Product: 2008 Kubota WSM OC60-E3,OC95-E3 Diesel Engine Service Repair Workshop Manual
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-e3oc95-e3-diesel-engine-service-repair-workshop-manual/

WSM

WORKSHOP MANUAL
DIESEL ENGINE

OC60-E3,OC95-E3

Kubota

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KiSC issued 02, 2008 A

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TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of OC60-E3 and OC95-E3. It is divided into three parts, “General”, “Mechanism” and “Servicing”.

■ **General**

Information on the engine identification, the general precautions, maintenance check list, check and maintenance and special tools are described.

■ **Mechanism**

Information on the construction and function are included. This part should be understood before proceeding with troubleshooting, disassembling and servicing.

Refer to Diesel Engine Mechanism Workshop Manual (Code No. 9Y021-01875) for the one which has not been described to this workshop manual.

■ **Servicing**

Information on the troubleshooting, servicing specification lists, tightening torque, checking and adjusting, disassembling and assembling, and servicing which cover procedures, precautions, factory specifications and allowable limits.

All information illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

The right is reserved to make changes in all information at any time without notice.

Due to covering many models of this manual, information or picture being used, have not been specified as one model.

January 2008

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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.

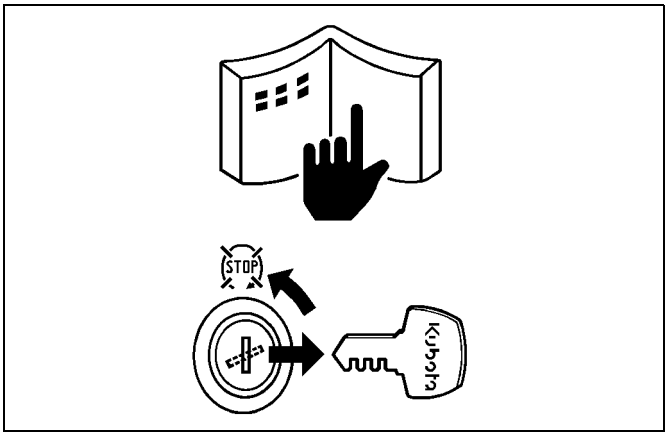
DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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.

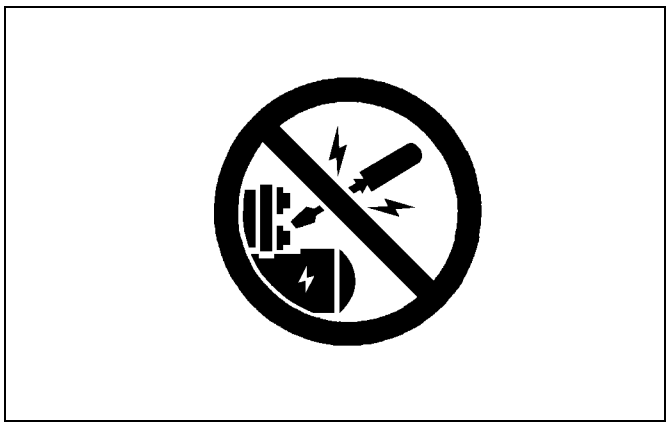
■ IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

■ NOTE : Gives helpful information.



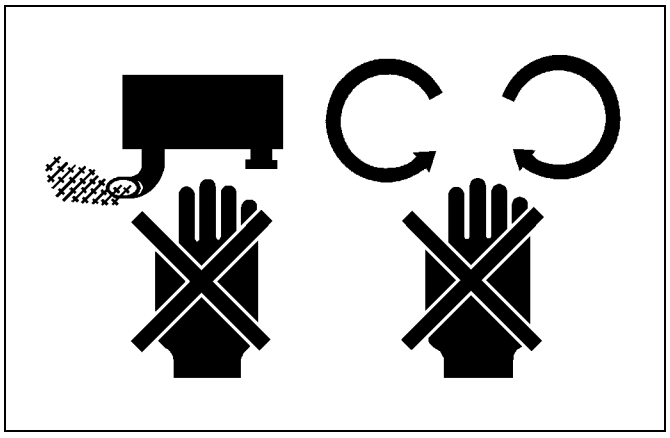
BEFORE SERVICING AND REPAIRING

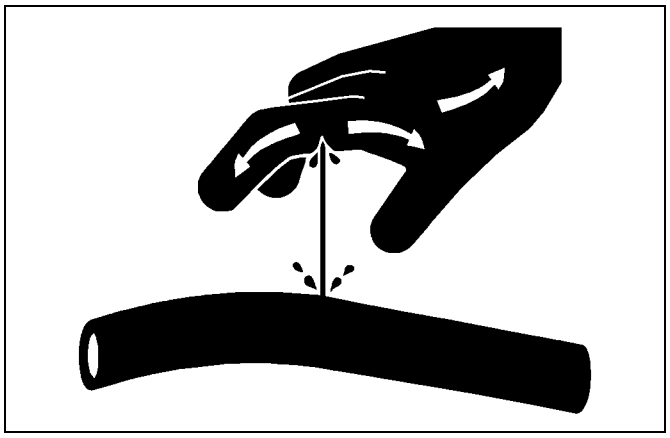
- Read all instructions and safety instructions in this manual and on your engine safety decals.
- Clean the work area and engine.
- Park the machine on a firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.
- Hang a "**DO NOT OPERATE**" tag in operator station.

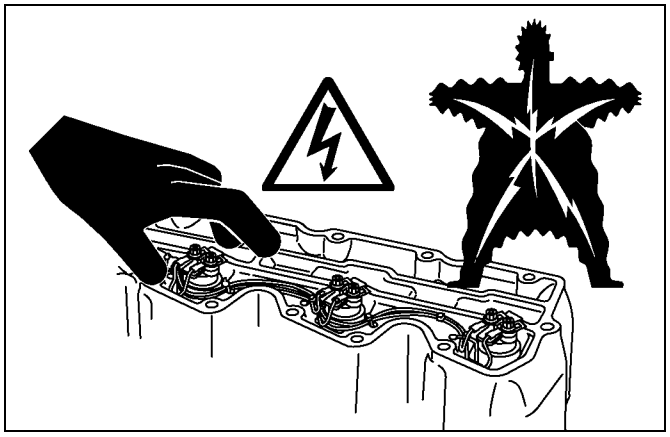


SAFETY STARTING

- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.

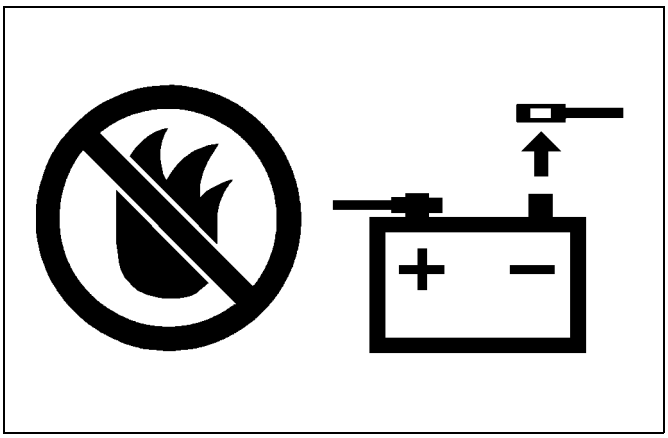






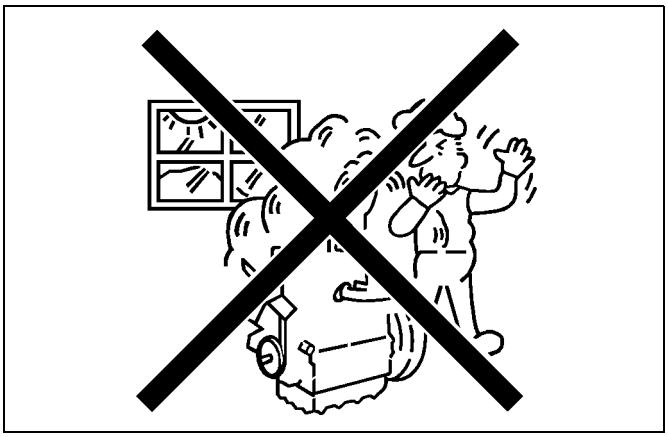
SAFETY WORKING

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.
- Do not open high-pressure fuel system.
  High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt to repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU, and is applied to the injector.
  Pay sufficient caution to electric shock when performing work activities.



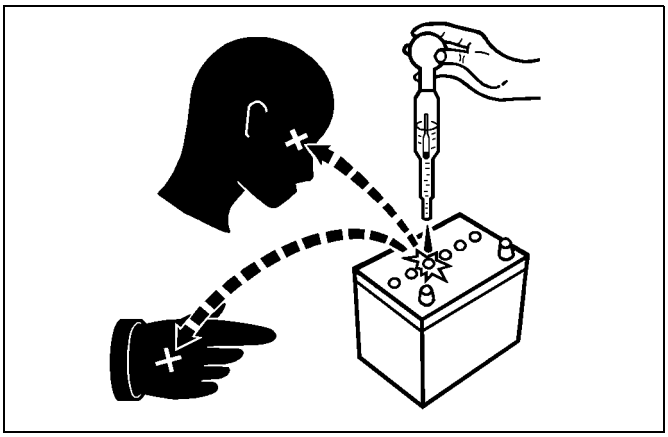
AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.



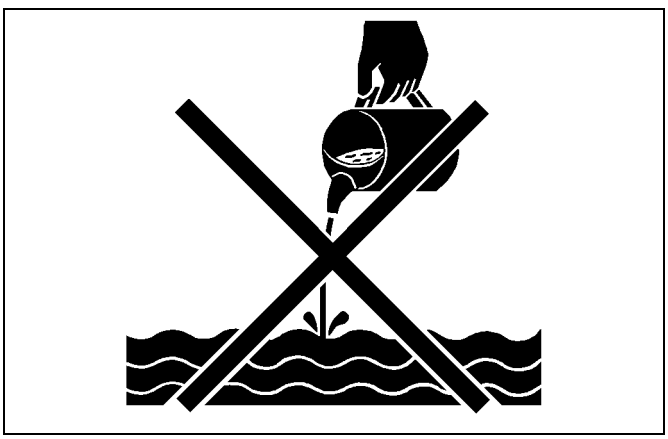
VENTILATE WORK AREA

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.



