SEN06495-11

Shop Manual

ENGINE

125E -7 SERIES

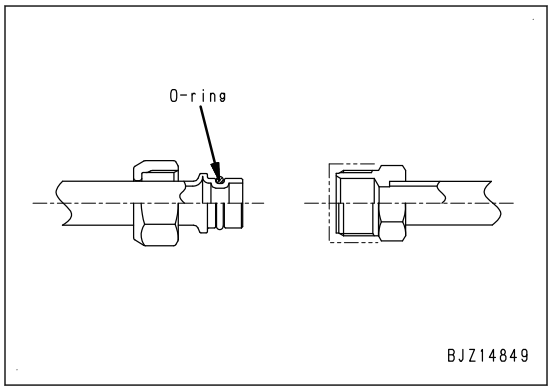
KOMATSU

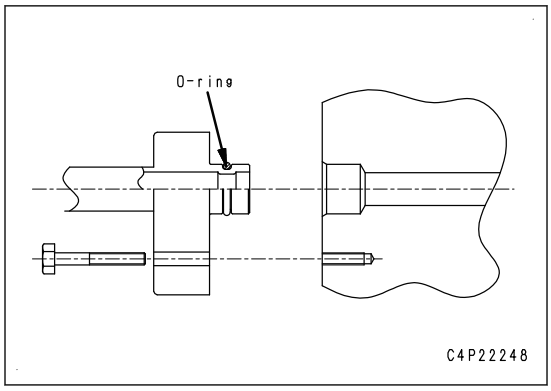
Abbreviation	Actual word spelled out
S/T	Steering
STRG	
SIG	Signal
SOL	Solenoid
STD	Standard
OPT	Option
OP	
PRESS	Pressure
SPEC	Specification
SW	Switch
TEMP	Temperature
T/C	Torque Converter
T/M	Transmission

REMARK

- The figure shows an example of fitting of O-ring.
- An O-ring is fitted to every joint of the air conditioner piping.

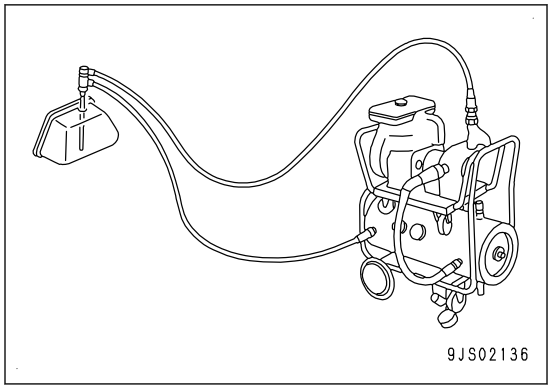
For tightening torques, see THE OTHER INFORMATION, “Precautions for disconnection and connection of air conditioner piping”.





REMARK

The oil cleaning equipment can remove the ultra fine (approximately 3 μm) particles that the filter built in the hydraulic equipment cannot remove. So, it is very effective device.



PRECAUTIONS FOR HANDLING FUEL SYSTEM EQUIPMENT

The machines equipped with common rail fuel injection system (CRI) consists of more precise parts than the parts used in the conventional fuel injection pump and nozzle. If foreign material enters this system, it may cause a failure. Use special care to prevent entry of the foreign material when servicing the fuel system.

Select an appropriate workplace

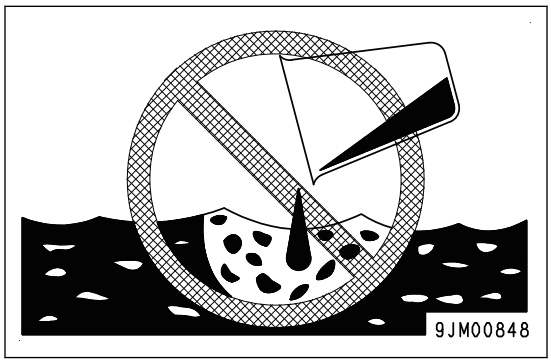
Avoid the work of adding hydraulic oil, replacing filters, or repairing the machine in rainy or windy weather, or in dusty environment.

Sealing the opening

Plug the removed pipes and the openings of the removed components with the caps, tapes, plastic bags, etc. to prevent foreign material from entering.

NOTICE

Do not expose the openings or stuff it, otherwise foreign material may enter or leaked oil may pollute the environment.
Do not discard the oil inconsiderately. Ask the customer for disposal or bring it back to dispose it appropriately.



How to clean parts when dirt is stuck

If any dirt or dust sticks the parts of the fuel system, clean it off thoroughly with clean fuel.

Precautions for replacing fuel filter cartridge

Be sure to use the Komatsu genuine fuel filter cartridge.

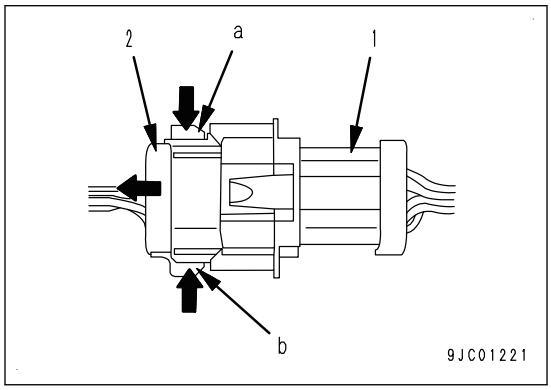
NOTICE

The machine equipped with common rail fuel injection system (CRI) consists of more precise parts than the parts used in the conventional fuel injection pump and nozzle. In order to prevent foreign material from entering this system, the filter employs a specially high performance of filter element. If a filter other than a Komatsu genuine filter is used, fuel system contamination and damage may occur. Therefore Komatsu recommends using only Komatsu fuel filters and install them following the procedures in the shop manual.

METHOD FOR DISCONNECTING AND CONNECTING DEUTSCH CONNECTOR

Method for disconnecting Deutsch connector

While pressing locks (a) and (b) from each side respectively, pull out female connector (2).

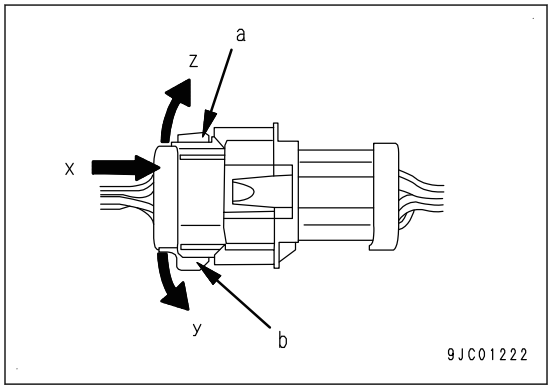


Method for connecting Deutsch connector

1. Push in female connector (2) horizontally, and insert it straight until it clicks. (Arrow: x)
2. In order to check whether locks (a) and (b) are completely inserted, insert female connector (2) by rocking it vertically (in the arrow z direction). (Arrow: x, y, z)

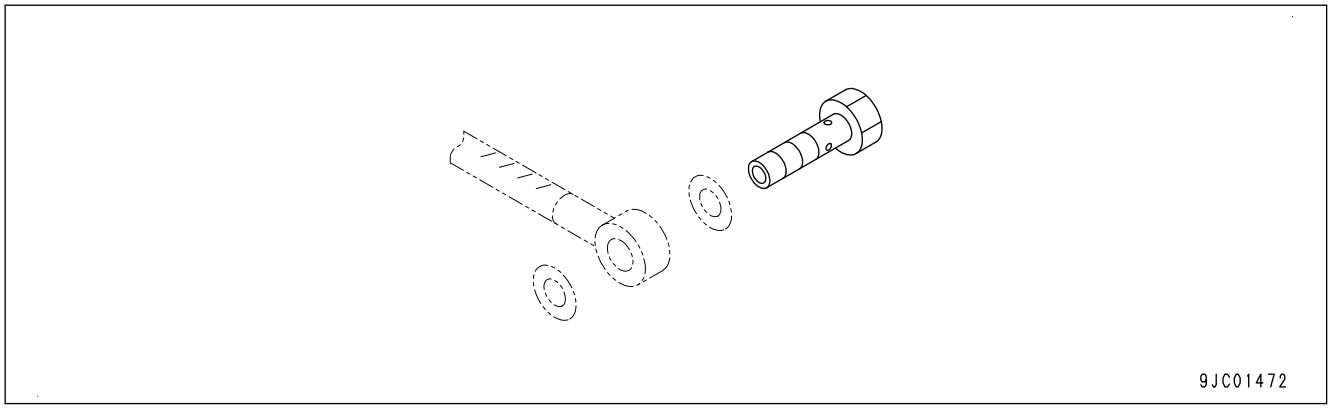
   REMARK

   Lock (a) in the figure is pulled down (not set completely), and lock (b) is set completely.



Types of circuits and color codes

Type of wire		AVS, AV, CAVS						AEX	
Type of circuit	Charge	R	WG	-	-	-	-	R	-
	Ground	B	-	-	-	-	-	B	-
	Start	R	-	-	-	-	-	R	-
	Light	RW	RB	RY	RG	RL	-	O	-
	Instrument	Y	YR	YB	YG	YL	YW	Y	Gr
	Signal	G	GW	GR	GY	GB	GL	G	Br
	Others	L	LW	LR	LY	LB	-	L	-
		Br	BrW	BrR	BrY	BrB	-	-	-
		Lg	LgR	LgY	LgB	LgW	-	-	-
		O	-	-	-	-	-	-	-
		Gr	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-
		Sb	-	-	-	-	-	-	-
		Dg	-	-	-	-	-	-	-
		Ch	-	-	-	-	-	-	-



Thread diameter (mm)	Tightening torque (Nm {kgfm})
6	8±2 {0.81±0.20}
8	10±2 {1.02±0.20}
10	12±2 {1.22±0.20}
12	24±4 {2.45±0.41}
14	36±5 {3.67±0.51}

Tightening torque table for tapered screws on 102, 107, and 114 series engines (National taper pipe thread (NPT))

REMARK

Tighten the National taper pipe threaded (NPT) screws used on the 102, 107, and 114 series engines to the torques shown in the following table unless otherwise specified.

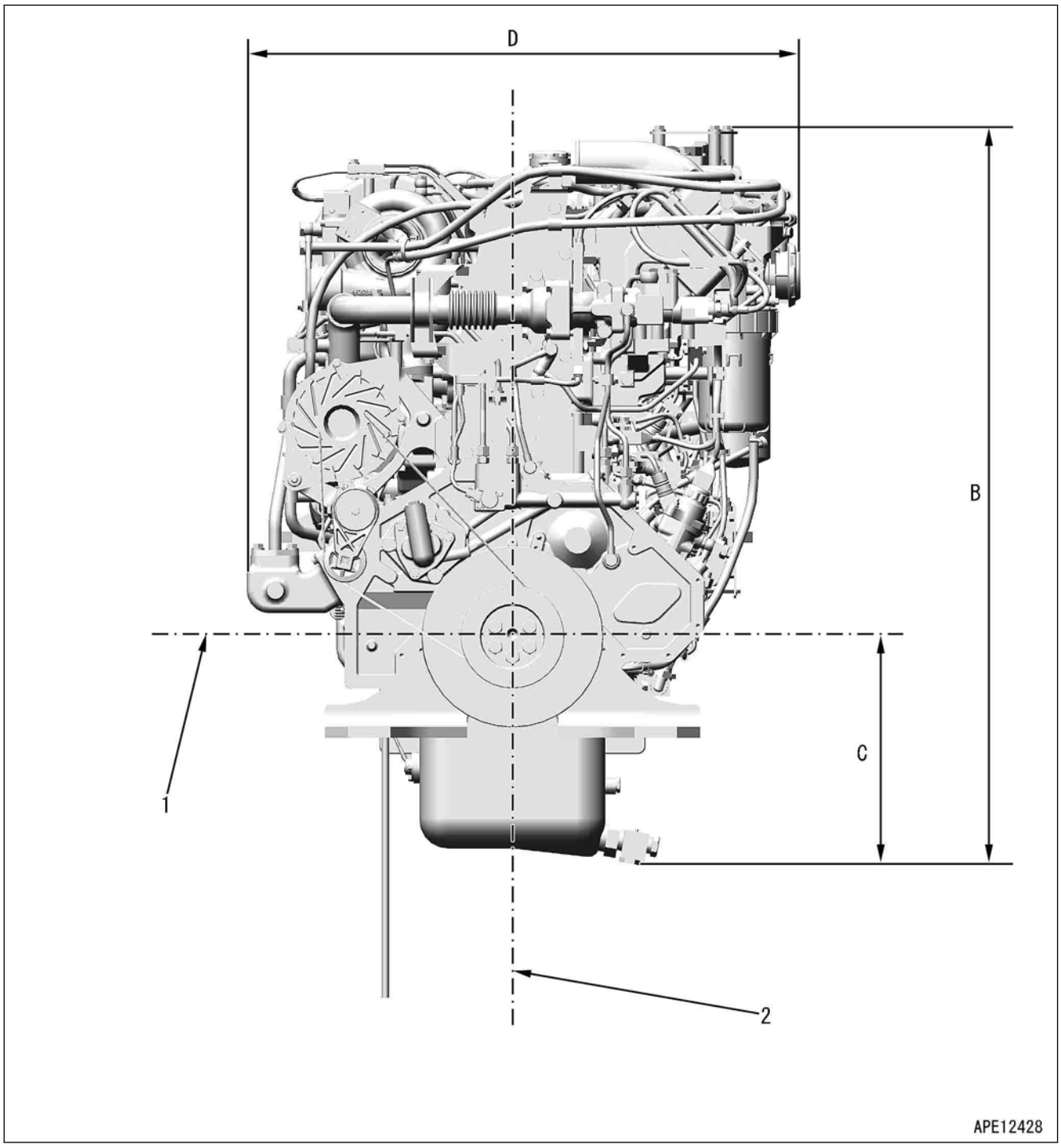
Material of female screw	In cast iron or steel	In aluminum
Nominal thread size	Tightening torque (Nm {kgfm})	Tightening torque (Nm {kgfm})
$^{1}/_{16}$	15±2 {1.53±0.20}	5±1 {0.51±0.10}
$^{1}/_{8}$	20±2 {2.04±0.20}	15±2 {1.53±0.20}
$^{1}/_{4}$	25±3 {2.55±0.31}	20±2 {2.04±0.20}
$^{3}/_{8}$	35±4 {3.57±0.41}	25±3 {2.55±0.31}
$^{1}/_{2}$	55±6 {5.61±0.61}	35±4 {3.57±0.41}
$^{3}/_{4}$	75±8 {7.65±0.82}	45±5 {4.59±0.51}

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ICT	Information and Communication Technology	Communication and electronic control	A general term for the engineering and its socially applied technology of information processing and communication.
IMA	Inlet Metering Actuator	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump fuel discharged volume. (Same as IMV)
IMU	Inertial Measurement Unit	Engine	This is a device to detect the angle (or angular velocity) and acceleration of the 3 axes that control motions.
IMV	Inlet Metering Valve	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump combustion discharged volume. (Same as IMA)
KCCV	Komatsu Closed Crankcase Ventilation	Engine	This is a mechanism that burns the blowby gas again by separating oil from blowby gas and returning it to the intake side. It primarily consists of filters.
KCSF	Komatsu Catalyzed Soot Filter	Engine	This is a filter that captures soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	This is a catalyst that is used for purifying exhaust gas. It is built in to KDPF or assembled with the muffler.
KDPF	Komatsu Diesel Particulate Filter	Engine	This is a component that is used to purify the exhaust gas. KDOC (catalyst) and KCSF (filter to capture soot) are built-in it. It is installed instead of the conventional muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM)	This is a function that performs braking with the optimum force and recovers the driving force of the wheels by actuating the inter-axle differential lock when the wheels runs idle while the machine travels on the soft ground.
LCD	Liquid Crystal Display	Machine monitor	This is an image display equipment such as a monitor in which the liquid crystal elements are assembled.
LED	Light Emitting Diode	Electronic parts	This is a semiconductor element that emits light when the voltage is applied in forward direction.
LIN	Local Interconnect Network	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
LS	Load Sensing	Hydraulic system	This is a function that detects differential pressure of pump, and controls discharged volume corresponding to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
MAF	Mass Air Flow	Engine	This indicates engine intake air flow. This is not used independently but is used as combined with sensor. Mass air flow sensor can be called as MAF sensor.

