WSM

WORKSHOP MANUAL
DIESEL ENGINE

V3800-TIEF4, V3800-TIEF4C, V3800-TIEF4H

Kubota

KiSC issued 08, 2018 A

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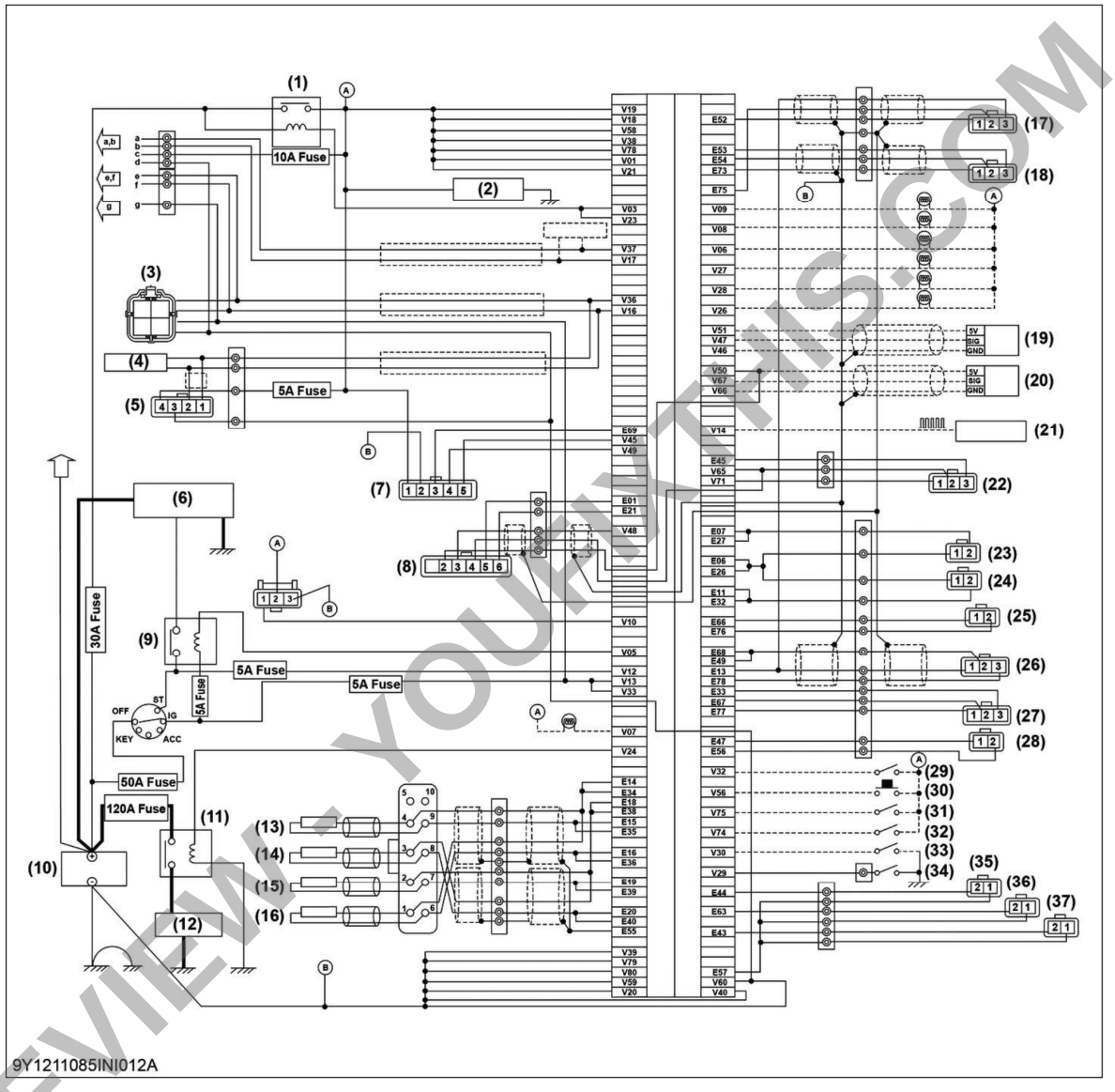
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5. System wiring diagram



9Y1211085INI012A

(1)	Main relay	(14)	Injector 2	(27)	Boost sensor
(2)	Fuel feed pump	(15)	Injector 3	(28)	Intake air temperature sensor
(3)	CAN 1 connector (for service)	(16)	Injector 4	(29)	Stop switch
(4)	Resistance connector (120 Ω)	(17)	Crankshaft position sensor	(30)	Parked regeneration switch
(5)	EGR valve	(18)	Camshaft position sensor	(31)	Parking switch
(6)	Starter	(19)	Accel sensor 1	(32)	Regeneration inhibit switch

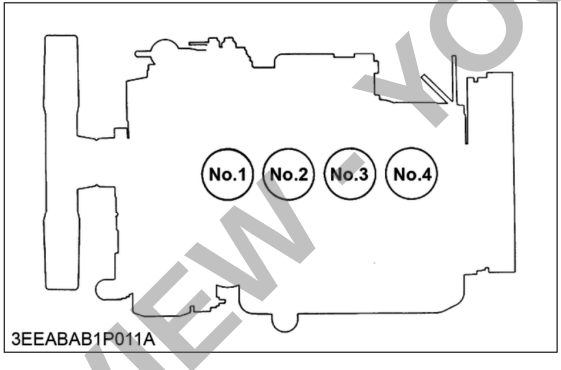
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Nonroad Emission regulations depends on the engine output classification.
Over the past several years, Kubota has been supplying diesel engines that comply with regulations in the respective countries affected by Nonroad Emission regulations. For Kubota Engines, EF4B will be the designation that identifies engine models affected by the next emission phase.
When servicing or repairing ###-EF4B series engines, use only replacement parts for that specific EF4B engine, designated by the appropriate EF4B Kubota Parts List and perform all maintenance services listed in the appropriate Kubota Operator's Manual or in the appropriate EF4B Kubota Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E4B engines), may result in emission levels out of compliance with the original EF4B 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. EF4B engines are identified with "EV" at the end of the Model designation, on the US EPA label. Please note: EF4B is not marked on the engine.

