

SHOP  
MANUAL

**KOMATSU**

**125-2 SERIES**  
**DIESEL ENGINE**

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# SAFETY

## SAFETY NOTICE

### IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for safe machine operation. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu for the specific purpose.

To prevent injury to workers, the symbol  is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

### GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
  - Always wear safety glasses when hitting parts with a hammer.
  - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, hand shield, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.

6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

### PREPARATIONS FOR WORK

7. Before adding oil or making any repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
8. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

**PRECAUTIONS DURING WORK**

11. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out. Before disconnecting or removing components of the oil, water or air circuits, first remove the pressure completely from the circuit.
12. The water and oil in the circuits are hot when the engine is stopped, so be careful not to get burned.  
Wait for the oil and water to cool before carrying out any work on the oil or water circuits.
13. Before starting work, remove the leads from the battery. Always remove the lead from the negative (-) terminal first.
14. When raising heavy components, use a hoist or crane.  
Check that the wire rope, chains and hooks are free from damage.  
Always use lifting equipment which has ample capacity.  
Install the lifting equipment at the correct places.  
Use a hoist or crane and operate slowly to prevent the component from hitting any other part.  
Do not work with any part still raised by the hoist or crane.
15. When removing covers which are under internal pressure or under pressure from a spring, always leave two bolts in position on opposite sides. Slowly release the pressure, then slowly loosen the bolts to remove.
16. When removing components, be careful not to break or damage the wiring. Damaged wiring may cause electrical fires.
17. When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips onto the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip, or can even start fires.
18. As a general rule, do not use gasoline to wash parts. In particular, use only the minimum of gasoline when washing electrical parts.
19. Be sure to assemble all parts again in their original places.  
Replace any damaged parts with new parts.
  - When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is being operated.
20. When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. Also, check that connecting parts are correctly installed.
21. When assembling or installing parts, always use the specified tightening torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.
22. When aligning two holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.
23. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurements.
24. Take care when removing or installing the tracks of track-type machines.  
When removing the track, the track separates suddenly, so never let anyone stand at either end of the track.

# FOREWORD

## GENERAL

This shop manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgments. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop. For ease of understanding, the manual is divided into the following chapters; these chapters are further divided into the each main group of components.

### STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

In addition, this section may contain hydraulic circuit diagrams, electric circuit diagrams, and maintenance standards.

### TESTING AND ADJUSTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs.

Troubleshooting charts correlating "Problems" with "Causes" are also included in this section.

### DISASSEMBLY AND ASSEMBLY

This section explains the procedures for removing, installing, disassembling and assembling each component, as well as precautions for them.

### MAINTENANCE STANDARD

This section gives the judgment standards for inspection of disassembled parts.

The contents of this section may be described in STRUCTURE AND FUNCTION.

### OTHERS

This section mainly gives hydraulic circuit diagrams and electric circuit diagrams.

In addition, this section may give the specifications of attachments and options together.

### NOTICE

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Use the specifications given in the book with the latest date.

**HOW TO READ THE SHOP MANUAL**

**VOLUMES**

Shop manuals are issued as a guide to carrying out repairs. They are divided as follows:

- Chassis volume:** Issued for every machine model
- Engine volume:** Issued for each engine series
- Electrical volume:** } Each issued as one
- Attachments volume:** } volume to cover all models

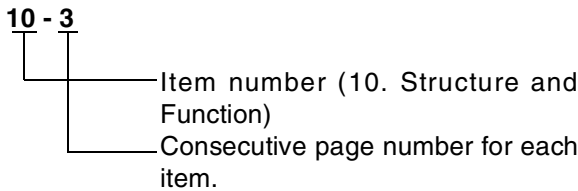
These various volumes are designed to avoid duplicating the same information. Therefore, to deal with all repairs for any model, it is necessary that chassis, engine, electrical and attachment volumes be available.

**DISTRIBUTION AND UPDATING**

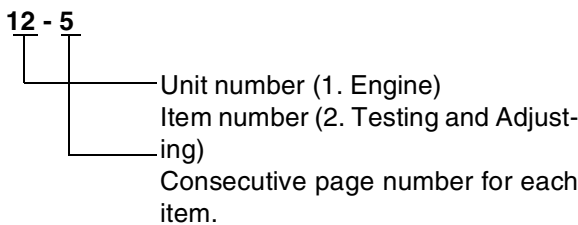
Any additions, amendments or other changes will be sent to KOMATSU distributors. Get the most up-to-date information before you start any work.

**FILING METHOD**

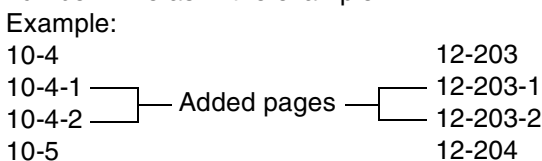
1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show how to read the page number.  
Example 1 (Chassis volume):



Example 2 (Engine volume):



3. Additional pages: Additional pages are indicated by a hyphen (-) and number after the page number. File as in the example.



**REVISED EDITION MARK**

When a manual is revised, an edition mark (①②③....) is recorded on the bottom of the pages.

**REVISIONS**

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
**SYMBOLS**

So that the shop manual can be of ample practical use, important safety and quality portions are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.
	Weight	Weight of parts of systems. Caution necessary when selecting hoisting wire, or when working posture is important, etc.
	Tightening torque	Places that require special attention for the tightening torque during assembly.
	Coat	Places to be coated with adhesives and lubricants, etc.
	Oil, water	Places where oil, water or fuel must be added, and the capacity.
	Drain	Places where oil or water must be drained, and quantity to be drained.

HOISTING INSTRUCTIONS

HOISTING

**!** Heavy parts (25 kg or more) must be lifted with a hoist, etc. In the **DISASSEMBLY AND ASSEMBLY** section, every part weighing 25 kg or more is indicated clearly with the symbol 

- If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
  - 1) Check for removal of all bolts fastening the part to the relative parts.
  - 2) Check for existence of another part causing interference with the part to be removed.

WIRE ROPES

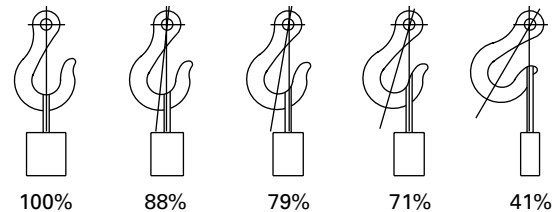
- 1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes  
(Standard "Z" or "S" twist ropes  
without galvanizing)

Rope diameter	Allowable load		
	mm	kN	tons
10	9.8	1.0	
11.5	13.7	1.4	
12.5	15.7	1.6	
14	21.6	2.2	
16	27.5	2.8	
18	35.3	3.6	
20	43.1	4.4	
22.4	54.9	5.6	
30	98.1	10.0	
40	176.5	18.0	
50	274.6	28.0	
60	392.2	40.0	

- ★ The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.
- 2) Sling wire ropes from the middle portion of the hook.

Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



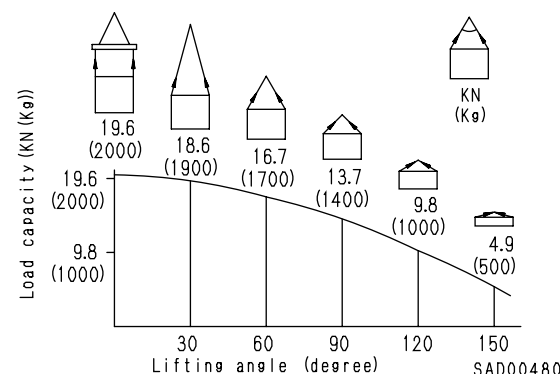
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- 3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound onto the load.

**!** Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

- 4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.

When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load kN {kg} when hoisting is made with two ropes, each of which is allowed to sling up to 9.8 kN {1000 kg} vertically, at various hanging angles. When two ropes sling a load vertically, up to 19.6 kN {2000 kg} of total weight can be suspended. This weight becomes 9.8 kN {1000 kg} when two ropes make a 120° hanging angle. On the other hand, two ropes are subjected to an excessive force as large as 39.2 kN {4000 kg} if they sling a 19.6 kN {2000 kg} load at a lifting angle of 150°.



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**METHOD OF DISASSEMBLING, CONNECTING PUSH-PULL TYPE COUPLER**

**!** Before carrying out the following work, release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.

**!** Even if the residual pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil receiving container.

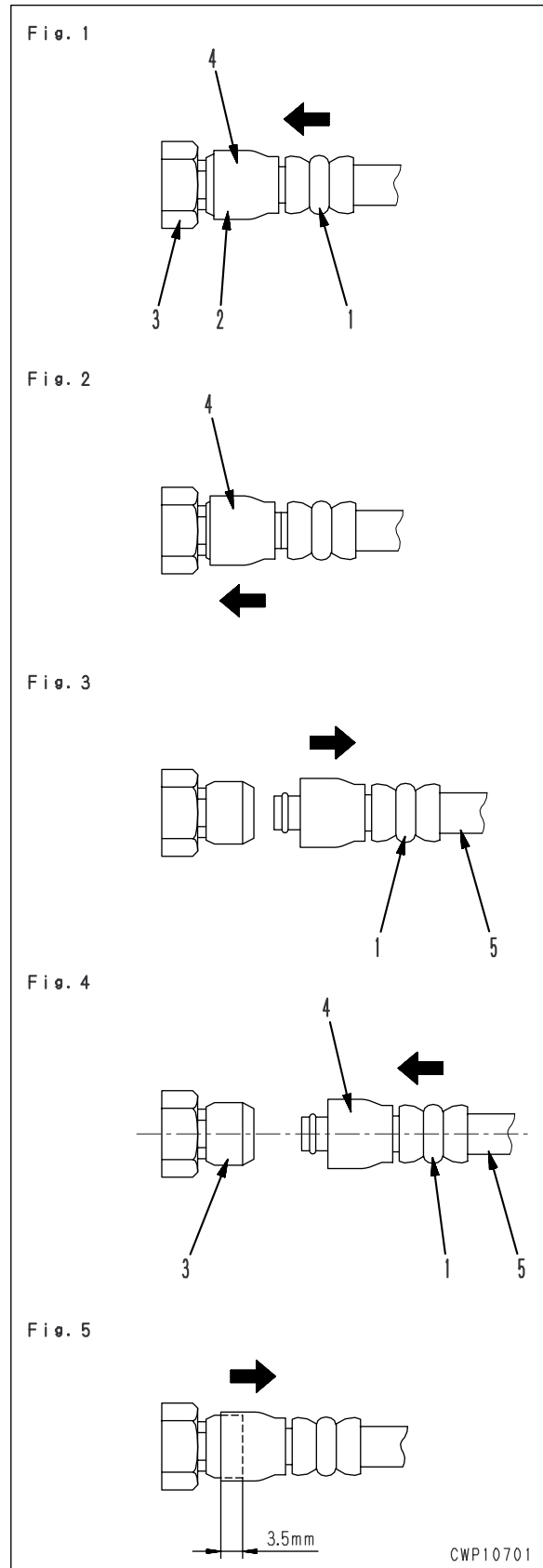
**Disconnection**

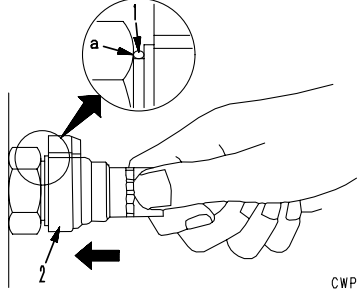
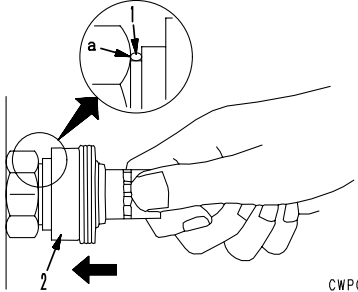
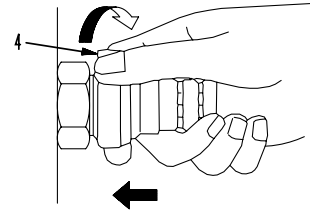
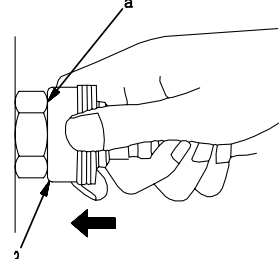
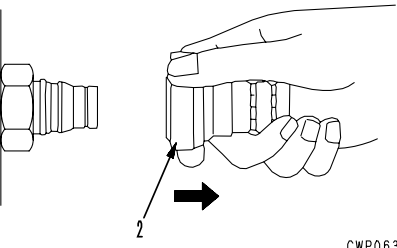
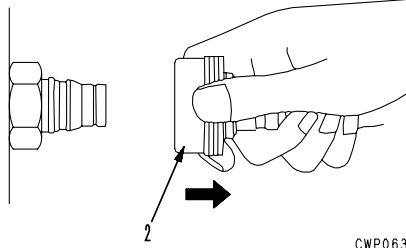
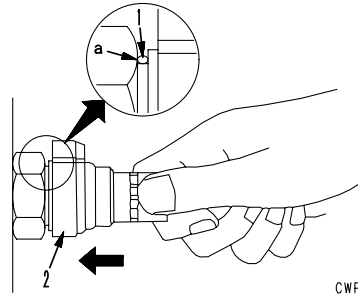
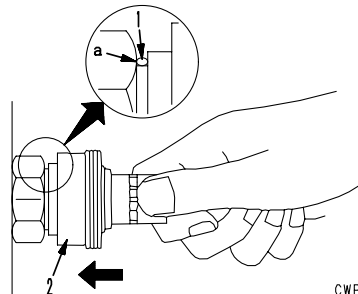
- 1) Release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.
- 2) Hold adapter (1) and push hose joint (2) into mating adapter (3). (See Fig. 1)
  - ★ The adapter can be pushed in about 3.5 mm.
  - ★ Do not hold rubber cap portion (4).
- 3) After hose joint (2) is pushed into adapter (3), press rubber cap portion (4) against (3) until it clicks. (See Fig. 2)
- 4) Hold hose adapter (1) or hose (5) and pull it out. (See Fig. 3)
  - ★ Since some hydraulic oil flows out, prepare an oil receiving container.

**Connection**

- 1) Hold hose adapter (1) or hose (5) and insert it in mating adapter (3), aligning them with each other. (See Fig. 4)
  - ★ Do not hold rubber cap portion (4).
- 2) After inserting the hose in the mating adapter perfectly, pull it back to check its connecting condition. (See Fig. 5)
  - ★ When the hose is pulled back, the rubber cap portion moves toward the hose about 3.5 mm. This does not indicate abnormality, however.

Type 1



	Type 2	Type 3
Disassembly	<p>1) Hold the mouthpiece of the tightening portion and push body (2) in straight until sliding prevention ring (1) contacts contact surface a of the hexagonal portion at the male end.</p>  <p style="text-align: right;">CWP06392</p>	<p>1) Hold the mouthpiece of the tightening portion and push body (2) in straight until sliding prevention ring (1) contacts contact surface a of the hexagonal portion at the male end.</p>  <p style="text-align: right;">CWP06391</p>
	<p>2) Hold in the condition in Step 1), and turn lever (4) to the right (clockwise).</p>  <p style="text-align: right;">CWP06394</p>	<p>2) Hold in the condition in Step 1), and push until cover (3) contacts contact surface a of the hexagonal portion at the male end.</p>  <p style="text-align: right;">CWP06393</p>
	<p>3) Hold in the condition in Steps 1) and 2), and pull out whole body (2) to disconnect it.</p>  <p style="text-align: right;">CWP06396</p>	<p>3) Hold in the condition in Steps 1) and 2), and pull out whole body (2) to disconnect it.</p>  <p style="text-align: right;">CWP06395</p>
Connection	<ul style="list-style-type: none"> <li>Hold the mouthpiece of the tightening portion and push body (2) in straight until sliding prevention ring (1) contacts contact surface a of the hexagonal portion at the male end to connect it.</li> </ul>  <p style="text-align: right;">CWP06392</p>	<ul style="list-style-type: none"> <li>Hold the mouthpiece of the tightening portion and push body (2) in straight until sliding prevention ring (1) contacts contact surface a of the hexagonal portion at the male end to connect it.</li> </ul>  <p style="text-align: right;">CWP06391</p>



## COATING MATERIALS

- ★ The recommended coating materials such as adhesives, gasket sealants and greases used for disassembly and assembly are listed below.
- ★ For coating materials not listed below, use the equivalent of products shown in this list.