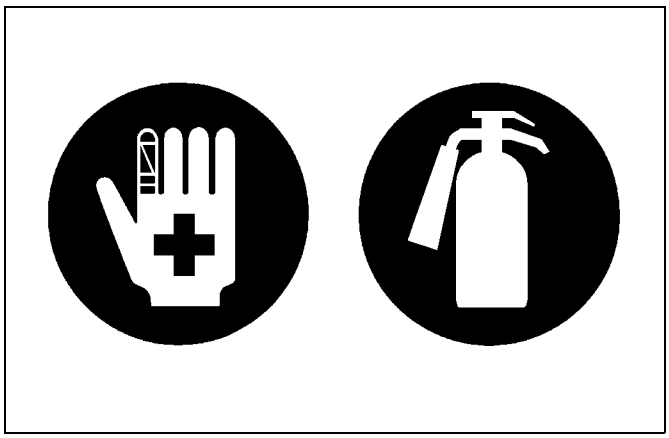
PREVENT ACID BURNS

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.



DISPOSE OF FLUIDS PROPERLY

- Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.



PREPARE FOR EMERGENCIES

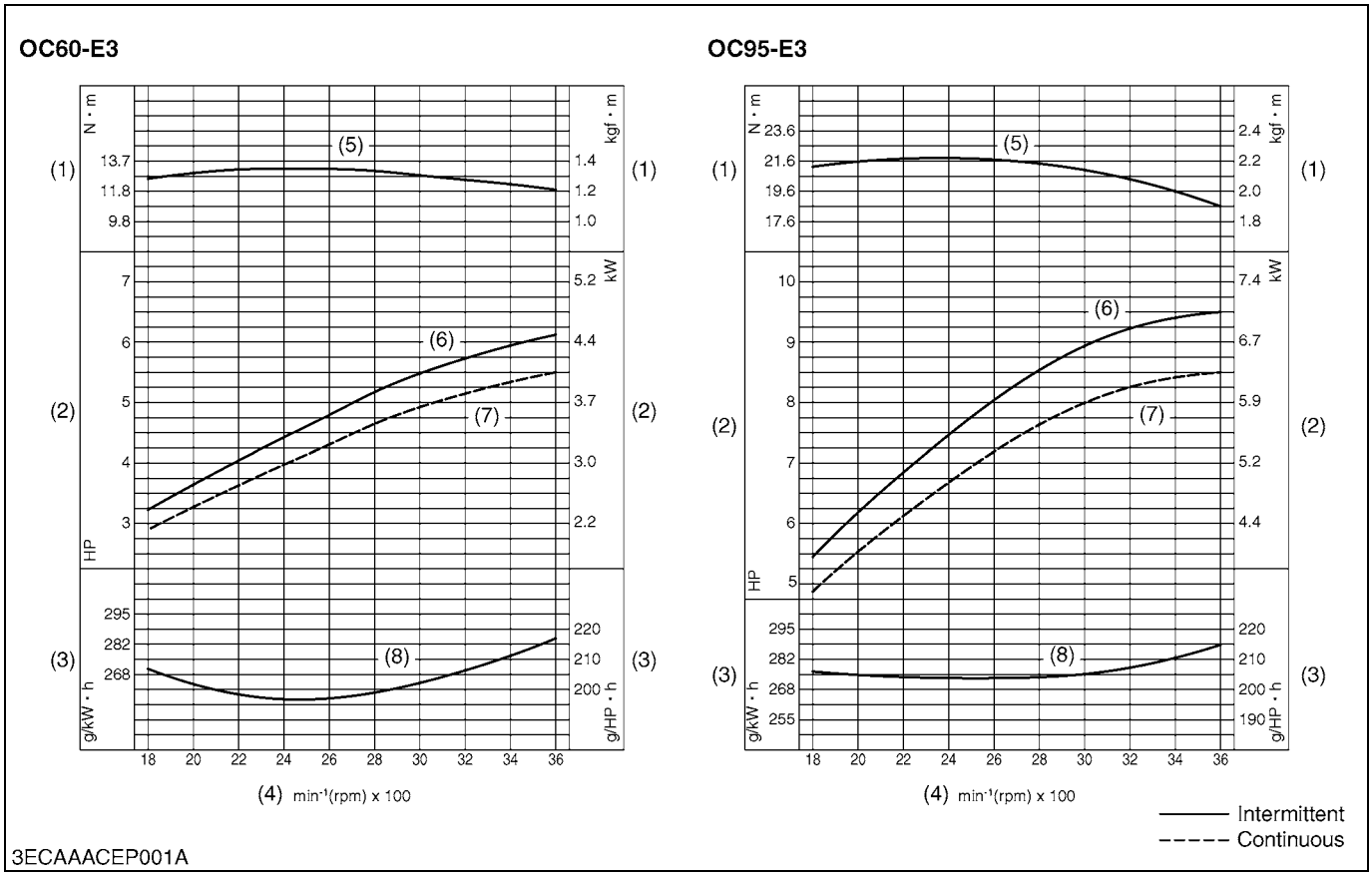
- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

SPECIFICATIONS

Model	OC60-E3(-X)	OC60-E3(-X)-L	OC95-E3(-X)	OC95-E3(-X)-L
Number of Cylinders	1			
Type	Oil-cooled 4-cycle diesel engine			
Bore × Stroke mm (in.)	72.0 x 68.0 (2.83 x 2.68)		83.0 x 77.0 (3.27 x 3.03)	
Total Displacement cm^3 (cu.in.)	276 (16.8)		416 (25.4)	
ISO Net Continuous kW/min^{-1} (rpm) (HP/min^{-1} (rpm))	4.2 / 3600 (5.6 / 3600)		6.25 / 3600 (8.38 / 3600)	
ISO/SAE Net Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))	4.5 / 3600 (6.0 / 3600)		7.0 / 3600 (9.4 / 3600)	
Maximum Bare Speed (min^{-1} (rpm))	3800			
Minimum Bare Idling Speed (min^{-1} (rpm))	1300			
Combustion System	TVCS (Three-vortex combustion system)			
Fuel Injection Pump	ND type (DENSO)			
Governor	Centrifugal mechanical governor			
Direction of Rotation	Clockwise (View from flywheel side)			
Injection Nozzle	DN4PD82 (DENSO)			
Injection Timing (Static)	0.28 rad (16 °) before T.D.C.		0.24 rad (14 °) before T.D.C.	
Injection Pressure	13.73 MPa (140,0 kgf/cm^2, 1991 psi)			
Compression Ratio	24.5 : 1		24.0 : 1	
Lubricating System	Forced lubrication by trochoid pump			
Oil Pressure Indicating	Electrical Type Switch			
Lubricating Filter	Oil strainer			
Cooling System	Oil cooling + Air cooling			
Starting System	Electric starting with starter			
Starting Motor	12 V 0.7 kW		12 V 1.2 kW	
Starting Support Device	By Glow Plug in Combustion Chamber			
EGR	None			
Battery	12 V, 27 AH equivalent		12 V, 36 AH equivalent	
Charging Alternator	12 V, 48 W	12 V, 170 W	12 V, 48 W	12 V, 170 W
Fuel	Diesel Fuel No. 2-D S500 or S15, see page G-5.			
Fuel Tank Capacity	3.5 L (0.92 U.S.gals)		5.5 L (1.5 U.S.gals)	
Lubricating Oil	Class CF lubricating oil as per API classification is recommended. For details on recommended lubricating oils, see page G-6.			
Lubricating Oil Capacity	1.3 L (1.4 U.S.qts)		1.7 L (1.8 U.S.qts)	
Weight (Dry) kg (lbs)	38.0 (83.8)		56.0 (123)	

W10441170

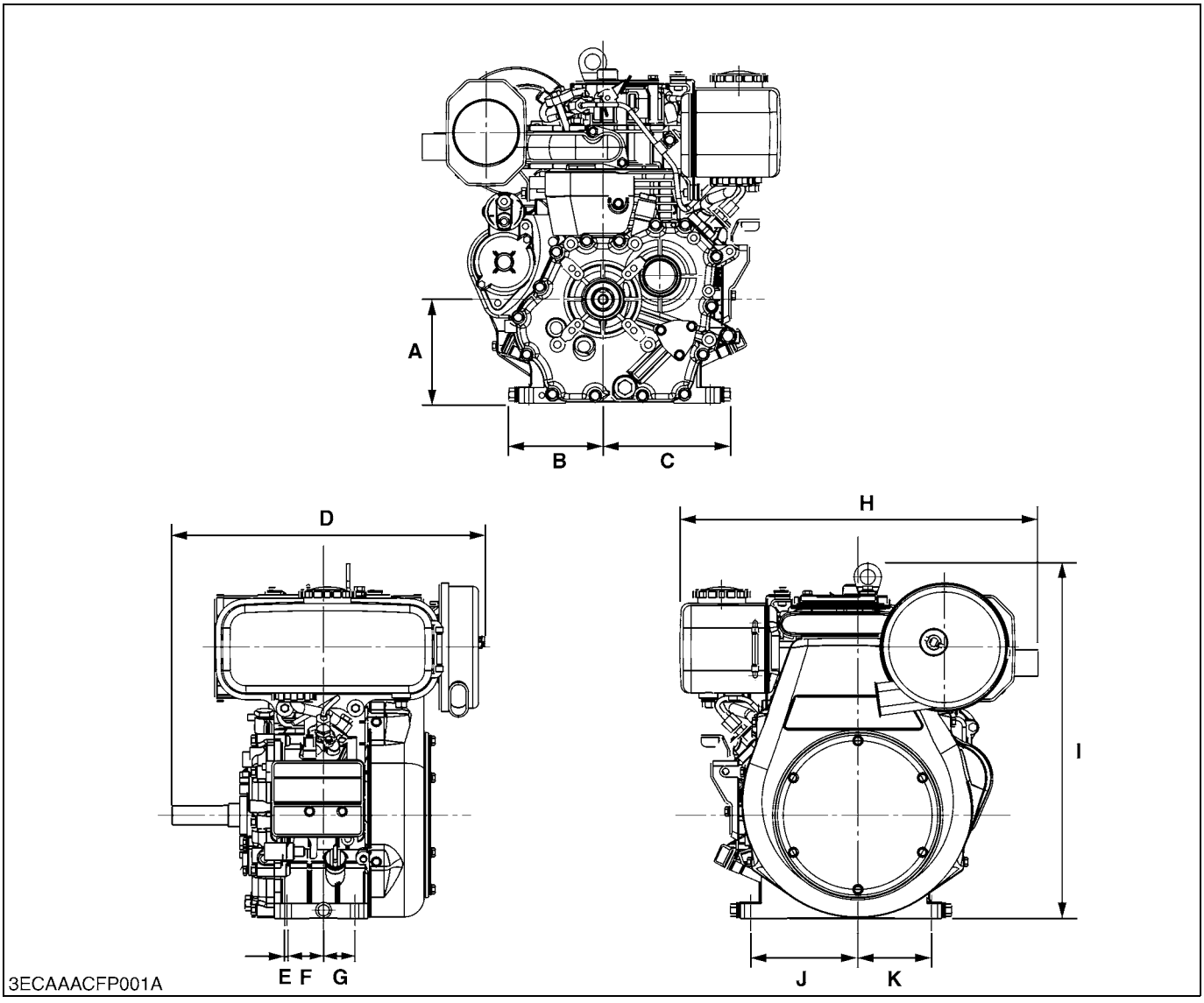
PERFORMANCE CURVES



(1) Torque
(2) Brake Horsepower
(3) Fuel Consumption
(4) Engine Speed
(5) Net Intermittent Torque
(6) Net Intermittent B.H.P.
(7) Net Continuous B.H.P.
(8) Net Intermittent B.S.F.C