Example: Engine Model Name V3800-TIEF4-XXXX or V3800-TIEF4C-XXXX

3. Cylinder number



You can see the cylinder numbers of Kubota diesel engine in the figure. The sequence of cylinder numbers is No.1, No.2, No.3 and No.4 and it starts from the gear case side.

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3. Tightening torques

Refer to the following table if the tightening torques of screws, bolts and nuts are not specified in each part.

3.1 Tightening torques of screws, bolts and nuts for general use

If the tightening torque is not specified, refer to the table below for the none specified torques values.

Indication on top of bolt	 No-grade or 4T			 7T		
Indication on top of nut	 No-grade or 4T					
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
M8	18 to 20	1.8 to 2.1	13 to 15	24 to 27	2.4 to 2.8	18 to 20
M10	40 to 45	4.0 to 4.6	29 to 33	49 to 55	5.0 to 5.7	37 to 41
M12	63 to 72	6.4 to 7.4	47 to 53	78 to 90	7.9 to 9.2	58 to 66

3.2 Tightening torques of screws, bolts and nuts for special use

■ NOTE

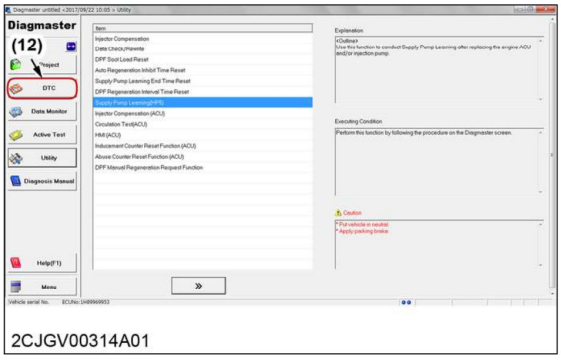
- **For the screws, bolts and nuts with the mark "*", apply engine oil to their threads and seats before you tighten.**
- **The alphabet "M" in Dimension × Pitch shows that the screw, bolt or nut dimensions are in the metric system. The dimension is the nominal external diameter in mm of the threads.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

Disassembling and assembling

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Drain plug	M22 × 1.5	45 to 53	4.5 to 5.5	33 to 39
Alternator pulley nut	—	58.4 to 78.9	5.95 to 8.05	43.1 to 58.2
*Main bearing case screw	M14 × 1.5	138 to 147	14.0 to 15.0	102 to 108
Flywheel housing mounting screw	M12 × 1.25	103 to 117	10.5 to 12.0	76.0 to 86.7
*Flywheel 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
Camshaft set screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Cam pulsar gear retaining screw	M5	4.7 to 5.6	0.48 to 0.58	3.5 to 4.1
Idle gear mounting screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Relief valve retaining plug	M22 × 1.5	95.2 to 108	9.70 to 11.1	70.2 to 80.2
Oil pump cover screw	M6	7.9 to 9.3	0.80 to 0.95	5.8to 6.8
Gear case cover mounting screw	M8 × 1.25	33 to 36	3.3 to 3.7	24 to 26
*Crankshaft screw	M16 × 1.5	255 to 274	26.0 to 28.0	188 to 202

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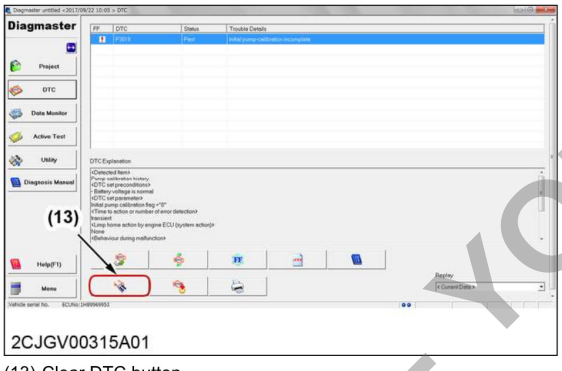


(12) DTC button

8. Confirm that the status of "P3019" is "Past", then click the **[Clear DTC]** button (13).

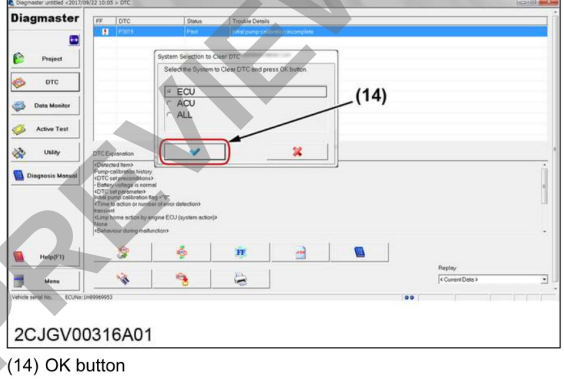
■ NOTE

- **This DTC is a DTC that always occurs when "Supply Pump Learning (HP5)" is executed, it is not a malfunction.**



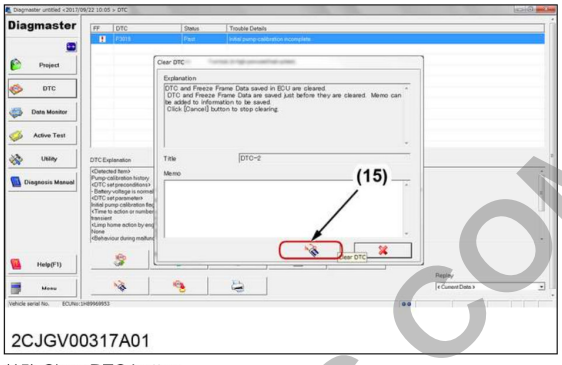
(13) Clear DTC button

9. Select the "ECU" system, then click the **[OK]** button (14).



(14) OK button

10. Click the **[Clear DTC]** button (15) to clear DTC and exit function.



(15) Clear DTC button

RELATED PAGE
5.24 Removing supply pump on page 3-138
6.24 Installing supply pump on page 3-162

7.55 Replacing injector

■ NOTE

- **When you register the injector ID to ECU, you have to stop the engine, then place the key switch in the ON position.**

Tools required

- Laptop computer (Diagmaster (software) installed)
- Interface (DST-i)

Removing injector

1. Remove the injector.

Installing injector

1. Install the injector.

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SCR mixing pipe slip band nut (1) to the specified torque.