Category	Komatsu code	Part No.	Q'ty	Container	Main applications, features
Adhesives	LT-1A	790-129-9030	150 g	Tube	<ul style="list-style-type: none"> <li>• Used to prevent rubber gaskets, rubber cushions, and cock plug from coming out.</li> </ul>
	LT-1B	790-129-9050	20 g (2 pcs.)	Polyethylene container	<ul style="list-style-type: none"> <li>• Used in places requiring an immediately effective, strong adhesive. Used for plastics (except polyethylene, polypropylene, tetrafluoroethylene and vinyl chloride), rubber, metal and non-metal.</li> </ul>
	LT-2	09940-00030	50 g	Polyethylene container	<ul style="list-style-type: none"> <li>• Features: Resistance to heat and chemicals</li> <li>• Used for anti-loosening and sealant purpose for bolts and plugs.</li> </ul>
	LT-3	790-129-9060 (Set of adhesive and hardening agent)	Adhesive: 1 kg Hardening agent: 500 g	Can	<ul style="list-style-type: none"> <li>• Used as adhesive or sealant for metal, glass and plastic.</li> </ul>
	LT-4	790-129-9040	250 g	Polyethylene container	<ul style="list-style-type: none"> <li>• Used as sealant for machined holes.</li> </ul>
	Holtz MH 705	790-126-9120	75 g	Tube	<ul style="list-style-type: none"> <li>• Used as heat-resisting sealant for repairing engine.</li> </ul>
	Three bond 1735	790-129-9140	50 g	Polyethylene container	<ul style="list-style-type: none"> <li>• Quick hardening type adhesive</li> <li>• Cure time: within 5 sec. to 3 min.</li> <li>• Used mainly for adhesion of metals, rubbers, plastics and woods.</li> </ul>
	Aron-alpha 201	790-129-9130	2 g	Polyethylene container	<ul style="list-style-type: none"> <li>• Quick hardening type adhesive</li> <li>• Quick cure type (max. strength after 30 minutes)</li> <li>• Used mainly for adhesion of rubbers, plastics and metals.</li> </ul>
	Loctite 648-50	79A-129-9110	50 cc	Polyethylene container	<ul style="list-style-type: none"> <li>• Resistance to heat, chemicals</li> <li>• Used at joint portions subject to high temperatures.</li> </ul>
Gasket sealant	LG-1	790-129-9010	200 g	Tube	<ul style="list-style-type: none"> <li>• Used as adhesive or sealant for gaskets and packing of power train case, etc.</li> </ul>
	LG-5	790-129-9070	1 kg	Can	<ul style="list-style-type: none"> <li>• Used as sealant for various threads, pipe joints, flanges.</li> <li>• Used as sealant for tapered plugs, elbows, nipples of hydraulic piping.</li> </ul>
	LG-6	790-129-9020	200 g	Tube	<ul style="list-style-type: none"> <li>• Features: Silicon based, resistance to heat, cold</li> <li>• Used as sealant for flange surface, tread.</li> <li>• Used as sealant for oil pan, final drive case, etc.</li> </ul>


Category	Komatsu code	Part No.	Q'ty	Container	Main applications, featuresr
Adhesives	LG-7	790-129-9070	1 g	Tube	<ul style="list-style-type: none"> <li>• Ftures: Silicon based, quick hardening type</li> <li>• Used as sealant for flywheel housing, intake manifold, oil an, thermostat housing, etc.</li> </ul>
	Three bond 1211	790-129-9090	100 g	Tube	<ul style="list-style-type: none"> <li>• Used as heat-resisting sealant for repairing engine.</li> </ul>
Molybdenum disulphide lubricant	LM-G	09940-00051	60 g	Can	<ul style="list-style-type: none"> <li>• Used as lubricant for sliding portion (to prevent from squeaking).</li> </ul>
	LM-P	09940-00040	200 g	Tube	<ul style="list-style-type: none"> <li>• Used to prevent seizure or scuffing of the thread when press fitting or shrink fitting.</li> <li>• Used as lubricant for linkage, bearings, etc.</li> </ul>
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA-160CNLI	Various	Various	<ul style="list-style-type: none"> <li>• General purpose type</li> </ul>
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYGA-160CNCA	Various	Various	<ul style="list-style-type: none"> <li>• Used for normal temperature, light load bearing at places in contact with water or steam.</li> </ul>
	Molybdenum disulphide lubricant	SYG2-400M	400 g (10 per case)	Belows type	<ul style="list-style-type: none"> <li>• Used for places with heavy load</li> </ul>

# STANDARD TIGHTENING TORQUE

## STANDARD TIGHTENING TORQUE TABLE (WHEN USING TORQUE WRENCH)

★ In the case of metric nuts and bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter of bolt	Width across flats					
mm	mm	Nm		kgm		CDL00372
6	10	13.2 ± 1.4		1.35 ± 0.15		
8	13	31 ± 3		3.2 ± 0.3		
10	17	66 ± 7		6.7 ± 0.7		
12	19	113 ± 10		11.5 ± 1		
14	22	177 ± 19		18 ± 2		
16	24	279 ± 30		28.5 ± 3		
18	27	382 ± 39		39 ± 4		
20	30	549 ± 59		56 ± 6		
22	32	745 ± 83		76 ± 8.5		
24	36	927 ± 103		94.5 ± 10.5		
27	41	1320 ± 140		135 ± 15		
30	46	1720 ± 190		175 ± 20		
33	50	2210 ± 240		225 ± 25		
36	55	2750 ± 290		280 ± 30		
39	60	3290 ± 340		335 ± 35		

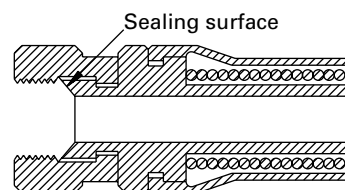
Thread diameter of bolt	Width across flats	
mm	mm	Nm
6	10	7.85 ± 1.95
8	13	18.6 ± 4.9
10	14	40.2 ± 5.9
12	27	82.35 ± 7.85

kgm

CDL00373

## TABLE OF TIGHTENING TORQUES FOR FLARED NUTS

★ In the case of flared nuts for which there is no special instruction, tighten to the torque given in the table below.



SAD00483

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
14	19	24.5 ± 4.9	2.5 ± 0.5
18	24	49 ± 19.6	5 ± 2
22	27	78.5 ± 19.6	8 ± 2
24	32	137.3 ± 29.4	14 ± 3
30	36	176.5 ± 29.4	18 ± 3
33	41	196.1 ± 49	20 ± 5
36	46	245.2 ± 49	25 ± 5
42	55	294.2 ± 49	30 ± 5

**TABLE OF TIGHTENING TORQUES FOR SPLIT FLANGE BOLTS**

★ In the case of split flange bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter	Width across flat	Tightening torque	
		Nm	kgm
mm	mm		
10	14	$65.7 \pm 6.8$	$6.7 \pm 0.7$
12	17	$112 \pm 9.8$	$11.5 \pm 1$
16	22	$279 \pm 29$	$28.5 \pm 3$

**TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PIPING JOINTS**

★ Unless there are special instructions, tighten the O-ring boss piping joints to the torque below.

Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	kgm
02	14	Varies depending on type of connector.	$34.3 \pm 4.9$	$3.5 \pm 0.5$
03, 04	20		$93.1 \pm 9.8$	$9.5 \pm 1$
05, 06	24		$142.1 \pm 19.6$	$14.5 \pm 2$
10, 12	33		$421.4 \pm 58.8$	$43 \pm 6$
14	42		$877.1 \pm 132.3$	$89.5 \pm 13.5$

**TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PLUGS**

★ Unless there are special instructions, tighten the O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	kgm
08	08	14	$7.35 \pm 1.47$	$0.75 \pm 0.15$
10	10	17	$11.27 \pm 1.47$	$1.15 \pm 0.15$
12	12	19	$17.64 \pm 1.96$	$1.8 \pm 0.2$
14	14	22	$22.54 \pm 1.96$	$2.3 \pm 0.2$
16	16	24	$29.4 \pm 4.9$	$3 \pm 0.5$
18	18	27	$39.2 \pm 4.9$	$4 \pm 0.5$
20	20	30	$49 \pm 4.9$	$5 \pm 0.5$
24	24	32	$68.6 \pm 9.8$	$7 \pm 1$
30	30	32	$107.8 \pm 14.7$	$11 \pm 1.5$
33	33	n	$127.4 \pm 19.6$	$13 \pm 2$
36	36	36	$151.9 \pm 24.5$	$15.5 \pm 2.5$
42	42	n	$210.7 \pm 29.4$	$21.5 \pm 3$
52	52	n	$323.4 \pm 44.1$	$33 \pm 4.5$

**TIGHTENING TORQUE FOR 102 ENGINE SERIES****1) BOLT AND NUTS**

Use these torques for bolts and nuts (unit: mm) of Cummins Engine.

Thread diameter	Tightening torque	
	Nm	kgm
6	10 ± 2	1.02 ± 0.20
8	24 ± 4	2.45 ± 0.41
10	43 ± 6	4.38 ± 0.61
12	77 ± 12	7.85 ± 1.22

**2) EYE JOINTS**

Use these torques for eye joints (unit: mm) of Cummins Engine.

Thread diameter	Tightening torque	
	Nm	kgm
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

**3) TAPERED SCREWS**

Use these torques for tapered screws (unit: inch) of Cummins Engine.

Thread diameter	Tightening torque	
	Nm	kgm
1 / 16	3 ± 1	0.31 ± 0.10
1 / 8	8 ± 2	0.81 ± 0.20
1 / 4	12 ± 2	1.22 ± 0.20
3 / 8	15 ± 2	1.53 ± 0.41
1 / 2	24 ± 4	2.45 ± 0.41
3 / 4	36 ± 5	3.67 ± 0.51
1	60 ± 9	6.12 ± 0.92

**TIGHTENING TORQUE TABLE FOR HOSES (TAPER SEAL TYPE AND FACE SEAL TYPE)**

- ★ Tighten the hoses (taper seal type and face seal type) to the following torque, unless otherwise specified.
- ★ Apply the following torque when the threads are coated (wet) with engine oil.

Nominal size of hose	Width across flats	Tightening torque (Nm {kgm})		Taper seal type Thread size (mm)	Face seal type	
		Range	Target		Nominal thread size - Threads per inch, Thread series	Root diameter (mm) (Reference)
02	19	35 - 63 {3.5 - 6.5}	44 {4.5}	14	$\frac{9}{16}$ - 18UNF	14.3
03	22	54 - 93 {5.5 - 9.5}	74 {4.5}	-	$\frac{11}{16}$ - 16UN	17.5
	24	59 - 98 {6.0 - 10.0}	78 {8.0}	18	-	-
04	27	84 - 132 {8.5 - 13.5}	103 {10.5}	22	$\frac{13}{16}$ - 16UN	20.7
05	32	128 - 186 {13.0 - 19.0}	157 {16.0}	24	1 - 14UNS	25.4
06	36	177 - 245 {18.0 - 25.0}	216 {22.0}	30	$1\frac{3}{16}$ - 12UNF	30.3
(10)	41	177 - 245 {18.0 - 25.0}	216 {22.0}	33	-	-
(12)	46	197 - 294 {20.0 - 30.0}	245 {25.0}	36	-	-
(14)	55	246 - 343 {25.0 - 35.0}	294 {30.0}	42	-	-

**ELECTRIC WIRE CODE**

In the wiring diagrams, various colors and symbols are employed to indicate the thickness of wires. This wire code table will help you understand WIRING DIAGRAMS.

Example: 5WB indicates a cable having a nominal number 5 and white coating with black stripe.

**CLASSIFICATION BY THICKNESS**

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number of strands	Dia. of strands (mm <sup>2</sup> )	Cross section (mm <sup>2</sup> )			
0.85	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
2	26	0.32	2.09	3.1	20	Lighting, signal etc.
5	65	0.32	5.23	4.6	37	Charging and signal
15	84	0.45	13.36	7.0	59	Starting (Glow plug)
40	85	0.80	42.73	11.4	135	Starting
60	127	0.80	63.84	13.6	178	Starting
100	217	0.80	109.1	17.6	230	Starting

**CLASSIFICATION BY COLOR AND CODE**

Priority	Classification	Circuits							
		Charging	Ground	Starting	Lighting	Instrument	Signal	Other	
1	Primary	Code	W	B	B	R	Y	G	L
		Color	White	Black	Black	Red	Yellow	Green	Blue
2	Auxiliary	Code	WR	—	BW	RW	YR	GW	LW
		Color	White & Red	—	White & Black	Red & White	Yellow & Red	Green & White	Blue & White
3		Code	WB	—	BY	RB	YB	GR	LR
		Color	White & Black	—	Black & Yellow	Red & Black	Yellow & Black	Green & Red	Blue & Yellow
4		Code	WL	—	BR	RY	YG	GY	LY
		Color	White & Blue	—	Black & Red	Red & Yellow	Yellow & Green	Green & Yellow	Blue & Yellow
5		Code	WG	—	—	RG	YL	GB	LB
		Color	White & Green	—	—	Red & Green	Yellow & Blue	Green & Black	Blue & Black
6		Code	—	—	—	RL	YW	GL	—
		Color	—	—	—	Red & Blue	Yellow & White	Green & Blue	—

## CONVERSION TABLE

### METHOD OF USING THE CONVERSION TABLE

The Conversion Table in this section is provided to enable simple conversion of figures. For details of the method of using the Conversion Table, see the example given below.

### EXAMPLE

- Method of using the Conversion Table to convert from millimeters to inches
1. Convert 55 mm into inches.
    - (1) Locate the number 50 in the vertical column at the left side, take this as (A), then draw a horizontal line from (A).
    - (2) Locate the number 5 in the row across the top, take this as (B), then draw a perpendicular line down from (B).
    - (3) Take the point where the two lines cross as (C). This point (C) gives the value when converting from millimeters to inches. Therefore, 55 mm = 2.165 inches.
  2. Convert 550 mm into inches.
    - (1) The number 550 does not appear in the table, so divide by 10 (move the decimal point one place to the left) to convert it to 55 mm.
    - (2) Carry out the same procedure as above to convert 55 mm to 2.165 inches.
    - (3) The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal point one place to the right) to return to the original value. This gives 550 mm = 21.65 inches.

