WSM

WORKSHOP MANUAL
DIESEL ENGINE

SM-E2B SERIES

Kubota

KiSC issued 06, 2006 A

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of SM-E2B series. 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. 9Y021-01870) 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.

November 2004

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.

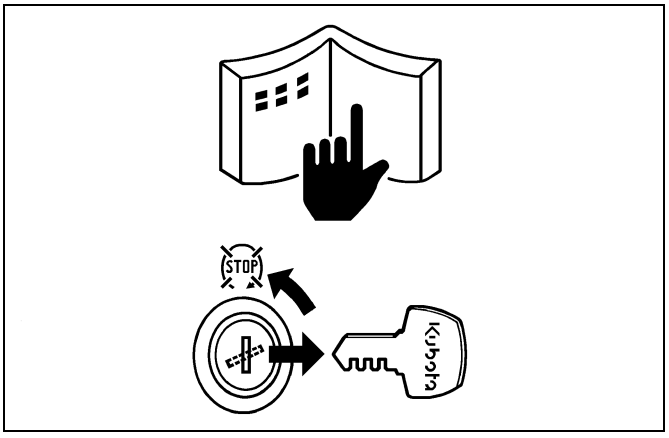
DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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.

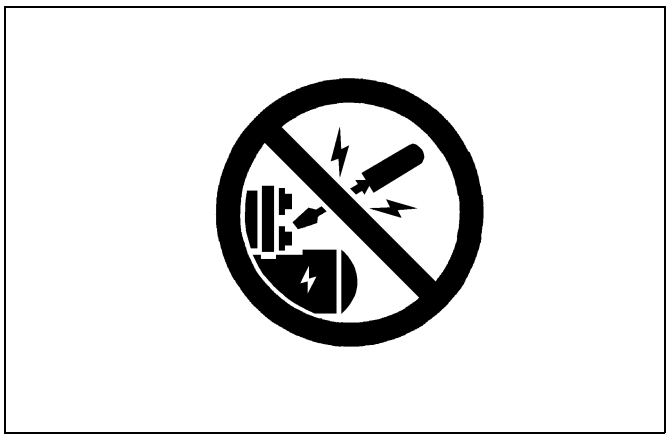
■ IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

■ NOTE : Gives helpful information.



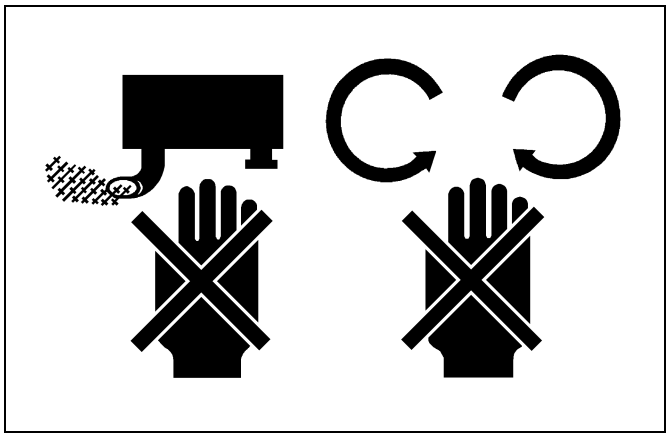
BEFORE SERVICING AND REPAIRING

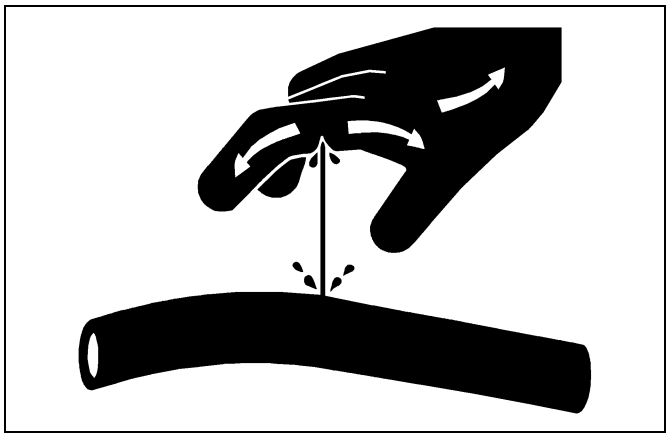
- Read all instructions and safety instructions in this manual and on your engine safety decals.
- Clean the work area and engine.
- Park the machine on a firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.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