DIMENSIONS

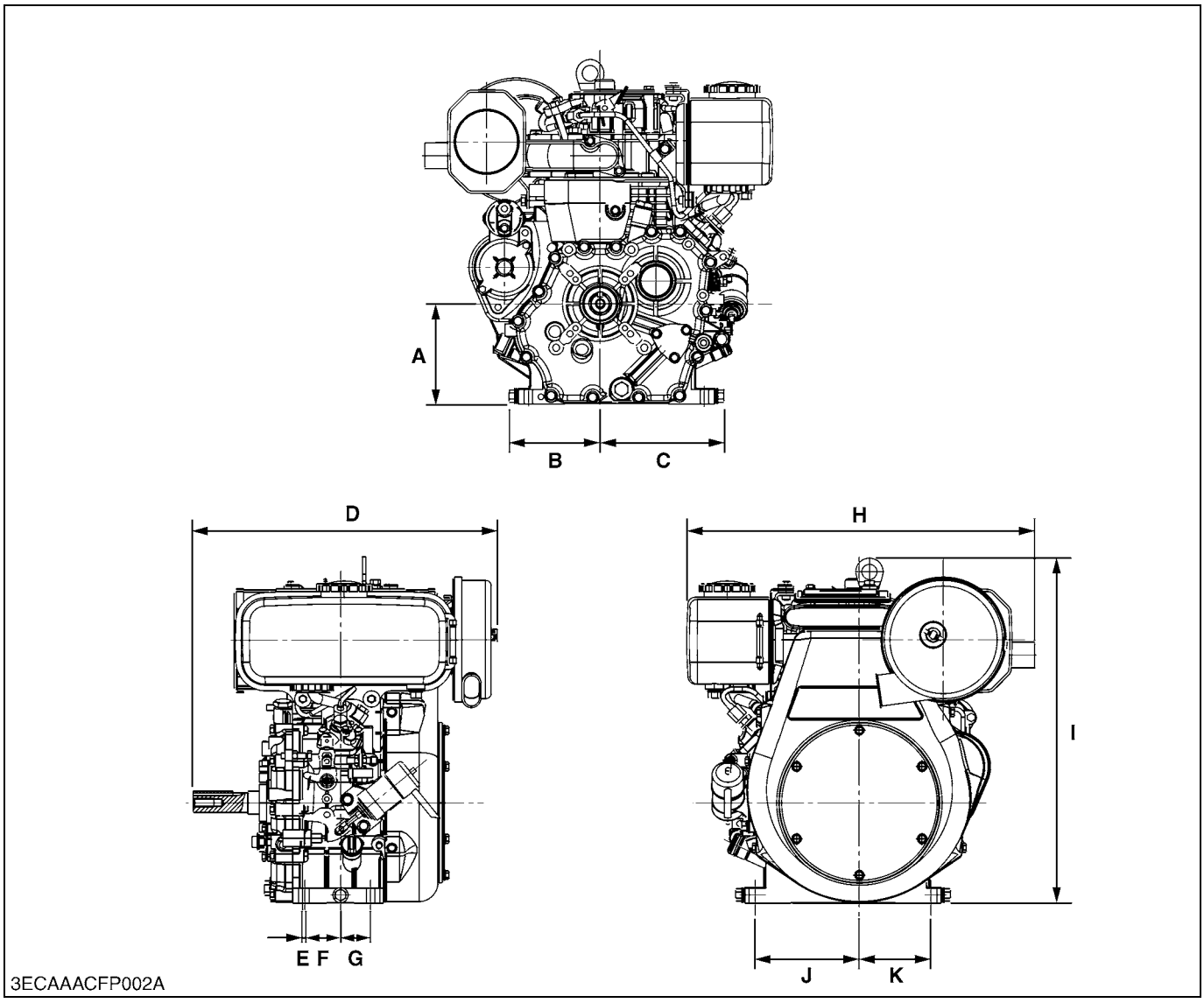
■ STANDARD TYPE [OC60-E3]



	STANDARD TYPE
A	133.5 mm (5.256 in.)
B	121 mm (4.76 in.)
C	164 mm (6.46 in.)
D	403.0 mm (15.87 in.)
E	3.0 mm (0.12 in.)
F	47.0 mm (1.85 in.)
G	40.0 mm (1.57 in.)
H	461.0 mm (18.15 in.)
I	458.0 mm (18.03 in.)
J	138 mm (5.43 in.)
K	95.0 mm (3.74 in.)

W1032756

■ X TYPE (WITH STOP SOLENOID) [OC60-E3]

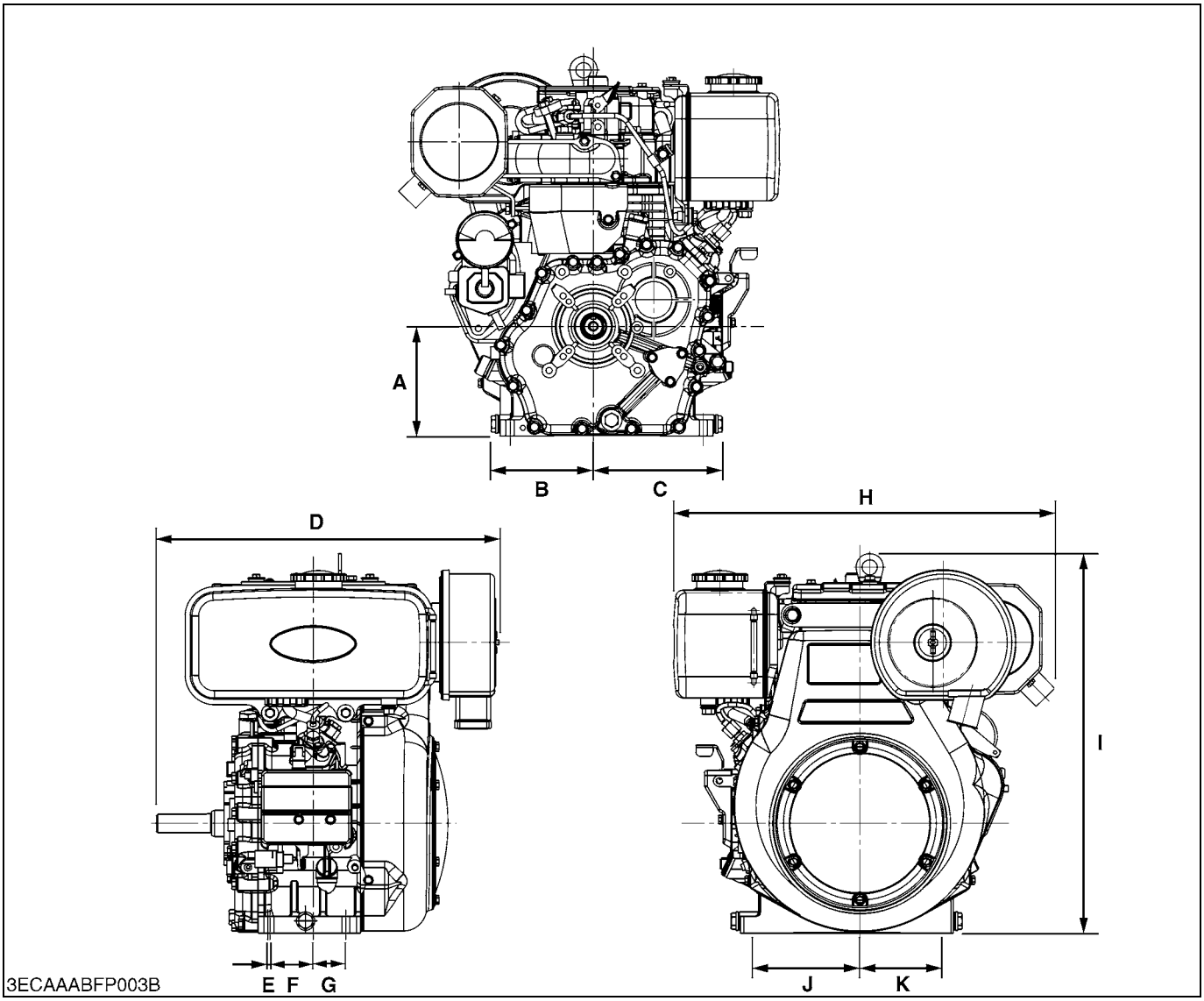


3ECAAACFP002A

	X TYPE
A	133.5 mm (5.256 in.)
B	121 mm (4.76 in.)
C	164 mm (6.46 in.)
D	403.0 mm (15.87 in.)
E	3.0 mm (0.12 in.)
F	47.0 mm (1.85 in.)
G	40.0 mm (1.57 in.)
H	461.0 mm (18.15 in.)
I	458.0 mm (18.03 in.)
J	138 mm (5.43 in.)
K	95.0 mm (3.74 in.)