SPECIFICATIONS: SAA6D125E-7 (PC490LC-11, PC490LCI-11)

Engine model			SAA6D125E–7
Number of cylinders - bore x stroke		mm	6 - 125×150
Piston displacement		ℓ{cc}	11.0{11040}
Firing order		–	1–5–3–6–2–4
Dimensions	Overall length	mm	1469
	Overall width	mm	1045
	Overall height (excluding exhaust pipe)	mm	1306
	Overall height (including exhaust pipe)	mm	–
Performance	Rated horsepower	kW{HP}/min^{-1}{rpm}	270±8.1{362±10.9}/1900{1900}
	Maximum torque	Nm{kgm}/min^{-1}{rpm}	1510±45{154±4.6}/1400{1400}
	Max. speed with no load (high idle speed)	min^{-1}{rpm}	1930±25{1930±25}
	Min. speed with no load (low idle speed)	min^{-1}{rpm}	1000±25{1000±25}
	Fuel consumption ratio at rated point	g/kWh{g/HPh}	210.7{157.2}
Dry weight		kg	1316
Fuel injection system		–	High pressure common rail type
Fuel injection system control		–	Electronic control type
Lubricating oil quantity (refill capacity)		ℓ	46(37)
Coolant level		ℓ	22
Alternator		–	24 V, 90 A
Starting motor		–	24 V, 7.5 kW or 11 kW
Turbocharger		–	KOMATSU, Model KTR85V

Front view



1: Center of crankshaft

2: Center of cylinder

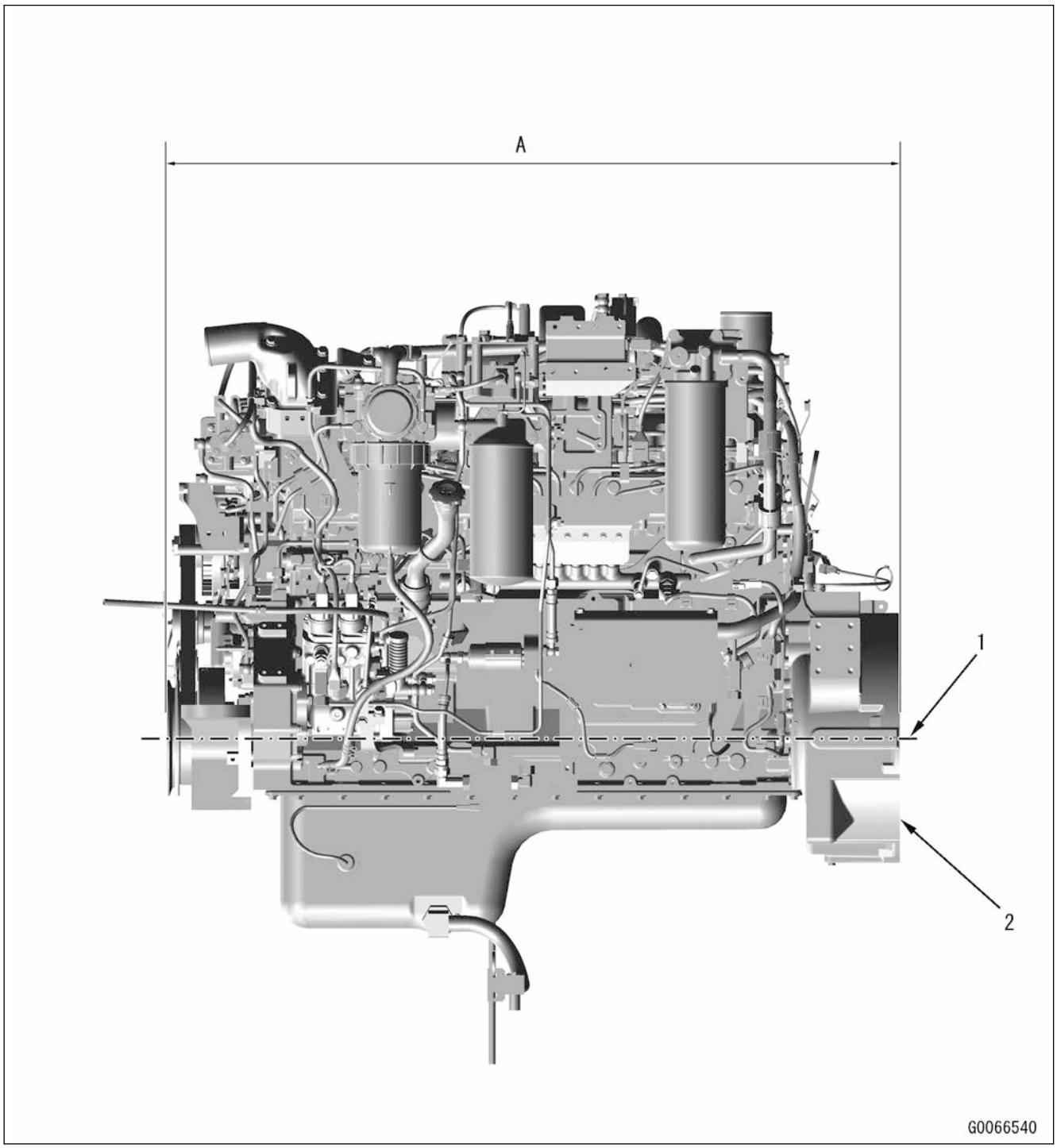
Dimension (B) : 1304 mm

Dimension (C) : 403 mm

Dimension (D) : 975 mm

ENGINE GENERAL VIEW: SAA6D125E-7 (WA475-10)

Left side view



1: Center of crankshaft

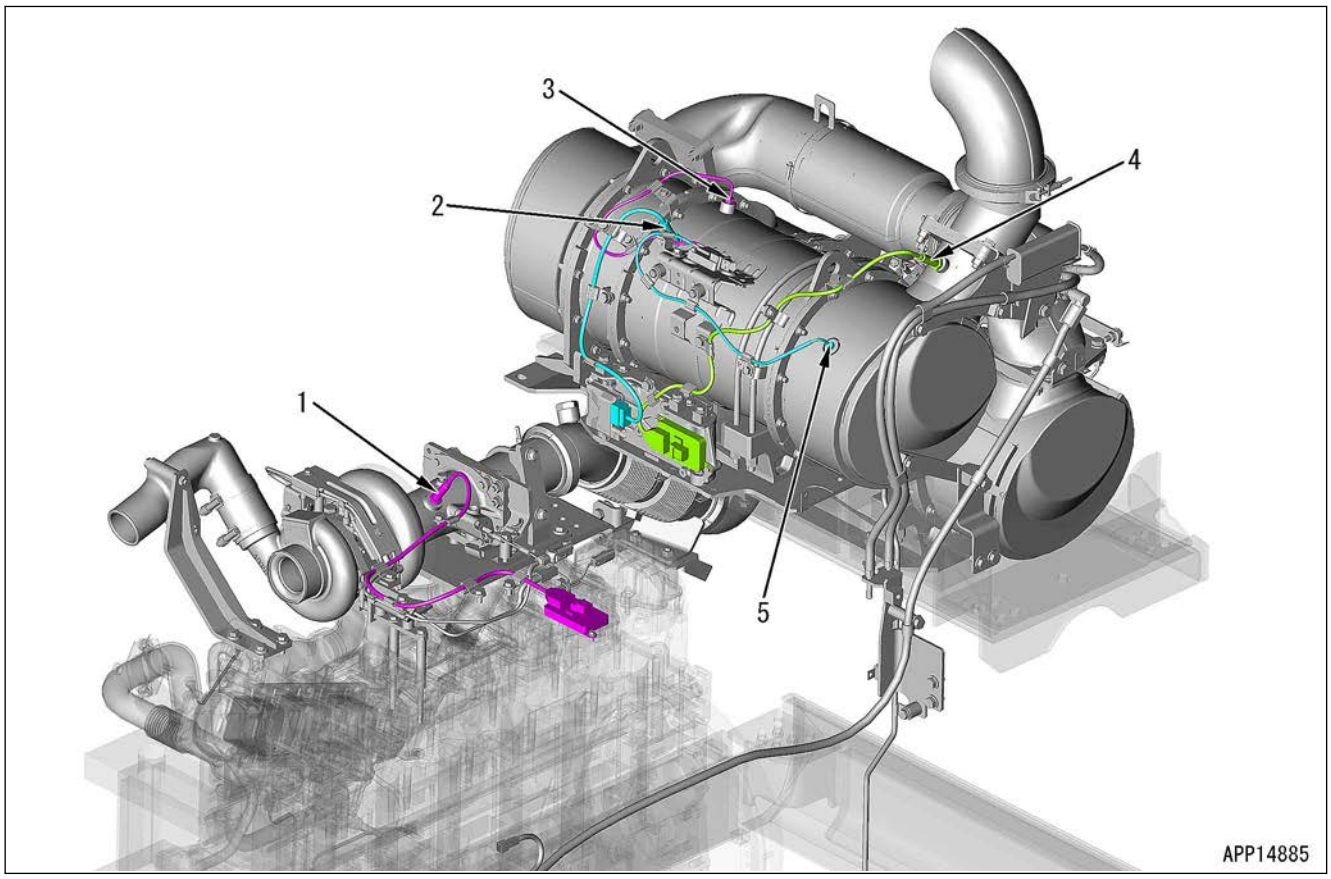
2: Rear face of flywheel housing

Dimension (A): 1434 mm

Unit: kg

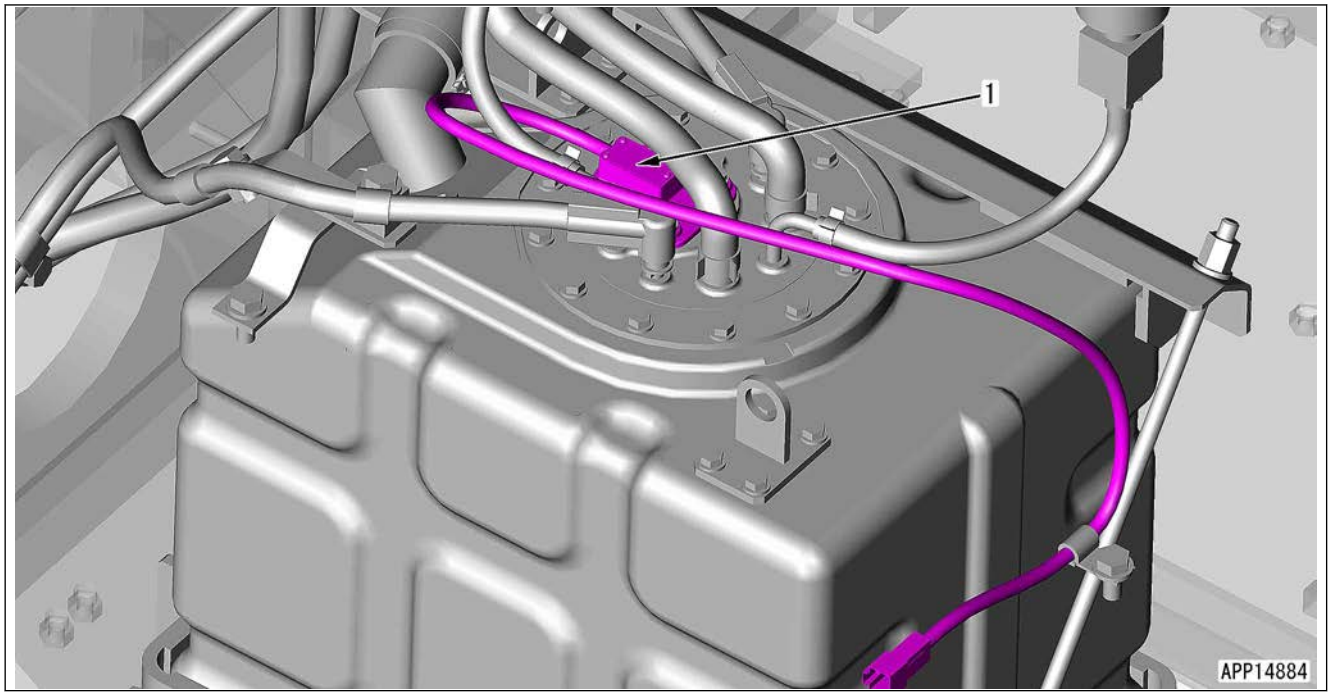
Item	Component parts, specifications	SAA6D125E–7	
Engine boost oil pump	–	5	
EGR Valve	–	11	
EGR cooler	–	11	
KDPF	–	WA480–8 WA480–8E0	57
		WA475-10	61
		WA470–8 WA470–8E0	71
		D85EX–18 D85EXI–18 D85PX–18 D85PXI–18 HM300–5 HM300–5E0 PC490LC–11 PC490LCI–11	75
KCCV ventilator	–	3	
SCR assembly	–	WA475-10	44
		WA480–8 WA480–8E0	47
		D85EX–18 D85EXI–18 D85PX–18 D85PXI–18 WA470–8 WA470–8E0	68
		HM300–5 HM300–5E0	69
		PC490LC–11 PC490LCI–11	70

Detailed drawing of SCR assembly



1: Turbocharger outlet NOx sensor
2: Ammonia sensor
3: SCR temperature sensor
4: SCR outlet NOx sensor
5: SCR outlet temperature sensor

Detailed drawing of AdBlue/DEF tank



1: AdBlue/DEF tank sensor

Status		Elapsed time (*1)	Machine monitor					Engine deration (*5)
			Message of SCR Information	Caution lamp (Action level)	Tone of audible alert	Failure code for abnormality (*2),(*3)	Failure code for Inducement strategy status (*4)	
4	Severe Inducement (Inducement 2)	4 hours	4: Engine power is under heavy deration.	Red  APP14418 Red  APP14415 Red  APP14413	Continuously	CA4151 CB4151	AS00R4 (Inducement 2 (SCR Device Abnormality))	Torque: 50% and RPM: 40%
5	Final Inducement (Inducement 3)	Until repairing	5: Engine is running at low idle.	Red  APP14418 Red  APP14415 Red  APP14413	Continuously	CA4151 CB4151	AS00R5 (Inducement 3 (SCR Device Abnormality))	Engine speed is fixed to low idle

*1: Elapsed time of each stage describes an accumulated time advancing to the next stage after starting “Warning” stage. Final Inducement is not cleared till abnormality is repaired.

*2: These failure codes are displayed on “Current Abnormality” in the operator mode, or “Abnormality Record” in the service mode. The failure code shown here is an example of failure code which is displayed on the machine monitor when an abnormality occurs. For the failure codes, see TROUBLESHOOTING, “TROUBLESHOOTING POINTS FOR UREA SCR SYSTEM”.

*3: The failure code which starts with CB may be displayed for the machine equipped with aftertreatment devices branching off to 2 lines.

*4: These failure codes are displayed on “Current Abnormality” in the operator mode, or “Abnormality Record” in the service mode.

*5: These percentages show a torque reduction ratio from the full torque curve, and a speed reduction ratio from the rated speed.