SAFETY STARTING

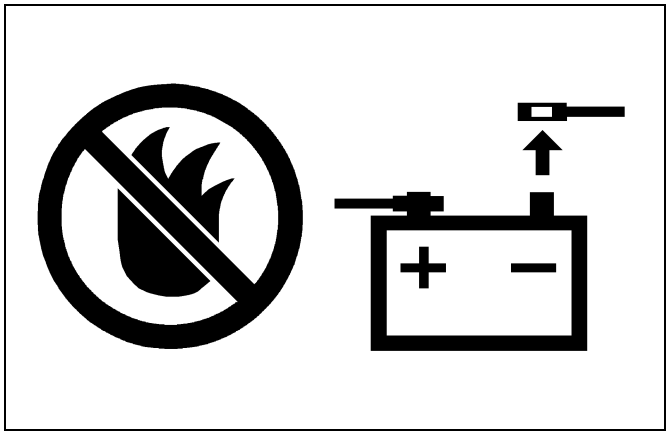
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.





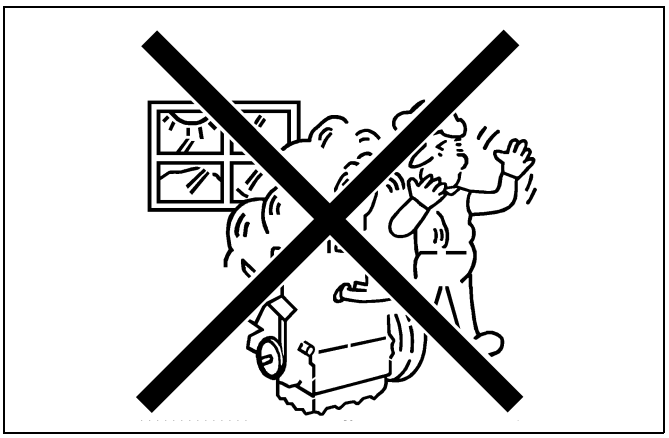
SAFETY WORKING

- 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.



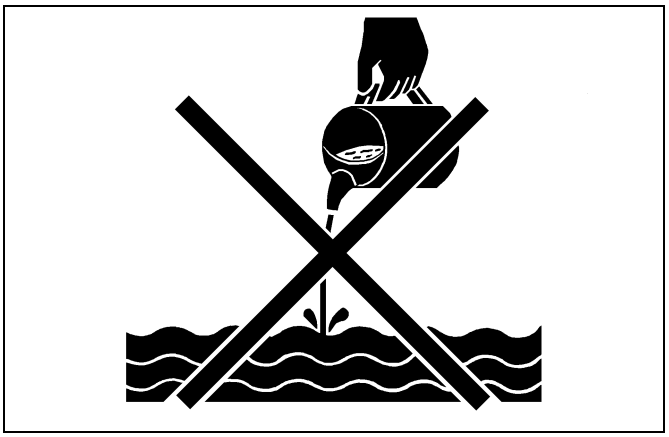
AVOID FIRES

- 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.



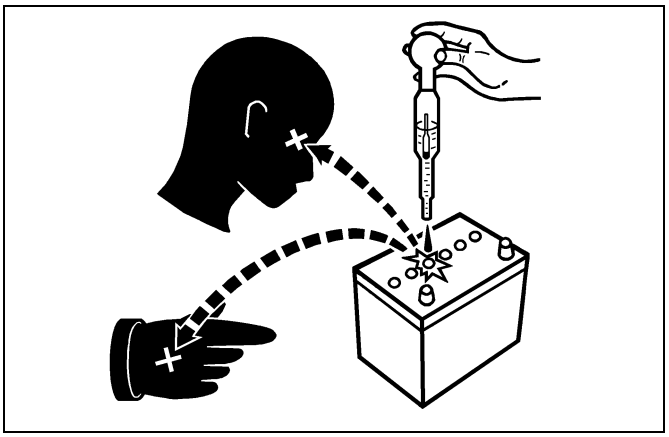
VENTILATE WORK AREA

- 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.



