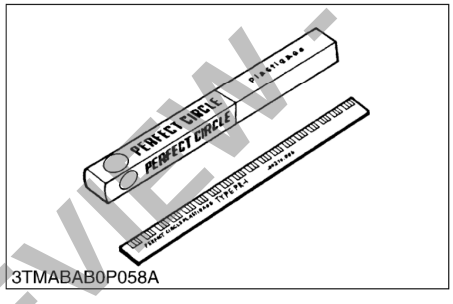
Valve Seat Cutter Set
Code No: 07909-33102
Application: Use for correcting valve seats.
W1038513


3TMABAB0P052B

Diesel Engine Compression Tester
Code No: 07909-30207
Application: Use for measuring diesel engine compression pressure.
W1038628

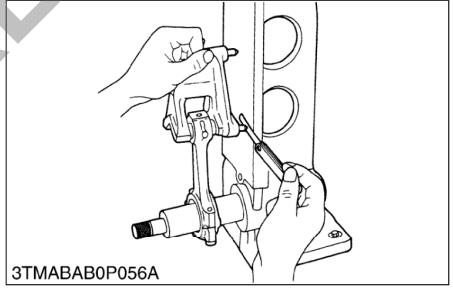

3TMABAB0P053B

Oil Pressure Tester
Code No: 07916-32031
Application: Use for measuring lubricating oil pressure.
W1063730



3TMABAB0P058A

Press Gauge
Code No: 07909-30241
Application: Use to check the oil clearance between crankshaft and bearing, etc.
Measuring range: Green.....0.025 to 0.076 mm (0.001 to 0.003 in.)
Red.....0.051 to 0.152 mm (0.002 to 0.006 in.)
Blue.....0.102 to 0.229 mm (0.004 to 0.009 in.)
W12277130


3TMABAB0P056A

Connecting Rod Alignment Tool
Code No: 07909-31661
Application: Use for checking the connecting rod alignment.
Application range: Connecting rod big end I.D. 30 to 75 mm (1.18 to 2.95 in.dia.). Connecting rod length 65 to 330 mm (2.56 to 12.99 in.).
W10387190

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