*6: Construction equipment with crawler

*7: Construction equipment with wheel

SCR ASSEMBLY

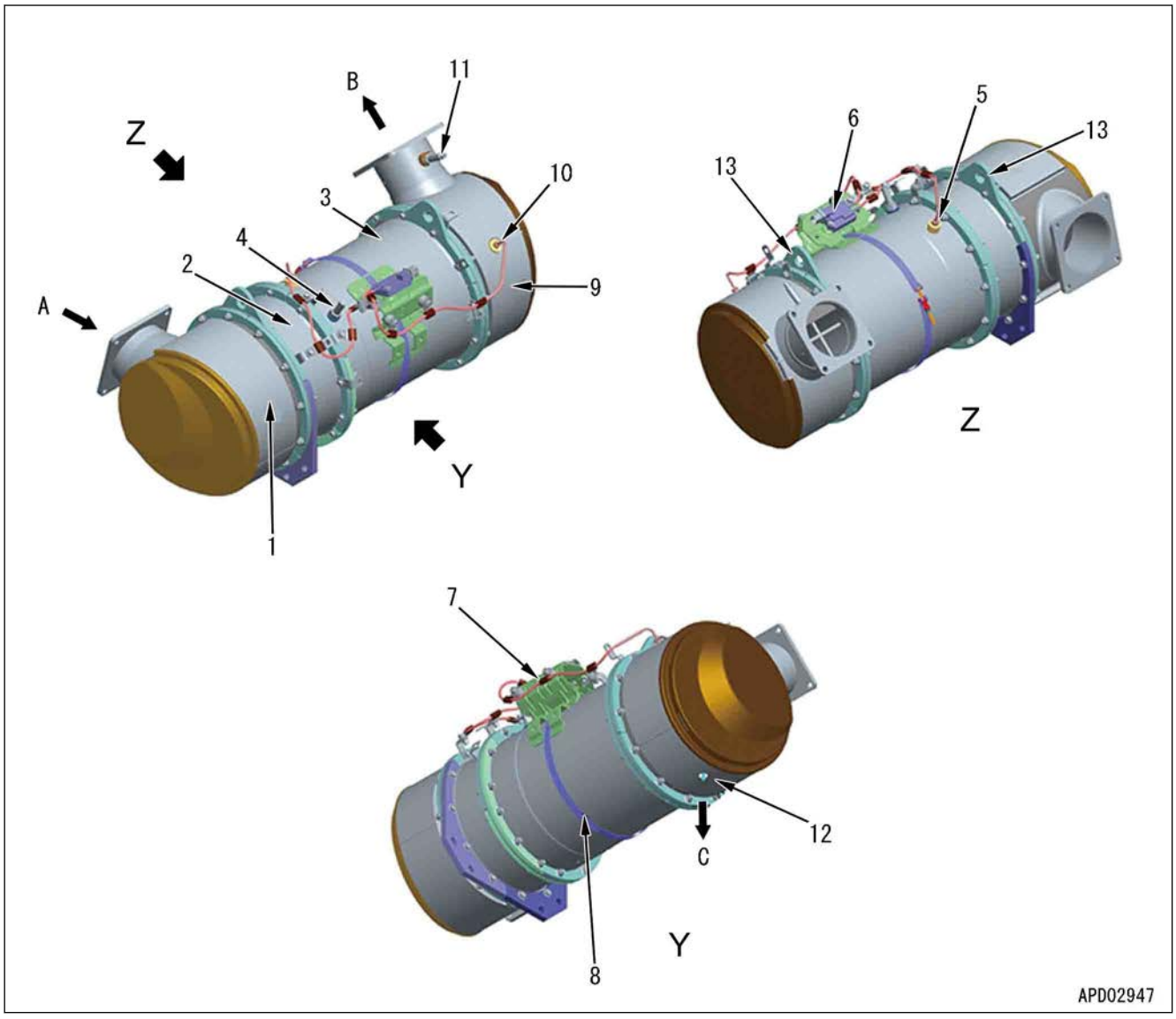
SCR

Abbreviation for Selective Catalytic Reduction

STRUCTURE OF SCR ASSEMBLY

REMARK

The shape is subject to machine models.

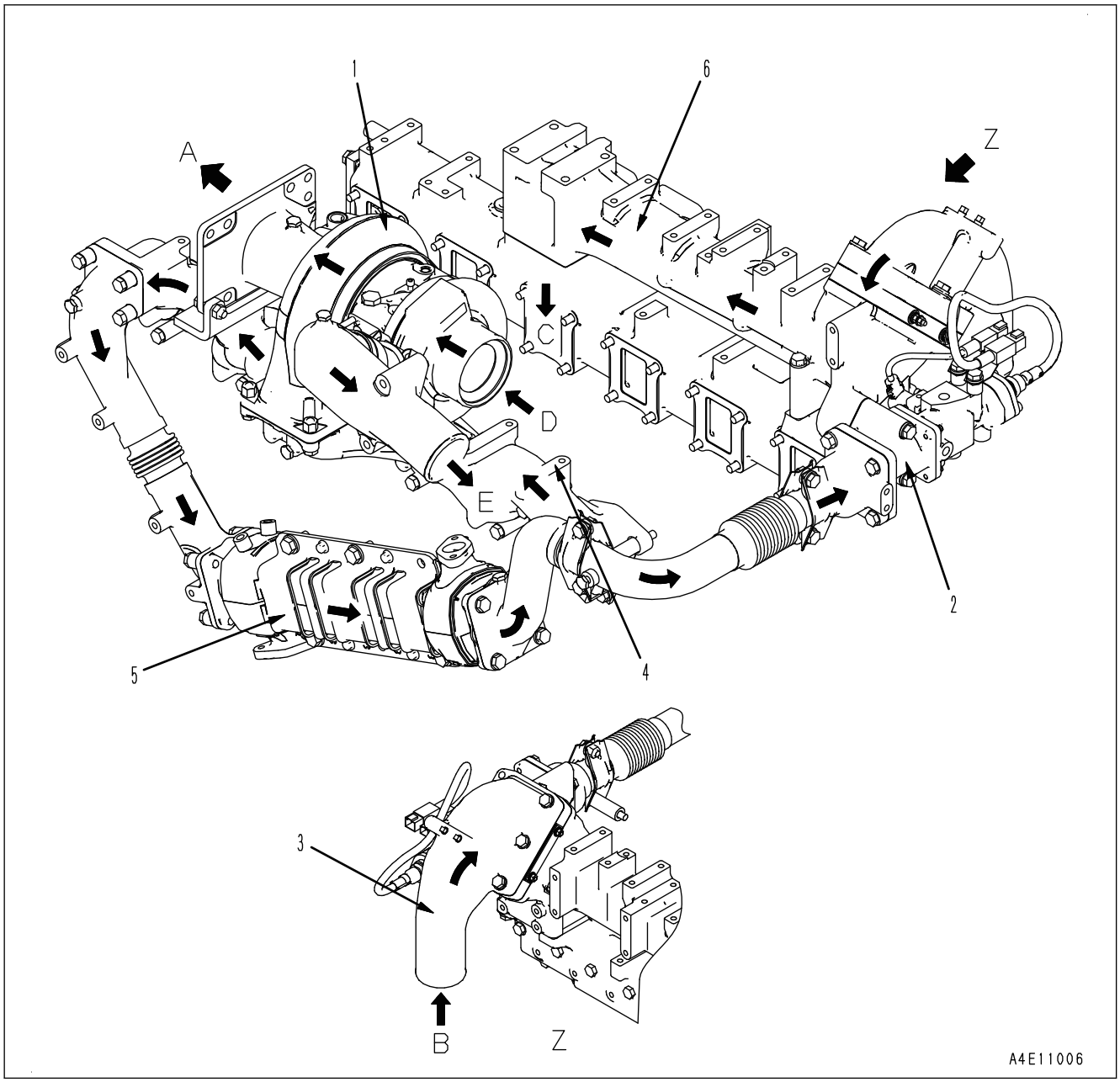


INTAKE AND EXHAUST SYSTEM PARTS

LAYOUT DRAWING OF INTAKE AND EXHAUST SYSTEM

REMARK

The shape is subject to machine models.



A: KDPF
B: From aftercooler
C: To intake manifold
1: VGT
2: EGR valve
3: Intake connector
D: From air cleaner
E: To aftercooler
4: Exhaust manifold
5: EGR cooler
6: Mixing connector

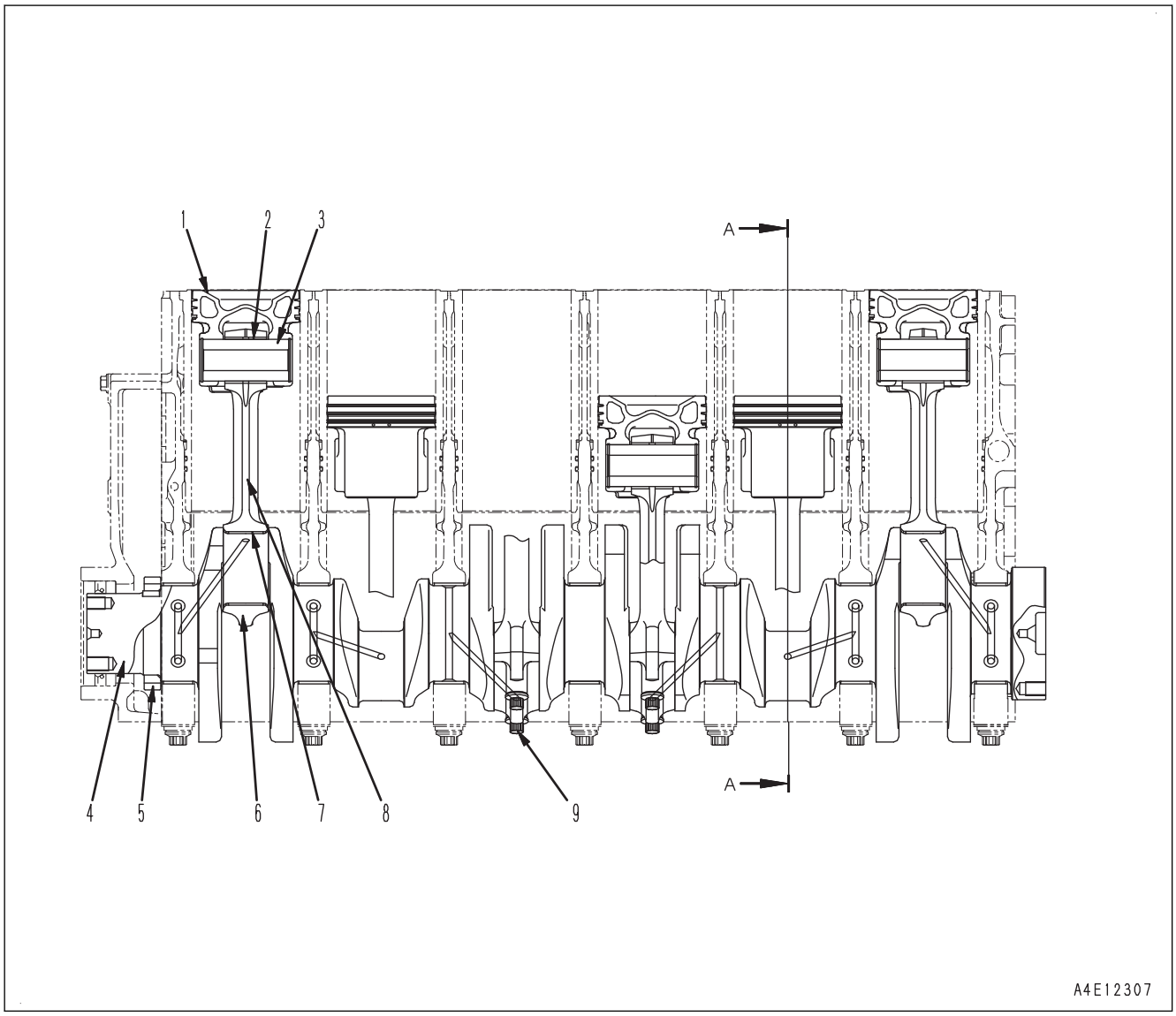
MAIN MOVING PARTS

STRUCTURE OF MAIN MOVING PARTS

REMARK

The shape is subject to machine models.

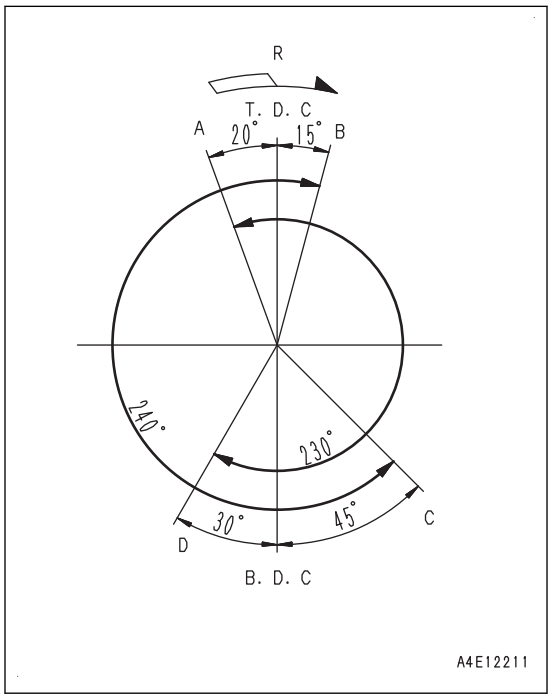
Sectional view



1: Piston
2: Connecting rod bushing
3: Piston pin
4: Crankshaft
5: Crankshaft gear (number teeth: 33)
6: Connecting rod cap
7: Connecting rod bearing
8: Connecting rod
9: Connecting rod cap bolt

Valve timing

A: Intake valve OPEN
B: Exhaust valve CLOSE
C: Exhaust valve OPEN
D: Intake valve CLOSE
R: Rotation direction
T.D.C: Top dead center
B.D.C: Bottom dead center



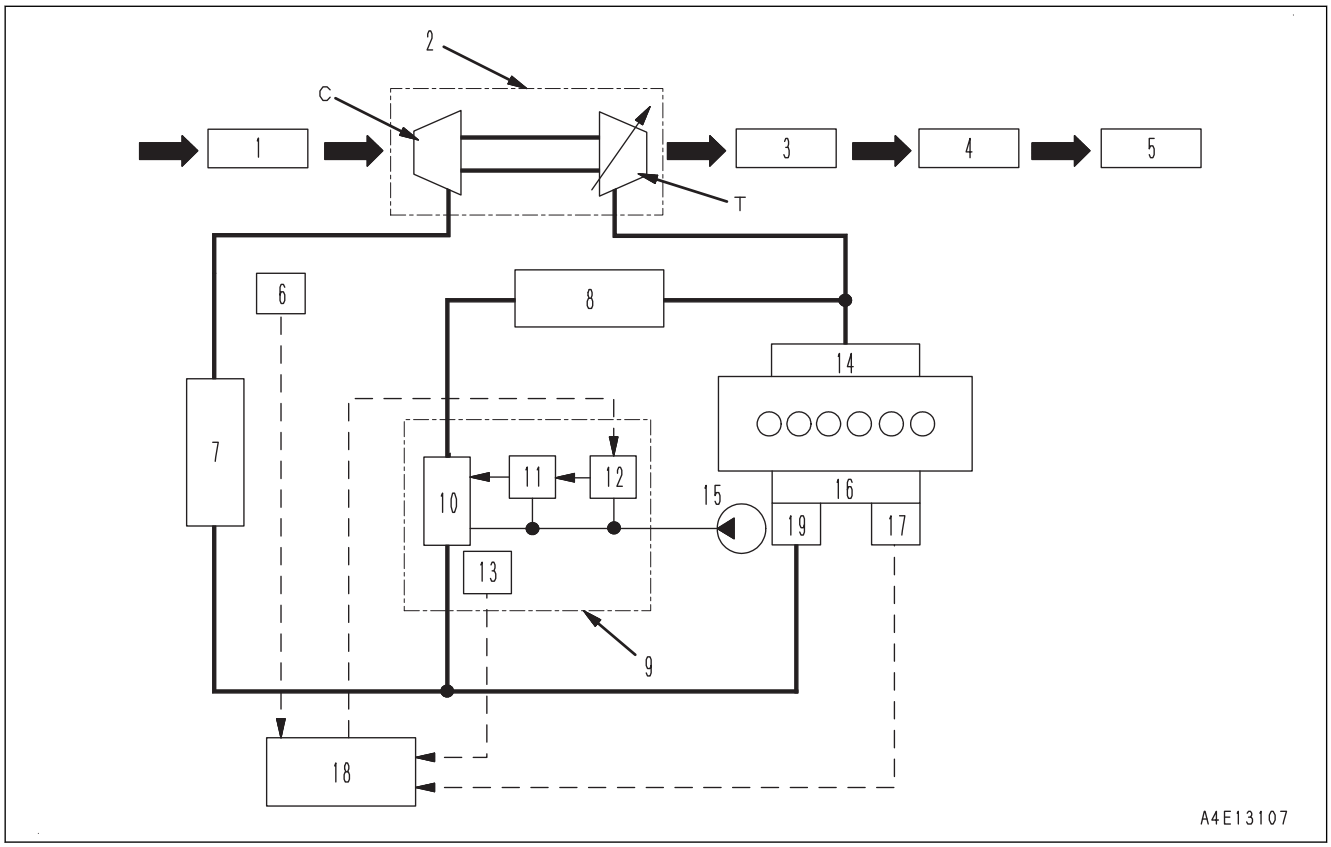
SPECIFICATIONS OF VALVE SYSTEM

Camshaft: Closed die forging
Journal portion, cam portion: Induction hardening

FUNCTION OF EGR SYSTEM

- EGR valve (hydraulically driven) (2) controls the gas flowing from the exhaust section to the intake section. Since the exhaust pressure is higher than the boost pressure, the exhaust gas flows to the intake section.
- EGR cooler (6) cools the exhaust gas.
  Engine coolant is used to cool the exhaust gas.
- Mixing connector (7) returns the air from the air-cooled aftercooler and the exhaust gas from EGR valve (2) to the intake section.
- Exhaust gas is always clean with this system which controls EGR circuit based on information sent from sensor installed to each part to obtain EGR rate according to the operating condition. (EGR ratio means the ratio of EGR gas contained in the intake gas.)
- Monitors EGR circuit for troubleshooting with sensor installed to each part to prevent a serious failure from occurring.