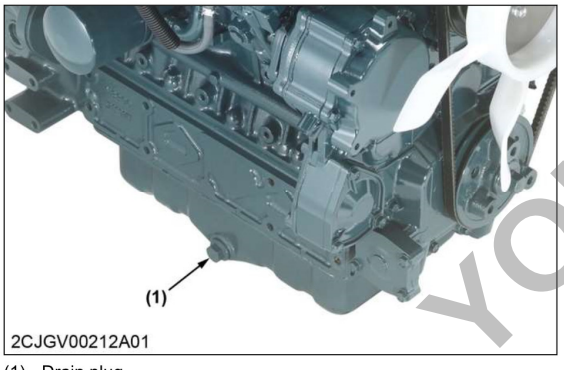
15. Replace the DEF injector band (3) and gasket with new one.
16. Make sure keep clean the contact surface of gasket.
17. Tighten the DEF injector band (3) to their specified torque.

Tightening torque	DEF injector band (3)	3.7 to 4.0 N·m 0.38 to 0.40 kgf·m 2.8 to 2.9 lbf·ft

5. Disassembling

5.1 Draining engine oil

1. Start and increase the temperature of the engine for approximately 5 minutes.
2. Put an oil pan below the engine.
3. Remove the drain plug (1) to drain the engine oil.



(1) Drain plug

4. After you drain, tighten the drain plug (1) to the specified torque.

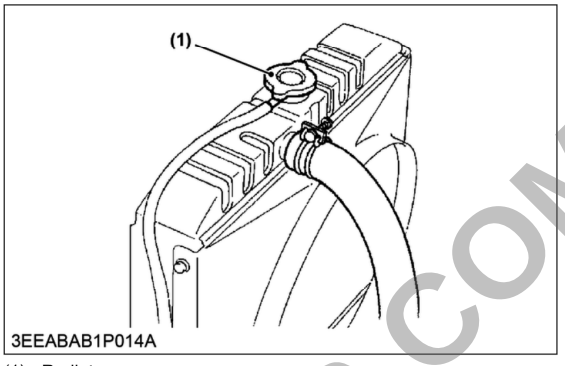
Tightening torque	Drain plug (1)	45 to 53 N·m 4.5 to 5.5 kgf·m 33 to 39 lbf·ft

5.2 Draining coolant

CAUTION

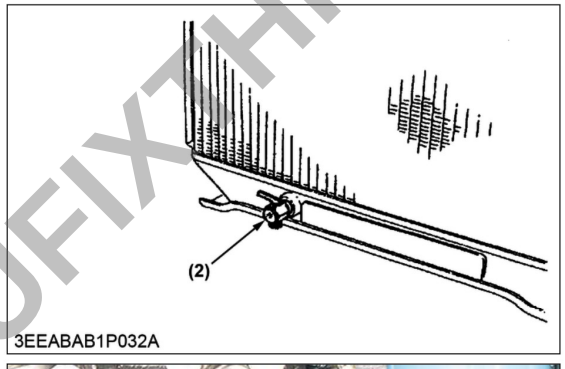
- **Do not remove the radiator cap while you operate or immediately after you stop the engine.**
- **If not, hot water can flow out from the radiator.**
- **Only open the cap after more than 10 minutes for the temperature of the radiator to decrease.**

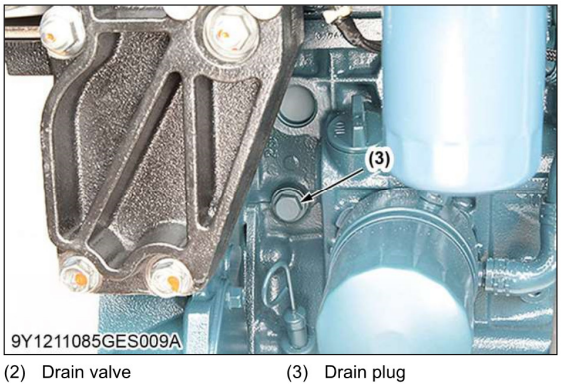
1. Prepare a bucket.
2. Remove the radiator cap (1) to drain the coolant fully.