### Millimeters to inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
(A) --- 50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

**Millimeters to Inches**

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

**Kilogram to Pound**

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0	0	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.53	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26



**Liter to U.S. Gallon**

1ℓ = 0.2642 U.S. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

**Liter to U.K. Gallon**

1ℓ = 0.21997 U.K. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.699	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

## kgm to ft. lb

1 kgm = 7.233 ft. lb

	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kg/cm<sup>2</sup> to lb/in<sup>2</sup>

1kg/cm<sup>2</sup> = 14.2233 lb/in<sup>2</sup>

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

**Temperature**

Fahrenheit-Centigrade Conversion ; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

$$1^{\circ}\text{C} = 33.8^{\circ}\text{F}$$

°C		°F	°C		°F	°C		°F	°C		°F
-40.4	<b>-40</b>	-40.0	-11.7	<b>11</b>	51.8	7.8	<b>46</b>	114.8	27.2	<b>81</b>	117.8
-37.2	<b>-35</b>	-31.0	-11.1	<b>12</b>	53.6	8.3	<b>47</b>	116.6	27.8	<b>82</b>	179.6
-34.4	<b>-30</b>	-22.0	-10.6	<b>13</b>	55.4	8.9	<b>48</b>	118.4	28.3	<b>83</b>	181.4
-31.7	<b>-25</b>	-13.0	-10.0	<b>14</b>	57.2	9.4	<b>49</b>	120.2	28.9	<b>84</b>	183.2
-28.9	<b>-20</b>	-4.0	-9.4	<b>15</b>	59.0	10.0	<b>50</b>	122.0	29.4	<b>85</b>	185.0
-28.3	<b>-19</b>	-2.2	-8.9	<b>16</b>	60.8	10.6	<b>51</b>	123.8	30.0	<b>86</b>	186.8
-27.8	<b>-18</b>	-0.4	-8.3	<b>17</b>	62.6	11.1	<b>52</b>	125.6	30.6	<b>87</b>	188.6
-27.2	<b>-17</b>	1.4	-7.8	<b>18</b>	64.4	11.7	<b>53</b>	127.4	31.1	<b>88</b>	190.4
-26.7	<b>-16</b>	3.2	-7.2	<b>19</b>	66.2	12.2	<b>54</b>	129.2	31.7	<b>89</b>	192.2
-26.1	<b>-15</b>	5.0	-6.7	<b>20</b>	68.0	12.8	<b>55</b>	131.0	32.2	<b>90</b>	194.0
-25.6	<b>-14</b>	6.8	-6.1	<b>21</b>	69.8	13.3	<b>56</b>	132.8	32.8	<b>91</b>	195.8
-25.0	<b>-13</b>	8.6	-5.6	<b>22</b>	71.6	13.9	<b>57</b>	134.6	33.3	<b>92</b>	197.6
-24.4	<b>-12</b>	10.4	-5.0	<b>23</b>	73.4	14.4	<b>58</b>	136.4	33.9	<b>93</b>	199.4
-23.9	<b>-11</b>	12.2	-4.4	<b>24</b>	75.2	15.0	<b>59</b>	138.2	34.4	<b>94</b>	201.2
-23.3	<b>-10</b>	14.0	-3.9	<b>25</b>	77.0	15.6	<b>0</b>	140.0	35.0	<b>95</b>	203.0
-22.8	<b>-9</b>	15.8	-3.3	<b>26</b>	78.8	16.1	<b>61</b>	141.8	35.6	<b>96</b>	204.8
-22.2	<b>-8</b>	17.6	-2.8	<b>27</b>	80.6	16.7	<b>62</b>	143.6	36.1	<b>97</b>	206.6
-21.7	<b>-7</b>	19.4	-2.2	<b>28</b>	82.4	17.2	<b>63</b>	145.4	36.7	<b>98</b>	208.4
-21.1	<b>-6</b>	21.2	-1.7	<b>29</b>	84.2	17.8	<b>64</b>	147.2	37.2	<b>99</b>	210.2
-20.6	<b>-5</b>	23.0	-1.1	<b>30</b>	86.0	18.3	<b>65</b>	149.0	37.8	<b>100</b>	212.0
-20.0	<b>-4</b>	24.8	-0.6	<b>31</b>	87.8	18.9	<b>66</b>	150.8	40.6	<b>105</b>	221.0
-19.4	<b>-3</b>	26.6	0	<b>32</b>	89.6	19.4	<b>67</b>	152.6	43.3	<b>110</b>	230.0
-18.9	<b>-2</b>	28.4	0.6	<b>33</b>	91.4	20.0	<b>68</b>	154.4	46.1	<b>115</b>	239.0
-18.3	<b>-1</b>	30.2	1.1	<b>34</b>	93.2	20.6	<b>69</b>	156.2	48.9	<b>120</b>	248.0
-17.8	<b>0</b>	32.0	1.7	<b>35</b>	95.0	21.1	<b>70</b>	158.0	51.7	<b>125</b>	257.0
-17.2	<b>1</b>	33.8	2.2	<b>36</b>	96.8	21.7	<b>71</b>	159.8	54.4	<b>130</b>	266.0
-16.7	<b>2</b>	35.6	2.8	<b>37</b>	98.6	22.2	<b>72</b>	161.6	57.2	<b>135</b>	275.0
-16.1	<b>3</b>	37.4	3.3	<b>38</b>	100.4	22.8	<b>73</b>	163.4	60.0	<b>140</b>	284.0
-15.6	<b>4</b>	39.2	3.9	<b>39</b>	102.2	23.3	<b>74</b>	165.2	62.7	<b>145</b>	293.0
-15.0	<b>5</b>	41.0	4.4	<b>40</b>	104.0	23.9	<b>75</b>	167.0	65.6	<b>150</b>	302.0
-14.4	<b>6</b>	42.8	5.0	<b>41</b>	105.8	24.4	<b>76</b>	168.8	68.3	<b>155</b>	311.0
-13.9	<b>7</b>	44.6	5.6	<b>42</b>	107.6	25.0	<b>77</b>	170.6	71.1	<b>160</b>	320.0
-13.3	<b>8</b>	46.4	6.1	<b>43</b>	109.4	25.6	<b>78</b>	172.4	73.9	<b>165</b>	329.0
-12.8	<b>9</b>	48.2	6.7	<b>44</b>	111.2	26.1	<b>79</b>	174.2	76.7	<b>170</b>	338.0
-12.2	<b>10</b>	50.0	7.2	<b>45</b>	113.0	26.7	<b>80</b>	176.0	79.4	<b>175</b>	347.0

## UNITS

In this manual, the measuring units are indicated with International System of units (SI).  
As for reference, conventionally used Gravitational System of units are indicated in parentheses { }.

**Example:**

N {kg}  
Nm {kgm}  
MPa {kg/cm<sup>2</sup>}  
kPa {mmH<sub>2</sub>O}  
kPa {mmHg}  
kW/rpm {HP/rpm}  
g/kWh {g/HPh}

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# 01 GENERAL

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## APPLICABLE MACHINE

★ Serial No. shows for engine serial No.

Engine	Serial No.	Applicable machine	
6D125-2		D53A, P-17, D58E, P-1, D65E-12, D70LE-12	Bulldozer
S6D125-2		D60, 65P-12, D65EX, PX-12	Bulldozer
		D75S-5	Dozer shovel
		D85A-21, 21B, 21D, 21S, D85E-21, D85P-21, D85C-21	Bulldozer
		D85E-SS-2, D85E-SS-2A	Bulldozer
		D87E, P-2	Bulldozer
		LW250-5	Rough terrain crane
		CS210-1	Crawler stabilizer
		FD250-2, FD400-2	Forklift truck
		EG220BS-2	DENYO Generator
		DCA-220SSK	MQ Generator
SA6D125-2		PC400-6C, PC400LC-6, PC450-6 MIGHTY, PC450LC-6 MIGHTY	Hydraulic excavator
		HD255-5	Dump truck
		WA470-3, WA450-3 (USA)	Wheel loader
		BR500JG-1	Mobile crusher
		FD430-2	Forklift truck
		EG300BS-5	TAIYO DENKI Generator
		DCA-300SK	MQ Generator
		DCA300SPK	DENYO Generator
		J6D125E-G1-2	Generator
SAA6D125-2		PC400-6 • PC450-6 (USA)	Hydraulic excavator
		PC400AC-6	Hydraulic excavator
		BR550JG-1	Mobile crusher
		SAA6D125-P400	Generator (50 Hz)
		Generator	Generator (50 Hz only)

## SPECIFICATIONS

Engine model		6D125-2			
Applicable machine		D53A-17, D53P-17	D58E-1, D58P-1	D65E-12, D70LE-12	
Number of cylinder – Bore x Stroke		mm	6 – 125 x 150		
Total piston displacement		ℓ {cc}	11.0 {11,040}		
Firing order			1 – 5 – 3 – 6 – 2 – 4		
Dimensions	Overall length	mm	1,305	1,305	1,483
	Overall width	mm	850	850	906
	Overall height (excluding exhaust pipe)	mm	1,555	1,555	1,566
	Overall height (including exhaust pipe)	mm	–	–	–
Performance	Flywheel horsepower	kW{HP}/rpm	95.6{130}/1,900 (Net)	95.6{130}/1,900 (Net)	131{175}/1,950 (Net)
	Maximum torque	Nm(kgm)/rpm	613{62.5}/1,300 (Net)	635{64.8}/1,300 (Net)	799{81.5}/1,100 (Net)
	High idling speed	rpm	2,050 – 2,150	2,050 – 2,150	2,050 – 2,150
	Low idling speed	rpm	800 – 850	800 – 850	800 – 850
	Minimum fuel consumption ratio	g/kW·h (g/HP·h)	211 {155}	212 {158}	214 {157}
Dry weight		kg	970	970	970
Fuel injection pump		DENSO NB (EP9) type			
Governor		RSV centrifugal, all speed type			
Lubricating oil amount (refill capacity)		ℓ	32 (28)	32 (28)	44 (38)
Coolant amount (engine only)		ℓ	52 (21)	52 (21)	56 (21)
Alternator			24 V, 35 A	24 V, 35 A	24 V, 35 A
Starting motor			24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW
Battery			12 V 140 Ah x 2	12 V 140 Ah x 2	12 V 140 Ah x 2
Turbocharger			–	–	–
Air compressor			–	–	–
Others			–	–	–

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S6D125-2

D65EX-12, D65P-12 D65PX-12, D60P-12	D75S-5	D85A-21, D85A-21S, D85A-21B, D85A-21D, D85E-21, D85P-21, D85C-21	D85E-SS-2 D85E-SS-2A	D87E-2 D87P-2
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6 - 125 x 150

11.04 {11,040}

1 - 5 - 3 - 6 - 2 - 4

1,483	1,585	1,451	1,483	1,524
906	900	1,110	906	940
1,545	1,902	1,605	1,545	2,012
-	-	-	-	-
140(188)/1,950 (Net)	152/(203)/2,000 (Net)	168(225)/2,000 (Net)	140(188)/1,950 (Net)	174(233)/2,100 (Net)
981(100)/1,200 (Net)	921(94)/1,500 (Net)	1,020(104)/1,400 (Net)	981(100)/1,200 (Net)	999(102)/1,400 (Net)
2,050 - 2,150	2,150 - 2,250	2,150 - 2,250	2,050 - 2,150	2,250 - 2,250
800 - 850	550 - 650	670 - 720	800 - 850	670 - 720
211 {157}	208 {155}	208 {155}	211 {157}	208 {155}
1,220	1,145	1,370	1,200	1,200
DENSO NB (EP9) type RSV centrifugal, all speed type	BOSCH PE-P (PS3S) type RSV centrifugal, all speed type	BOSCH PE-P (PS3S) type RSV centrifugal, all speed type	DENSO NB (EP9) type RSV centrifugal, all speed type	BOSCH PE-P (PS3000) type RSV centrifugal, all speed type
44 (38)	32 (28)	32 (29)	44 (38)	32 (29)
56 (21)	65 (21)	71 (21)	56 (21)	(21)
24 V, 35 A	24 V, 35 A	24 V, 35 A	24 V, 35 A	24 V, 50 A
24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW
12 V 140 Ah x 2	12 V 170 Ah x 2	12 V 170 Ah x 2	12 V 140 Ah x 2	12 V 110 Ah x 2
GARRET TO4E type	SCHWITZER S3A type	SCHWITZER S3A type	GARRET TO4E type	SCHWITZER S3A type
-	-	-	-	-
-	-	-	-	-

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Engine model		S6D125-2		
Applicable machine		LW250-5	CS210-1	
Number of cylinder – Bore x Stroke	mm	6 – 125 x 150		
Total piston displacement	ℓ (cc)	11.04 (11,040)		
Firing order		1 – 5 – 3 – 6 – 2 – 4		
Dimensions	Overall length	mm	1,791	1,484
	Overall width	mm	889	1,016
	Overall height (excluding exhaust pipe)	mm	1,465	1,216
	Overall height (including exhaust pipe)	mm	–	–
Performance	Flywheel horsepower	kW(HP)/rpm	177(237)/2,100 (Net)	152(203)/2,000 (Net)
	Maximum torque	Nm(kgm)/rpm	1,080(110)/1,400 (Net)	926(94.5)/1,300
	High idling speed	rpm	2,250 – 2,350	2,150 – 2,250
	Low idling speed	rpm	675 – 695	600 – 650
	Minimum fuel consumption ratio	g/kW·h (g/HP·h)	208 (155)	205 (153)
Dry weight	kg	1,130	1,100	
Fuel injection pump		BOSCH PE-P (PS3000) type	BOSCH PE-P (PS3S) type	
Governor		RSV centrifugal, all speed type	RSV centrifugal, all speed type	
Lubricating oil amount (refill capacity)	ℓ	38 (34)	38 (34)	
Coolant amount (engine only)	ℓ	40.4 (21)	53 (21)	
Alternator		24 V, 50 A	24 V, 50 A	
Starting motor		24 V, 7.5 kW	24 V, 7.5 kW	
Battery		12 V 120 Ah x 2	12 V 136 Ah x 2	
Turbocharger		SCHWITZER S3A type	SCHWITZER S3A type	
Air compressor		ZEXEL, reciprocation, single cylinder type	ZEXEL, reciprocation, single cylinder type	
Others		With exhaust retarder	–	

S6D125-2

FD250-2	FD400-2		EG220BS-2	DCA-220SSK (MQ generator)
6 - 125 x 150				
11.04 (11,040)				
1 - 5 - 3 - 6 - 2 - 4				
1,456	1,456		1,743	1,743
972	972		859	810
1,255	1,255		1,404	1,404
-	-		-	-
162(217)/2,100 (Net)	199(266)/2,000 (Net)		178(239)/1,500 (50 Hz) 204(273)/1,800 (60 Hz) (Net)	204(273)/1,800 (60 Hz) (Net)
981(100)/1,400 (Net)	1,140(116)/1,400 (Net)		max. 1,570 (50 Hz) max. 1,880 (60 Hz)	Max. 1,890 (60 Hz)
2,250 - 2,350	2,250 - 2,350		700 - 800	700 - 800
650 - 700	650 - 700		211 (157) (50 Hz) 220 (164) (60 Hz)	220 (162) (60 Hz)
201 (150)	201 (150)			
980	980		1,070	1,070
BOSCH PE-P (PS3S) type			BOSCH PE-P (PS3S) type	
RSV centrifugal, all speed type			RSV centrifugal, all speed type	
26 (24)	26 (24)		42 (38)	40 (36)
(21)	(21)		(21)	33 (21)
24 V, 35 A	24 V, 35 A		24 V, 35 A	24 V, 35 A
24 V, 7.5 kW	24 V, 7.5 kW		24 V, 7.5 kW	24 V, 7.5 kW
12 V 200 Ah x 2	12 V 200 Ah x 2		12 V 150 Ah x 2	12 V 150 Ah x 2
SCHWITZER S3A type	SCHWITZER S3A type		SCHWITZER S3A type	SCHWITZER S3A type
-	-		-	-
-	-		-	-