W1040012

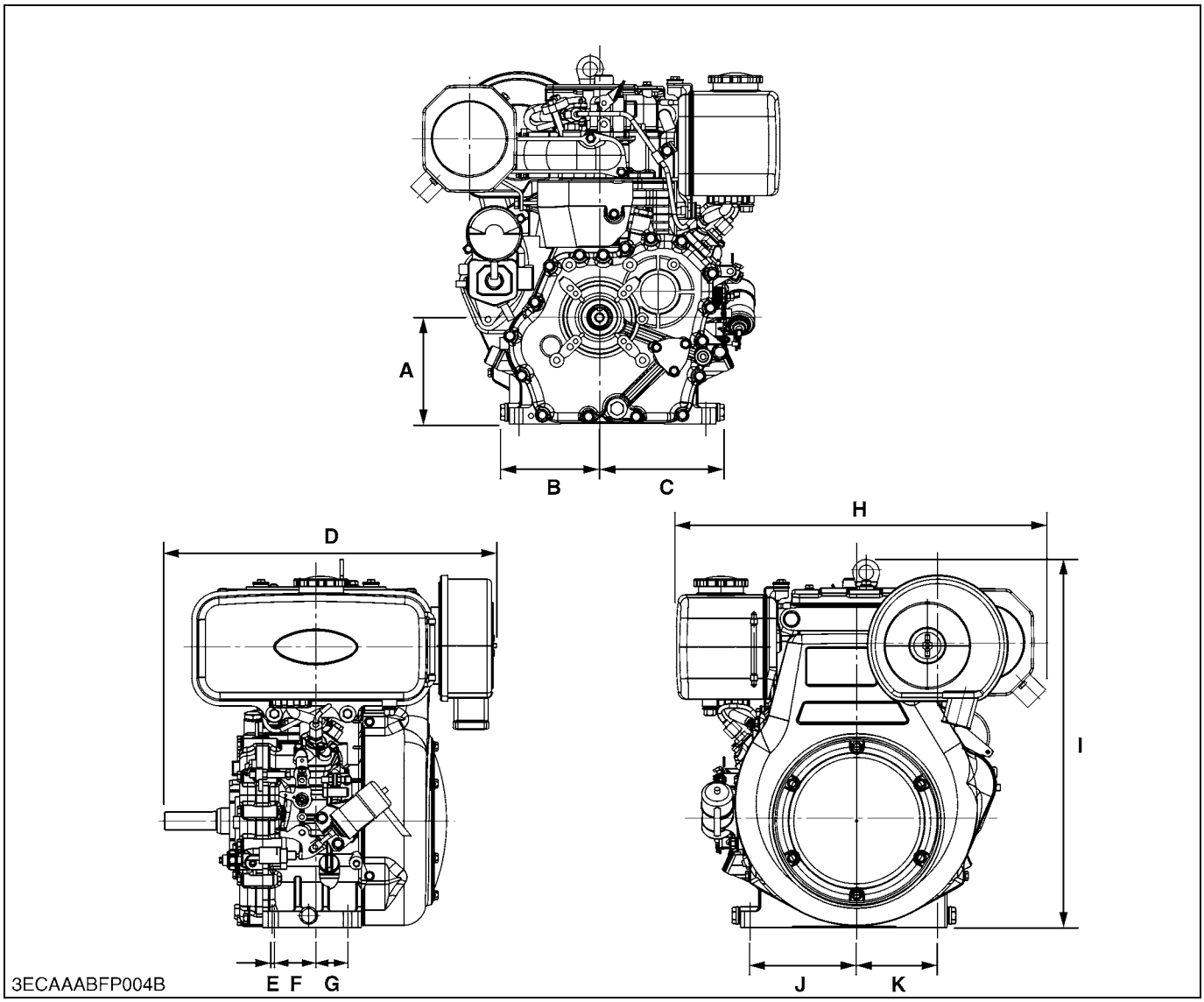
■ STANDARD TYPE [OC95-E3]



	STANDARD TYPE
A	145 mm (5.71 in.)
B	135 mm (5.31 in.)
C	170 mm (6.69 in.)
D	452.0 mm (17.80 in.)
E	3.0 mm (0.12 in.)
F	57.0 mm (2.24 in.)
G	43.0 mm (1.69 in.)
H	503.0 mm (19.80 in.)
I	501.0 mm (19.72 in.)
J	145 mm (5.71 in.)
K	110 mm (4.33 in.)

W1032869

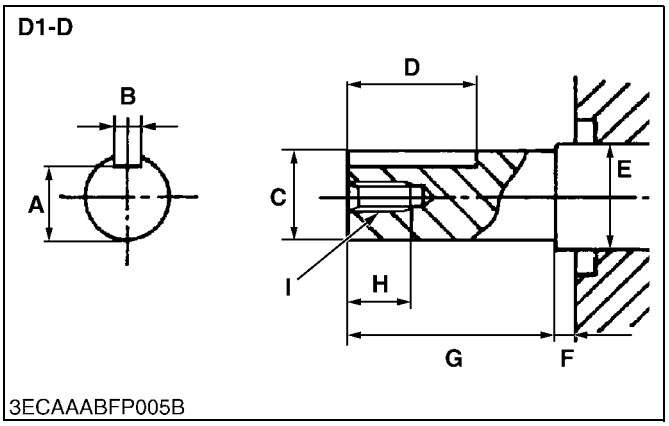
■ X TYPE (WITH STOP SOLENOID) [OC95-E3]



	X TYPE
A	145 mm (5.71 in.)
B	135 mm (5.31 in.)
C	170 mm (6.69 in.)
D	452.0 mm (17.80 in.)
E	3.0 mm (0.12 in.)
F	57.0 mm (2.24 in.)
G	43.0 mm (1.69 in.)
H	503.0 mm (19.80 in.)
I	501.0 mm (19.72 in.)
J	145 mm (5.71 in.)
K	110 mm (4.33 in.)

W1035048

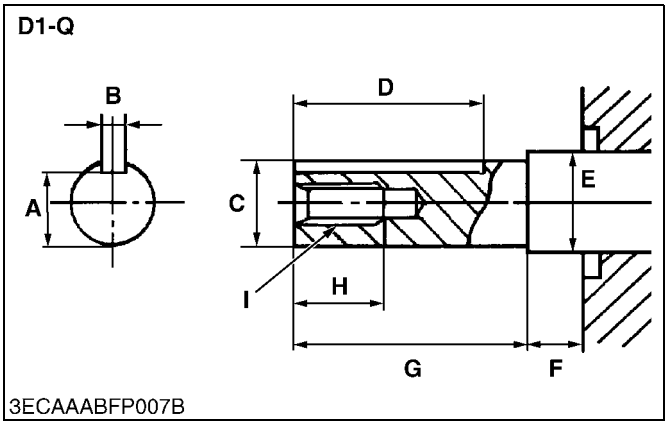
PTO SHAFT DIMENSIONS



■ [OC60-E3]

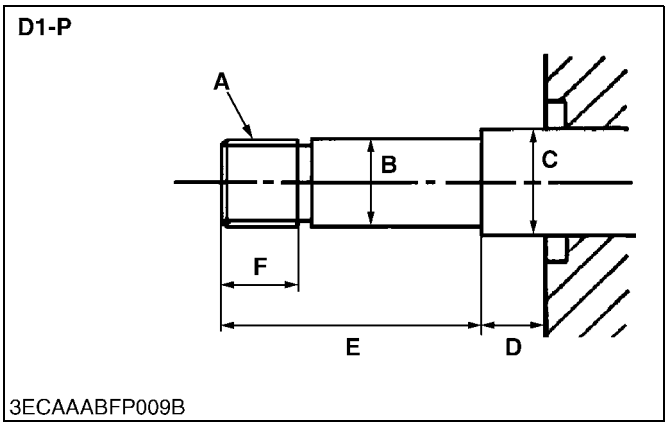
A	20.800 to 21.000 mm (0.81890 to 0.82677 in.)
B	7.000 to 7.022 mm (0.2756 to 0.2764 in.)
C	24.979 to 25.000 mm dia. (0.98343 to 0.98425 in. dia.)
D	38.0 mm (1.50 in.)
E	30.0 mm dia. (1.18 in. dia.)
F	3.0 mm (0.12 in.)
G	60.0 mm (2.36 in.)
H	18 mm (0.71 in.)
I	M 8 x 1.25 mm (M 0.31 x 0.05 in.)

W1024466



A	21.619 to 21.819 mm (0.85115 to 0.85901 in.)
B	6.312 to 6.342 mm (0.2485 to 0.2496 in.)
C	25.379 to 25.400 mm dia. (0.99918 to 1.0000 in. dia.)
D	56.0 mm (2.20 in.)
E	30.0 mm dia. (1.18 in. dia.)
F	16.3 mm (0.642 in.)
G	72.2 mm (2.84 in.)
H	28.0 mm (1.10 in.)
I	7 / 16 - 20 UNF

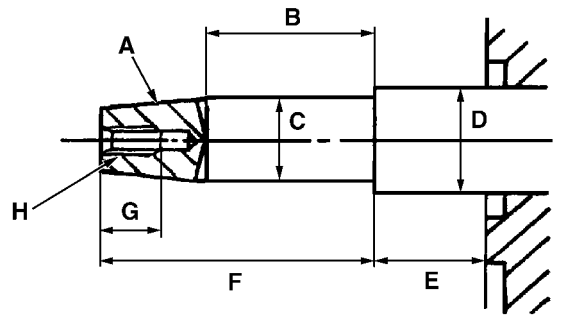
W1024885



A	1 - 14 UNS
B	25.379 to 25.400 mm dia. (0.99918 to 1.0000 in. dia.)
C	30.0 mm dia. (1.18 in. dia.)
D	16.3 mm (0.642 in.)
E	72.2 mm (2.84 in.)
F	24.5 mm (0.965 in.)

W1025022

D1-G

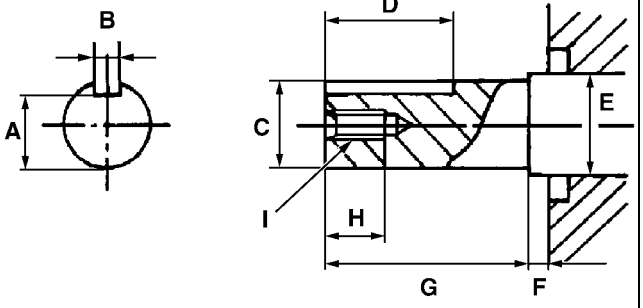


3ECAAABFP011B

A	Taper 2 - 1 / 4 per foot
B	46.5 mm (1.83 in.)
C	22.14 to 22.16 mm dia. (0.8717 to 0.8724 in. dia.)
D	30.0 mm dia. (1.18 in. dia.)
E	30.5 mm (1.20 in.)
F	75.5 mm (2.97 in.)
G	18 mm (0.71 in.)
H	5 / 16 - 24 UNF

W1025139

D1-D



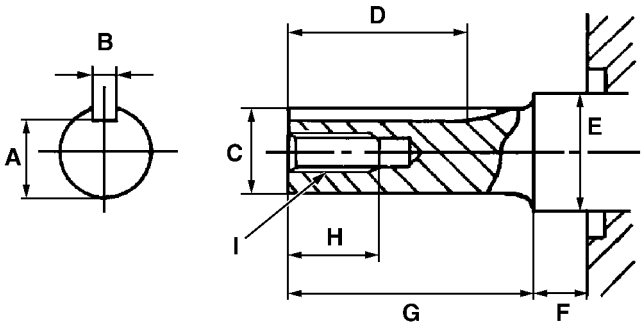
3ECAAABFP006B

■ **[OC95-E3]**

A	20.800 to 21.000 mm (0.81890 to 0.82677 in.)
B	7.000 to 7.022 mm (0.2756 to 0.2764 in.)
C	24.979 to 25.000 mm dia. (0.98343 to 0.98425 in. dia.)
D	38.0 mm (1.50 in.)
E	35.0 mm dia. (1.38 in. dia.)
F	3.0 mm (0.12 in.)
G	60.0 mm (2.36 in.)
H	18 mm (0.71 in.)
I	M 8 x 1.25 mm (M 0.31 x 0.05 in.)