(1) Radiator cap

3. Open the drain valve (2) and drain plug (3) to drain the coolant.





(2) Drain valve (3) Drain plug

4. After you drain, close the drain valve (2) and drain plug (3).

5.3 Removing selective catalytic reduction (SCR) muffler

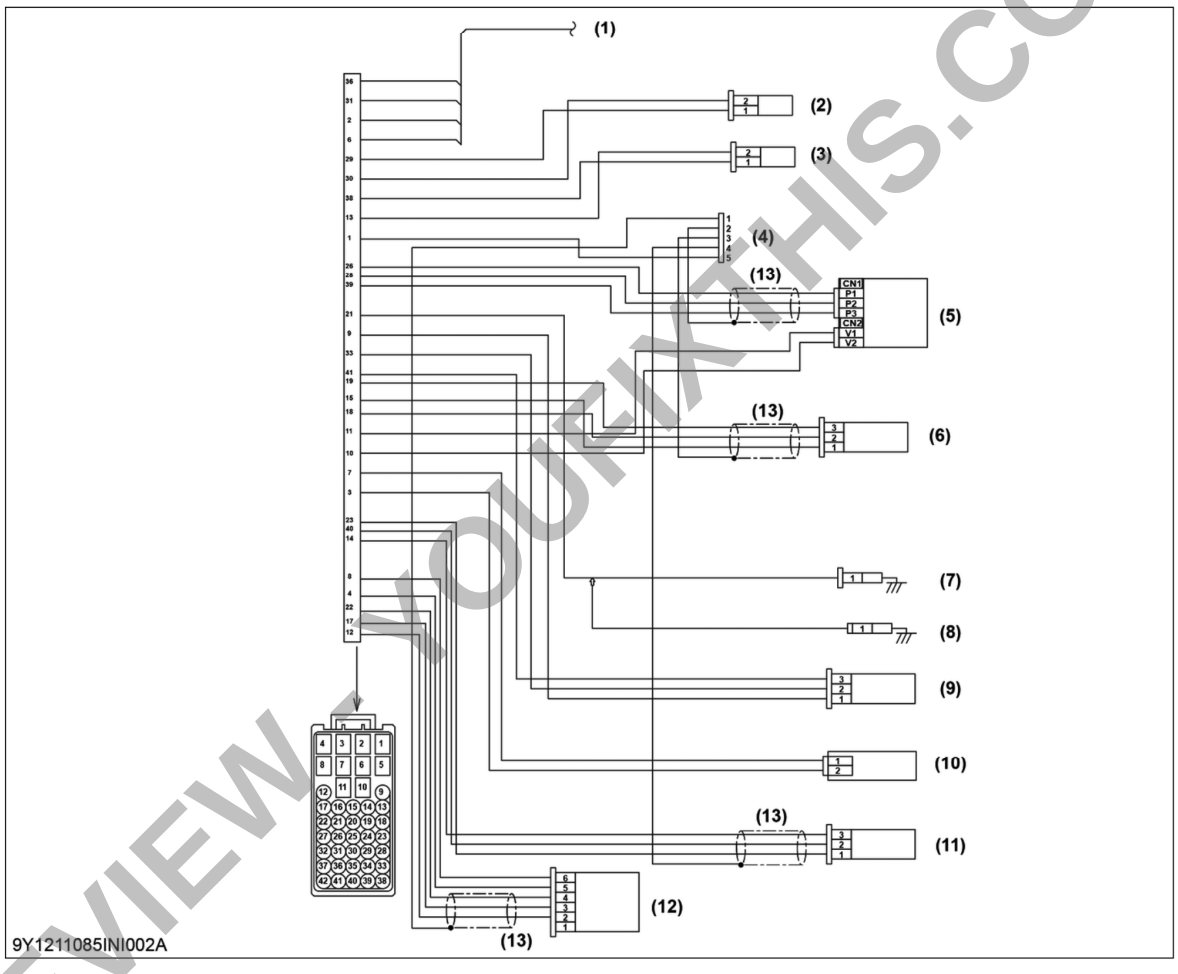
IMPORTANT

- **Be sure to loosen the NOx sensor tightening nut or the SCR inlet temperature sensor tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**

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WIRING DIAGRAM

1. Engine intermediate harness (Engine side harness)



(1)	–	CAN and EGR
(2)	CN201	Intake air temperature sensor
(3)	CN202	Coolant temperature sensor
(4)	–	Border 12 (ENG)
(5)	CN204	Rail assembly
(6)	CN206	Crankshaft position sensor
(7)	CN207	Oil pressure switch 1

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SERVICING

1. Troubleshooting

1.1 Troubleshooting for V3800-TIEF4, TIEF4C

This "Troubleshooting" shows only mechanical failures. The failures related to the common rail system (CRS), refer to the diagnosis manual (DM) for common rail system engine.

Symptom	Probable cause	Solution	Reference page
The engine does not start	No fuel	Fill up the fuel	—
	Air in the fuel system	Bleed the air	—
	Water in the fuel system	Change the fuel and repair or replace the fuel system	2-22
	The fuel pump is damaged	Replace	—
	The fuel hose is clogged	Replace	2-18
	The fuel filter is clogged	Replace	2-22
	The viscosity of fuel at low temperature is too high	Replace the specified fuel	1-5 2-9
	The cetane number of fuel is low	Replace the specified fuel	1-5 2-9
	Fuel leakage because of loose injection pipe retaining nut	Tighten the retaining nut	3-172
	The injector is clogged	Replace	3-212
	The supply pump is damaged	Replace	3-210
	Seizure of the crankshaft, camshaft, piston or bearing	Repair or replace	—
	Compression leakage from the cylinder	Replace the head gasket Tighten the cylinder head screw	3-136 3-165 3-120
	Incorrect valve timing	Check the timing gear	3-141 3-159
	Piston ring and cylinder are worn out	Replace	3-198 3-198 3-203 3-204
	Incorrect valve clearance	Adjust valve clearance	3-102
The starter does not operate	Discharged battery	Charge or replace	—
	Starter is damaged	Repair or replace	3-108
	The key switch is damaged	Replace	—