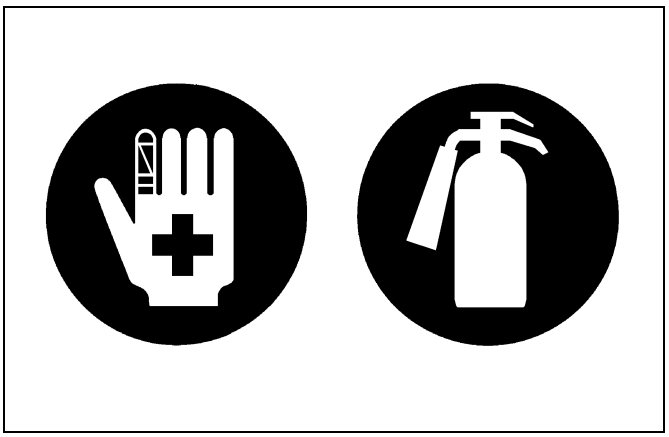
DISPOSE OF FLUIDS PROPERLY

- 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.



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.



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		**Z482-E2B**	**Z602-E2B**	
Number of Cylinders		2		
Type		Vertical, Water-cooled, 4 cycle IDI diesel engine		
Bore × Stroke	mm (in.)	67 × 68 (2.64 × 2.68)	72 × 73.6 (2.83 × 2.90)	
Total Displacement	cm^3 (cu.in.)	479 (29.23)	599 (36.55)	
ISO Net Continous kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		8.1 / 3600 (10.9 / 3600)	8.8 / 3200 (11.8 / 3200)	10.1 / 3600 (13.5 / 3600)
ISO / SAE Net Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		9.3 / 3600 (12.5 / 3600)	10.1 / 3200 (13.5 / 3200)	11.6 / 3600 (15.5 / 3600)
SAE Gross Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		9.9 / 3600 (13.3 / 3600)	10.8 / 3200 (14.5 / 3200)	12.5 / 3600 (16.8 / 3600)
Maximum Bare Speed	(min^{-1} (rpm))	3800	3450	3800
Minimum Bare Idling Speed	(min^{-1} (rpm))	900 to 1000		
Combustion Chamber		Spherical type (E-TVCS)		
Fuel Injection Pump		Bosch MD type mini pump		
Governor		All speed mechanical governor		
Direction of Rotation		Counter-clockwise (viewed from flywheel side)		
Injection Nozzle		Bosch “Throttle” type		
Injection Timing		0.35 rad (20 °) before T.D.C.	0.31 rad (18 °) before T.D.C.	0.35 rad (20 °) before T.D.C.
Firing Order		1-2		
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)		
Compression Ratio		23.5 : 1	24 : 1	
Lubricating System		Forced lubrication by trochoid pump		
Oil Pressure Indicating		Electrical type switch		
Lubricating Filter		Full flow paper filter (Cartridge type)		
Cooling System		Pressurized radiator, forced circulation with water pump (not included in the basic engine)		
Starting System		Electric Starting with Starter		
Starting Motor		12 V, 0.8 kW	12 V, 1.0 kW	
Starting Support Device		By glow plug in combustion chamber		
Battery		12 V, 28 AH equivalent	12 V, 36 AH equivalent	
Charging Alternator		12 V, 150 W	12 V, 480 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 G-5, 8.		
Lubricating Oil Capacity	Oil Pan Depth 101 mm (3.98 in.)	2.1 L (0.55 U.S.gals)	2.5 L (0.66 U.S.gals)	
	Oil Pan Depth 121 mm (4.76 in.)	2.5 L (0.66 U.S.gals)	–	
Weight (Dry)	kg (lbs)	53.1 (117.1)	57.0 (125.7)	