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Engine model		SA6D125-2		
Applicable machine		PC400-6 (CUSTOM), PC400LC-6 (CUSTOM), PC450-6 (MIGHTY), PC450LC-6 (MIGHTY)		HD255-5
Number of cylinder – Bore x Stroke		mm	6 – 125 x 150	
Total piston displacement		ℓ (cc)	11.04 {11,040}	
Firing order			1 – 5 – 3 – 6 – 2 – 4	
Dimensions	Overall length	mm	1,761	1,520
	Overall width	mm	1,015	814
	Overall height (excluding exhaust pipe)	mm	1,238	1,247
	Overall height (including exhaust pipe)	mm	–	–
Performance	Flywheel horsepower	kW(HP)/rpm	228(306)/1,950 (Net)	235(315)/2,100 (Net)
	Maximum torque	Nm(kgm)/rpm	1,210(123)/1,400 (Net)	1,280(131)/1,400 (Net)
	High idling speed	rpm	2,100 – 2,200	2,400 – 2,500
	Low idling speed	rpm	750 – 850	725 – 775
	Minimum fuel consumption ratio	g/kW•h (g/HP•h)	208 {155}	203 {151}
Dry weight		kg	1,250	1,100
Fuel injection pump			BOSCH PE-P (PS3S) type	BOSCH PE-P (PS3S) type
Governor			BOSCH RSV, centrifugal, all speed type	BOSCH RFD, centrifugal, max. and min. speed type
Lubricating oil amount (refill capacity)		ℓ	38   ★41 (34)   ★(37)	32 (29)
Coolant amount (engine only)		ℓ	41 (22)	40 (22)
Alternator			24 V, 35 A	24 V, 50 A
Starting motor			24 V, 7.5 kW	24 V, 7.5 kW
Battery			12 V 150 Ah x 2	12 V 150 Ah x 2
Turbocharger			SCHWITZER S3A type	SCHWITZER S3A type
Air compressor			–	ZEXEL, reciprocation, single cylinder type
Others			With aftercooler	With aftercooler

★ When bypass filter is installed

SA6D125-2

WA450-3 (USA) WA470-3	BR500JG-1	FD430-2	EG300BS-5 DCA300SPK (DENYO Generator)	DCA-300SSK (MQ Generator)
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6 - 125 x 150

11.04 {11,040}

1 - 5 - 3 - 6 - 2 - 4

1,534	1,761	1,506	1,742	1,743
880	1,015	972	810	859
1,530	1,238	1,255	1,390	1,390
-	-	-	-	-
194(260)/2,200 (Net)	228(310)/1,950 (Net)	221(296)/2,100 (Net)	232(311)/1,500 (50Hz) 257(345)/1,800 (60Hz) (Net)	257(345)/1,800 (60 Hz) (Net)
1,049{107}/1,400 (Net)	1,210{124}/1,400 (Net)	1,180{120}/1,400 (Net)	-	-
2,400 - 2,500	2,100 - 2,200	2,250 - 2,350	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,890 (60 Hz)
700 - 800	750 - 850	800 - 850	700 - 800	700 - 800
198 {148}	208 {153}	207 {154}	209 {156} (50 Hz) 220 {164} (60 Hz)	220 {162} (60 Hz)
1,145	1,250	1,000	1,180	1,180

BOSCH PE-P (PS3S) type

BOSCH RSV, centrifugal, all speed type

47 (40)	38 ★41 (34) ★(37)	26 (24)	62 (56)	62 (56)
63 (22)	41 (22)	(22)	(22)	(22)
24 V, 50 A	24 V, 35 A	24 V, 35 A	24 V, 35 A	24 V, 35 A
24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW	24 V, 7.5 kW
12 V 150 Ah x 2	12 V 150 Ah x 2	12 V 200 Ah x 2	12V 150 Ah x 2	12V 150 Ah x 2
SCHWITZER S3A type	SCHWITZER S3A type	SCHWITZER S3A type	SCHWITZER S3A type	SCHWITZER S3A type
-	-	ZEXEL, reciprocation, single cylinder type	-	-
With aftercooler	With aftercooler	With aftercooler	With aftercooler	With aftercooler

615002

Engine model		SA6D125-2		
Applicable machine		J6D125E-G1-2 (Generator)		
Number of cylinder – Bore x Stroke	mm	6 – 125 x 150		
Total piston displacement	ℓ (cc)	11.04 {11,040}		
Firing order		1 – 5 – 3 – 6 – 2 – 4		
Dimensions	Overall length	mm	1,745	
	Overall width	mm	972	
	Overall height (excluding exhaust pipe)	mm	1,390	
	Overall height (including exhaust pipe)	mm	–	
Performance	Flywheel horsepower	kW(HP)/rpm	185(248)/1,500 (50Hz) 209(280)/1,800 (60Hz) (Net)	
	Maximum torque	Nm(kgm)/rpm	–	
	High idling speed	rpm	Max. 1,575 (50 Hz) Max. 1,890 (60 Hz)	
	Low idling speed	rpm	700 – 800	
	Minimum fuel consumption ratio	g/kW·h (g/HP·h)	210 {157} (50 Hz) 220 {164} (60 Hz) (at rated)	
Dry weight	kg	1,080		
Fuel injection pump	BOSCH PE-P (PS3S) type			
Governor	ZEXEL, electronic control type			
Lubricating oil amount (refill capacity)	ℓ	65 (61)		
Coolant amount (engine only)	ℓ	35 (22)		
Alternator	24 V, 35 A (OPT)			
Starting motor	24 V, 7.5 kW			
Battery	12 V 150 Ah x 2			
Turbocharger	SCHWITZER S3A type			
Air compressor	–			
Others	With aftercooler			

615002

SAA6D125-2

PC400-6 • PC450-6 (USA) BR550JG-1		PC400AC-6		
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6 - 125 x 150

11.04 {11,040}

1 - 5 - 3 - 6 - 2 - 4

1,765		1,486		
1,056		1,056		
1,238		1,250		
-		-		
228 (306)/2,050 (Net)		228 (306)/2,050		
1,210 {123.7}/1,500 (net)		1,210 {123.7}/1,500		
2,200 - 2,300		2,200 - 2,300		
675 - 725		675 - 725		
208 {153}		216 {161}		
1,150		1,160		

BOSCH PE-P (PS3S) type

BOSCH RSV, centrifugal, all speed type

38 ★41 (34) ★(37)		38 (34)		
(20)		(22)		
24 V, 50 A				
24 V, 11 kW				
12 V 150 Ah x 2				
SCHWITZER S3A type				
-				
With air cooled aftercooler				

★ When bypass filter is installed

615002

Engine model		SAA6D125-2		
Applicable machine		Generator (50 Hz only)	SAA6D125-P400 (50 Hz)	
Number of cylinder – Bore x Stroke		mm	6 – 125 x 150	
Total piston displacement		ℓ {cc}	11.04 {11,040}	
Firing order			1 – 5 – 3 – 6 – 2 – 4	
Dimensions	Overall length	mm	1,856	1,787
	Overall width	mm	982	1,022
	Overall height (excluding exhaust pipe)	mm	1,286	1,390
	Overall height (including exhaust pipe)	mm	-	-
Performance	Flywheel horsepower	kW{HP}/rpm	Rated flywheel horsepower 298 {400}/1,500 Maximum flywheel horsepower 328{440}/1,500 (Net)	298{400}/1,500 (prime power) 329{441}/1,500 (standby power)
	Maximum torque	Nm(kgm)/rpm	-	-
	High idling speed	rpm	Max. 1,575 (at rated) Max. 1,600 (at max.)	Max. 1,575 (prime power) Max. 1,600 (standby power)
	Low idling speed	rpm	700 – 800	700 – 800
	Minimum fuel consumption ratio	g/kW·h (g/HP·h)	212 {159}	210 {157}
Dry weight		kg	1,175	1,175
Fuel injection pump			BOSCH PE-P (PS3S) type	BOSCH PE-P (PS7S) type
Governor			BOSCH RSV centrifugal, all speed ype	BOSCH RSV centrifugal, all speed ype
Lubricating oil amount (refill capacity)		ℓ	62	62
Coolant amount (engine only)		ℓ	32 (19)	32 (19)
Alternator			24 V, 35 A	24 V, 35 A
Starting motor			24 V, 7.5 kW	24 V, 7.5 kW
Battery			12 V 150 Ah x 2	12 V 150 Ah x 2
Turbocharger			SCHWITZER S3A type	SCHWITZER S3A type
Air compressor			-	-
Others			With aftercooler	With aftercooler



SAA6D125-2

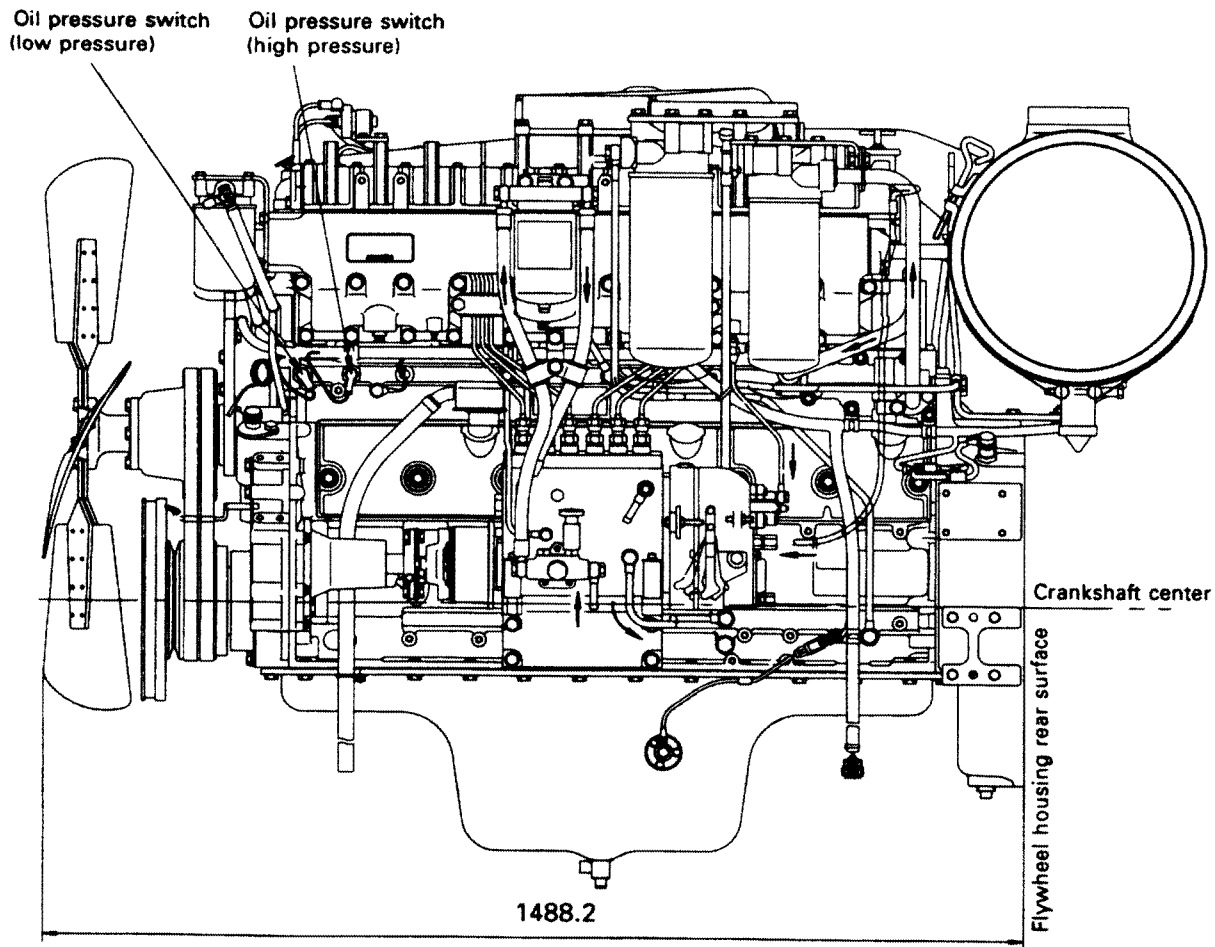
615002

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# GENERAL ASSEMBLY DRAWING

SA6D125-2 LEFT SIDE VIEW [For PC400-6 (CUSTOM), PC400LC-6 (CUSTOM),  
PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1]

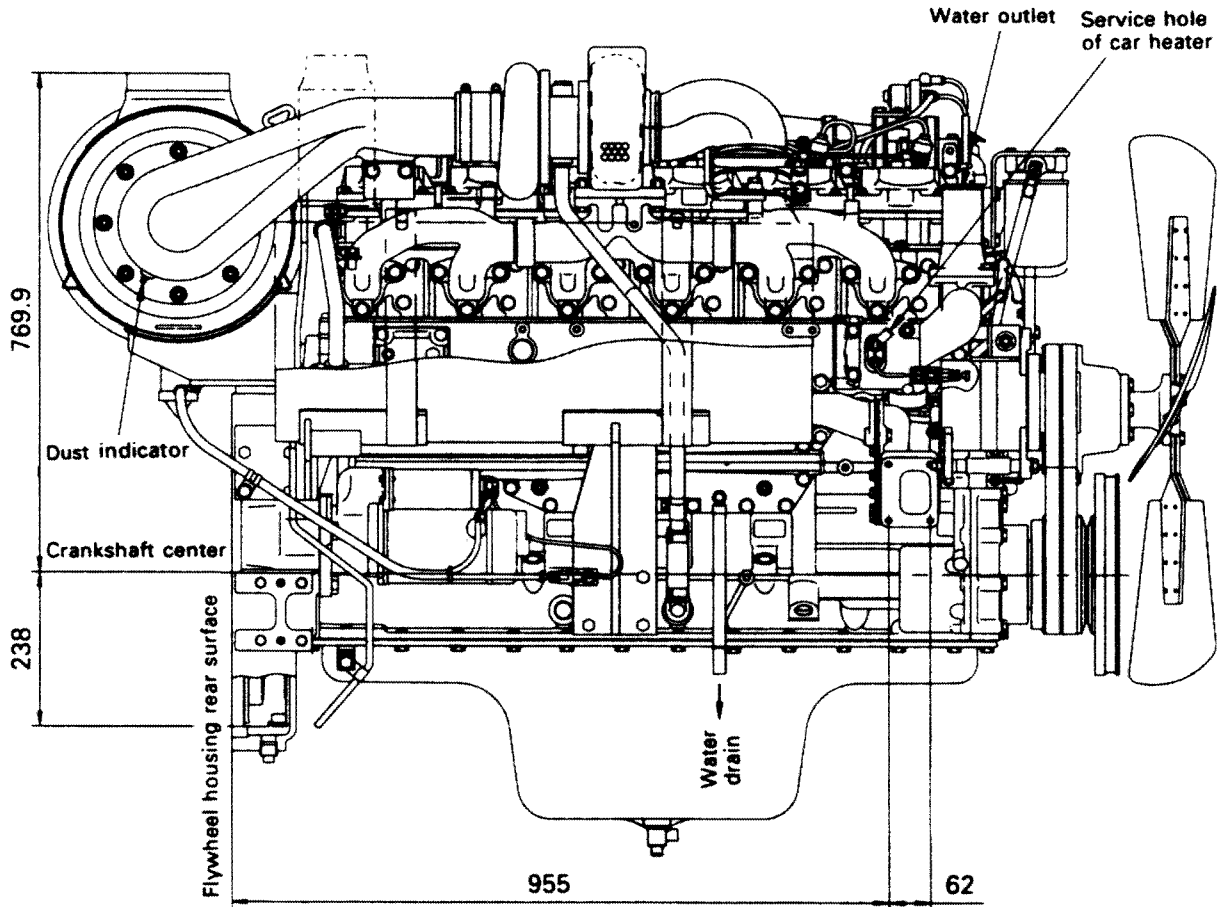


615002

SDE00036

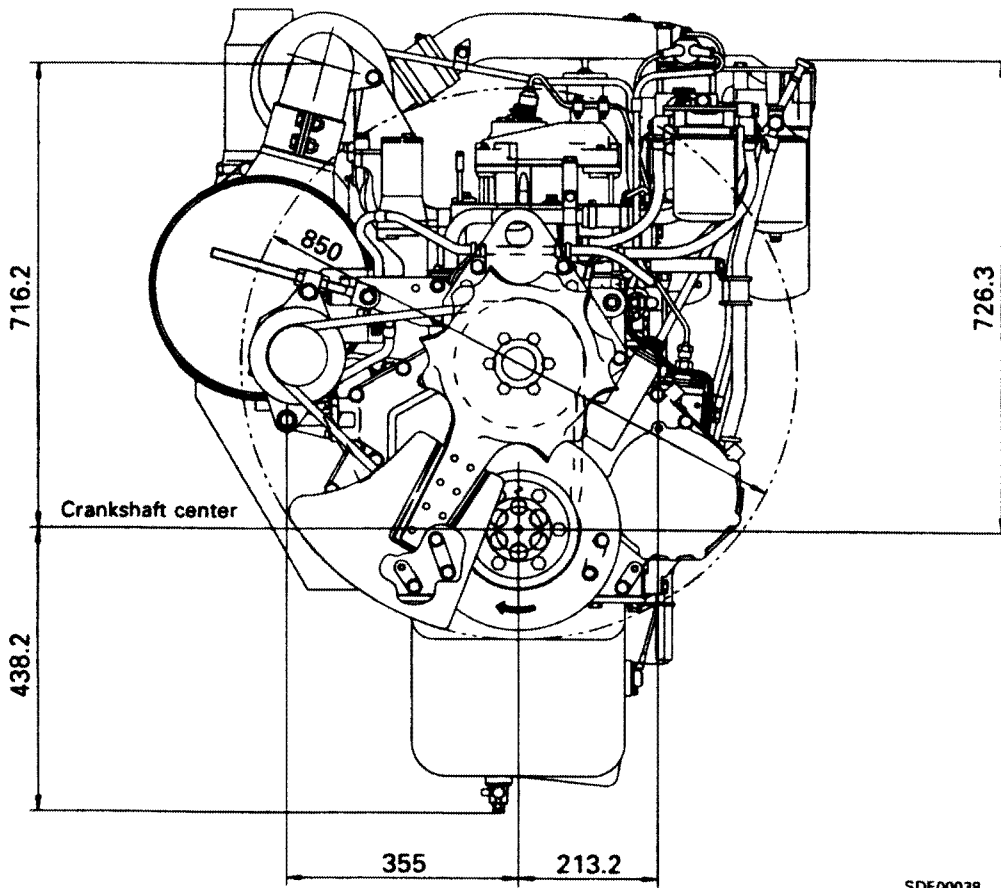
SA6D125-2 RIGHT SIDE VIEW [For PC400-6 (CUSTOM), PC400LC-6 (CUSTOM),  
PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1]