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SPECIFICATIONS

1. Specification for V3800-TIEF4, TIEF4C, TIEF4H

Model	V3800-TIEF4	V3800-TIEF4C	V3800-TIEF4H
Number of cylinder	4		
Engine type	Vertical, water-cooled, 4-cycle DI diesel engine		
Bore × stroke	100 × 120 mm (3.94 × 4.72 in.)		
Total displacement	3769 cm^3 (230.0 cu.in.)		
SAE gross continuous	75.1 kW / 2600 min^{-1}(rpm) (101 HP / 2600 min^{-1}(rpm))		83.8 kW / 2400 min^{-1}(rpm) (121 HP / 2400 min^{-1}(rpm))
SAE gross intermittent	86.4 kW / 2600 min^{-1}(rpm) (116 HP / 2600 min^{-1}(rpm))		96.4 kW / 2400 min^{-1}(rpm) (129 HP / 2400 min^{-1}(rpm))
Maximum bare speed	2800 min^{-1}(rpm)		2600 min^{-1}(rpm)
Minimum bare idling speed	800 min^{-1}		
Combustion chamber	Reentrant type, Center Direct Injection System (E-CDIS)		
Fuel injection pump	DENSO common rail system		
Governor			
Injector			
Fuel injection timing			
Fuel injection pressure			
Direction of rotation	Counter-clockwise (viewed from flywheel side)		
Firing order	1-3-4-2		
Compression ratio	17.0		
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		
Starting system	Electric starting with starter		
Starter motor	12 V, 3.0 kW		
Starting support device	Intake air heater in intake manifold		
EGR	External EGR (EGR cooler + electric EGR valve + reed valve)		
Battery	12 V, 136 AH equivalent		12 V, 120 AH equivalent
Charging alternator	12 V, 720 W		12 V, 1200 W
Fuel	Diesel Fuel No. 2-D S15		
Lubricating oil	Class CJ-4 lubricating oil as per API classification is recommended. For details on recommended lubricating oils.		
Lubricating oil capacity	13.2 L (3.49 U.S.gals, 2.90 Imp.gals)		16.5 L (4.36 U.S.gals, 3.63 Imp.gals)
Weight (dry)	368 kg (811 lbs)		405 kg (893 lbs)

NOTE

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

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MAINTENANCE CHECK LIST

To make sure that the engine operates safely for a long time, refer to the table below to do regular inspections.

	Inspection item	Service interval												Reference page
		Daily	Every fuel refilling	Initial 50 hrs	Every 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 3000 hrs	Every 8000 hrs	Every 1 year	Every 2 years	
	Checking engine oil level	○												2-13
	Checking fuel level	○												2-13
	Checking coolant level	○												2-14
	Checking fan belt	○												2-14
	Checking DEF/ AdBlue®* level	○												2-16
*4	Refilling diesel exhaust fluid (DEF/AdBlue®*)		○											2-16
	Changing engine oil			○			○							2-17
	Replacing oil filter cartridge			○			○							2-17
	Checking fuel hoses and clamp bands				○									2-18
	Checking radiator hose and clamp bands					○								2-18
*2	Cleaning of air cleaner primary element					○								2-19
	Adjusting fan belt tension					○								2-19
	Checking intake air line					○								2-20
*1	Replacing fuel filter cartridge						○							2-22
	Replacing water separator filter (Type 2)						○					○		2-22
*3	Cleaning water jacket and radiator interior						○							2-22
*3	Replacing fan belt						○						○	2-24
*3	Checking valve clearance							○						2-25
*3 *4	Checking injector (with Diagmaster)								○					2-26
*3 *4	Checking EGR cooler								○					2-27
*4	Replacing oil separator element								○					2-28
*3	Checking PCV (Positive crankcase ventilation) valve								○					2-28
*3 *4	Checking DEF/ AdBlue®* injector tip								○					2-29
	Checking DEF/AdBlue®* hoses								○					2-29
*3 *4	Checking turbocharger									○				2-29
*3 *4	Cleaning DPF									○				2-30
*3 *4	Judging to reuse DPF filter comp before cleaning (only service dealer)									○				2-34

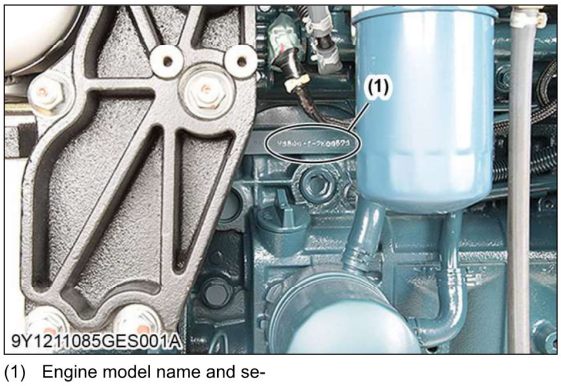
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ENGINE IDENTIFICATION

1. Model name and engine serial number



(1) Engine model name and serial number

You must identify the engine model name and serial number before you start a job.
When you get in touch with the manufacturer, always tell your engine model name and serial number.

Engine serial number

The engine serial number is an identified number for the engine.
It appears after the engine model name.
It shows the month and year of manufacture as below.

Engine series

Number or alphabet	Series
1	05 (include: WG)
2	V3 (include: WG)
3	08
4	SM (include: WG)
5	Air cooled gasoline
6	GZ, OC, AC, EA, E
7	03 (include: WG)
8	07
A	EA, RK
B	03 (KET production)
C	V3, 07 (KEW production)

Production year

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

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

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CHECK AND MAINTENANCE

1. Daily check points

1.1 Checking engine oil level

■ IMPORTANT

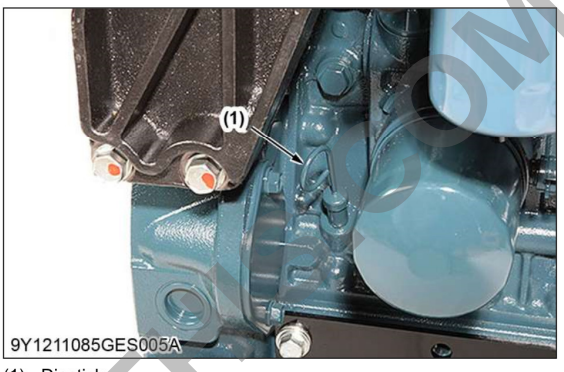
- **On diesel particulate filter (DPF) equipped engines, part of the fuel may get mixed with engine oil during the regenerating process.**
  This may dilute the oil and increase its quantity.
  If the oil rises above the dipstick upper limit, it means the oil has been diluted too much, resulting in a trouble.
  In such case, immediately change the oil for new one.
- **When you use an oil of different brand or viscosity from the previous, drain the remaining oil.**
  Do not mix 2 different types of oil.