W1025343

D1-Q

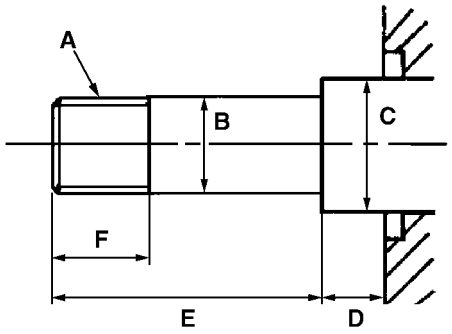


3ECAAABFP008B

A	21.619 to 21.819 mm (0.85115 to 0.85901 in.)
B	6.312 to 6.342 mm (0.2485 to 0.2496 in.)
C	25.379 to 25.400 mm dia. (0.99918 to 1.0000 in. dia.)
D	56.0 mm (2.20 in.)
E	35.0 mm dia. (1.38 in. dia.)
F	16.3 mm (0.642 in.)
G	72.2 mm (2.84 in.)
H	28.0 mm (1.10 in.)
I	7 / 16 - 20 UNF

W1025567

D1-P

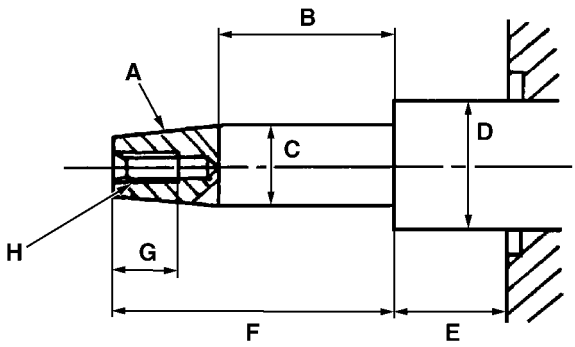


3ECAAABFP010B

A	1 - 14 UNS
B	25.379 to 25.400 mm dia. (0.99918 to 1.0000 in. dia.)
C	35.0 mm dia. (1.38 in. dia.)
D	16.3 mm (0.642 in.)
E	72.2 mm (2.84 in.)
F	25 mm (0.98 in.)

W1025704

D1-G



3ECAAABFP012B

A	Taper 2 - 1 / 4 per foot
B	46.5 mm (1.83 in.)
C	22.14 to 22.16 mm dia. (0.8717 to 0.8724 in. dia.)
D	35.0 mm dia. (1.38 in. dia.)
E	30.5 mm (1.20 in.)
F	75.5 mm (2.97 in.)
G	18 mm (0.71 in.)
H	5 / 16 - 24 UNF

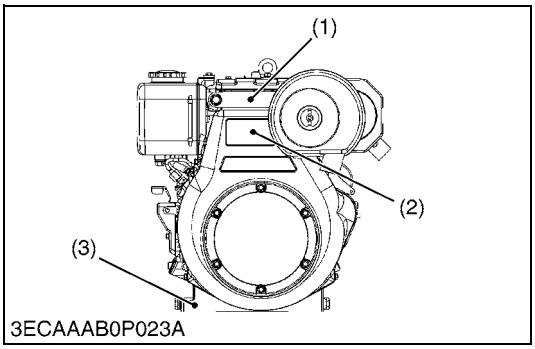
W1025829

GENERAL

CONTENTS

1. ENGINE IDENTIFICATION

[1] MODEL NAME AND ENGINE SERIAL NUMBER



When contacting the manufacture, always specify your engine model name and serial number.

The engine model and its serial number need to be identified before the engine can be serviced or parts replaced.

■ **Engine Serial Number**

The engine serial number is an identified number for the engine. It is marked after the engine model number.

It indicates month and year of manufacture as follows.

- **Year of manufacture**

Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

(1) Model Name
(2) Emission Label
(3) Engine Model Name and Serial Number

W1026455

- **Month of manufacture**

Month	Engine Lot Number	
January	A0001 ~ A9999	B0001 ~ BZ999
February	C0001 ~ C9999	D0001 ~ DZ999
March	E0001 ~ E9999	F0001 ~ FZ999
April	G0001 ~ G9999	H0001 ~ HZ999
May	J0001 ~ J9999	K0001 ~ KZ999
June	L0001 ~ L9999	M0001 ~ MZ999
July	N0001 ~ N9999	P0001 ~ PZ999
August	Q0001 ~ Q9999	R0001 ~ RZ999
September	S0001 ~ S9999	T0001 ~ TZ999
October	U0001 ~ U9999	V0001 ~ VZ999
November	W0001 ~ W9999	X0001 ~ XZ999
December	Y0001 ~ Y9999	Z0001 ~ ZZ999

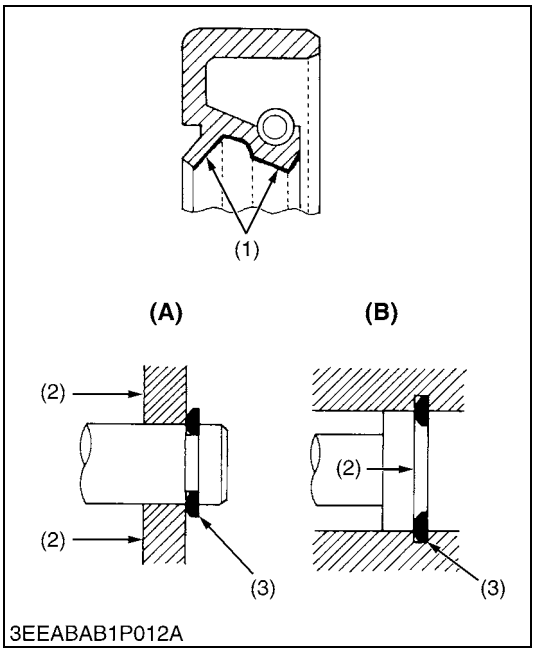
* Alphabetical letters "**I**" and "**O**" are not used.

e.g. OC95 - 8 B A001
(a) (b)(c) (d)

(a) Engine Model Name : **OC95**
(b) Year : **8** indicates **2008**
(c) Month : **A** or **B** indicates **January**
(d) Lot number : (**0001 ~ 9999** or **A001 ~ Z999**)

W1024938

2. GENERAL PRECAUTIONS



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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

W1026590

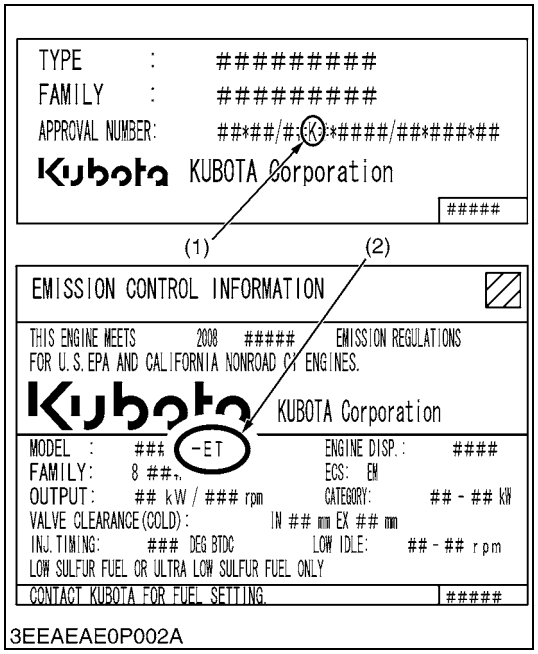
3. E3 ENGINE

[Example : Engine Model Name OC95-E3-XXXX]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Non-Road Emission Standards continue to change. The timing or applicable date of the specific Non-Road Emission regulations depends on the engine output classification.

Over the past several years, Kubota has been supplying diesel engines that comply with regulations in the respective countries affected by Non-Road Emission regulations. For Kubota Engines, E3 will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing ###-E3 series engines, use only replacement parts for that specific E3 engine, designated by the appropriate E3 Kubota Parts List and perform all maintenance services listed in the appropriate Kubota Operator's Manual or in the appropriate E3 Kubota Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E2 engines), may result in emission levels out of compliance with the original E3 design and EPA or other applicable regulations.Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E3 engines are identified with "ET" at the end of the Model designation, on the US EPA label. Please note : E3 is not marked on the engine.



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Category (1)	Engine output classification	EU regulation
K	From 19 to less than 37 kW	STAGE IIIA
J	From 37 to less than 75 kW	STAGE IIIA
I	From 75 to less than 130 kW	STAGE IIIA

Category (2)	Engine output classification	EPA regulation
ET	Less than 19kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Tier 3
	From 75 to less than 130 kW	Tier 3

(1) EU regulation engine output classification category
(2) “E3” engines are identified with “ET” at the end of the Model designation, on the US EPA label.
“E3” designates Tier 3 and some Interim Tier 4 / Tier 4 models, depending on engine output classification.

W1031971

4. LUBRICANTS, AND FUEL

No.	Place	Capacity		Lubricants and fuel
		OC60-E3	**OC95-E3**	
1	Engine oil	1.3 L 1.4 U.S.qts	1.7 L 1.8 U.S.qts	Higher than CF class (API) Above 25 °C (77 °F) : SAE10W-30 SAE10W-40 SAE30 0 to 25 °C (32 to 77 °F) : SAE10W-30 SAE10W-40 SAE20 Below 0 °C (32 °F) : SAE10W-30 SAE10W-40 SAE10
2	Fuel	3.5 L 0.92 U.S.gals	5.5 L 1.5 U.S.gals	**See NOTE**

W1027116

■ **NOTE**

Engine Oil :

- **Refer to the following table for the suitable American Petroleum Institute (API) classification of engine oil according to the engine type (with internal EGR, external EGR or non-EGR) and the Fuel Type Used : (Low Sulfur, Ultra Low Sulfur or High Sulfur Fuels).**

Fuel Type	Engine oil classification (API classification)	
	Engines with non-EGR Engines with internal EGR	Engines with external EGR
High Sulfur Fuel [0.05 % (500 ppm) ≤ Sulfur Content < 0.50 % (5000 ppm)]	**CF** (If the "CF-4, CG-4, CH-4, or CI-4" engine oil is used with a high-sulfur fuel, change the engine oil at shorter intervals. (approximately half))	–
Low Sulfur Fuel [Sulfur Content < 0.05 % (500 ppm)] or Ultra Low Sulfur Fuel [Sulfur Content < 0.0015 % (15 ppm)]	**CF, CF-4, CG-4, CH-4** or **CI-4**	**CF** or **CI-4** (Class CF-4, CG-4 and CH-4 engine oils cannot be used on EGR type engines.)