CIRCUIT DIAGRAM OF EGR SYSTEM



C: Blower impeller
1: Air cleaner
2: VGT
3: KDPF
4: AdBlue/DEF mixing tube(*1)
5: SCR assembly(*1)
6: Ambient pressure sensor
7: After cooler
8: EGR cooler
9: EGR unit
10: EGR valve

T: Turbine impeller
11: Hydraulic actuator (power piston)
12: EPC valve (for EGR valve)
13: EGR valve lift sensor
14: Exhaust manifold
15: Engine boost oil pump
16: Intake manifold
17: Charge (boost) pressure and temperature sensor
18: Engine controller
19: Mixing connector

*1: This may not be installed on some machine models and specifications.

KCCV VENTILATOR

KCCV

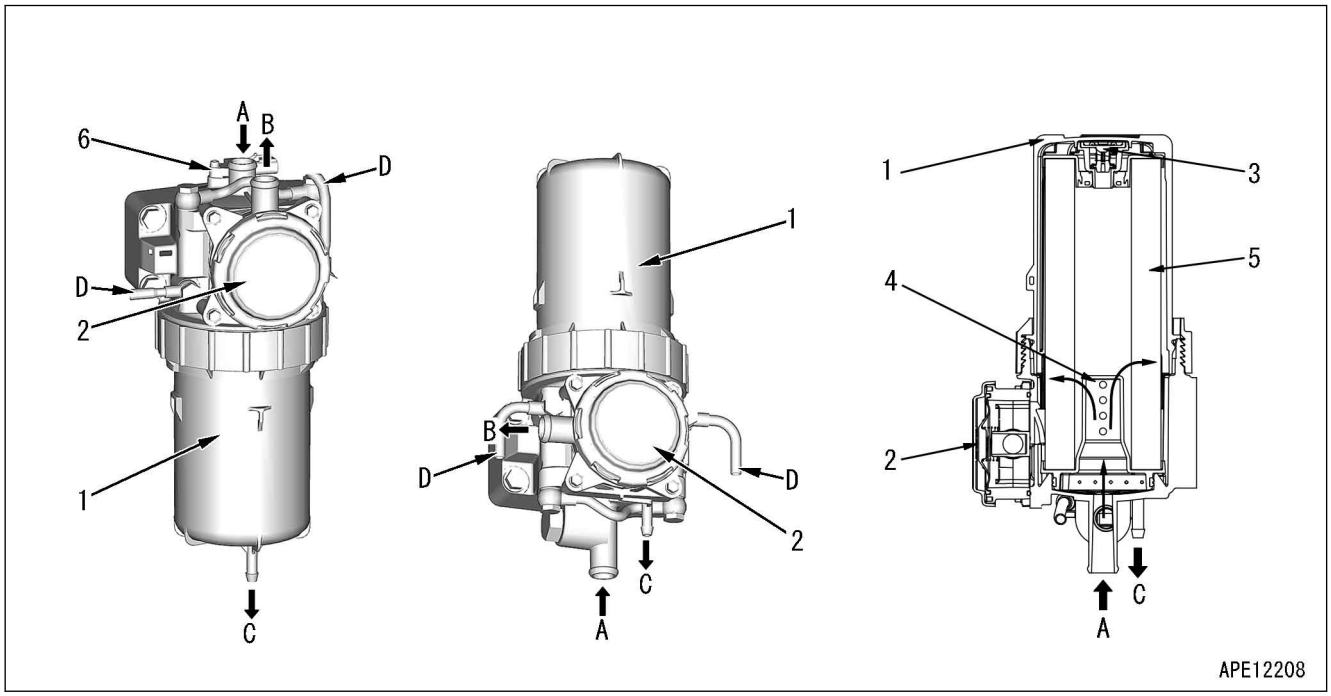
Abbreviation for KOMATSU Closed Crankcase Ventilation

STRUCTURE OF KCCV VENTILATOR

REMARK

The shape is subject to machine models.

General view and sectional view



A: Blowby gas inlet (engine breather)
B: Blowby gas outlet (to VGT intake side)
1: Case
2: CDR valve
3: Relief valve
C: Oil drain port (to engine oil pan)
D: Coolant passage
4: Impactor
5: Filter
6: Crankcase pressure sensor

Structure

- Filter (5) is classified by the working direction for filter replacement into the top load type (removed upward) and bottom load type (removed downward).
- The top load type (removed upward) and bottom load type (removed downward) are different from each other in the position of the crankcase pressure sensor.
  In the top load type (removed upward), the crankcase pressure sensor is installed to the blowby gas inlet piping.
  In the bottom load type (removed downward), the crankcase pressure sensor is installed to the top of KCCV ventilator.

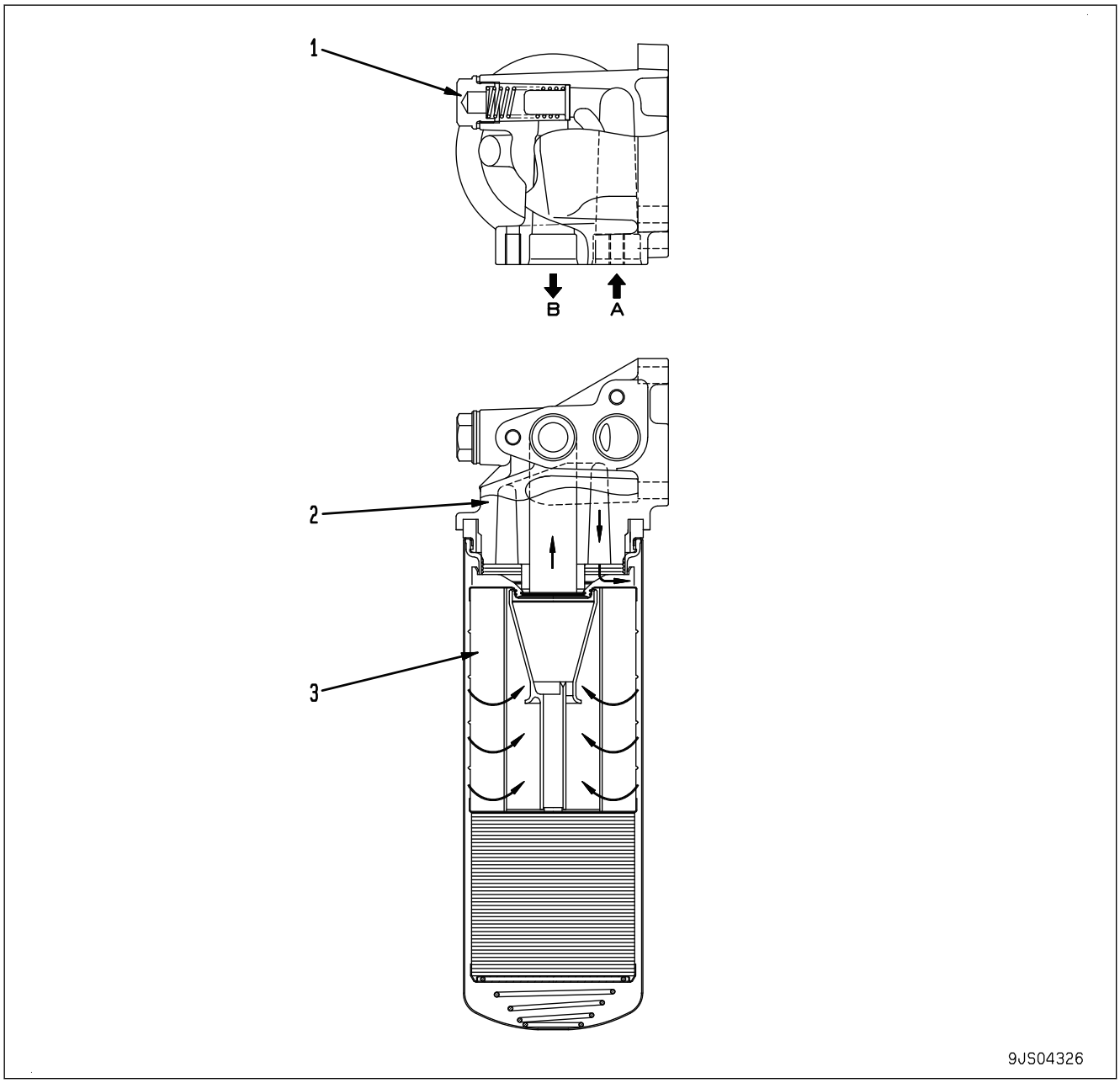
ENGINE OIL FILTER

STRUCTURE OF ENGINE OIL FILTER

REMARK

The shape is subject to machine models.

General view and sectional view



A: Engine oil inlet
B: Engine oil outlet
1: Safety valve
3: Cartridge
2: Filter head

SPECIFICATIONS OF ENGINE OIL FILTER

Filtering area of engine oil filter: 0.44 m^2 (full flow)

Cracking pressure of safety valve: 343±19 kPa {3.5±0.2 kgf/cm^2}

FUEL INJECTION TIMING CONTROL FUNCTION

The fuel injection timing control function is used instead of the conventional timer function. It controls the fuel injection timing properly from the engine speed and fuel injection rate.

FUEL INJECTION PRESSURE CONTROL FUNCTION

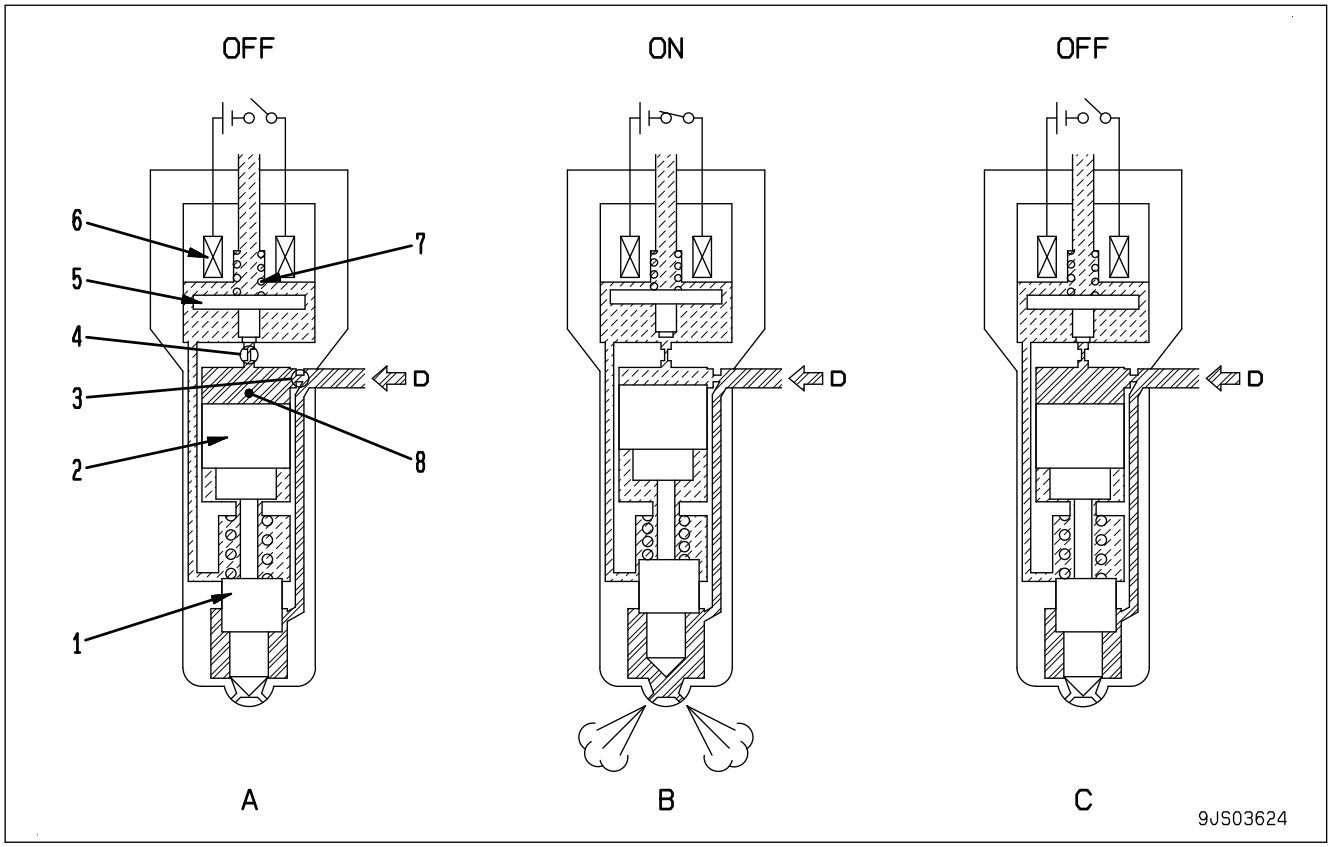
(Common rail fuel pressure control function)

- The fuel injection pressure control function (common rail fuel pressure control function) measures the fuel pressure with the common rail pressure sensor and feeds it back to the engine controller to control the volume discharged from the supply pump.
- The pressure feedback control is performed so that the fuel injection rate matches with the optimum (command) value which is set according to the engine speed and fuel injection rate.

OPERATION OF CRI CONTROL SYSTEM

1. When TWV (Two-Way solenoid Valve) is turned ON (energized), the fuel circuit is so changed that the high-pressure fuel in the control chamber flows out through the orifice, and the needle valve is raised by the nozzle cracking force generated by the high-pressure fuel on the nozzle side, and then fuel injection starts.
   The fuel injection timing is controlled electronically by the energization timing of TWV.
2. When TWV is turned OFF (de-energized), the fuel circuit is so changed that the high-pressure fuel acts on the control chamber, and the needle valve lowers and finishes fuel injection.
   The fuel injection rate is controlled electronically by the energization period of TWV.

OPERATION OF INJECTOR



A: No fuel injection
B: Start of fuel injection
1: Nozzle
2: Control piston
3: Orifice (in)
4: Orifice (out)
C: Finish of fuel injection
D: High-pressure fuel in common rail
5: Valve body
6: Solenoid
7: Spring
8: Pressure control chamber

No fuel injection (A)

1. When solenoid (6) is not energized, valve body (5) is pressed down by spring (7).
2. Since high-pressure fuel (D) is applied to pressure control chamber (8), nozzle (1) is closed and injects no fuel.

Start of fuel injection (B)

1. When solenoid (6) is energized, valve body (5) is pulled up by the electromagnetic force, and the fuel passage opens.
2. Since the fuel in pressure control chamber (8) flows out through orifices (3) and (4), nozzle (1) moves up and starts fuel injection.
3. The fuel injecting rate is gradually increased by the orifices (3) and (4).
4. The maximum fuel injecting rate is achieved by keeping energizing the solenoid (6)

Finish of fuel injection (C)

1. When solenoid (6) is de-energized, valve body (5) is pressed down by spring (7), and the fuel passage closes.
2. Since high-pressure fuel (D) is applied suddenly to pressure control chamber (8), nozzle (1) is closed, and fuel injection is finished.