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

W10336300

Model		D662-E2B	D722-E2B
Number of Cylinders		3	
Type		Vertical, Water-cooled, 4 cycle IDI diesel engine	
Bore × Stroke	mm (in.)	64 × 68 (2.52 × 2.68)	67 × 68 (2.64 × 2.68)
Total Displacement	cm^3 (cu.in.)	656 (40.03)	719 (43.88)
ISO Net Continuous kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		11.2 / 3600 (15.0 / 3600)	12.2 / 3600 (16.4 / 3600)
ISO / SAE Net Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		12.9 / 3600 (17.3 / 3600)	14.0 / 3600 (18.8 / 3600)
SAE Gross Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		14.3 / 3600 (19.2 / 3600)	14.9 / 3600 (20.0 / 3600)
Maximum Bare Speed	(min^{-1} (rpm))	3800	
Minimum Bare Idling Speed	(min^{-1} (rpm))	900 to 1000	
Combustion Chamber		Spherical type (E-TVCS)	
Fuel Injection Pump		Bosch MD type mini pump	
Governor		All speed mechanical governor	
Direction of Rotation		Counter-clockwise (viewed from flywheel side)	
Injection Nozzle		Bosch “Throttle” type	
Injection Timing		0.35 rad (20 °) before T.D.C.	
Firing Order		1-2-3	
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)	
Compression Ratio		23 : 1	23.5 : 1
Lubricating System		Forced lubrication by trochoid pump	
Oil Pressure Indicating		Electrical type switch	
Lubricating Filter		Full flow paper filter (Cartridge type)	
Cooling System		Pressurized radiator, forced circulation with water pump (not included in the basic engine)	
Starting System		Electric Starting with Starter	
Starting Motor		12 V, 0.8 kW	
Starting Support Device		By glow plug in combustion chamber	
Battery		12 V, 36 AH equivalent	
Charging Alternator		12 V, 150 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 G-5, 8.	
Lubricating Oil Capacity	Oil Pan Depth 101 mm (3.98 in.)	3.2 L (0.85 U.S.gals)	
	Oil Pan Depth 121 mm (4.76 in.)	3.8 L (1.00 U.S.gals)	
Weight (Dry)	kg (lbs)	63.7 (140.4)	63.1 (139.1)