EGR : Exhaust Gas Re-circulation

W1024941

- **CJ-4 classification oil is intended for use in engines equipped with DPF (Diesel Particulate Filter) and is Not Recommended for use in Kubota E3 specification engines.**
- **Oil used in the engine should have API classification and Proper SAE Engine Oil Viscosity according to the ambient temperatures where the engine is operated.**
- **With strict emission control regulations now in effect, the CF-4 and CG-4 engine oils have been developed for use with low sulfur fuels, for On-Highway vehicle engines. When a Non-Road engine runs on high sulfur fuel, it is advisable to use a "CF or better" classification engine oil with a high Total Base Number (a minimum TBN of 10 is recommended).**

Fuel :

- **Cetane Rating : The minimum recommended Fuel Cetane Rating is 45. A cetane rating greater than 50 is preferred, especially for ambient temperatures below −20 °C (−4 °F) or elevations above 1500 m (5000 ft).**
- **Diesel Fuel Specification Type and Sulfur Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.**
- **Use of diesel fuel with sulfur content less than 0.10 % (1000 ppm) is strongly recommended.**
- **If high-sulfur fuel (sulfur content 0.50 % (5000 ppm) to 1.0 % (10000 ppm)) is used as a diesel fuel, change the engine oil and oil filter at shorter intervals. (approximately half)**
- **DO NOT USE Fuels that have sulfur content greater than 1.0 % (10000 ppm).**
- **Diesel fuels specified to EN 590 or ASTM D975 are recommended.**
- **No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)**
- **Since KUBOTA diesel engines of less than 56 kW (75 hp) utilize EPA Tier 4 and Interim Tier 4 standards, the use of low sulfur fuel or ultra low sulfur fuel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S500 or S15 diesel fuel as an alternative to No.2-D, and use No.1-D S500 or S15 diesel fuel as an alternative to No.1-D for ambient temperatures below −10 °C (14 °F).**

1) SAE : Society of Automotive Engineers
2) EN : European Norm
3) ASTM : American Society of Testing and Materials
4) US EPA : United States Environmental Protection Agency
5) No.1-D or No.2-D, S500 : Low Sulfur Diesel (LSD) less than 500 ppm or 0.05 wt.%
   No.1-D or No.2-D, S15 : Ultra Low Sulfur Diesel (ULSD) 15 ppm or 0.0015 wt.%

5. MAINTENANCE CHECK LIST

No	Item		Service interval									Refere-nce page
			Daily	Initial 25 h	Every 100 h	Every 500 h	Every 800 h	Every 1500 h	Every 3000 h	Every 1 year	Every 2 years	
1	Engine oil	Checking	☆									G-8
		Changing		☆	☆							G-9
2	Oil strainer	Cleaning		☆	☆							G-9
3	Rubber hoses and clamp bands	Checking	☆									G-8
		Changing									☆	G-13
4	Air cleaner	Cleaning			☆							G-10
		Changing	Once year or after 6 cleanings									G-13
5	Fuel filter	Cleaning			☆							G-10
		Changing				☆						G-10
6	Valve clearance	Checking					☆					G-11
7	Nozzle injection pressure and spraying condition	Checking						☆				G-11, 12
		Cleaning						☆				G-11, 12
8	Fuel injection pump	Checking							☆			G-12, 13
9	Battery	Checking			☆							G-10

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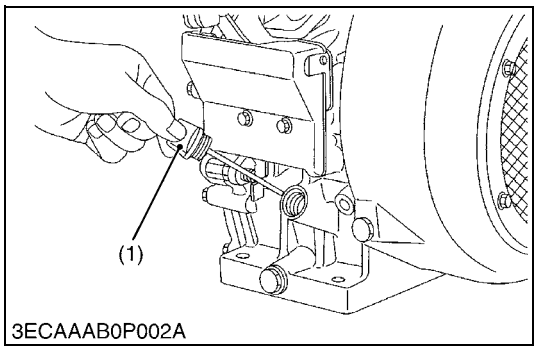
6. CHECK AND MAINTENANCE

[1] DAILY CHECK



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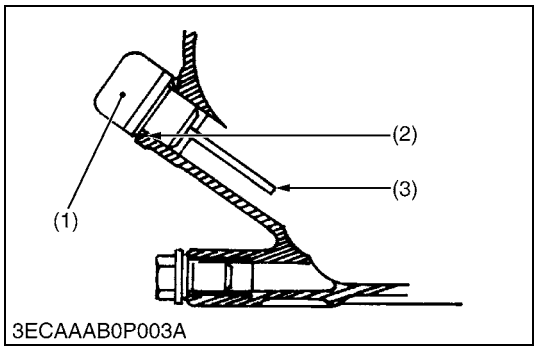

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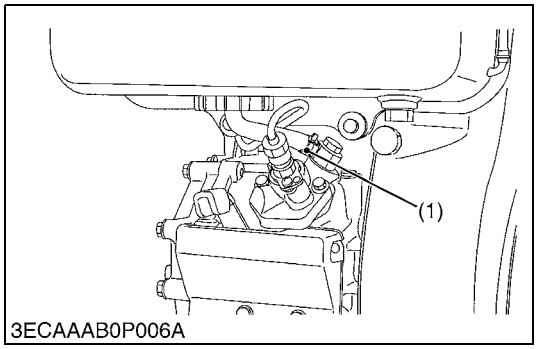

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Checking Engine Oil Level

1. Put the engine on a flat surface, and check the amount and condition of the oil with an oil plug (1).
2. If the oil level is below the lower limit (2), add new oil up to the upper limit (3).
3. When using an oil of different maker or viscosity from the previous one, remove all old oil. Never mix two different types of oil.

■ **NOTE**

- **Use the proper engine oil viscosity (SAE) according to the ambient temperature.**

(1) Oil Plug
(2) Lower Limit
(3) Upper Limit

W1010961

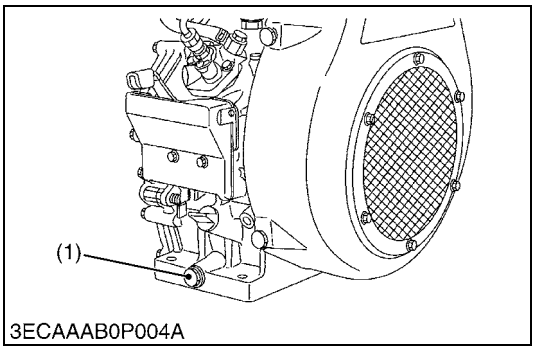
Checking Fuel Hose and Clamp Bands

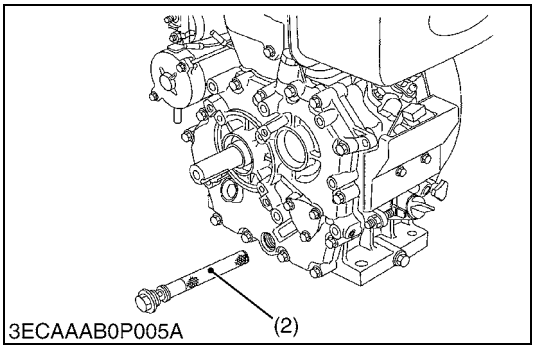
1. If the clamps (1) are loose, replace with new ones.
2. The fuel and lubricating hoses are made of rubber and ages regardless of period of service. Change the fuel pipes together with the clamps every two year.
3. However, if the fuel and lubricating hose and clamp are found to be damaged or deteriorated earlier than two years, replace with new ones.

(1) Clamp

W1011435

[2] CHECK POINT OF INITIAL 25 HOURS





Changing Engine Oil and Cleaning Oil Strainer

1. After warming up the engine, remove the drain plug (1) and drain the oil completely.
2. Put the drain plug and supply the specified quantity of the specified oil through the oil inlet.

■ **NOTE**

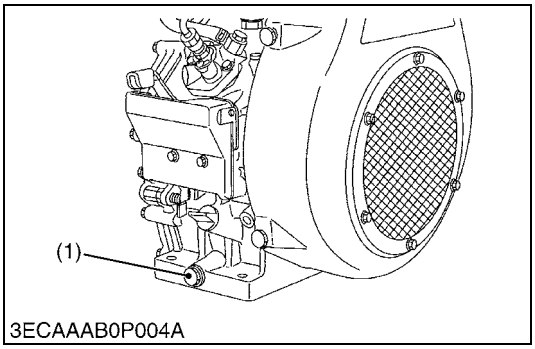
- **Clean the oil strainer (2) each time oil is changed. (When cleaning oil strainer)**

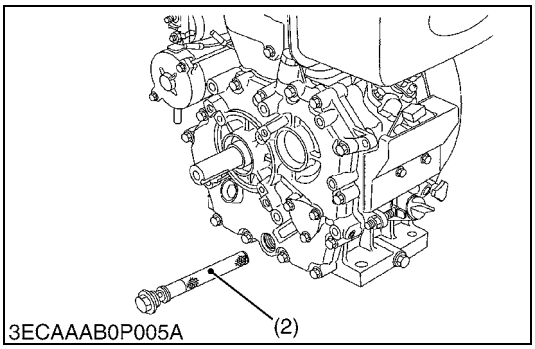
1. Clean the oil strainer with fuel oil.
2. If the oil strainer is deformed or broken, replace it.

(1) Drain Plug (2) Oil Strainer

W1011599

[3] CHECK POINTS OF EVERY 100 HOURS





Changing Engine Oil and Cleaning Oil Strainer

1. After warming up the engine, remove the drain plug (1) and drain the oil completely.
2. Put the drain plug and supply the specified quantity of the specified oil through the oil inlet.