ELECTRICAL SYSTEM

COMPONENT PARTS OF ELECTRICAL SYSTEM

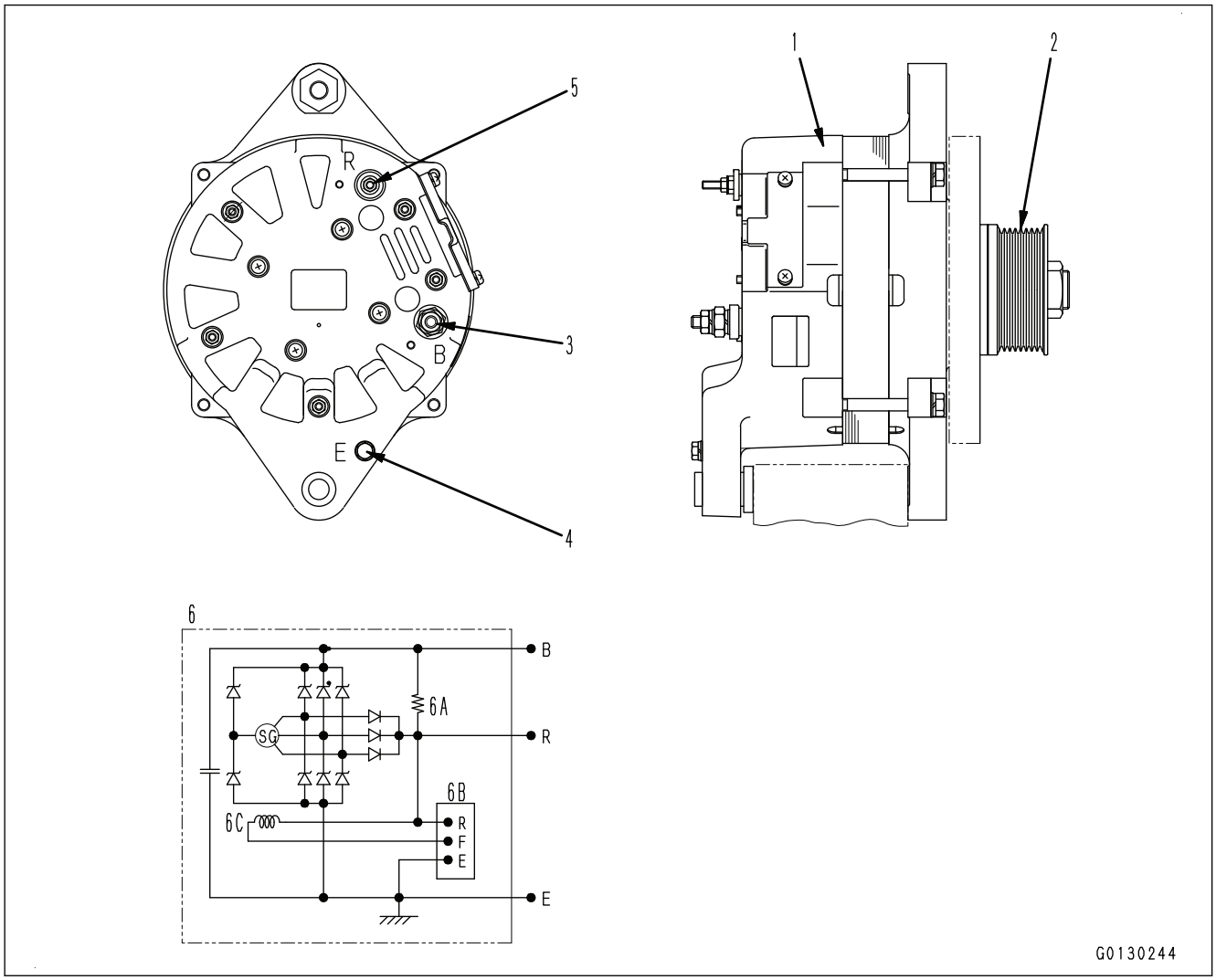
ALTERNATOR

STRUCTURE OF ALTERNATOR WITH BUILT-IN REGULATOR (OPEN TYPE, 90A)

REMARK

The shape is subject to machine models.

General view and circuit diagram



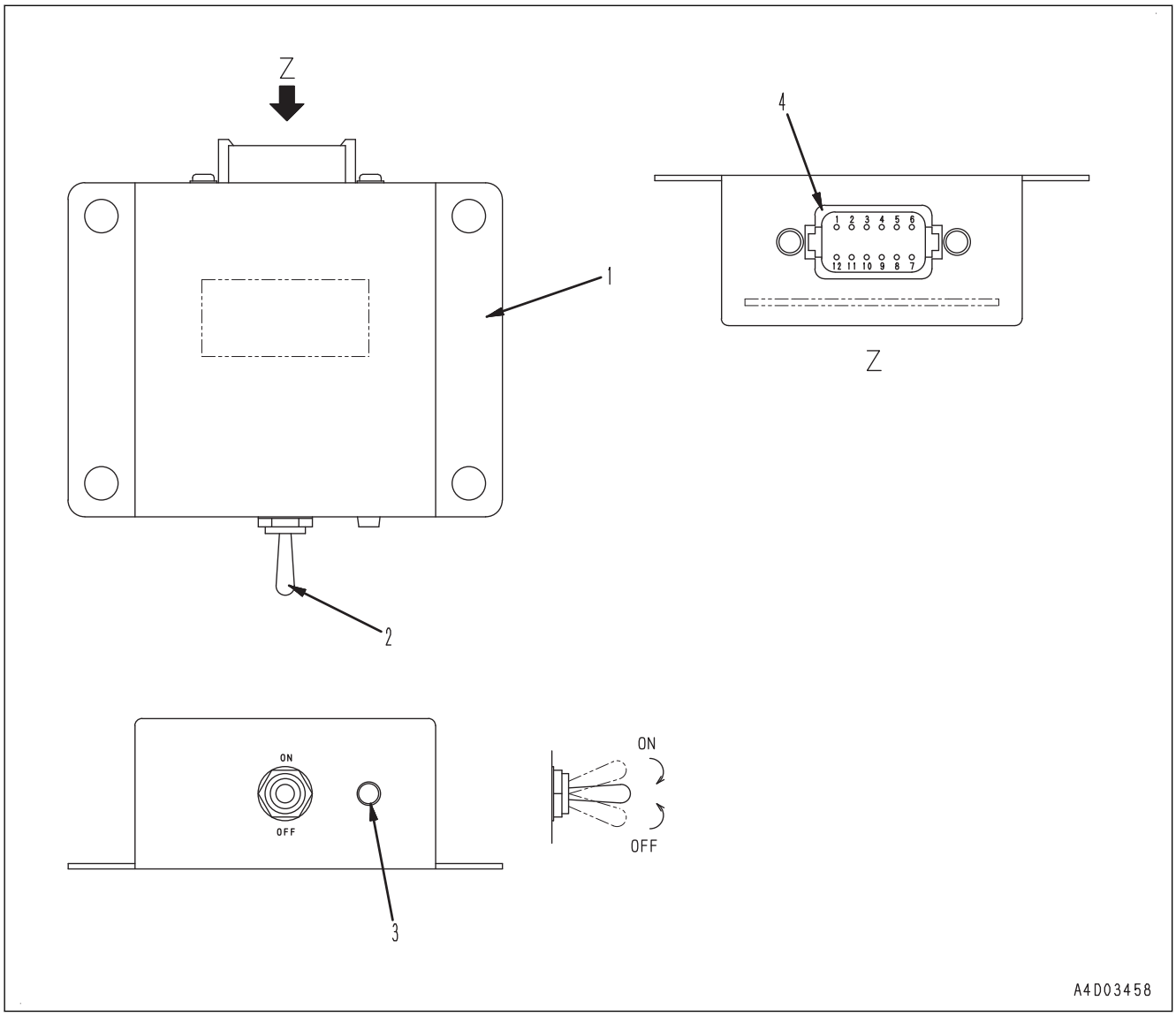
1: Alternator
2: Alternator pulley
3: Terminal B
4: Terminal E
5: Terminal R
6: Internal wiring diagram
6A: Initial excitation resistance
6B: Regulator
6C: Field coil

No.	Sensor	Connector label name
9	Coolant temperature sensor	TWTR
10	Engine wiring harness intermediate connector	OEM
11	Common rail pressure sensor:	PFUEL
12	NE (crankshaft) speed sensor	NE
13	Engine controller connector 2	J2
14	Engine controller connector 1	J1
15	Charge pressure sensor	PIM
16	Supply pump 1 connector	PCV2
17	Bkup (camshaft) speed sensor	G
18	Supply pump 2 connector	PCV1

FUEL FEED PUMP SWITCH

STRUCTURE OF FUEL FEED PUMP SWITCH

General view



1: Body
2: Toggle switch
3: LED lamp
4: Connector

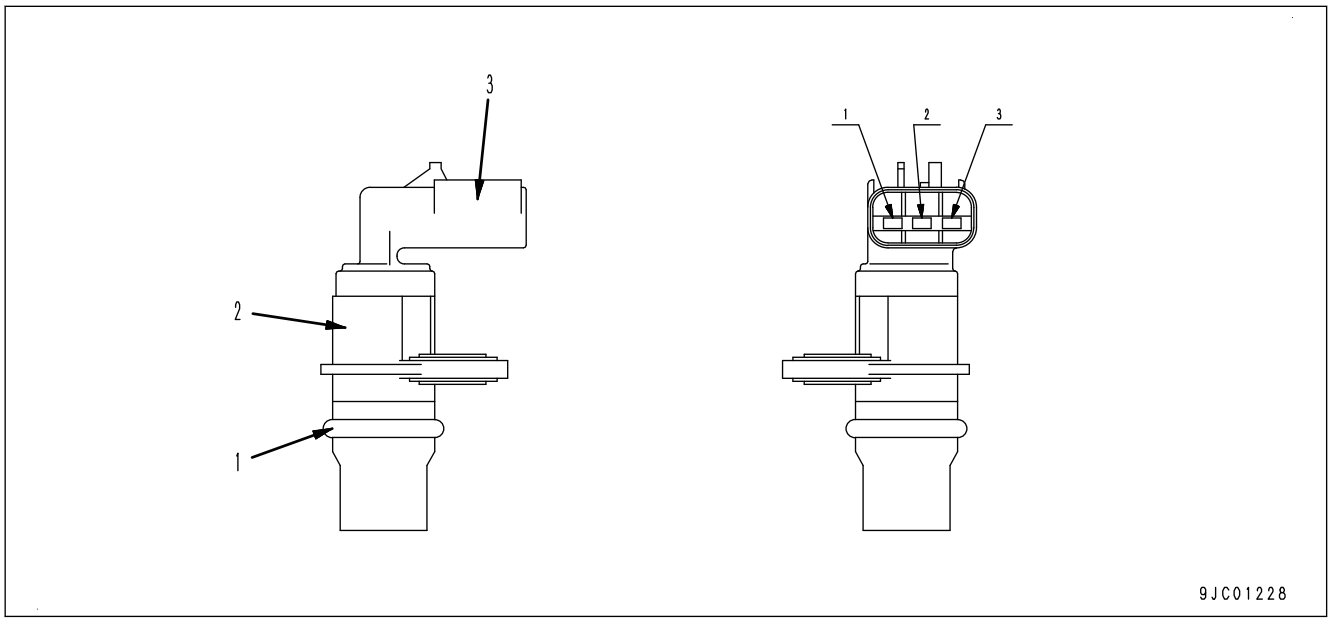
FUNCTION OF FUEL FEED PUMP SWITCH

- This switch receives signals from the engine controller and drives the fuel feed pump.
- The fuel feed pump is driven to bleed air from the fuel line by operating the toggle switch, when the fuel filter is replaced, etc.
  Air in the fuel line is bled by driving the fuel feed pump for the set time of the built-in timer.
- When the starting switch is at OFF position, the fuel feed pump is driven in the following pattern; Pump is driven (30 seconds) → Pump is stopped (10 seconds). After 10 cycles of this pattern, the pump is stopped automatically.

STRUCTURE OF NE (CRANKSHAFT) SPEED SENSOR

NE (crankshaft) speed sensor is attached to the crankshaft pulley part of engine front cover.

General view



1: O-ring
2: Sensor
3: Connector

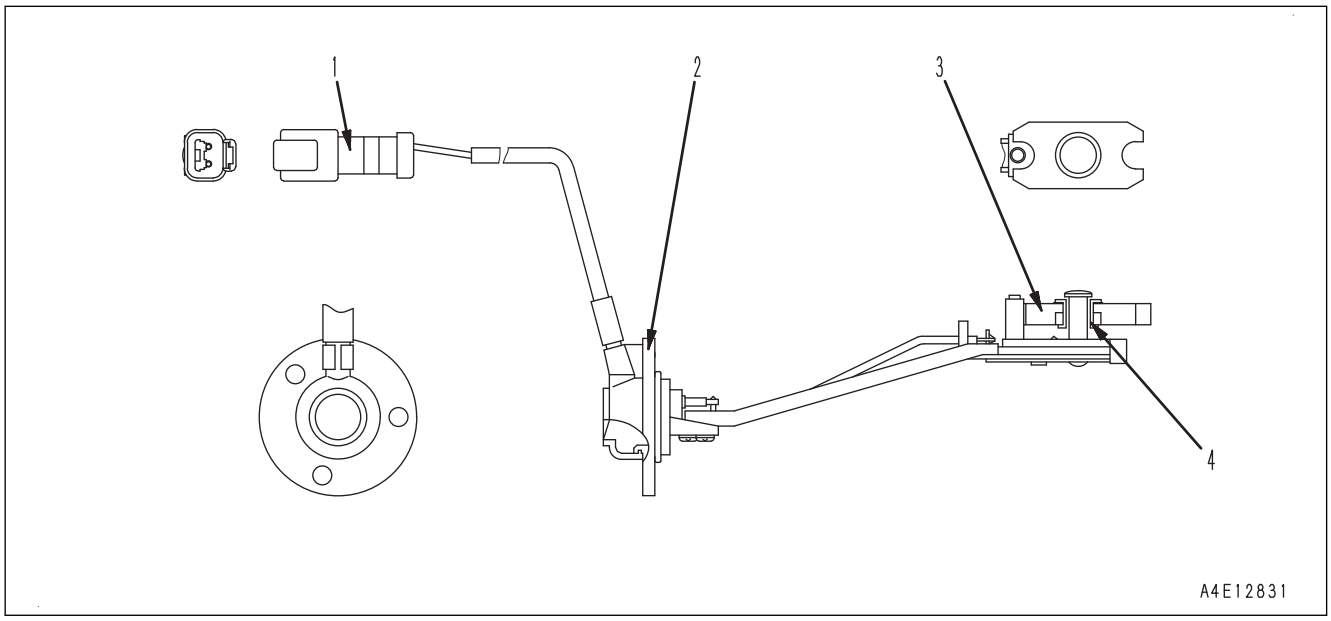
FUNCTION OF NE (CRANKSHAFT) SPEED SENSOR

It outputs pulse voltage by the rotation of the gear.

STRUCTURE OF ENGINE OIL LEVEL SENSOR

Engine oil level sensor is attached to the side of engine oil pan.

General view



1: Connector (DT-2P)
2: Bracket
3: Float
4: Switch

FUNCTION OF ENGINE OIL LEVEL SENSOR

As the oil goes blow specified level, float drops and turns “OFF” the switch.