615002



SDE00037

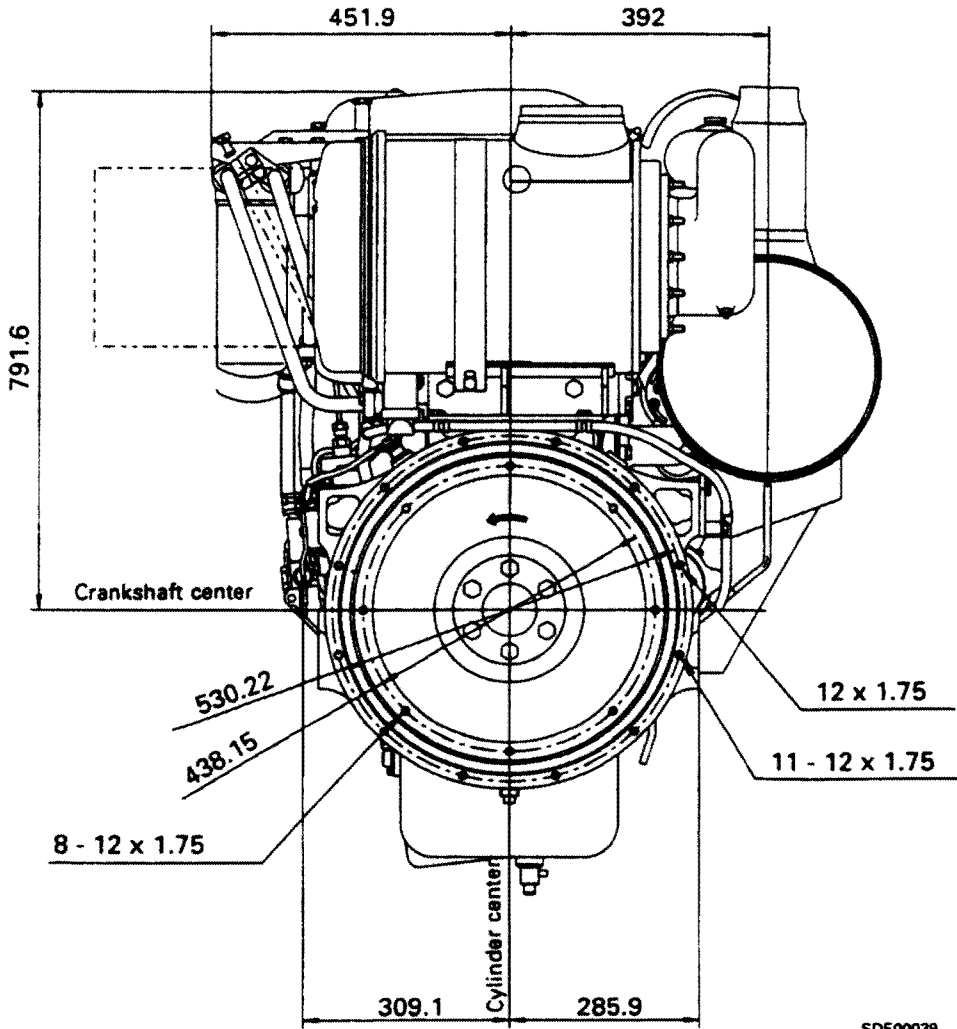
SA6D125-2 FRONT SIDE VIEW [For PC400-6 (CUSTOM), PC400LC-6 (CUSTOM),  
PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1]



SDE00038

615002

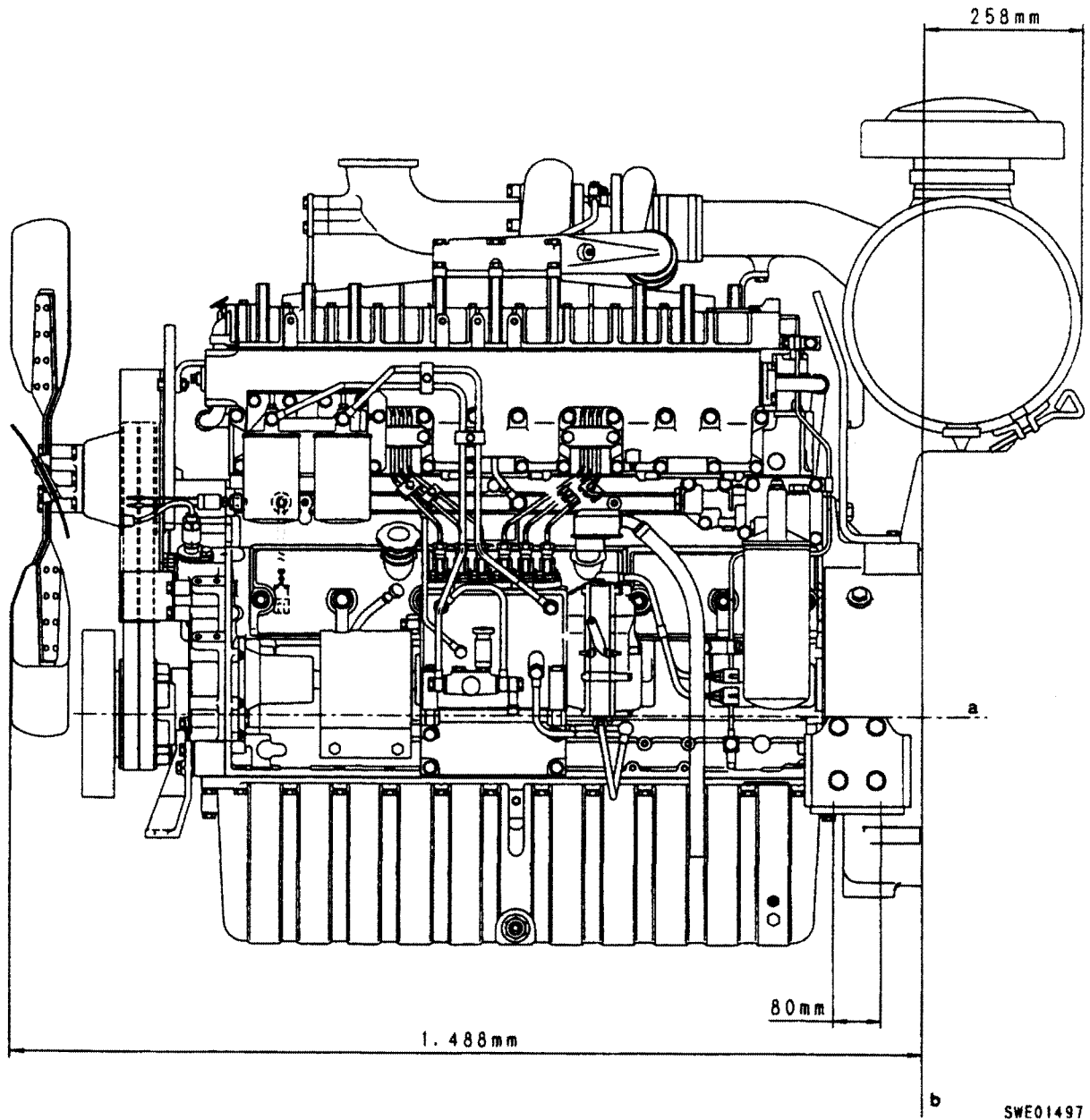
SA6D125-2 REAR SIDE VIEW [For PC400-6 (CUSTOM), PC400LC-6 (CUSTOM),  
PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1]



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SDE00039

SA6D125-2 LEFT SIDE VIEW [For J6D125E-G1-2 (Generator)]

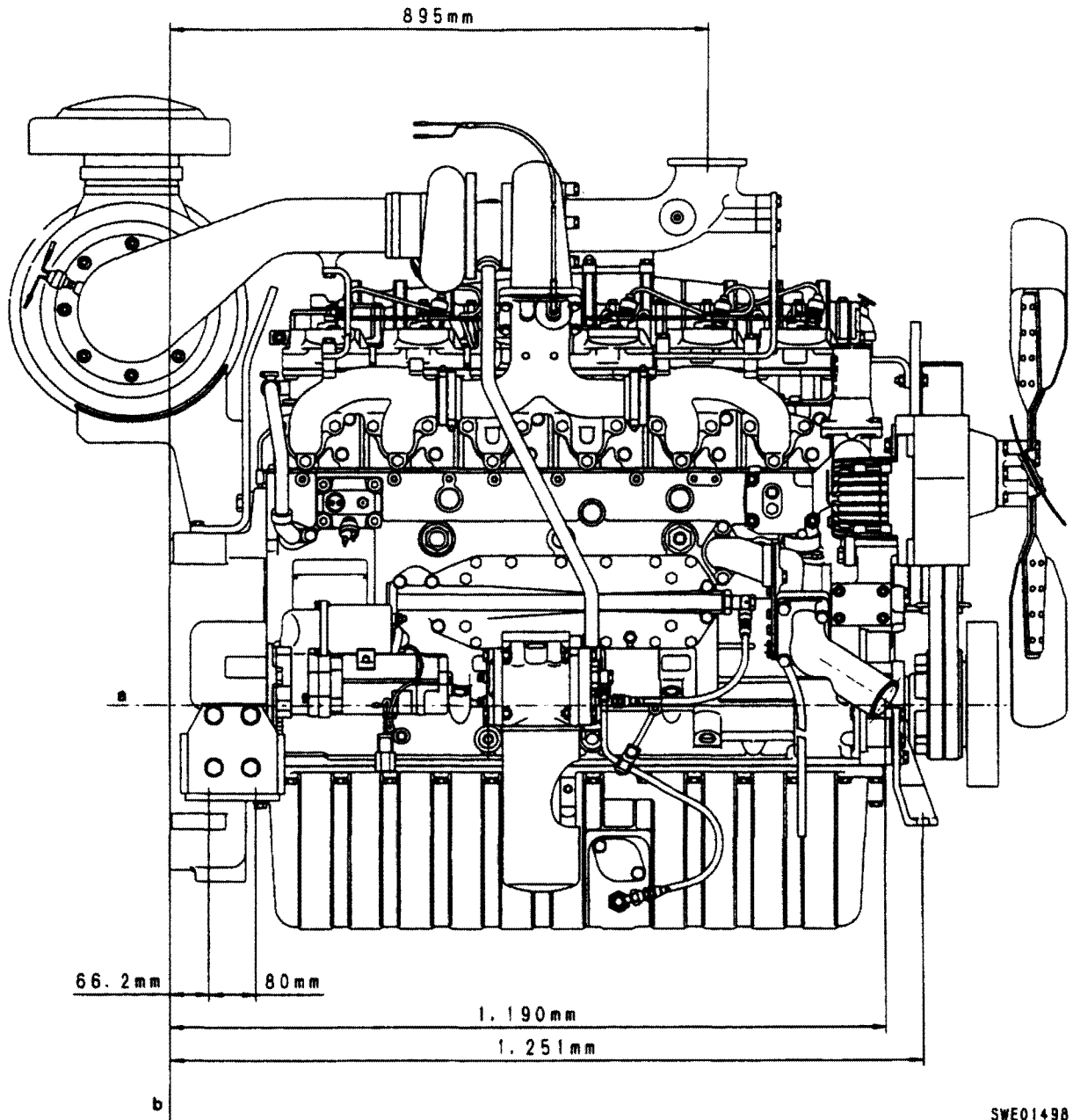


615002

SWE01497

- a. Crankshaft center
- b. Flywheel housing rear surface

SA6D125-2 RIGHT SIDE VIEW [For J6D125E-G1-2 (Generator)]

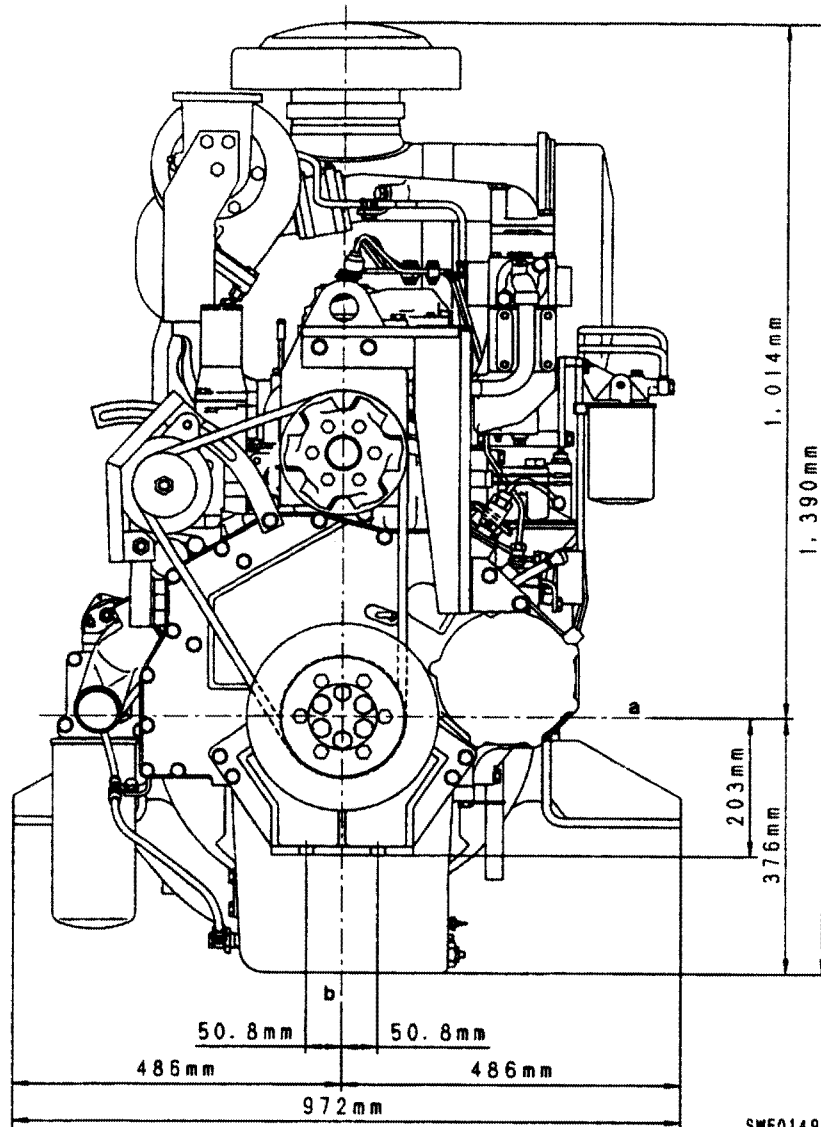


615002

SWE01498

- a. Crankshaft center
- b. Flywheel housing rear surface

SA6D125-2 FRONT SIDE VIEW [For J6D125E-G1-2 (Generator)]