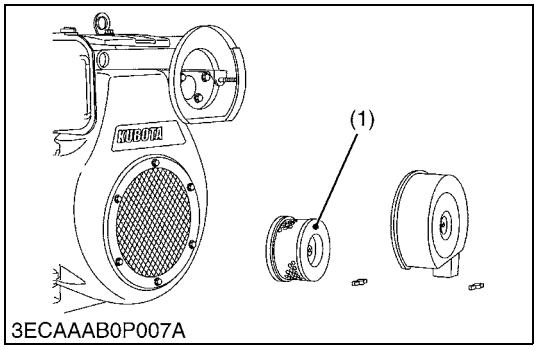
■ **NOTE**

- **Clean the oil strainer (2) each time oil is changed. (When cleaning oil strainer)**

1. Clean the oil strainer with fuel oil.
2. If the oil strainer is deformed or broken, replace it.

(1) Drain Plug (2) Oil Strainer

W1011951



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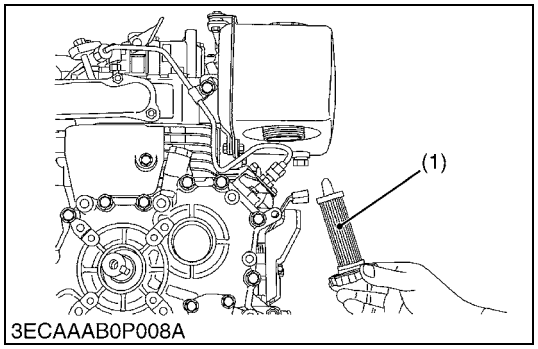
Cleaning and Changing Air Cleaner Element

■ **NOTE**
- **Change air cleaner element (1) once a year or six times of cleaning.**
  (Cleaning Air Filter Element)
- **When dry dust adheres**

1. To clean the element, use clean dry compressed air on the inside of the element.
   Air pressure at the nozzle must not exceed 205 kPa (2.1 kgf/cm^2, 30 psi).
   Maintain reasonable distance between the nozzle and the filter.

(1) Element

W1012219



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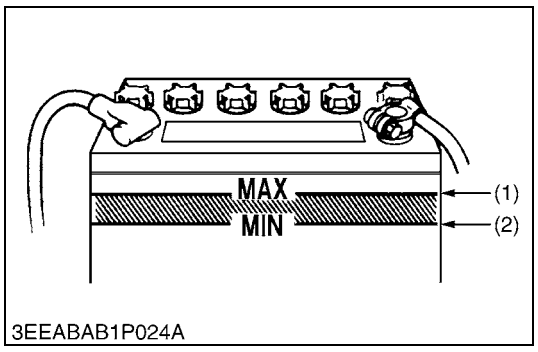
Cleaning Fuel Filter

1. Empty the fuel tank and disconnect the fuel pipe.
2. Loosen the ring nut and take out the filter (1).
3. Wash the filter clean off impurities with fresh fuel.
4. Take much care when handling the element because it is very fragile.

■ **NOTE**
- **If the element should have holes, replace it with a new one. A damaged element will shorten the service life of the nozzle and injection pump.**

(1) Filter

W1012894



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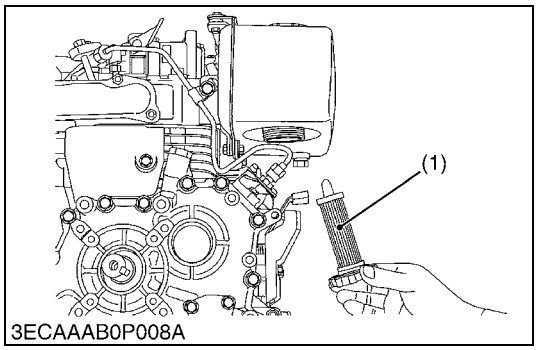
Checking Battery Electrolyte Level

1. Check the battery electrolyte level.
2. If the level is below than lower level line (2), and the distilled water to pour level of each cell.

(1) Upper level Line (1) Lower Level Line

W1018526

[4] CHECK POINT OF EVERY 500 HOURS



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Changing Fuel Filter

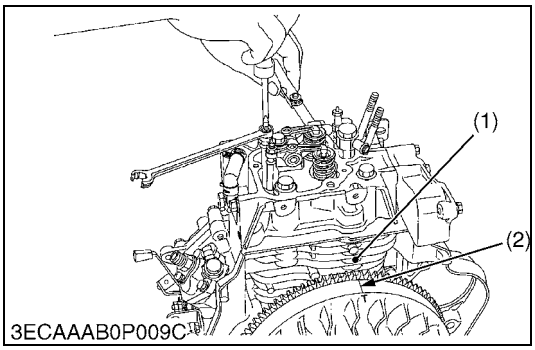
1. Empty the fuel tank and disconnect the fuel pipe.
2. Loosen the ring nut and take out the filter (1).
3. Replace the filter (1).
4. Take much care when handling the element because it is very fragile.

■ **NOTE**
- **A damaged element will shorten the service life of the nozzle and injection pump.**

(1) Filter

W1013115

[5] CHECK POINT OF EVERY 800 HOURS



Checking Valve Clearance

■ **IMPORTANT**

- **Valve clearance must be checked and adjusted when engine is cold.**

1. Remove the cylinder head cover.
2. Align the "**T**" mark line (2) on the flywheel and the mark (1) on the fin at the T.D.C. in the compression stroke.
3. Check the intake and exhaust valve clearance with a thickness gauge.
4. If the clearance is not within the factory specifications, adjust with the adjusting screw.
5. After adjusting the valve clearance, firmly tighten the lock nut on the adjusting screw.

■ **NOTE**

- **After rotating the flywheel clockwise twice or three times, check the valve clearance again.**

Valve clearance	Factory spec.	0.14 to 0.18 mm 0.0056 to 0.0070 in.

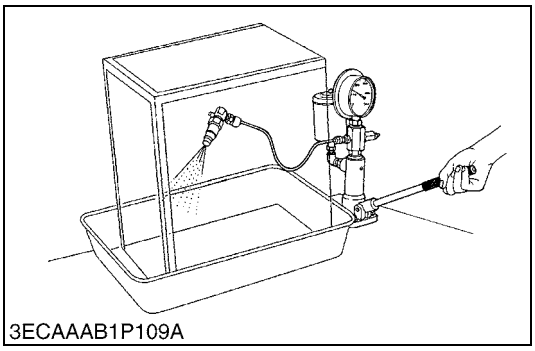
(1) Mark (2) **T** Mark Line

W1013378

[6] CHECK POINTS OF EVERY 1500 HOURS

CAUTION

- **Check the nozzle injection pressure and condition after confirming that there is nobody standing in the direction the fume goes.**
- **If the fume from the nozzle penetrate the human body, cells may be destroyed and blood poisoning may be caused.**



Checking Nozzle Injection Pressure

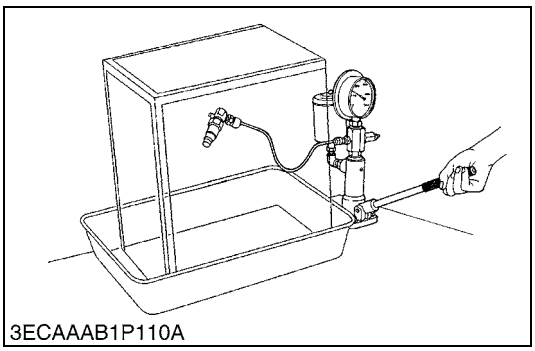
1. Set the injection nozzle to the nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, disassemble the injection nozzle, and change adjusting washer until the proper injection pressure is obtained.

Nozzle injection pressure	Factory spec.	13.93 to 14.70 MPa 142.0 to 150.0 kgf/cm^2 2020 to 2133 psi

(Reference)

- Pressure variation with 0.10 mm (0.0039 in.) difference of adjusting washer thickness 981 kPa (10.0 kgf/cm^2, 142 psi).

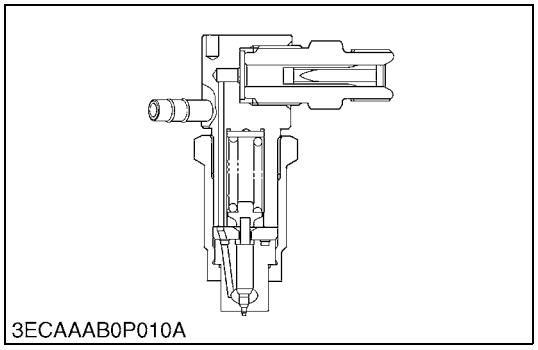
W1013861



Valve Seat Tightness

1. Apply a pressure 12.75 to 13.92 MPa (130.0 to 142.0 kgf/cm^2, 1849 to 2019 psi) lower than the fuel injection pressure.
2. After keeping the nozzle under this pressure for 10 seconds, check to see if fuel leaks from the nozzle.
3. If any fuel leak is found, replace the nozzle piece.

W1018875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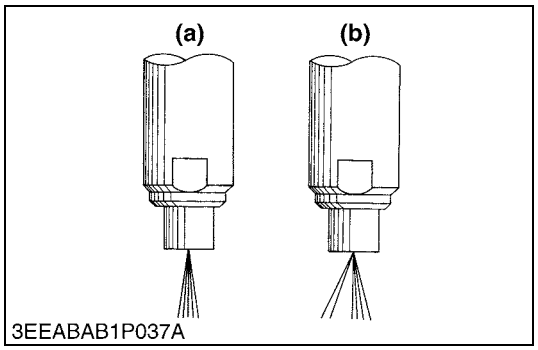

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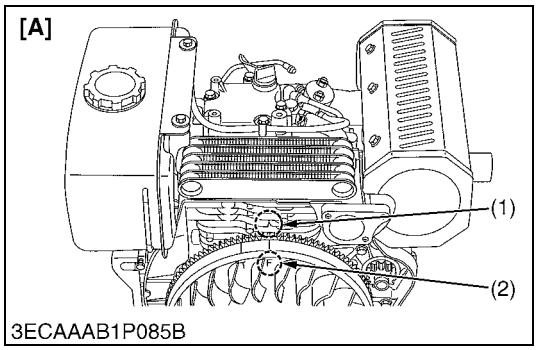
Nozzle Spraying Condition

1. Check the nozzle spray condition.
2. If the spray pattern and spraying direction are faulty, replace the nozzle piece.