STANDARD VALUE TABLE FOR ENGINE

STANDARD VALUE TABLE FOR ENGINE: SAA6D125E-7 (D85EX-18, D85EXI-18, D85PX-18, D85PXI-18)

Performance

Engine				SAA6D125E-7	
Item	Test condition		Unit	Standard value for new machine	Failure criterion
Engine speed	Engine coolant temperature: 60 to 100 °C	Max. speed with no load (High idle)	min^{-1} {rpm}	2100 ± 50 {2100 ± 50}	–
		Min. speed with no load (Low idle)		750 (+50/0) {750 (+50/0)}	–

Air intake and exhaust system

Engine				SAA6D125E-7	
Item	Test condition		Unit	Standard value for new machine	Failure criterion
Air intake resistance	Whole speed range		kPa {mmH_2O}	Max. 3.73 {Max. 380}	7.47 {762}
Boost pressure	At rated horsepower (gauge pressure)		kPa {mmHg}	Min. 113 {Min. 850}	87 {650}
Exhaust temperature	Whole speed range (ambient temperature20 °C)		°C	Max. 650	650
Exhaust gas color	• Engine coolant temperature: 60 to 100 °C • At rated horsepower • After it is kept for 5 seconds at normal condition	Engine outlet (between VGT and KDPF inlet)	Bosch index	Max. 1.5	2.5
		SCR outlet (exhaust pipe outlet)		Max. 0.5	0.5
Valve clearance	Intake valve		mm	0.33	–
	Exhaust valve			0.71	–
EGR valve, VGT oil pressure	At Max. speed with no load (High idle)		MPa {kgf/cm^2}	Min. 1.43 {Min. 14.6}	1.43 {14.6}
	At Min. speed with no load (Low idle)			Min. 1.18 {Min. 12.0}	1.18 {12.0}

Main body

Engine			SAA6D125E-7	
Item	Test condition	Unit	Standard value for new machine	Failure criterion
Compression pressure	• Engine oil temperature: 40 to 60 °C • Engine speed: 200 to 250 rpm	MPa {kgf/cm^2}	Min. 2.9 {Min. 30}	2.0 {20}

STANDARD VALUE TABLE FOR ENGINE: SAA6D125E-7 (WA480-8, WA480-8E0)

Performance

Engine				SAA6D125E-7	
Item	Test condition		Unit	Standard value for new machine	Failure criterion
Engine speed	Engine coolant temperature: 60 to 102 °C	Max. speed with no load (High idle)	min^{-1} {rpm}	2190 ± 50 {2190 ± 50}	–
		Min. speed with no load (Low idle)		800 (+50/0) {800 (+50/0)}	–

Air intake and exhaust system

Engine				SAA6D125E-7	
Item	Test condition		Unit	Standard value for new machine	Failure criterion
Air intake resistance	Whole speed range		kPa {mmH_2O}	Max. 3.73 {Max. 380}	7.47 {762}
Boost pressure	At rated horsepower (gauge pressure)		kPa {mmHg}	Min. 127 {Min. 950}	100 {750}
Exhaust temperature	Whole speed range (ambient temperature20 °C)		°C	Max. 650	650
Exhaust gas color	• Engine coolant temperature: 60 to 102 °C • At rated horsepower • After it is kept for 5 seconds at normal condition	Engine outlet (between VGT and KDPF inlet)	Bosch index	Max. 1.5	2.5
		SCR outlet (exhaust pipe outlet)		Max. 0.5	0.5
Valve clearance	Intake valve		mm	0.33	–
	Exhaust valve			0.71	–
EGR valve, VGT oil pressure	At Max. speed with no load (High idle)		MPa {kgf/cm^2}	Min. 1.43 {Min. 14.6}	1.43 {14.6}
	At Min. speed with no load (Low idle)			Min. 1.18 {Min. 12.0}	1.18 {12.0}

Main body

Engine			SAA6D125E-7	
Item	Test condition	Unit	Standard value for new machine	Failure criterion
Compression pressure	• Engine oil temperature: 40 to 60 °C • Engine speed: 200 to 250 rpm	MPa {kgf/cm^2}	Min. 2.9 {Min. 30}	2.0 {20}
Blowby pressure	At rated horsepower (when KCCV is disconnected)	kPa {mmH_2O}	Max. 1.96 {Max. 200}	3.92 {400}

RUNNING-IN STANDARD AND PERFORMANCE TEST STANDARD: SAA6D125E-7 (WA475-10)

Engine operation standard for break in period

Engine		SAA6D125E-7				
Item		Step				
		1	2	3	4	5
Operation time	min	2	8	2	3	5
Engine speed	rpm	700	800	1000	1200	1600
Dynamometer load	N {kg}	0 {0}	452 {46}	904 {92}	1446 {148}	1807 {184}
Output	kW {HP}	0 {0}	27 {36}	68 {91}	130 {175}	217 {291}

REMARK

- This table shows the values when the fan is not installed.
- The loads for the dynamometer in this table shows the value when the dynamometer arm is 716 mm long.

Performance test standard

Engine		SAA6D125E-7			
Test item		At rated horsepower	Maximum torque	Max. speed with no load	Min. speed with no load
Specification value (Gross value)	–	217 kW /1600 rpm {291.0 HP / 1600 rpm}	1528 Nm / 1330 rpm {155.8kgm / 1330 rpm	1890 ± 50 rpm	700 (+50/0) rpm
Engine speed	rpm	1600	1330	1890 ± 50	700 (+50/0)
Dynamometer load	N {kg}	1754 to 1863 {179 to 190}	2069 to 2197 {211 to 224}	—	–
Output (Gross value)	kW {HP}	217 {291.0}	–	–	–
Torque (Gross value)	Nm {kgm}	–	1528 {155.8}	–	–
Fuel consumption	sec / 300 cc	–	–	–	–
Coolant temperature	°C	80 to 90	80 to 90	80 to 90	80 to 90
Lubrication oil temperature	°C	90 to 110	90 to 110	90 to 110	90 to 110
Lubrication oil pressure	kPa {kg/cm^2}	290 to 690 {3.0 to 7.0}	190 to 540 {2.0 to 5.5}	290 to 690 {3.0 to 7.0}	Min. 80 {Min. 0.8}
Exhaust gas temperature (inlet of turbocharger)	°C	Max. 600	Max. 640	–	–

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
TOPS	Tip-Over Protective Structure	Cab and canopy	This is a protective structure that intended to protect the operator wearing seat belt from suffering injury which may be caused if the cab is crushed when the machine tips over. (Roll-over protective structure of hydraulic excavator) This performance is standardized as ISO 12117.
TWV	2-Way Valve	Hydraulic system	This is a solenoid valve that switches over direction of flow.
VGT	Variable Geometry Turbocharger	Engine	This is a turbocharger on which the cross-section area of the exhaust passage is variable.
VHPC	Variable Horse Power Control	Engine control	This is a function that finely controls the maximum output of the machine so that high work efficiency and low fuel consumption rate are both achieved.

*1: Code for applicable machine model

D: Bulldozer

HD: Dump truck

HM: Articulate dump truck

PC: Hydraulic excavator

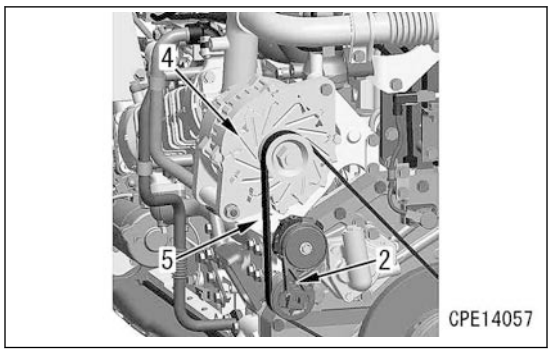
WA: Wheel loader

List of abbreviations used in the circuit diagrams

Abbreviation	Actual word spelled out
A/C	Air Conditioner
A/D	Analogue-to-Digital
A/M	Air Mix Damper
ACC	Accessory
ADD	Additional
AUX	Auxiliary
BR	Battery Relay
CW	Clockwise
CCW	Counter Clockwise
ECU	Electronic Control Unit
ECM	Electronic Control Module
ENG	Engine
EXGND	External Ground
F.G.	Frame Ground
GND	Ground
IMA	Inlet Metering Actuator
NC	No Connection

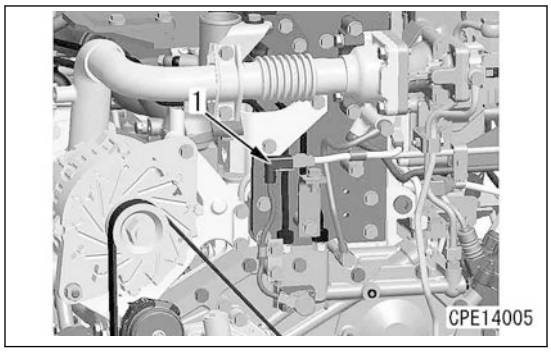
Work	Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Details of work
Installation of engine rear oil seal	N	1	795T-421-1340	Push tool	■	1		○	Press fit of standard oil seal (with guide)
		2	01010-61635	Bolt	■	3			
		3	01643-31645	Washer	■	3			
		4	795-931-1220	Push tool	■	1			Press fit of sleeved oil seal
		5	01010-41650	Bolt	■	3			
		6	01643-31645	Washer	■	3			
		7	795T-421-1340	Push tool	■	1		○	
		8	01010-61645	Bolt	■	3			
		9	01643-31645	Washer	■	9			
Removal of supply pump	P	1	795-630-5500	Standard puller	■	1			Removal of supply pump drive gear
		2	01010-81090	Bolt	■	2			
		3	01643-31032	Washer	■	2			
Installation of oil seal for valve stem in cylinder head	Q		795T-411-1510	Screwdriver	■	1	N	○	Press fit of oil seal in valve system
Installation of exhaust connector	S	1	795T-621-2820	Push tool	■	1	N	○	Press fit of exhaust connector seal
		2	795T-621-3310	Installer	■	1	N	○	Measurement of exhaust connector installed dimensions

5. Remove the auto-tensioner (2) from the auto-tensioner tensioner bracket (5).
6. Remove the alternator assembly (4) from the auto-tensioner bracket (5).
7. Remove the auto-tensioner bracket (5) from the front cover and cylinder block.

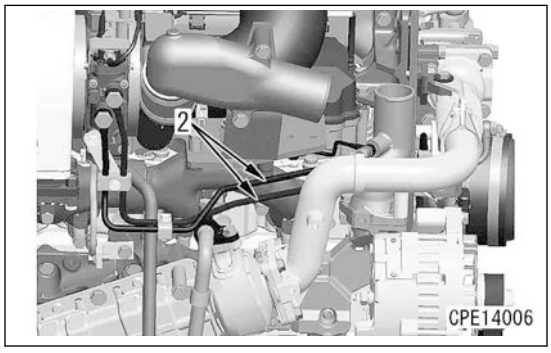


Oil tube for VGT hydraulic actuator

8. Disconnect EPC valve connector VGT-SOL (1).

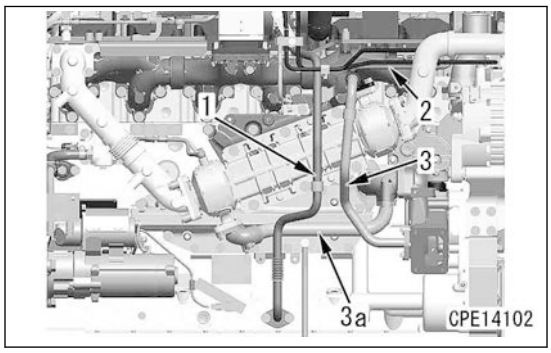


9. Disconnect the oil tube (2) for VGT hydraulic actuator.

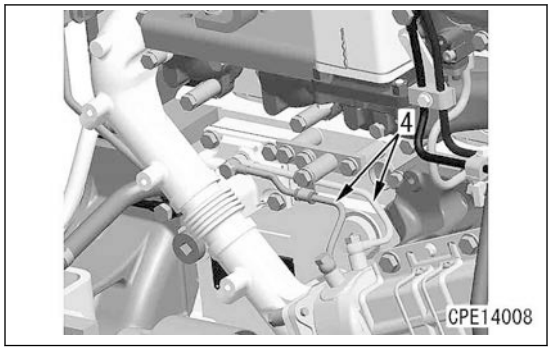


EGR cooler

10. Disconnect VGT oil drain tube (1).
11. Disconnect the air vent tube (2) and EGR coolant tubes (3) and (3a).

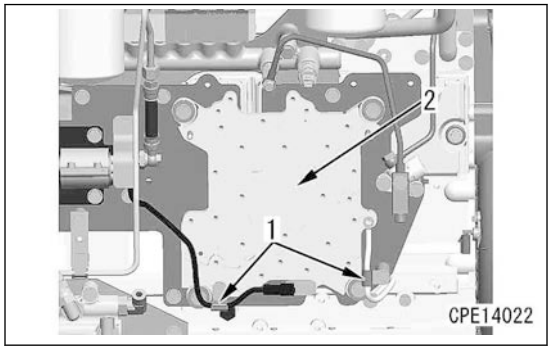


12. Disconnect EGR air vent tubes (4) (2 pieces).



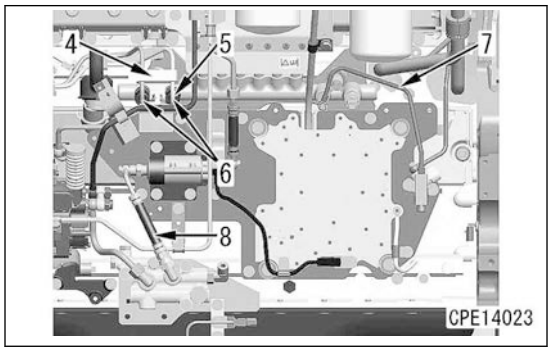
Engine controller cooler

63. Remove the wiring harness clamps (1) (2 pieces).
64. Remove the mounting bolts (4 pieces), and remove the engine controller cooler (2).



Fuel high-pressure pipe between supply pump and common rail

65. Remove the clamps (4) (3 pieces).
66. Remove the fuel spray prevention cap (5) of the common rail fuel high-pressure pipe.
67. Disconnect the common rail fuel high-pressure pipes (6) (2 pieces).
68. Disconnect the overflow tube (7).
69. Disconnect the fuel hose (8) for the fuel doser pump.

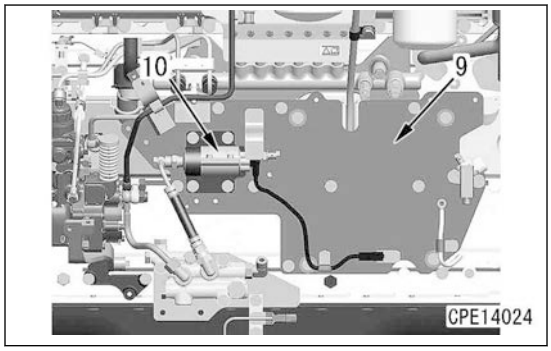


70. Sling the bracket (9).
71. Remove the mounting bolts and sling bracket (9) and remove it.

REMARK

Remove the bracket with fuel doser pump (10) attached.

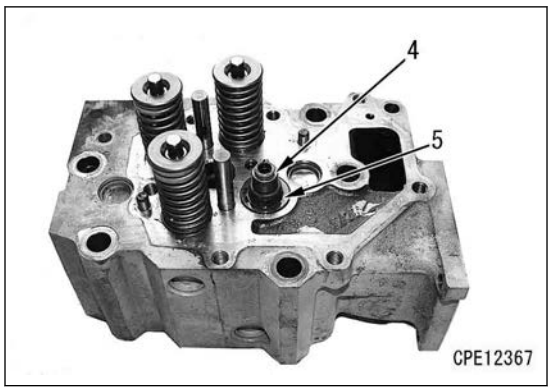
Bracket (9):
25 kg

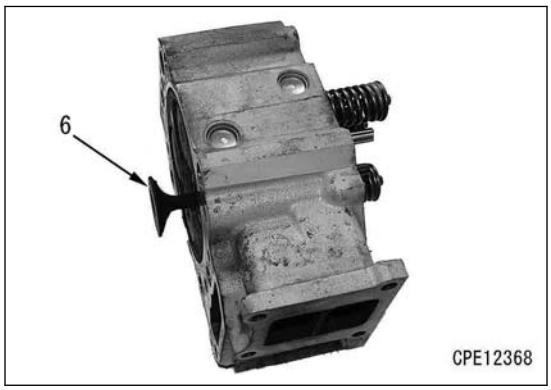


116. Remove the oil seal (4) and remove the lower seat (5).
117. Put the cylinder head sideways and remove the valve (6).

REMARK

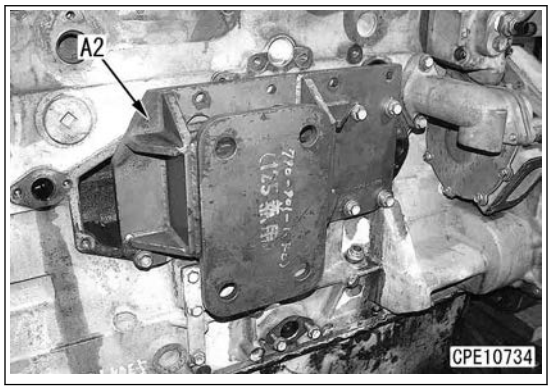
Check and record the combinations of the valves and cylinder heads.



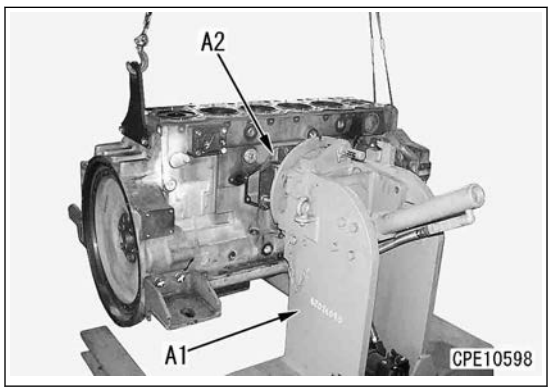


Engine repair stand (installation)

118. Install the tool A2.



119. Sling the engine with the lifting tools, set the previously installed tool A2 to the tool A1, and then tighten the mounting bolts.