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

W10304910

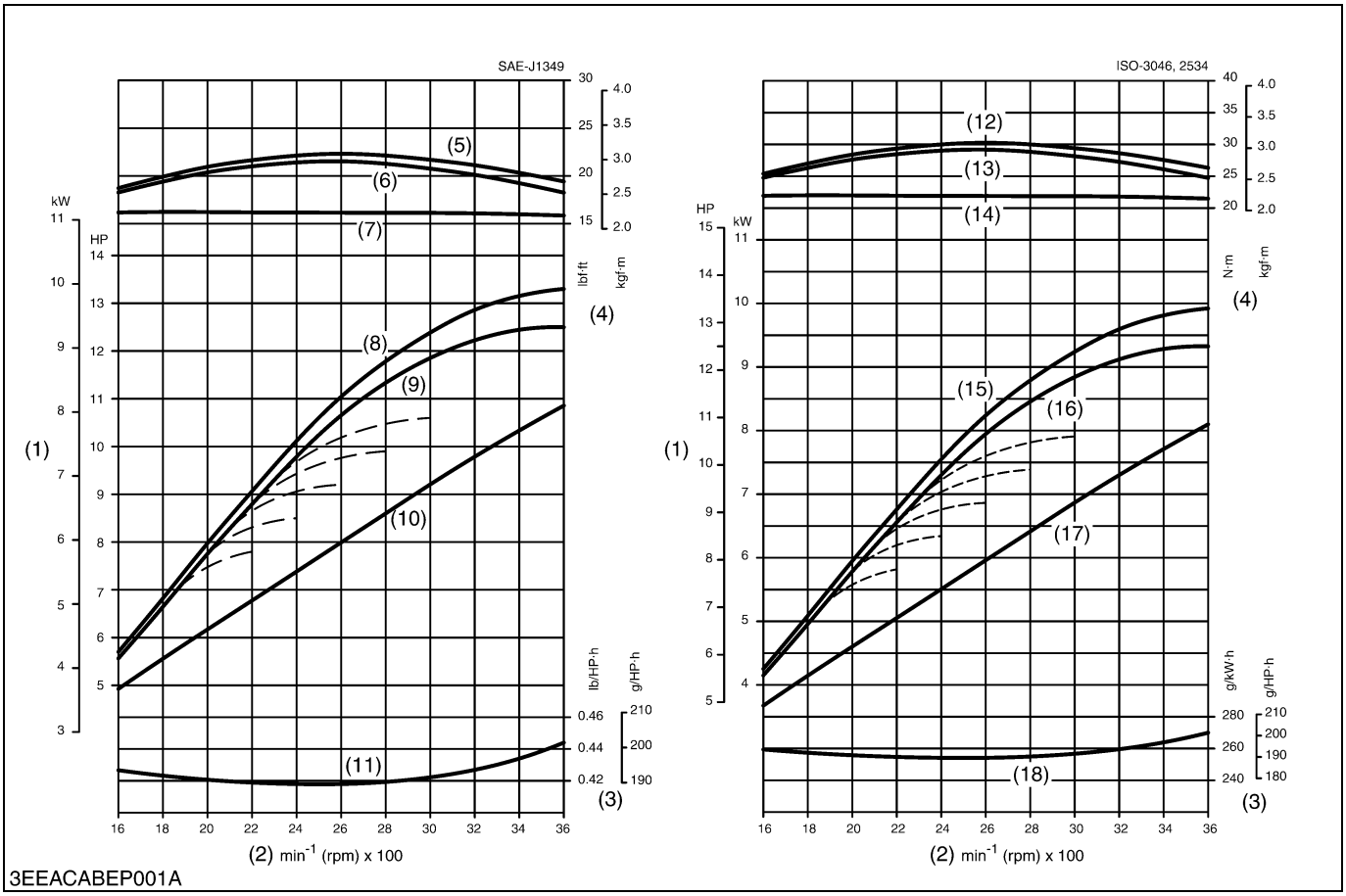
Model		D782-E2B	D902-E2B	
Number of Cylinders		3		
Type		Vertical, Water-cooled, 4 cycle IDI diesel engine		
Bore × Stroke	mm (in.)	67 × 73.6 (2.64 × 2.90)	72 × 73.6 (2.83 × 2.90)	
Total Displacement	cm^3 (cu.in.)	778 (47.48)	898 (54.80)	
ISO Net Continuous kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		11.7 / 3200 (15.7 / 3200)	13.4 / 3200 (18.0 / 3200)	15.2 / 3600 (20.4 / 3600)
ISO / SAE Net Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		13.5 / 3200 (18.1 / 3200)	15.4 / 3200 (20.6 / 3200)	17.5 / 3600 (23.5 / 3600)
SAE Gross Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		14.1 / 3200 (18.9 / 3200)	16.1 / 3200 (21.6 / 3200)	18.5 / 3600 (24.8 / 3600)
Maximum Bare Speed	(min^{-1} (rpm))	3450		3800
Minimum Bare Idling Speed	(min^{-1} (rpm))	900 to 1000		
Combustion Chamber		Spherical type (E-TVCS)		
Fuel Injection Pump		Bosch MD type mini pump		
Governor		All speed mechanical governor		
Direction of Rotation		Counter-clockwise (viewed from flywheel side)		
Injection Nozzle		Bosch “Throttle” type		
Injection Timing		0.30 rad (17 °) before T.D.C.	0.31 rad (18 °) before T.D.C.	0.35 rad (20 °) before T.D.C.
Firing Order		1-2-3		
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)		
Compression Ratio		24 : 1		
Lubricating System		Forced lubrication by trochoid pump		
Oil Pressure Indicating		Electrical type switch		
Lubricating Filter		Full flow paper filter (Cartridge type)		
Cooling System		Pressurized radiator, forced circulation with water pump (not included in the basic engine)		
Starting System		Electric Starting with Starter		
Starting Motor		12 V, 1.0 kW	12 V, 1.2 kW	
Starting Support Device		By glow plug in combustion chamber		
Battery		12 V, 36 AH equivalent	12 V, 52 AH equivalent	
Charging Alternator		12 V, 150 W	12 V, 480 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 G-5, 8.		
Lubricating Oil Capacity	Oil Pan Depth 101 mm (3.98 in.)	–	3.7 L (0.98 U.S.gals)	
	Oil Pan Depth 121 mm (4.76 in.)	3.6 L (0.95 U.S.gals)	–	
Weight (Dry)	kg (lbs)	63.5 (139.7)	72.0 (158.7)	