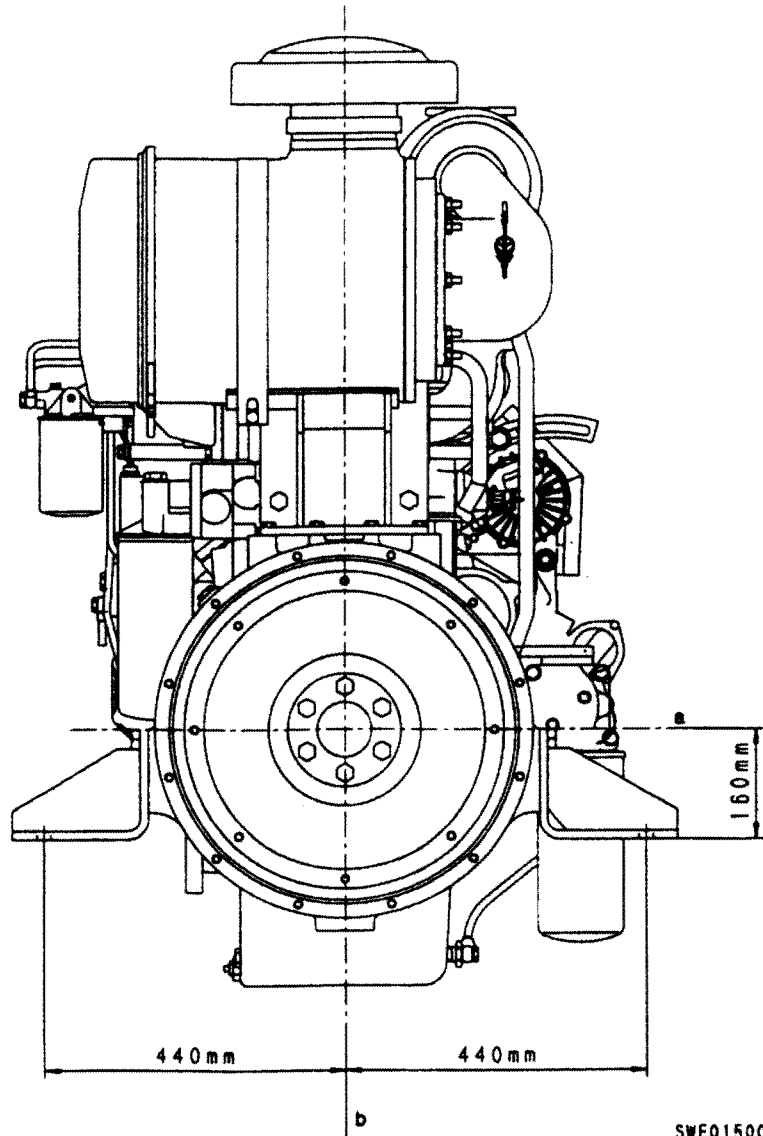


615002

- a. Crankshaft center
- b. Cylinder liner center

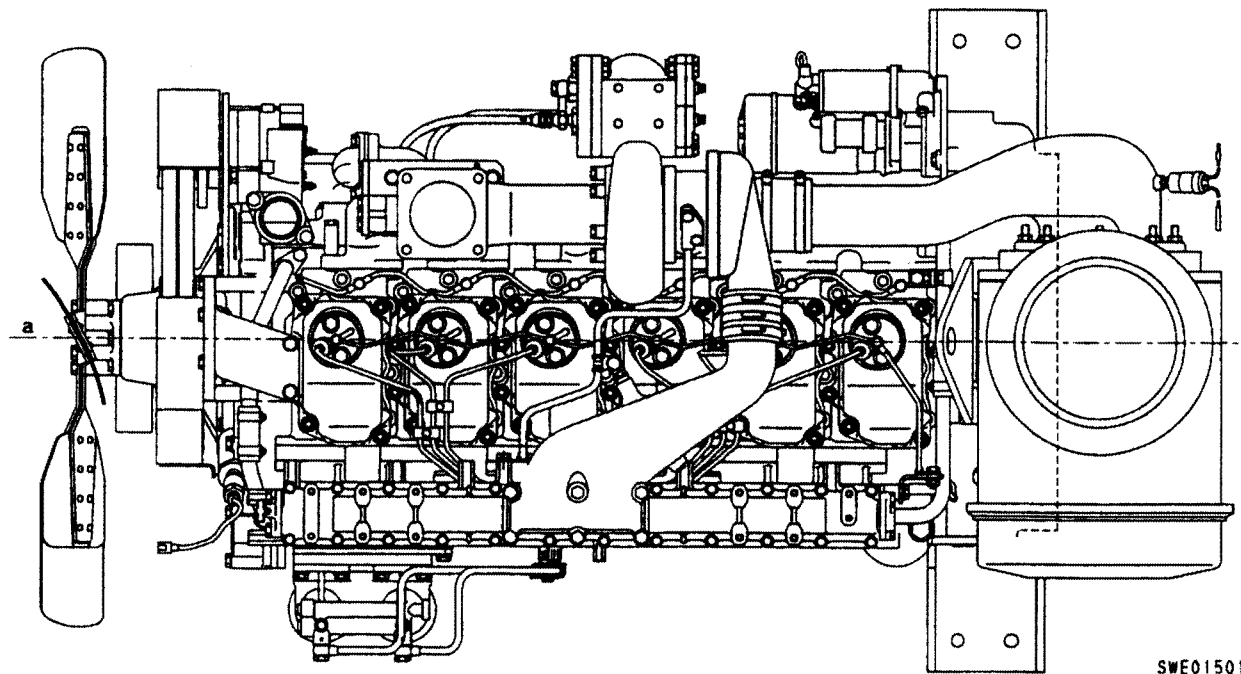


SA6D125-2 REAR SIDE VIEW [For J6D125E-G1-2 (Generator)]



- a. Crankshaft center
- b. Cylinder liner center

SA6D125-2 TOP SIDE VIEW [For J6D125E-G1-2 (Generator)]



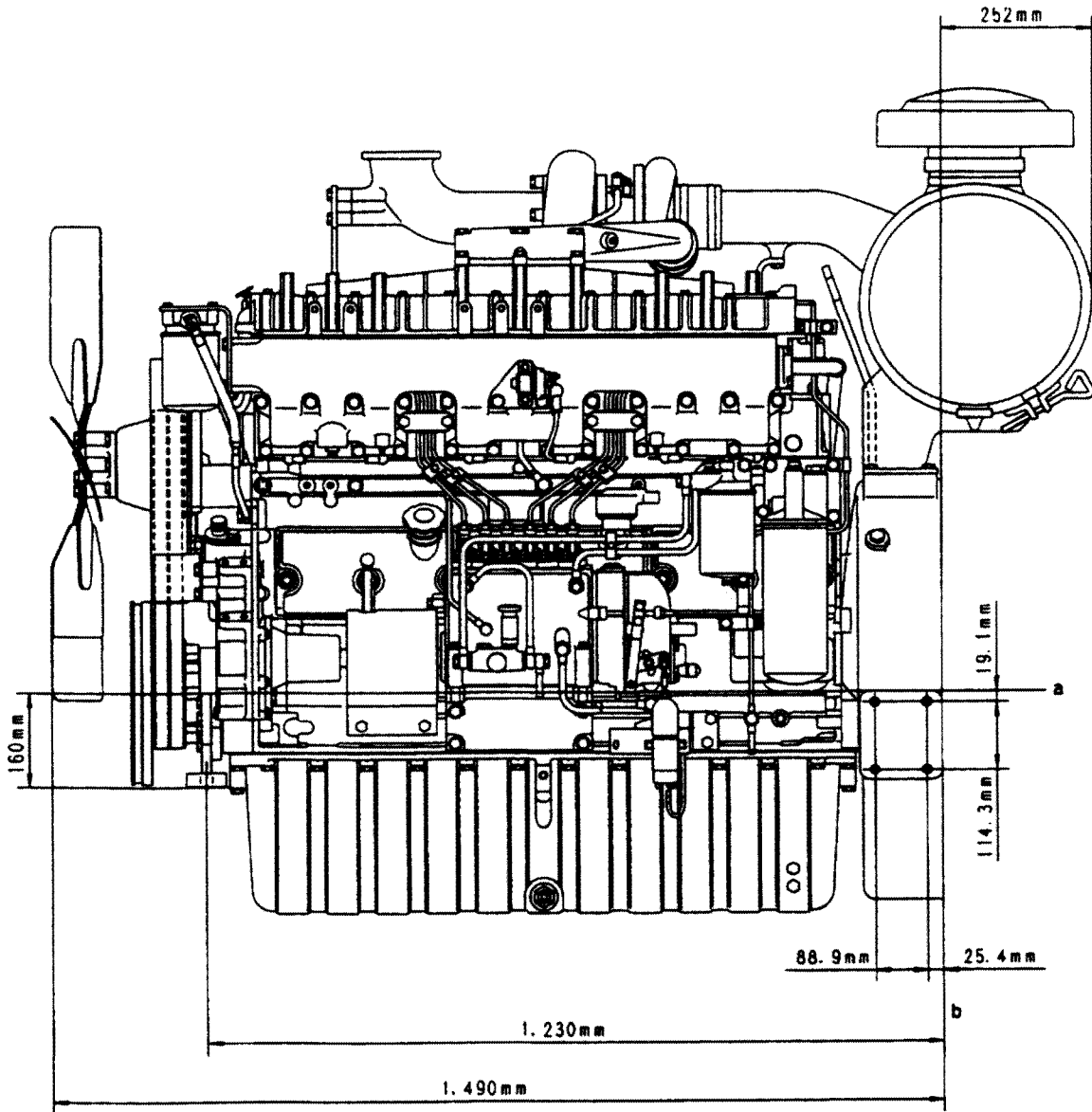
615002

SWE01501

a. Crankshaft center

SA6D125-2 LEFT SIDE VIEW [For DCA300SSK (DENYO generator)]

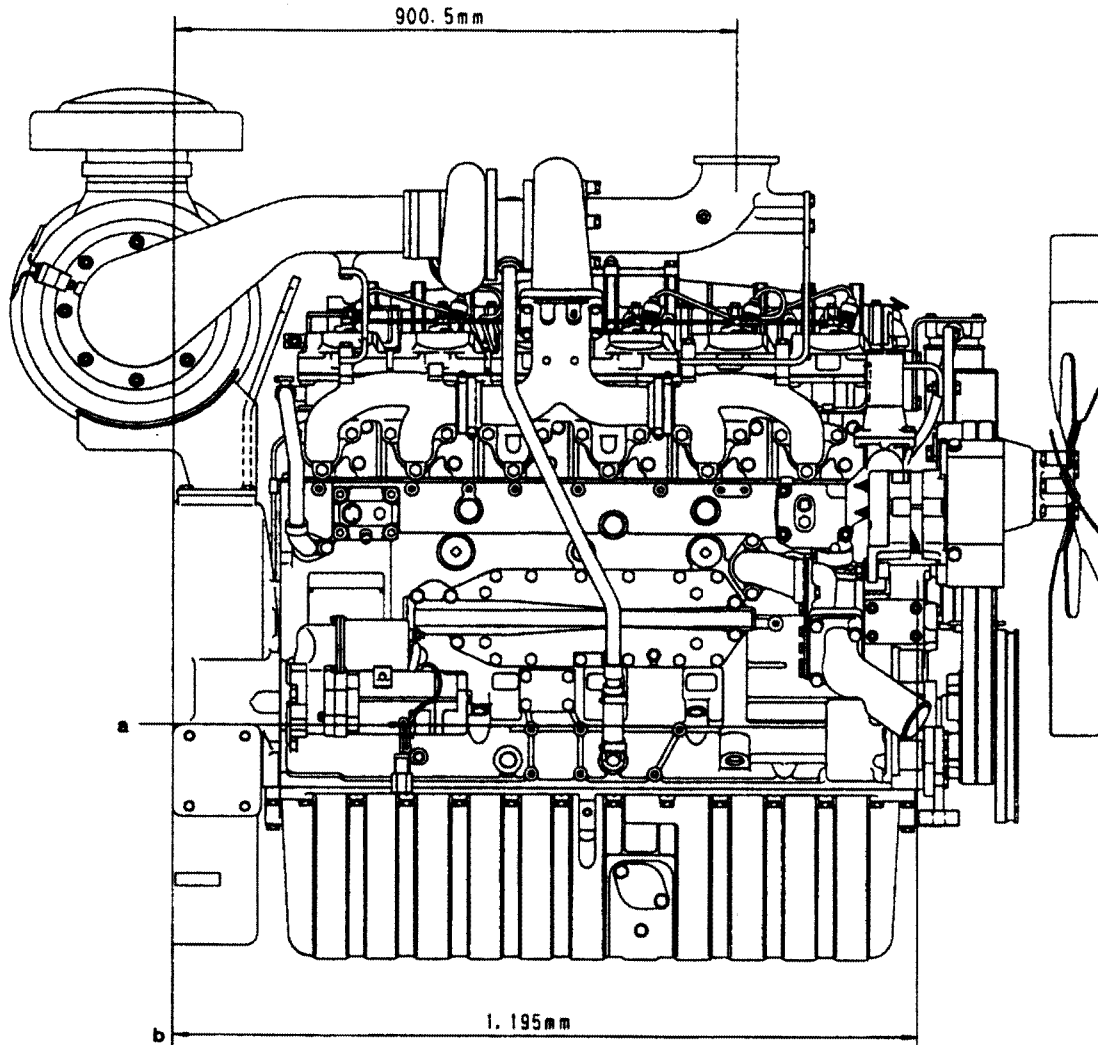
615002



- a. Crankshaft center
- b. Flywheel housing rear surface

SJE01502

SA6D125-2 RIGHT SIDE VIEW [For DCA300SSK (DENYO generator)]