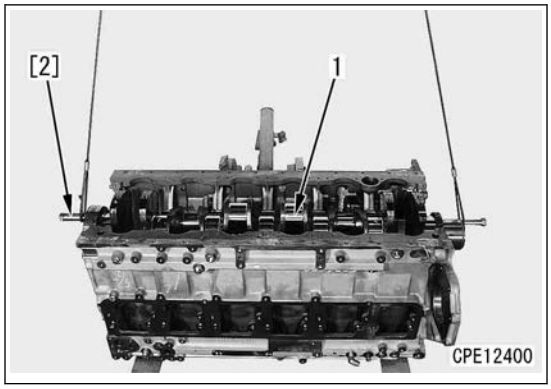


167. Sling the crankshaft (1) with the bolts [2], and remove it.

REMARK

To remove the crankshaft (1), be careful not to damage its journals.

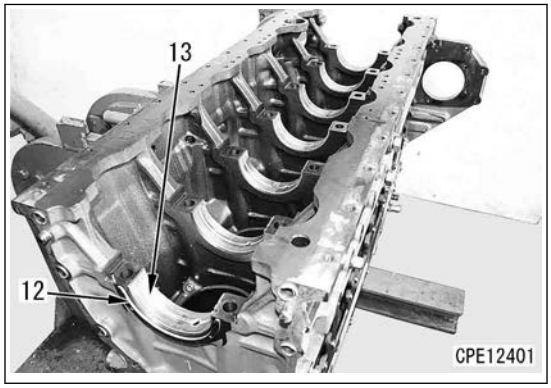
Crankshaft (1):
110 kg



168. Remove the upper thrust bearing (12). (Only for the journal of No. 7)

REMARK

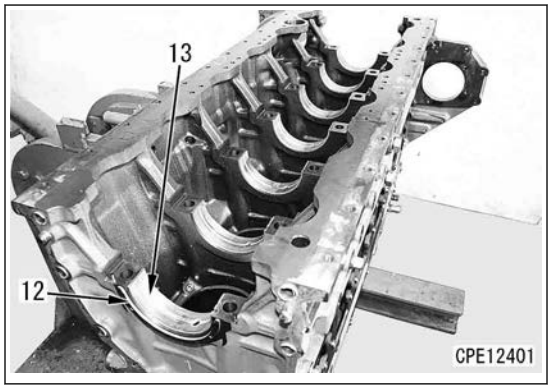
Check the mounting position of the upper thrust bearing (12), and record it.



169. Remove the upper main bearing (13) from each main journal.

REMARK

Discriminate the parts (main caps, main bearings, thrust bearings) to indicate the positions to be installed, and then store them in group by every cylinder number.

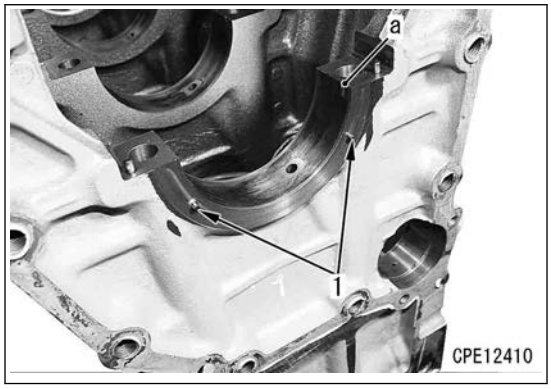


REMARK

The cylinder block and main bearing are fitting selective parts. (The spare parts are prepared to secure the standard clearance.)

13. Drive the roll pin (1) into the cylinder block and adjust their protrusion to the following. (Only for the journal of No. 7)

    Protrusion of the roll pin (1): 1.5 to 1.9 mm

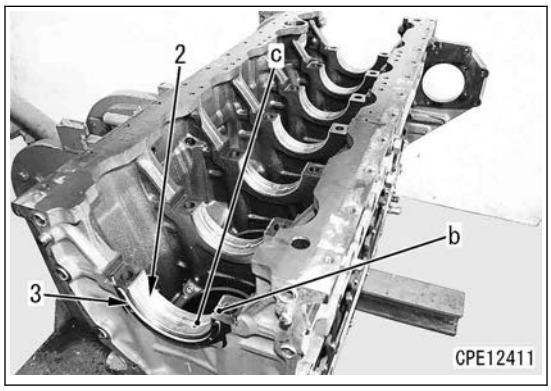


14. Install the upper main bearing (2) while fitting its protrusion (b) to notch (a) of the cylinder block.

    REMARK

    - Check that the oil hole (C) of the upper main bearing (2) is aligned to the oil hole of the cylinder block.
    - Check that no foreign material sticks to the back of the upper main bearing (2) before installing.

    Upper main bearing inner surface (2):
    Engine oil



15. Install the upper thrust bearing (3). (Only for the journal of No. 7)

    REMARK

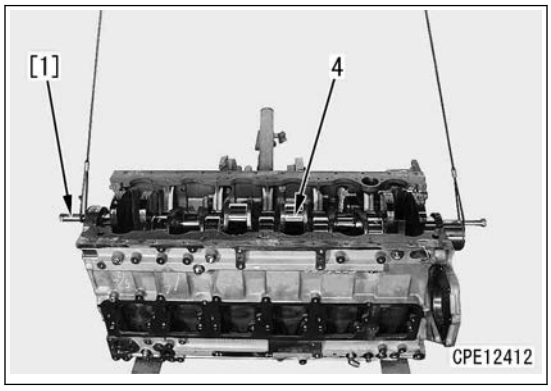
    Install the upper thrust bearing (3) with the grooved face directed toward the crankshaft.

    Upper thrust bearing (3):
    Engine oil

16. Before installing the crankshaft, check the following.
    - The thread portions at the front and rear of the crankshaft are free from defects. (The bolts can be screwed in smoothly by hand.)
    - The crank pin and main journal are free from scratches or dent.
    - Inside of the oil hole is free from dirt.

17. Sling the crankshaft (4) and set it to the mounting position with the bolts [1].

    Crankshaft (4):
    110 kg



    NOTICE

    When replacing the crankshaft gear, heat the crankshaft gear with a bearing heater to 150°C, and fit it quickly.

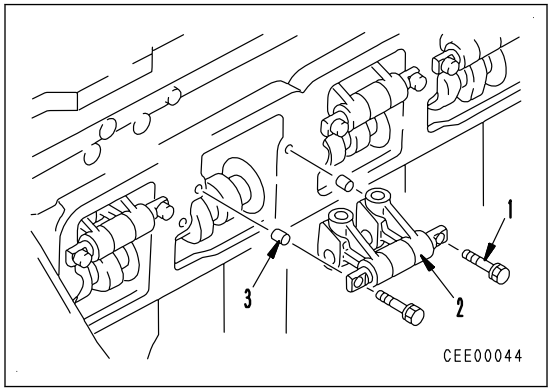
18. When installing, take care not to damage the journal of the crankshaft (4) by hitting it against the cylinder block.

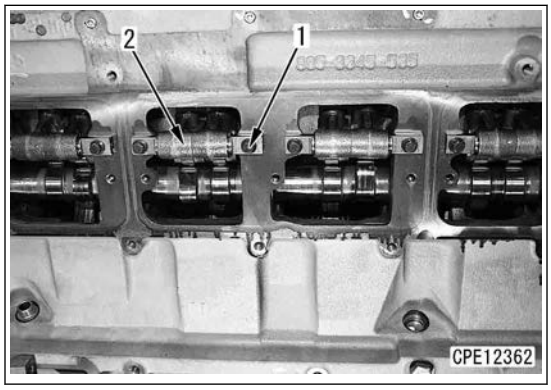
    Journal of the crankshaft (4):
    Engine oil

Cam follower

62. Drive the dowel pins (3) into the cylinder block.
63. Install the cam follower assemblies (2) (6pieces) and tighten the mounting bolts (1).

    Mounting bolt (1):
    44 to 59 Nm {4.5 to 6.0 kgfm}





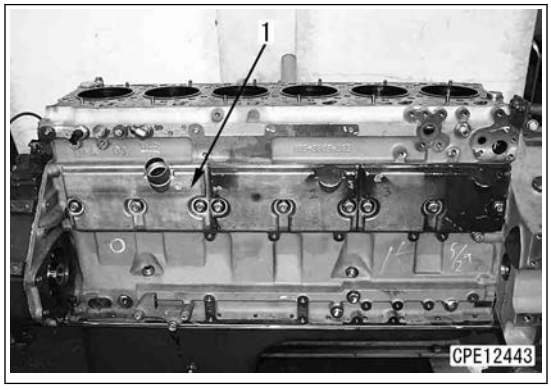
Cam follower cover

64. Install O-ring and install the cam follower cover (1).

    REMARK

    Install O-ring not to twist it.

    Mounting bolt:
    9.8 to 12.7 Nm {1.0 to 1.3 kgfm}



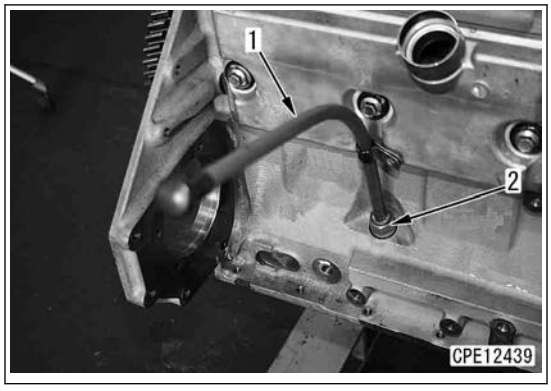
Dipstick

65. Install the collar onto the dipstick pipe (1) and fix it with the nut (2).

    Nut (2):
    44 to 59 Nm {4.5 to 6.0 kgfm}

    REMARK

    - Be careful about the oil gauge mounting position since it varies in response to the model.
    - Match the marks put on the cylinder block and dipstick pipe when the dipstick pipe is removed.



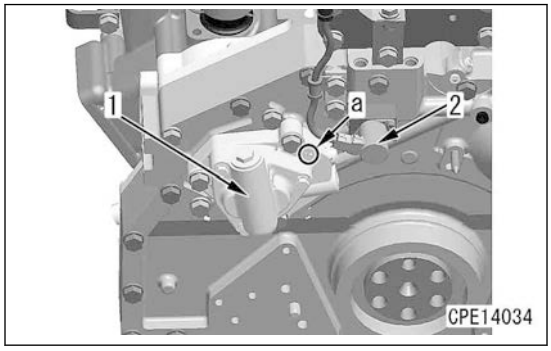
Boost pump and EPC valve

92. Install O-rings (3 pieces) and EPC valve (2).

Mounting bolt:
9.8 to 12.7 Nm {1.0 to 1.3 kgfm}

93. Install O-rings (3 pieces) and boost pump (1).

94. Check that there is the embossed mark (T4) at the part (a) of the boost pump (1).



Front support bracket

95. Sling the front support bracket (1) with the eyebolt [1], and install the mounting bolt.

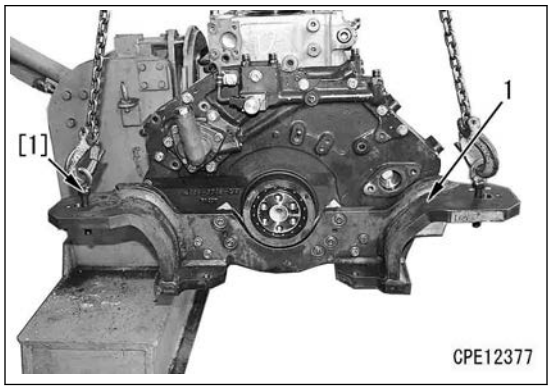
Front support bracket (1):
50 kg

Mounting bolt of the front support bracket (1):
Liquid adhesive (LT-2)

Mounting bolt of the front support bracket (1):
59 to 74 Nm {6.0 to 7.5 kgfm}

REMARK

- The front support bracket (1) differs depending on the machine model.
- The front support mounting bolt differs depending on the machine model.



Damper and pulley assembly

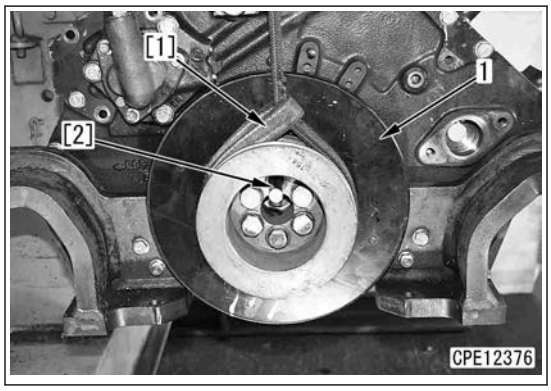
96. Sling the damper and pulley assembly (1) with the lifting tool [1] and install it with the guide bolt [2].

Damper and pulley assembly (1):
25 kg

⚠ Install them with mounting bolts.

Mounting bolt (1 piece) (width across flats: 22 mm):
157 to 196 Nm {16 to 20 kgfm}

Mounting bolt (5 pieces) (width across flats: 24 mm):
245 to 309 Nm {25.0 to 31.5 kgfm}

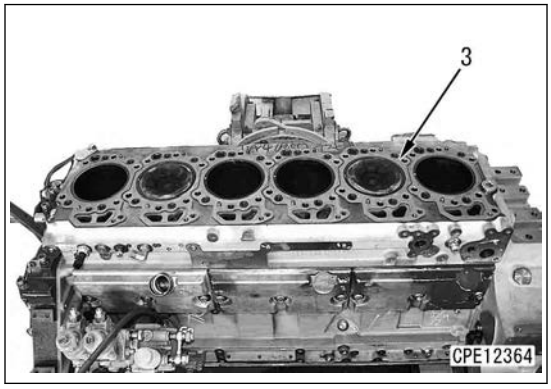


Cylinder head assembly (installation)

127. Check that there is no dust or foreign material on the cylinder head mounting face and inside the cylinders, and fit the cylinder head gasket (3) (6 pieces).

REMARK

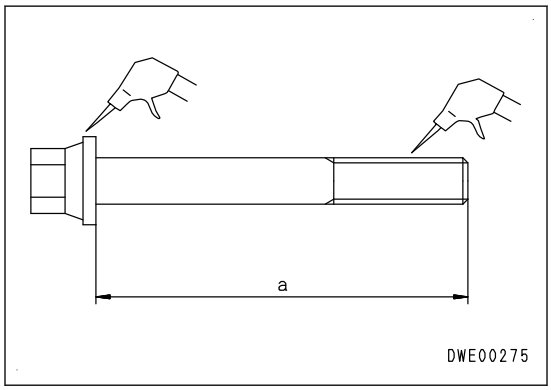
Check that the grommet of the cylinder head gasket (3) has no peeling or omission.



128. Check the cylinder head mounting bolts for the following. If the following applies to a bolt, do not reuse that bolt but replace it.

Number of tightening times: 6 (5 punch marks at the bolt head)

Bolt stem length allowable limit (a): Min. 171.4 mm

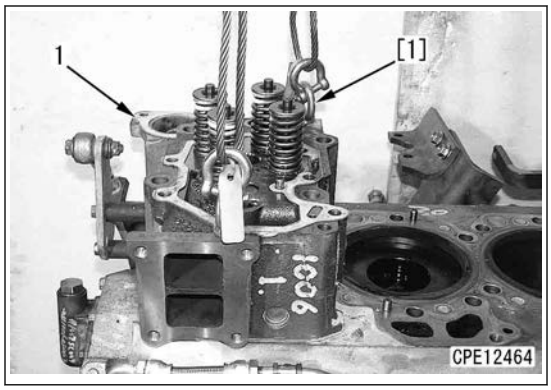


129. Sling the cylinder head assembly (1) with the eyebolt [1], align it with the dowel pin, and install it.

Cylinder head assembly (1):

20 kg

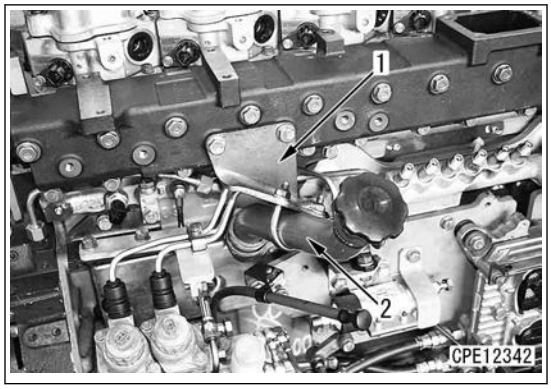
130. Tighten the mounting bolts and auxiliary bolt of the cylinder head assembly.



192. Install the oil filler pipe (2) and bracket (1).

REMARK

The shape varies in response to the machine model.