■ NOTE

- **When you check the engine oil level, make sure that you put it in a level position.**
  If not, you cannot measure oil quantity accurately.
- **Make sure that you keep the oil level between the upper and lower lines of the dipstick.**
  Too much oil can decrease the output or cause too much blow-by gas.
  On the closed breather type engine, the port absorbs the mist and too much oil can cause oil hammer.
  But if the oil level is not sufficient, the moving parts of engine can get a seizure.

Above 25 ℃ (77 ℉)	SAE 30 or SAE 10W-30, SAE 15W-40
0 ℃ to 25 ℃ (32 ℉ to 77 ℉)	SAE 20 or SAE 10W-30, SAE 15W-40
Below 0 ℃ (32 ℉)	SAE10W or SAE 10W-30, SAE 15W-40

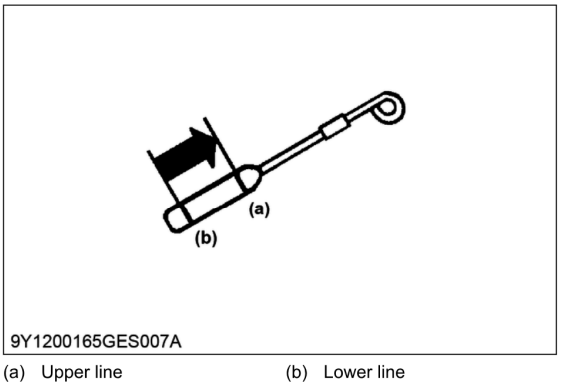
1. Make the engine level.
2. Pull out the dipstick (1) and clean it. Put in and pull it out again.



(1) Dipstick

3. Make sure that the oil level is between the upper line (a) and lower line (b).

Engine oil capacity	V3800-TIEF4 V3800-TIEF4C	13.2 L 3.49 U.S.gals 2.90 Imp.gals
	V3800-TIEF4H	16.5 L 4.36 U.S.gals 3.63 Imp.gals



(a) Upper line (b) Lower line

■ NOTE

- **If the level is too low, add new oil to the upper line (a).**

1.2 Checking fuel level

■ IMPORTANT

- **When Biodiesel fuel is used, it is advisable to replace the fuel filter with a new one after half the specified replacement intervals. (Compared with the use of mineral oil diesel fuels, the**

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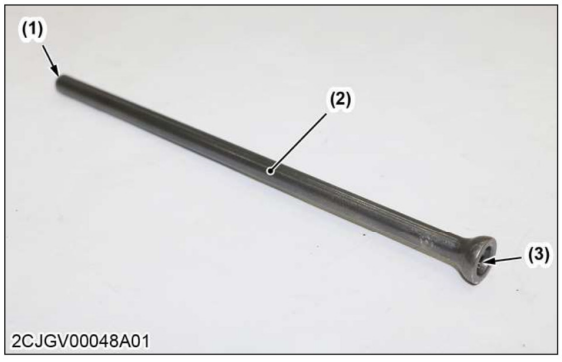
2.18 Push rod

2.18.1 Outline of push rod

The push rod transfers tappet movement to the rocker arm.

2.18.2 Structure of push rod

The push rod is mounted so as to contact the tappet and rocker arm.



(1) Tappet side
(2) Push rod
(3) Rocker arm side

2.18.3 Function of push rod

The push rod transfers movement of the tappet in contact with the cam to the rocker arm.

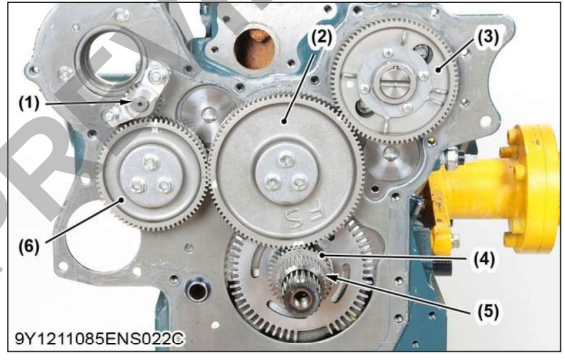
2.19 Timing gears

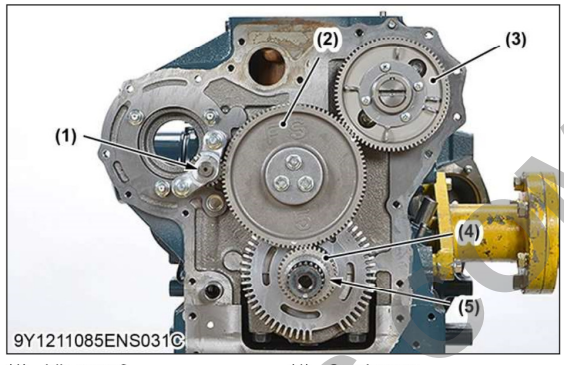
2.19.1 Outline of timing gears

The timing gear transfers power from the crankshaft to each gears.

2.19.2 Structure of timing gears

Timing gears are made up of the crank gear, idler gear, and cam gear.





(1) Idle gear 3
(2) Idle gear 1
(3) Cam gear
(4) Crank gear
(5) Oil pump drive gear
(6) Idle gear 2

2.19.3 Function of timing gears

The timing gears transfer power from the crankshaft to each gears.
The timing gears determine movement timing of each of the parts in conjunction with movement of the piston.
Timing gears synchronize timing for rotation of the crankshaft and opening and closing of valves.
Therefore, when assembling each of the marks has to be aligned.