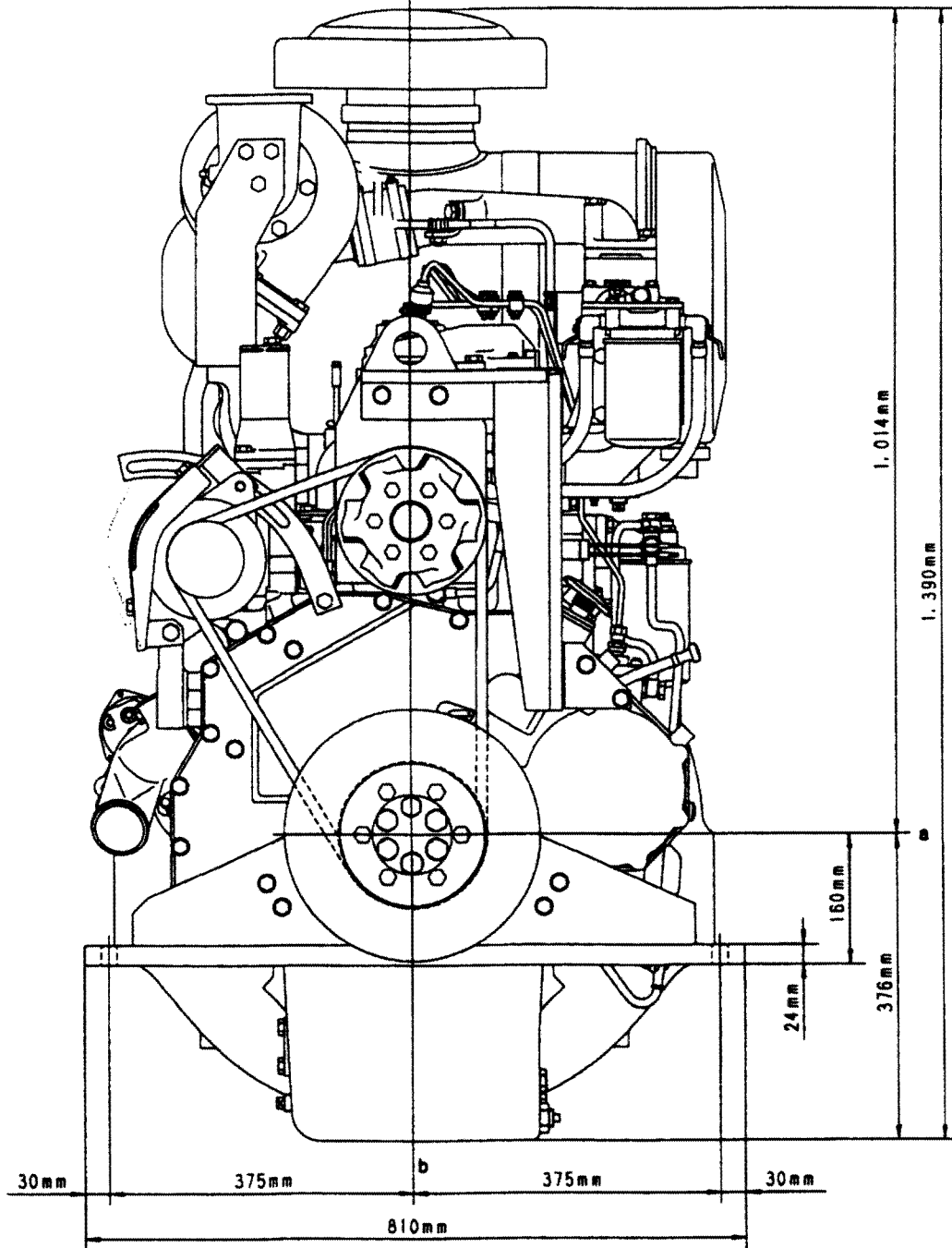


- a. Crankshaft center
- b. Flywheel housing rear surface

SJE01503

SA6D125-2 FRONT SIDE VIEW [For DCA300SSK (DENYO generator)]

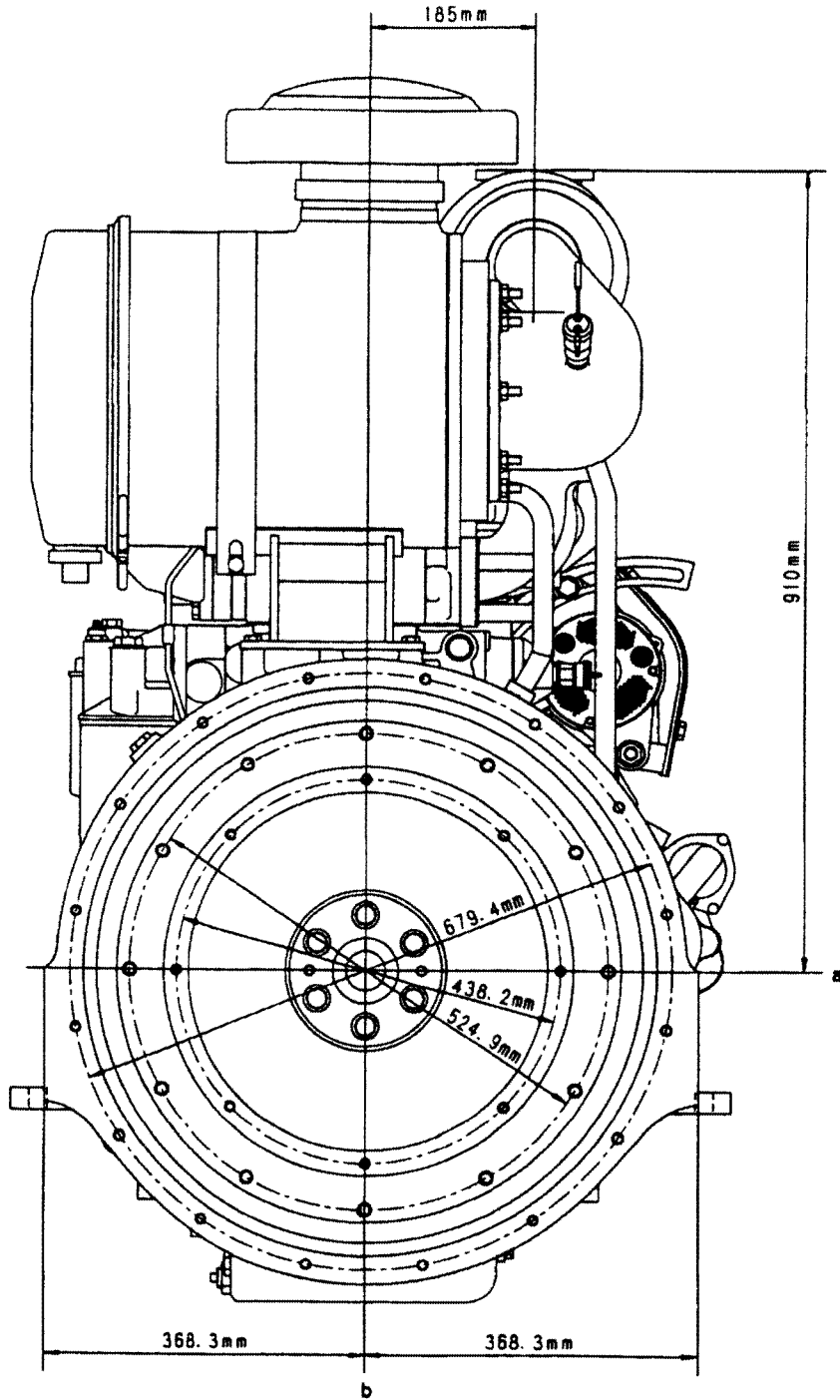
615002



- a. Crankshaft center
- b. Cylinder liner center

SJE01504

SA6D125-2 REAR SIDE VIEW [For DCA300SSK (DENYO generator)]

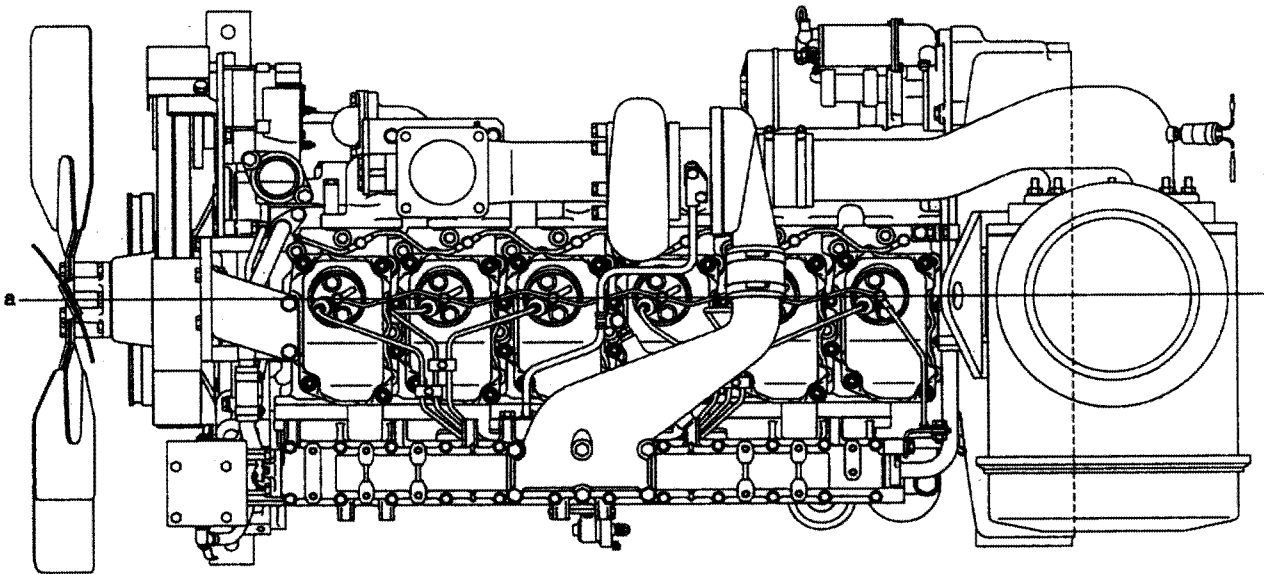


615002

SJE01505

- a. Crankshaft center
- b. Cylinder liner center

SA6D125-2 TOP SIDE VIEW [For DCA300SSK (DENYO generator)]

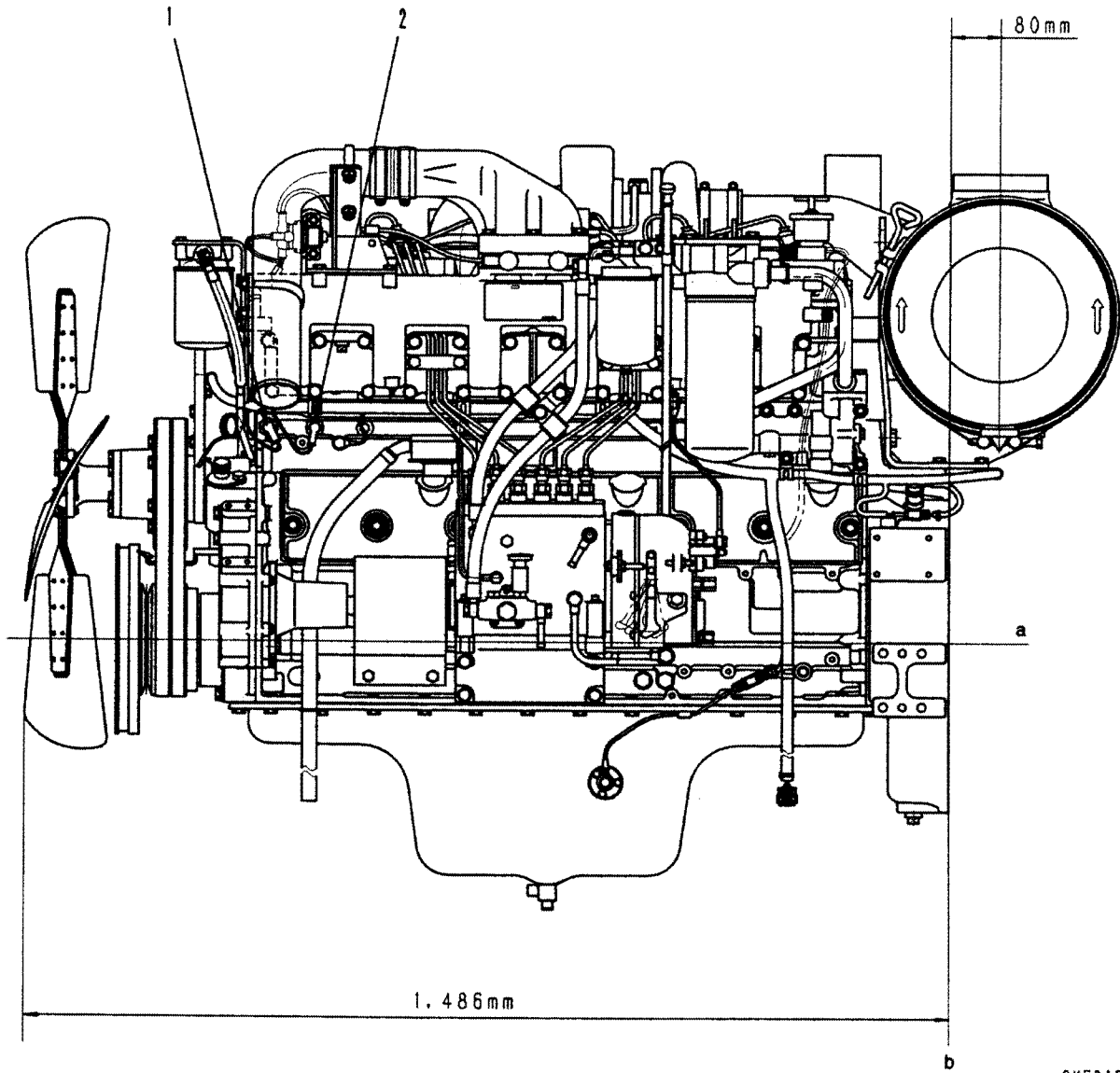


615002

SJE01506

a. Cylinder liner center

SAA6D125-2 LEFT SIDE VIEW [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]



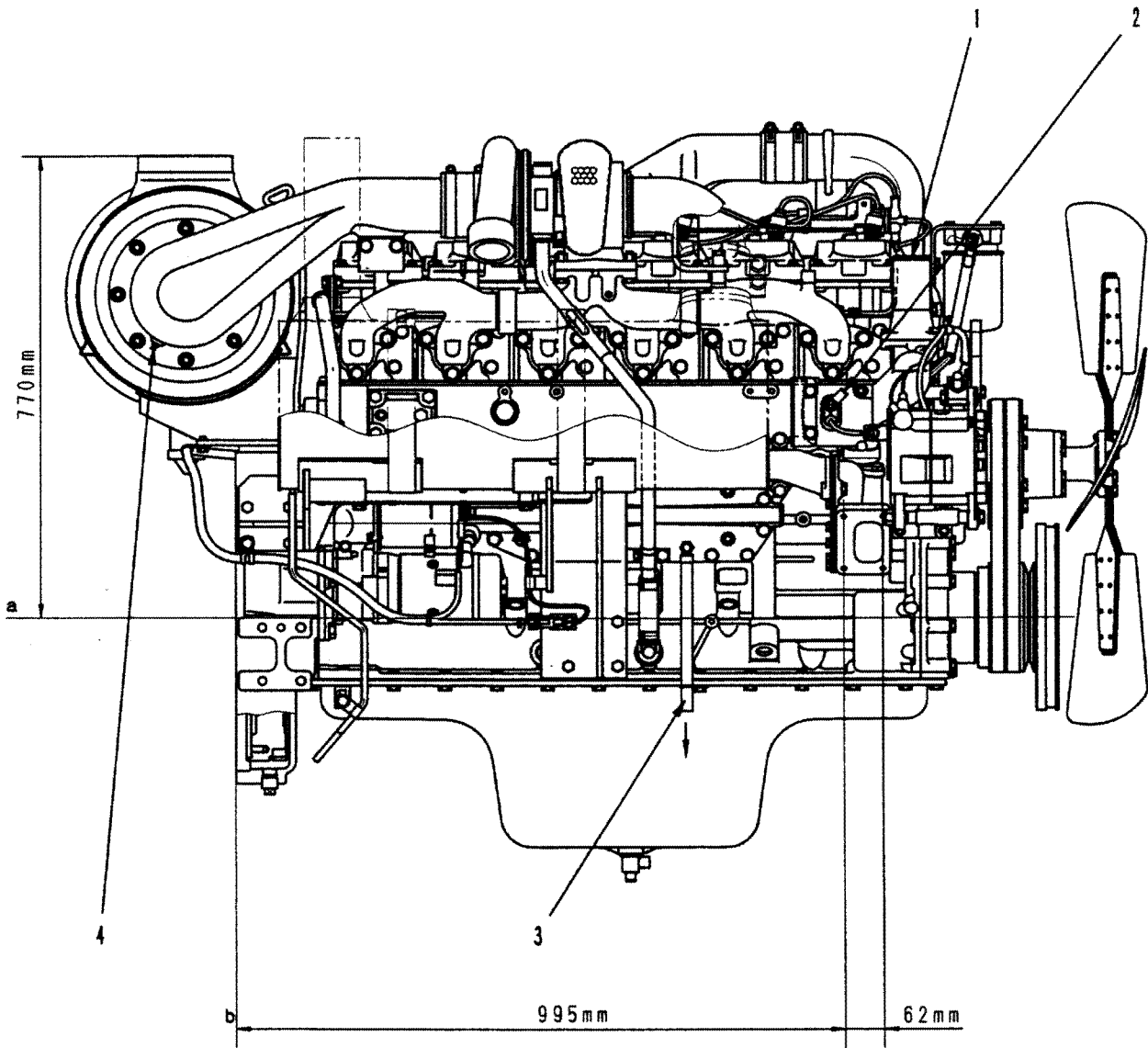
615002

SXE01508

- 1. Oil pressure switch  
(Low pressure)
- 2. Oil pressure switch  
(High pressure)
- a. Crankshaft center
- b. Flywheel housing rear surface