(a) Good **(b) Bad**

W1014313

[7] CHECK POINTS OF EVERY 3000 HOURS



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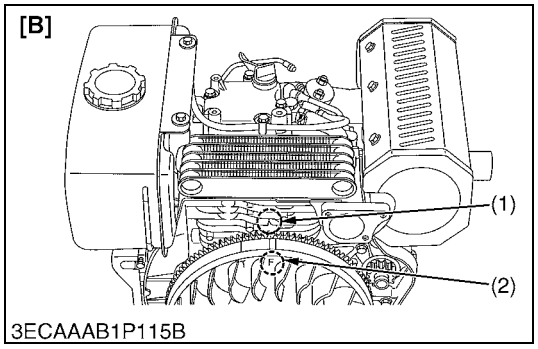

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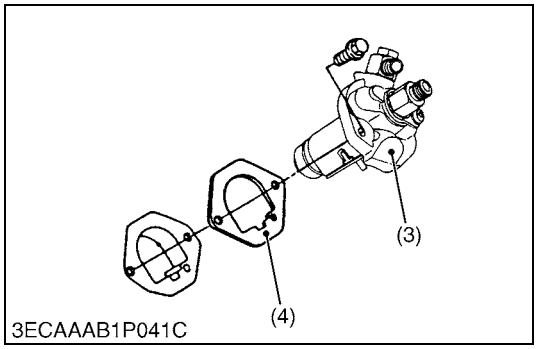

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Adjusting Injection Timing

1. Connect the injection pipe to the injection pump as shown in the figure.
2. Set the speed control lever to the maximum speed position.
3. Turn the flywheel clockwise to check that fuel comes out from the tip of the injection pipe.
4. Turn the flywheel so that the **F** mark (2) on the flywheel circumference reaches near below the mark (1) on the fin slowly turn the flywheel clockwise from that position, and stop it immediately when the fuel level at the tip of the injection pipe begins rising. At this time, check if the **F** mark (2) on the flywheel circumference aligns with the fin mark.
5. If the timing is incorrect, adjust it with shims (4).

Injection timing	Factory spec.	OC60-E3	0.2662 to 0.2923 rad (15.25 ° to 16.75 °) before T.D.C.
		OC95-E3	0.2313 to 0.2574 rad (13.25 ° to 14.75 °) before T.D.C.

■ **NOTE**

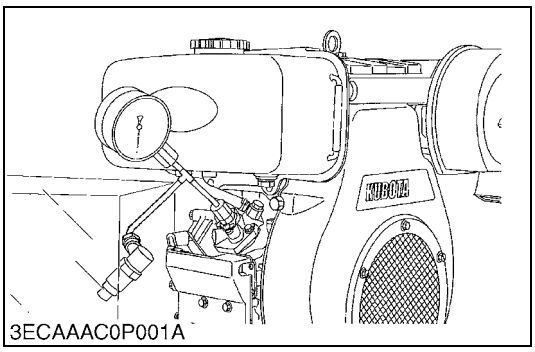
- There are 2 **F** mark lines in **[B]**.
- Use the line near **T** mark to adjust.

(Reference)

- Insert the same number of shims (4) as used before between crank case and injection pump (3), and then check the injection timing.
- Shims (4) are available in thickness of 0.10 mm (0.0039 in.), 0.15 mm (0.0059 in.), 0.225 mm (0.00886 in.) and 0.50 mm (0.020 in.). Combine these shims for adjustments.

(1) Mark **[A] OC60-E3**
(2) **F** Mark **[B] OC95-E3**
(3) Injection Pump
(4) Injection Timing Adjusting Shim

W1013668

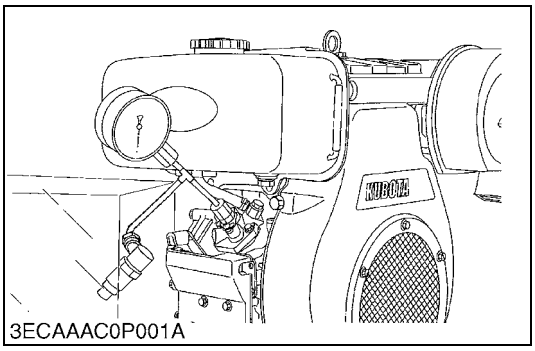


Fuel Tightness of Pump Element

1. Set an injection pump pressure tester to the injection pump.
2. Set the speed control lever to the maximum speed position.
3. Turn the engine ten times or more with the starter to increase the pressure.
4. If the pressure can not reach the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Pump element fuel tightness	Allowable limit	14.71 MPa 150.0 kgf/cm^2 2134 psi

W1015239



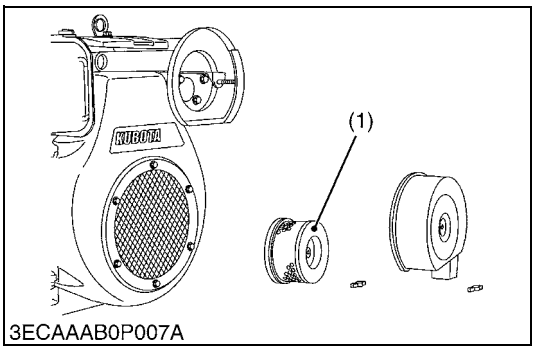
Fuel Tightness of Delivery Valve

1. In the same way as to check the pump element fuel tightness, turn the engine ten times or more with the starter so that the pressure is increased to specified pressure.
2. Set the plunger at the bottom dead center to reduce the delivery chamber pressure to zero.
3. Measure the fall time for the pressure to drop to the reference pressure from the specified initial pressure.
4. If the measurement is less than the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Delivery valve fuel tightness	Allowable limit	14.70 → 13.93 MPa 150.0 → 142.0 kgf/cm^2 2133 → 2020 psi	5 seconds or less

W1015469

[8] CHECK POINT OF EVERY 1 YEAR



Cleaning and Changing Air Cleaner Element

■ **NOTE**

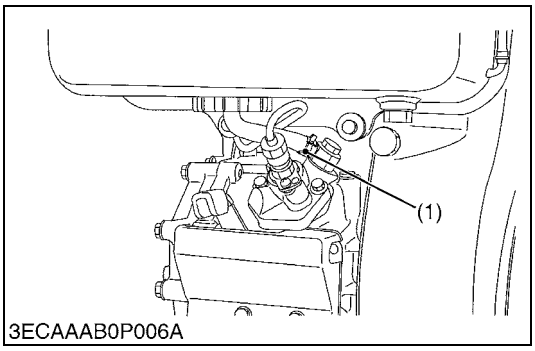
- **Change air cleaner element (1) once a year or six times of cleaning.**
  (Cleaning Air Filter Element)
- **When dry dust adheres**

1. To clean the element, use clean dry compressed air on the inside of the element.
   Air pressure at the nozzle must not exceed 205 kPa (2.1 kgf/cm^2, 30 psi).
   Maintain reasonable distance between the nozzle and the filter.

(1) Element

W1014656

[9] CHECK POINT OF EVERY 2 YEARS



Changing Fuel Hose and Clamp Bands

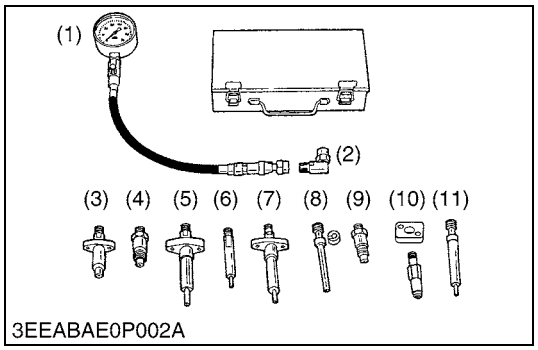
1. If the clamps (1) are loose, replace with new ones.
2. The fuel and lubricating hoses are made of rubber and ages regardless of period of service. Change the fuel pipes together with the clamps every two year.
3. However, if the fuel and lubricating hose and clamp are found to be damaged or deteriorated earlier than two years, replace with new ones.

(1) Clamp

W1014904

Product: 2008 Kubota WSM OC60-E3,OC95-E3 Diesel Engine Service Repair Workshop Manual
Full Download: https://www.arepairmanual.com/downloads/2008-kubota-wsm-oc60-e3oc95-e3-diesel-engine-service-repair-workshop-manual/

7. SPECIAL TOOLS



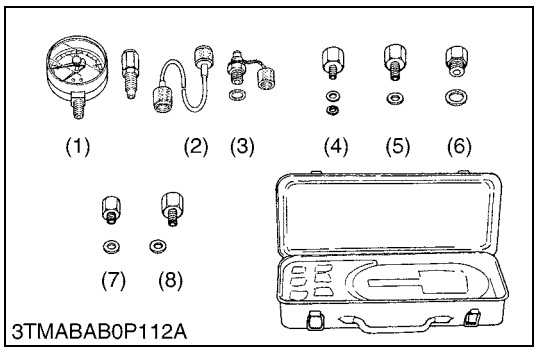
Diesel Engine Compression Tester (for Injection Nozzle)

Code No: 07909-30208 (Assembly) 07909-31251 (**G**)
07909-30934 (**A** to **F**) 07909-31271 (**I**)
07909-31211 (**E** and **F**) 07909-31281 (**J**)
07909-31231 (**H**)

Application: Use to measure diesel engine compression and diagnosis of need for major overhaul.

(1) Gauge
(2) **L** Joint
(3) Adaptor **A**
(4) Adaptor **B**
(5) Adaptor **C**
(6) Adaptor **E**
(7) Adaptor **F**
(8) Adaptor **G**
(9) Adaptor **H**
(10) Adaptor **I** (for OC60 / 95)
(11) Adaptor **J**

W1024200



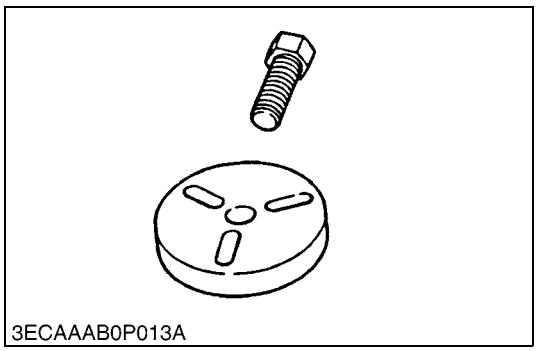
Oil Pressure Tester

Code No: 07916-32032

Application: Use to measure lubricating oil pressure.

(1) Gauge
(2) Cable
(3) Threaded Joint
(4) Adaptor **1**
(5) Adaptor **2**
(6) Adaptor **3**
(7) Adaptor **4**
(8) Adaptor **5**

W1024318



Flywheel Puller

Code No: 07916-30161

Application: Use for removing the flywheel from crankshaft.

W1020401

Sample of manual. Download All 108 pages at:
https://www.arepairmanual.com/downloads/2008-kubota-wsm-oc60-e3oc95-e3-diesel-engine-service-repair-workshop-manual/