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8.7.4 Specification of starter (planetary gear reduction type)

Nominal output	12 V, 3.0 kW
Pinion gear teeth	9

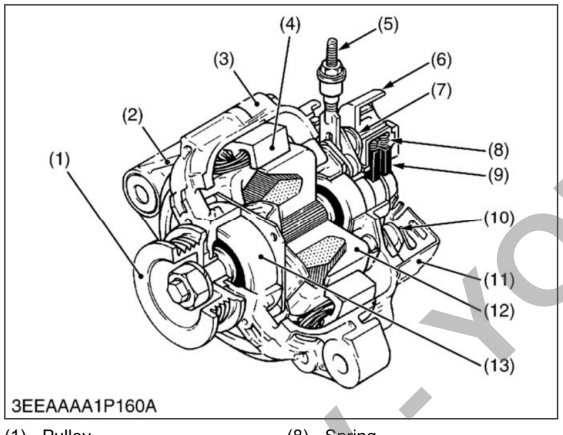
8.8 Alternator

8.8.1 Outline of alternator

The alternator self energizes while the engine is running and charges the battery.
Charging the battery using the alternator prevents reduction in battery capacity making it possible to use it for long term.

8.8.2 Structure of alternator

The alternator is made up of a pulley, starter, and IC regulator and the like.

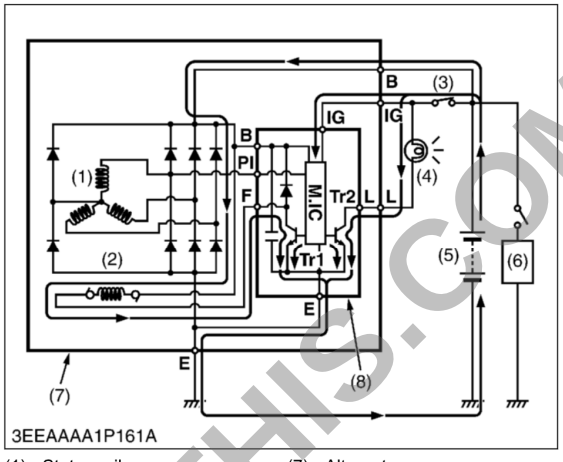


(1) Pulley
(2) Drive end frame
(3) Rear end frame
(4) Stator
(5) Terminal
(6) Connector
(7) IC regulator
(8) Spring
(9) Brush
(10) Rectifier
(11) Rear end cover
(12) Rotor
(13) Bearing

8.8.3 Function of alternator

The alternator generates 3 phase current by means of a fixed coil and rotation of a rotor.
The current generated is rectified using a rectifier made up of diodes.
The rectified current charges the battery.

Operation of charging system



(1) Stator coil
(2) Rotor coil
(3) Main switch
(4) Charge lamp
(5) Battery
(6) Load
(7) Alternator
(8) IC regulator
M.I Monolithic IC C
Tr1 Transistor
Tr2 Transistor

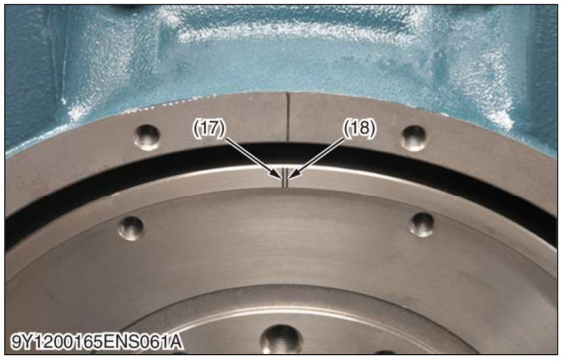
When Main Switch Is Turned to "ON" Position

As the battery voltage is added to the terminal IG, M.IC circuit detects it and makes current pour to the Tr1.
It results to pour the initial exciting current to the rotor coil (2).
(In this case, M.IC circuit makes current pour on and off the Tr1 in pulse and limits the battery discharging current to small value (Approx. 0.17 A) when the main switch (3) is turned on.)
As the alternator (7) is not rotated, it doesn't generate. Therefore the voltage of terminal PI is zero volt.
M.IC circuit detects it and makes current pour to the Tr2.
It results light on the charge lamp (4).

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19. Measure the actual interval (19) between the crankshaft T.D.C. (17) and the detection point of crankshaft position sensor T.D.C. (18).





(17) Crankshaft T.D.C.
(18) Detection point of crankshaft position sensor T.D.C.
(19) Actual interval

20. Calculation of fuel injection timing correction 1.0 mm (0.039 in.) = 360 / (flywheel diameter × π).

■ IMPORTANT

- **The reference line indicates the crankshaft T.D.C. (17) of the crankshaft.**
  If the detected T.D.C. is ahead of the crankshaft T.D.C., it is considered minus.
  If the detected T.D.C. lags behind the crankshaft T.D.C., it is considered plus.

■ NOTE

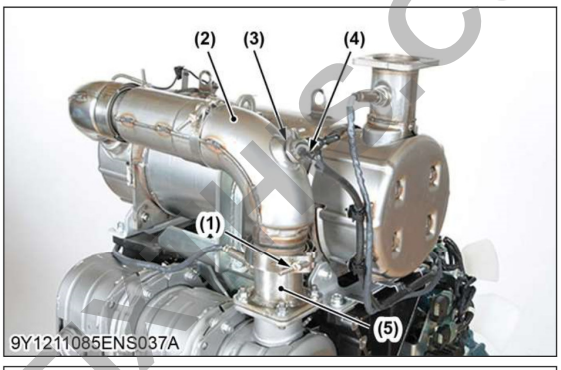
- **Corrected angle = (360 / (flywheel diameter × π)) × actual interval**

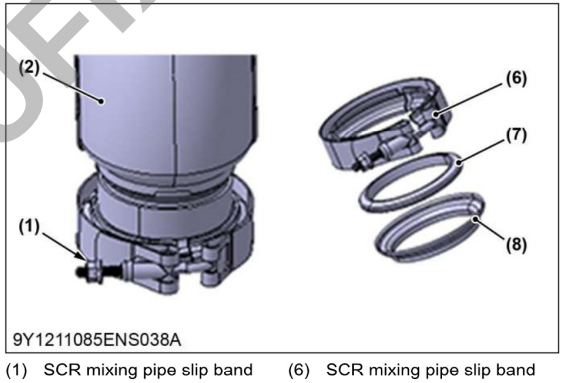
21. Overwrite the injection timing correction value in the engine ECU.