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

W10321290

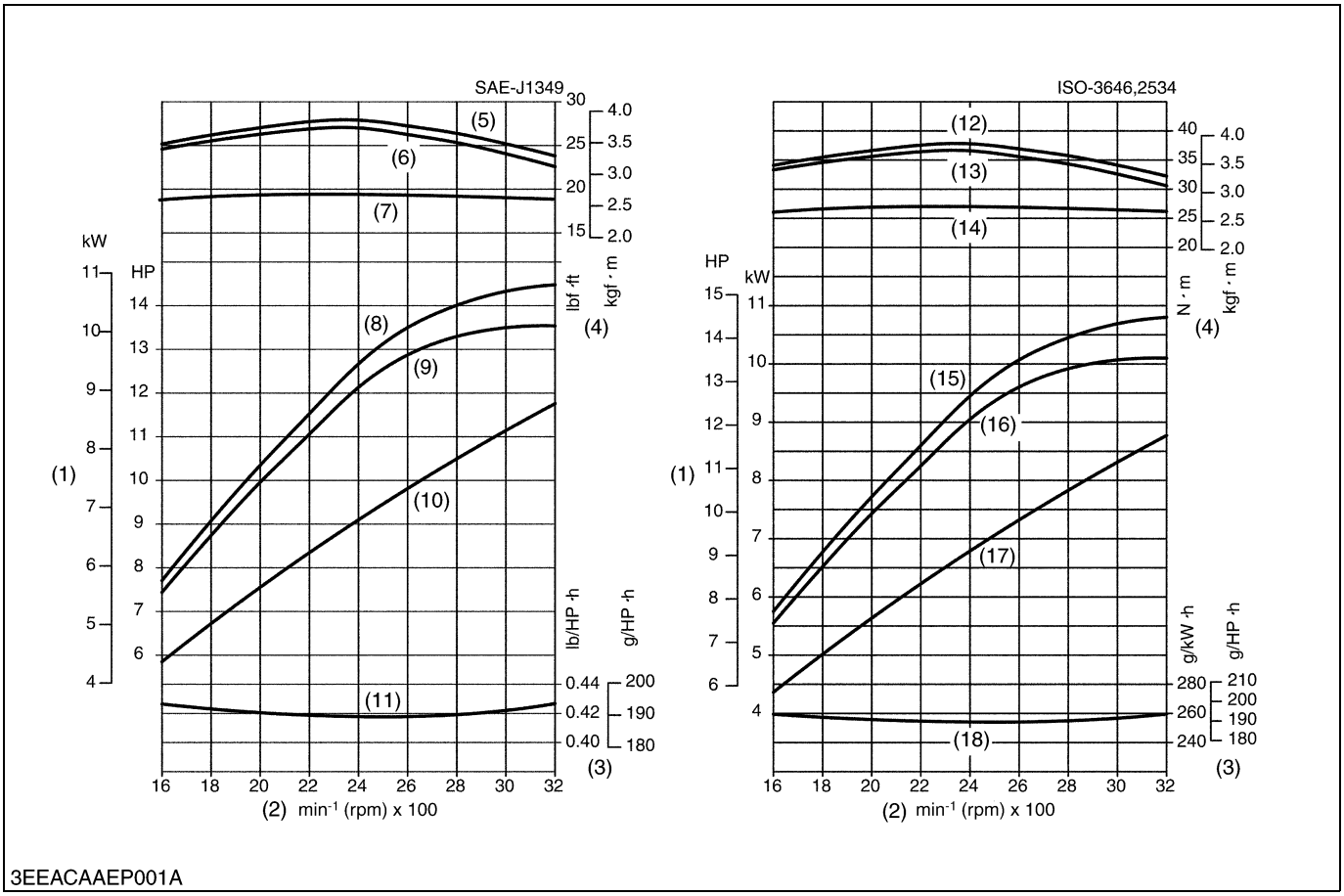
PERFORMANCE CURVES

■ Z482-E2B



(1) Brake Horsepower
(2) Engine Speed
(3) B.S.F.C.
(4) Torque
(5) Gross Intermittent Torque
(6) Net Intermittent Torque
(7) Net Continuous Torque
(8) Gross Intermittent B.H.P.
(9) Net Intermittent B.H.P.
(10) Net Continuous B.H.P.
(11) Net Intermittent B.S.F.C.
(12) Gross Torque
(13) Overload Torque
(14) Continuous Torque
(15) Gross B.H.P.
(16) Overload B.H.P.
(17) Continuous B.H.P.
(18) Overload B.S.F.C.

■ Z602-E2B (3200 min^{-1} (rpm) spec.)



(1) Brake Horsepower
(2) Engine Speed
(3) B.S.F.C.
(4) Torque
(5) Gross Intermittent Torque
(6) Net Intermittent Torque
(7) Net Continuous Torque
(8) Gross Intermittent B.H.P.
(9) Net Intermittent B.H.P.
(10) Net Continuous B.H.P.
(11) Net Intermittent B.S.F.C.
(12) Gross Torque
(13) Overload Torque
(14) Continuous Torque
(15) Gross B.H.P.
(16) Overload B.H.P.
(17) Continuous B.H.P.
(18) Overload B.S.F.C.