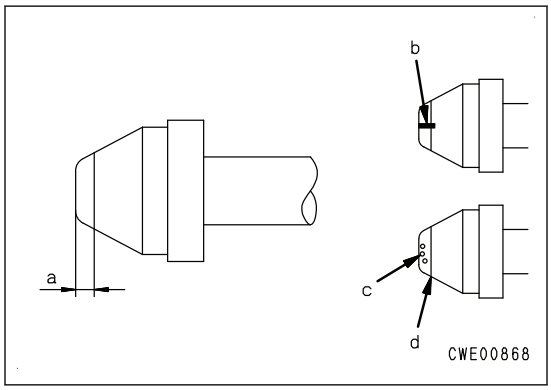


Fuel high-pressure pipe between the common rail and fuel injector

193. If the taper seal part of the fuel high-pressure pipe connecting part has any of the following problems, replace the fuel high-pressure pipe with a new one since fuel may leak.

REMARK

- There is the visible lengthwise slit (b) or spot (c) in the range (a) of 2 mm from the end.
- Level difference caused by fatigue which is felt with nail in the taper seal end part (d) of 2 mm from end.



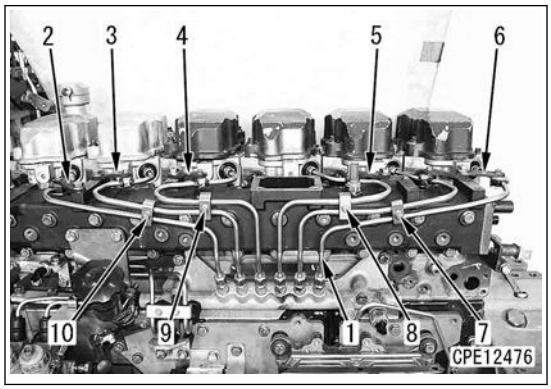
194. Install the fuel high-pressure pipes (1) (6 pieces), and tighten them to the specified torque.

REMARK

The mounting angle of the inlet connector has been adjusted at the installation of the fuel injector.

Sleeve nut: Supply pump side:
39.2 to 44.1 Nm {4.0 to 4.5 kgfm}

Sleeve nut: Common rail side:
39.2 to 44.1 Nm {4.0 to 4.5 kgfm}



195. Install the bracket and clamps (2) to (6) loosely, and then tighten the clamps to the specified torque.

Clamping bolt:
11.8 to 14.7 Nm {1.2 to 1.5 kgfm}

196. Tighten the mounting bolts for brackets (2) through (6) to the specified torque.

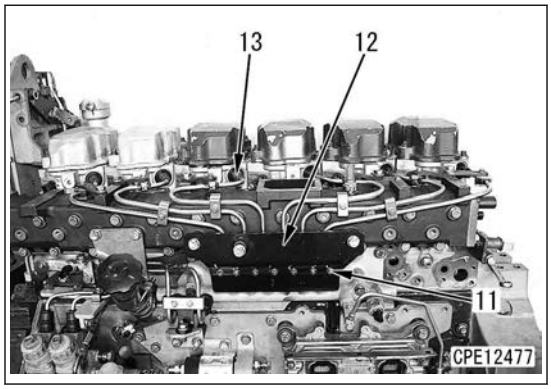
197. Install all the clamps (7) to (10) loosely.

198. Install the clamp (11) to the bracket (12) loosely, and then tighten clamp (11) to the specified torque.

REMARK

The clamp (11) is on the back of the bracket (12) and used to fix 6 fuel high-pressure pipes.

Clamping bolt:
11.8 to 14.7 Nm {1.2 to 1.5 kgfm}

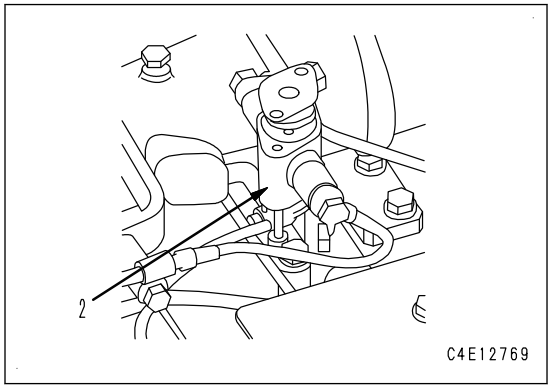


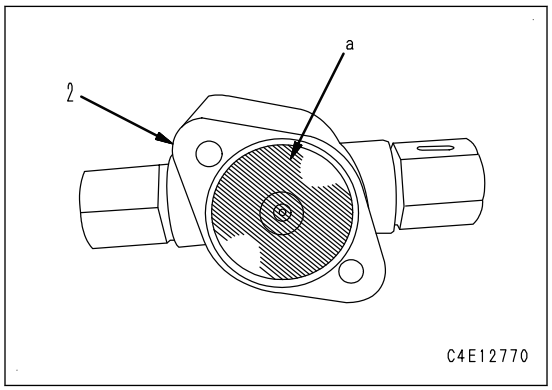
199. Lightly fasten the bracket (12).

200. Tighten the clamps (7) to (10) to the specified torque.

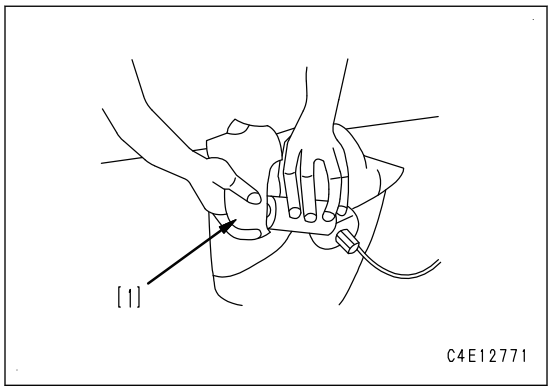
Fuel doser

256. Follow the procedure described below to remove the soot (a) from the fuel dose (2).

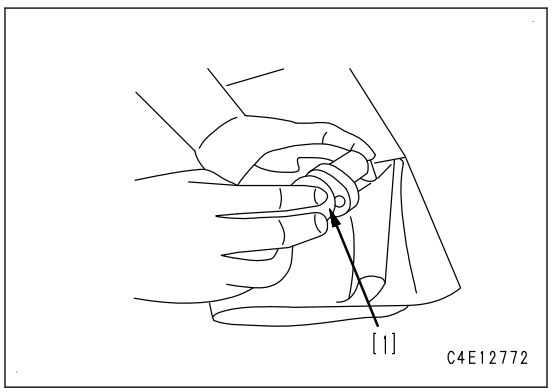




1) Press the cloth [1] with a generous amount of diesel fuel against the soot accumulated at the fuel doser injection port end, to soak the soot into the fuel.



2) After the fuel soaks into the soot, wipe off excessive fuel with the cloth [1].



3. At the same time, match timing marks (C) on supply pump drive gear (30) and cam gear (31), and then tighten mounting nut (22).

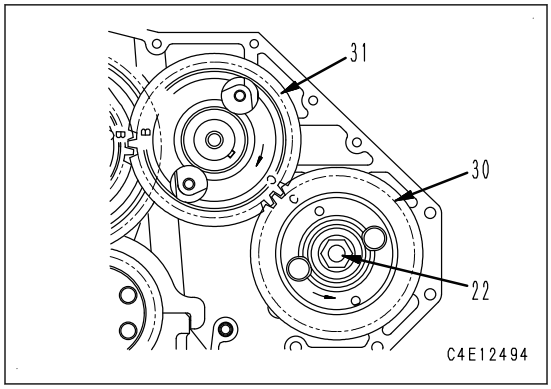
   REMARK

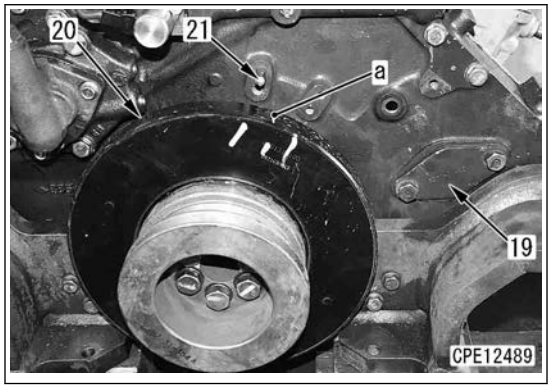
   - Rotate the crankshaft in the normal direction (counterclockwise seeing from the flywheel side) to set center point (a) between stamp line 2/5TOP and 3/4TOP of damper (20) to pointer (21). (Stamp line 1/6TOP comes bottom.)
   - At this time, check that the forcing tap of the drive gear aligns with the mounting bolt hole of cover (19). (If it is not, rotate the crankshaft one more turn.)
   - At this position, the key of the supply pump shaft is rotated clockwise by 15 ° from the top.

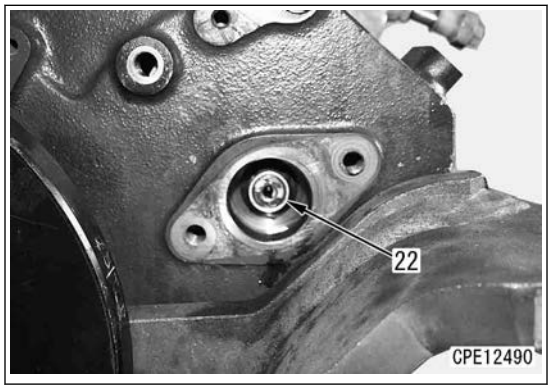
   Mounting nut(22) :
   176 to 196 Nm {18 to 20 kgfm}

4. Install cover (19).

   Mounting bolt of cover (19) :
   98 to 123 Nm {10.0 to 12.5 kgfm}







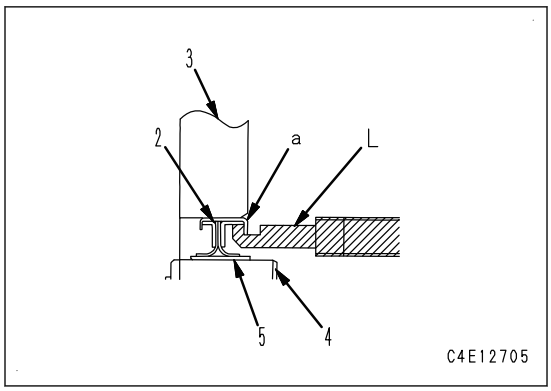
5. Removal of sleeved oil seal
   1) Replace the tip of tool L with the hook type tip and hitch it to outer case (a) of engine rear oil seal (2).
   2) Pull slide hammer [SH] of tool L toward you, and remove engine rear oil seal (2) by using impact power.

      REMARK

      Perform above evenly at several places so that engine rear oil seal (2) does not incline.
   3) Cut and remove sleeve (5) with a chisel and a hammer.

      REMARK

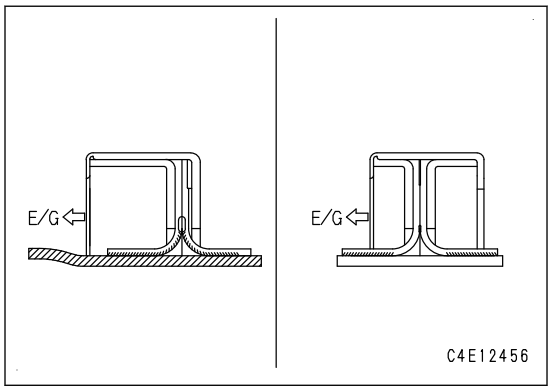
      - Be careful not to damage crankshaft (4).
      - Remove all the chips.



METHOD FOR INSTALLING ENGINE REAR OIL SEAL

Oil seal

1. Select the oil seal according to the following procedure.
   1) Check the wear of the crankshaft and select the type of the Teflon seal (lay-down lip seal) to install, “standard oil seal” or “sleeved oil seal”, depending on the wear of the crankshaft.
   2) When the crankshaft is worn to a degree of luster (you can feel the wear with the pad of your finger and the wear depth is a maximum of 10μm) and there are no scratches, install the standard oil seal. In other cases, install sleeved oil seal.
   3) In the figure, left side shows the standard oil seal, and right side shows the sleeved oil seal.



Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ICT	Information and Communication Technology	Communication and electronic control	A general term for the engineering and its socially applied technology of information processing and communication.
IMA	Inlet Metering Actuator	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump fuel discharged volume. (Same as IMV)
IMU	Inertial Measurement Unit	Engine	This is a device to detect the angle (or angular velocity) and acceleration of the 3 axes that control motions.
IMV	Inlet Metering Valve	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump combustion discharged volume. (Same as IMA)
KCCV	Komatsu Closed Crankcase Ventilation	Engine	This is a mechanism that burns the blowby gas again by separating oil from blowby gas and returning it to the intake side. It primarily consists of filters.
KCSF	Komatsu Catalyzed Soot Filter	Engine	This is a filter that captures soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	This is a catalyst that is used for purifying exhaust gas. It is built in to KDPF or assembled with the muffler.
KDPF	Komatsu Diesel Particulate Filter	Engine	This is a component that is used to purify the exhaust gas. KDOC (catalyst) and KCSF (filter to capture soot) are built-in it. It is installed instead of the conventional muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM)	This is a function that performs braking with the optimum force and recovers the driving force of the wheels by actuating the inter-axle differential lock when the wheels runs idle while the machine travels on the soft ground.
LCD	Liquid Crystal Display	Machine monitor	This is an image display equipment such as a monitor in which the liquid crystal elements are assembled.
LED	Light Emitting Diode	Electronic parts	This is a semiconductor element that emits light when the voltage is applied in forward direction.
LIN	Local Interconnect Network	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
LS	Load Sensing	Hydraulic system	This is a function that detects differential pressure of pump, and controls discharged volume corresponding to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
MAF	Mass Air Flow	Engine	This indicates engine intake air flow. This is not used independently but is used as combined with sensor. Mass air flow sensor can be called as MAF sensor.

Unit: mm

No.	Item	Criteria		Remedy
5	Outside diameter of cylinder liner (O-ring portion)	Standard dimension	Tolerance	Replace cylinder liner
		141	+0.386 +0.361	
	Clearance between cylinder liner and block (O-ring portion)	Standard clearance: 0.014 to 0.079		Replace cylinder liner or block
6	Protrusion on the upper surface of cylinder liner	Not crushed or damaged		Replace cylinder liner

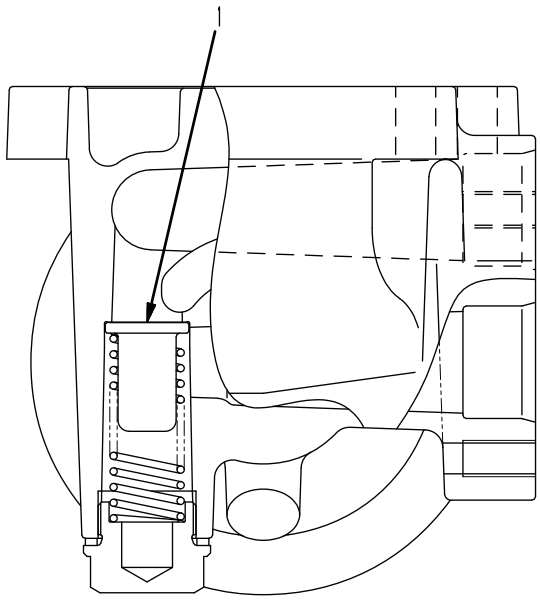
Unit: mm

No.	Item	Judgment criteria					Remedy
1	Clearance between main idler gear bushing and shaft	Standard dimensions	Tolerance		Standard clearance	Allowable clearance	Replace the bushing
			Shaft	Hole			
		47.6	+0.014 +0.001	+0.063 +0.039	0.025 to 0.062	0.20	
2	Clearance between engine oil pump idler gear bushing and shaft	35	-0.025 -0.041	+0.065 0	0.025 to 0.106	0.20	
3	End play of main idler gear	Standard		Repair limit			Replace thrust bearing
		0.05 to 0.17		0.4			
4	End play of engine oil pump idler gear	0.05 to 0.21		0.4			

*1: Shows the values other than the engine which is installed to WA475-10.

*2: Shows the values of the engine which is installed to WA475-10.

MAINTENANCE STANDARD OF SAFETY VALVE OF ENGINE OIL FILTER



No.	Item	Criteria	Remedy
1	Cracking pressure of safety valve	Standard: 343±19 kPa {3.5±0.2 kgf/cm^2}	Replace