4.38 Replacing the SCR mixing pipe and slip band

Removing SCR mixing pipe and slip band

1. Remove the DEF injector band (3) and gasket.
2. Remove the DEF injector (4) from the SCR mixing pipe (2).
3. Check and write down the position of the SCR mixing pipe slip band nut (1) and what direction it is facing.
4. Loosen the SCR mixing pipe slip band nut (1).
5. Pull out the SCR inlet pipe (5).
6. Open up the joint of SCR mixing pipe slip band (6) and remove it from the SCR mixing pipe (2).
7. Remove the SCR mixing pipe slip band gasket (7).
8. Remove the SCR mixing pipe slip band slip flare (8).





(1) SCR mixing pipe slip band nut
(2) SCR mixing pipe
(3) DEF injector band
(4) DEF injector
(5) SCR inlet pipe
(6) SCR mixing pipe slip band
(7) SCR mixing pipe slip band gasket
(8) SCR mixing pipe slip band slip flare

Installing SCR mixing pipe and slip band

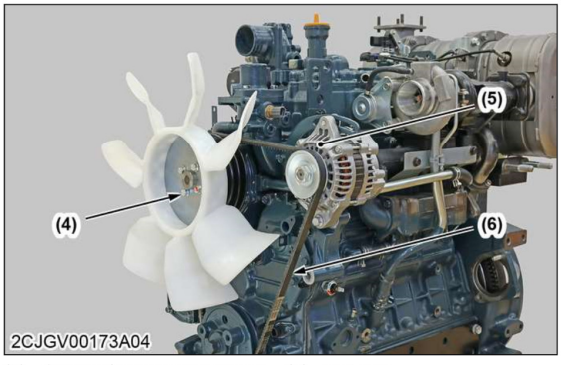
1. Make sure the new SCR mixing pipe slip band gasket (7) and slip flare (8) are fully set in the V shaped part (10) for the band.
2. Assemble the SCR mixing pipe slip band (6) on the SCR mixing pipe flare (9).
3. Make sure the SCR mixing pipe flare (9) is set on the SCR mixing pipe slip band gasket (7) and V shaped part (10).
4. Reconfirm that the SCR mixing pipe slip band gasket (7) and slip flare (8) are fully set in the V shaped part (10) for the band.
5. Install the SCR inlet pipe (5) on the SCR mixing pipe slip band (6) and push it on until it reaches the SCR mixing pipe flare (9).

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4. Tighten the cooling fan mounting screw (4).

Tightening torque	Cooling fan mounting screw (4)	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

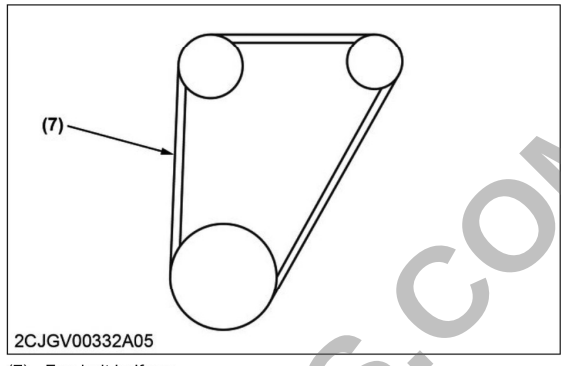


(4) Cooling fan mounting screw (6) Fan belt
(5) Alternator

5. Adjust the tension of fan belt halfway (7) between the fan drive pulley and fan pulley with sonic belt tension meter.

Sonic belt tension meter setting value	V3800-TIEF4, V3800-TIEF4C	V3800-TIEF4H
Mass (Mass per 1 rib 1 m of belt)	110 g/rib/m	18 g/rib/m
Width (Number of ribs)	1	6
Span (Distance of between the fan drive pulley and alternator pulley)	290 mm 11.4 in.	317 mm 12.5 in.

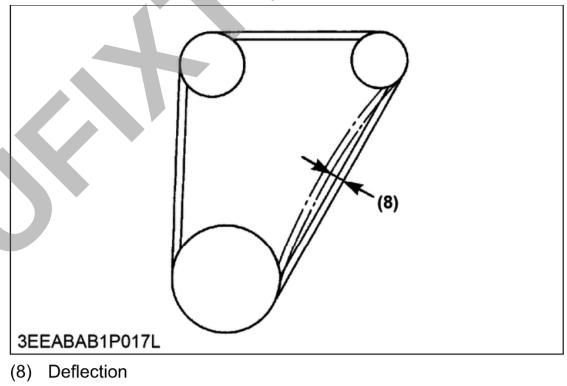
Belt tension (After installing)	Factory specification	V3800-TIEF4 V3800-TIEF4C	441 to 480 N 45.0 to 48.9 kgf 99.2 to 107 lbf
		V3800-TIEF4H	650 to 850 N 66.3 to 86.6 kgf 147 to 191 lbf
Belt tension (After engine operation)	Factory specification	V3800-TIEF4 V3800-TIEF4C	391 to 480 N 39.9 to 48.9 kgf 87.9 to 107 lbf
		V3800-TIEF4H	420 to 550 N 42.9 to 56.0 kgf 94.5 to 123 lbf



(7) Fan belt halfway

(Reference)

a. Push the belt halfway between the fan drive pulley and alternator pulley at a specified force to measure the deflection (8).



(8) Deflection

Deflection (8)	Factory specification	V3800-TIEF4 V3800-TIEF4C	10 to 12 mm 0.40 to 0.47 in. (under load of 59 to 68 N (6.0 to 7.0 kg, 14 to 15 lbf))
		V3800-TIEF4H	9.0 to 11 mm 0.36 to 0.43 in. (under load of 59 to 68 N (6.0 to 7.0 kg, 14 to 15 lbf))

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