SAA6D125-2 RIGHT SIDE VIEW [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]

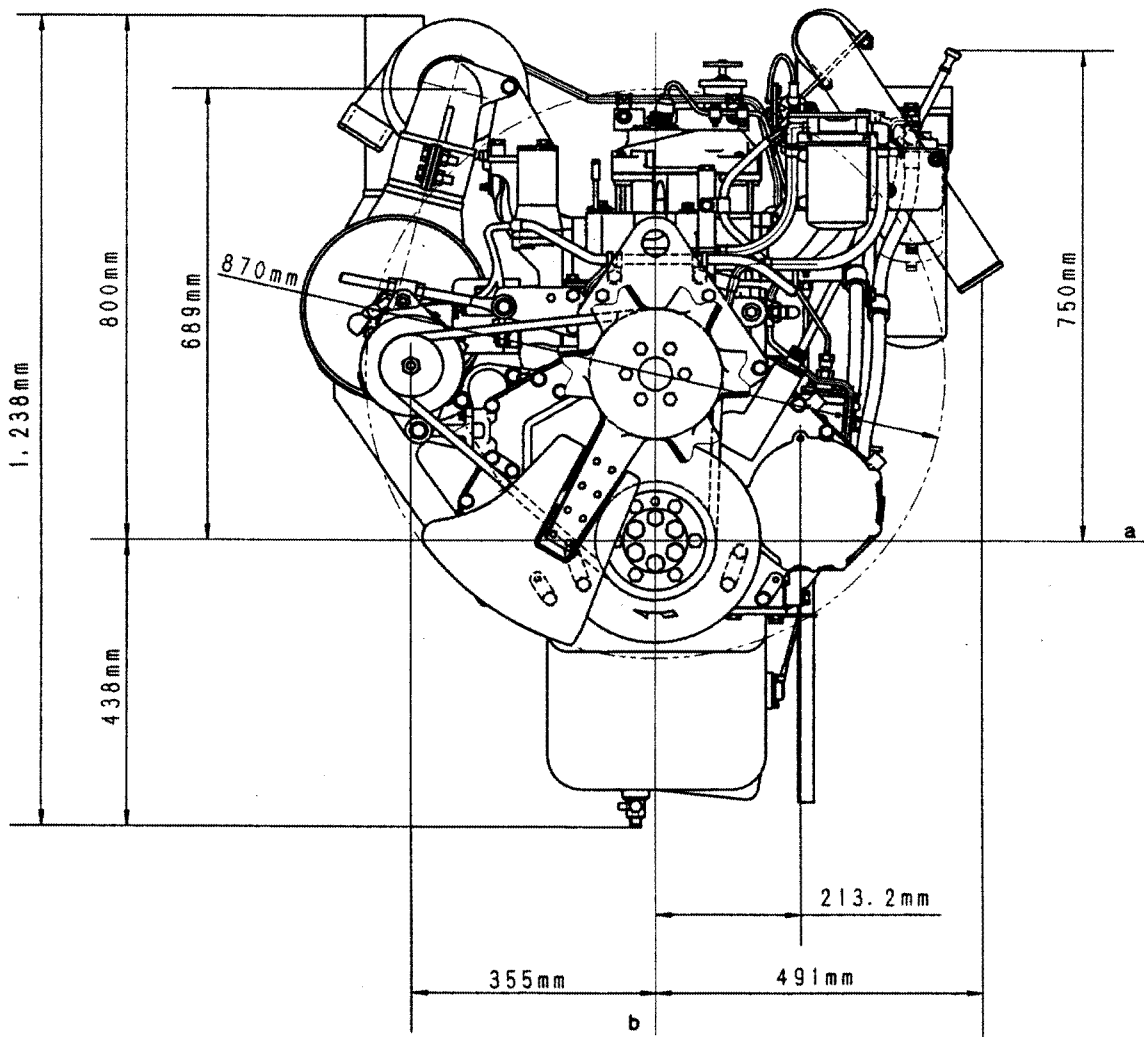


615002

SXE01509

- 1. Water outlet
- 2. Service hole of car heater
- 3. Water drain pipe
- 4. Dust indicator
  
- a. Crankshaft center
- b. Flywheel housing rear surface

SAA6D125-2 FRONT SIDE VIEW [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]

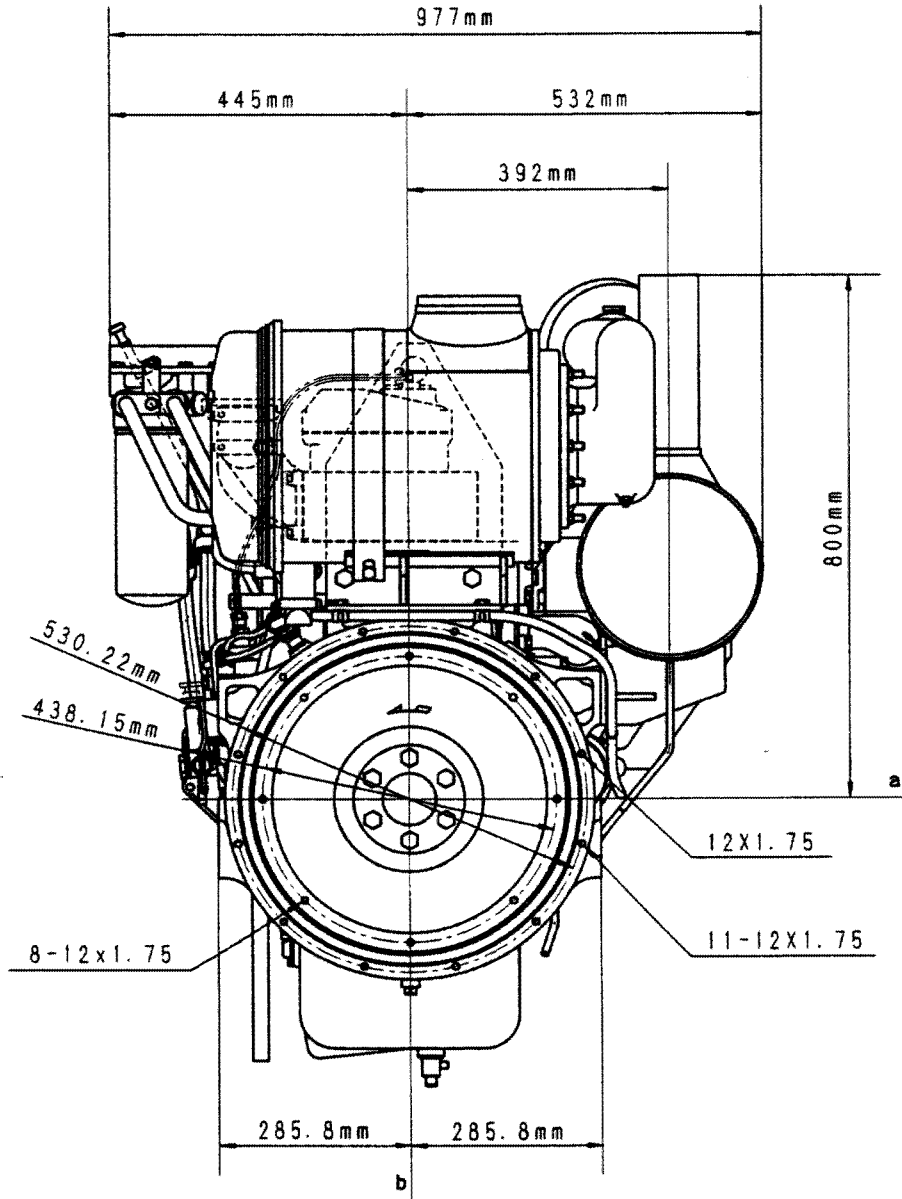


- a. Crankshaft center
- b. Cylinder liner center

SXE01510

615002

SAA6D125-2 REAR SIDE VIEW [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]

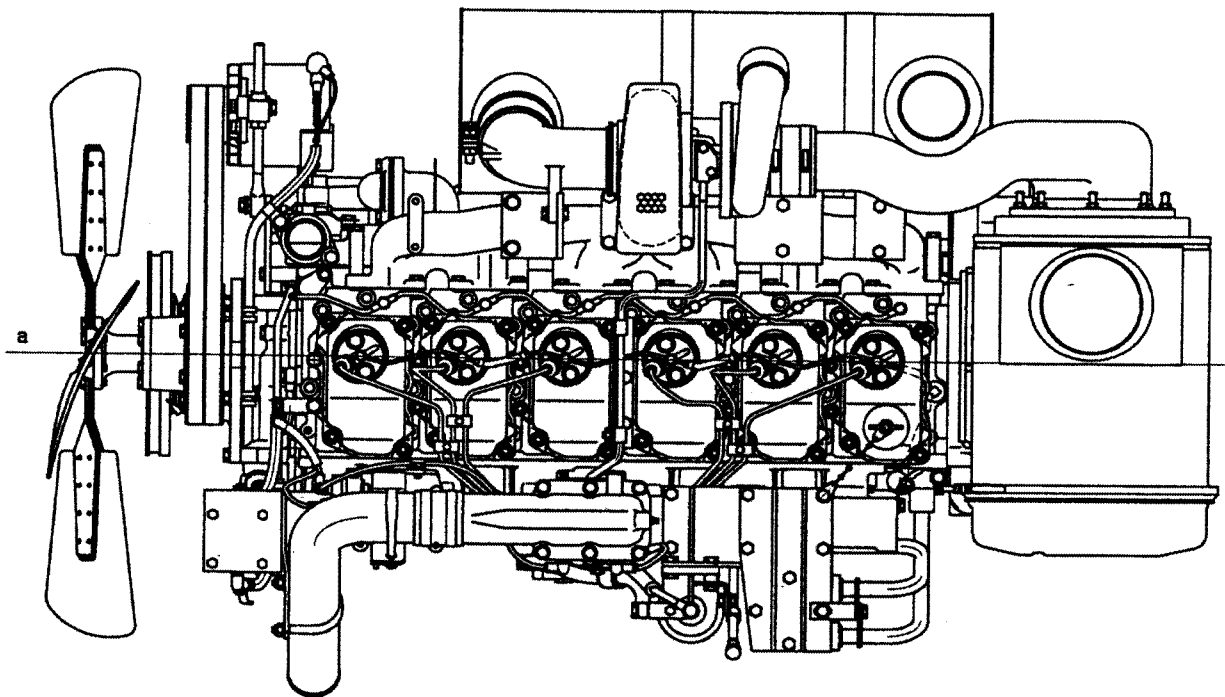


615002

- a. Crankshaft center
- b. Cylinder liner center

SXE01511

SAA6D125-2 TOP SIDE VIEW [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]



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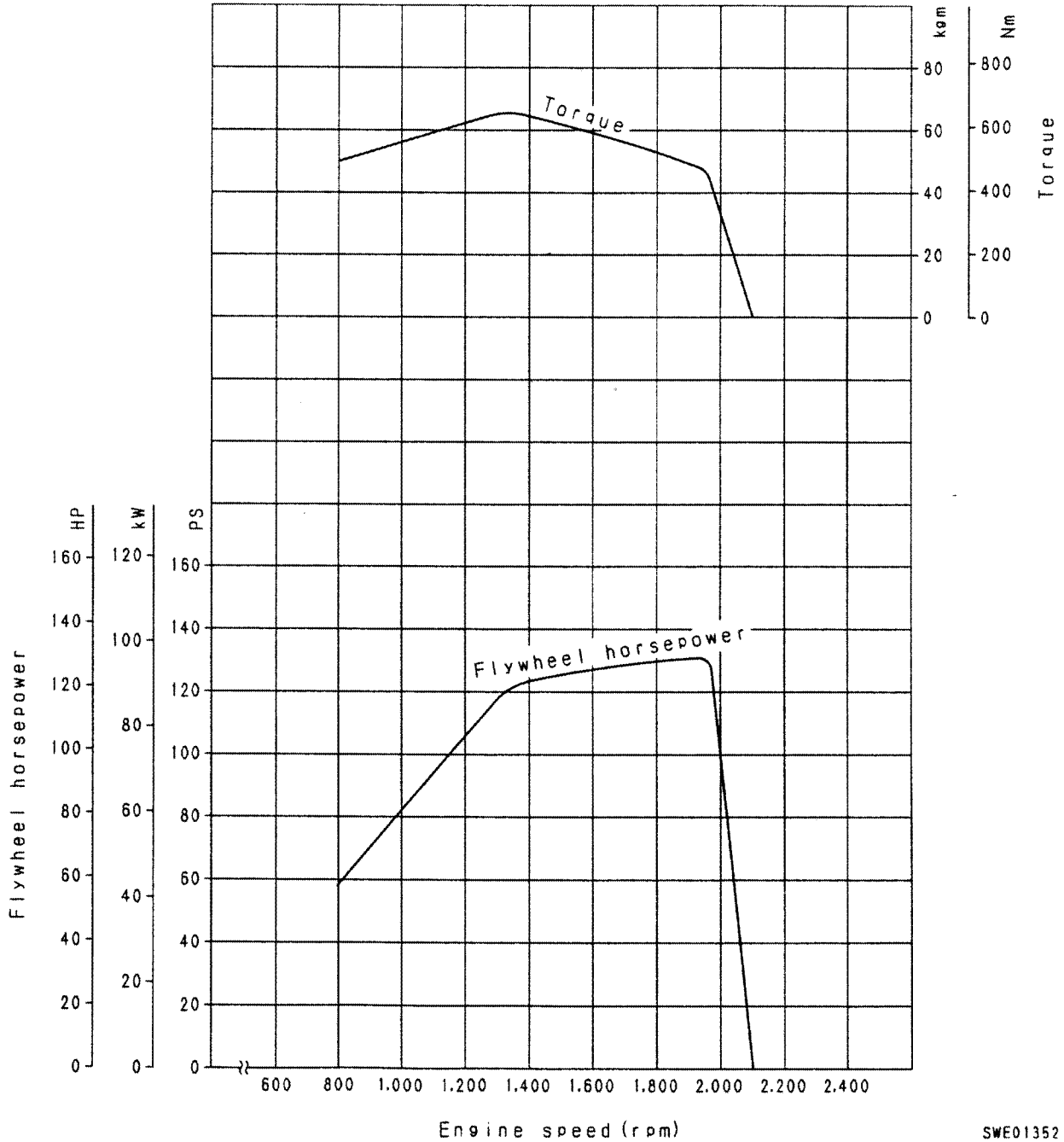
SXE01512

a. Cylinder liner center

# ENGINE PERFORMANCE CURVE

## 6D125-2 (D58E-1, D58P-1)

Flywheel horsepower: 95.6 kW (130 HP)/1,900 rpm (Net)  
Maximum torque: 635 Nm (64.8 kgm)/1,300 rpm (Net)



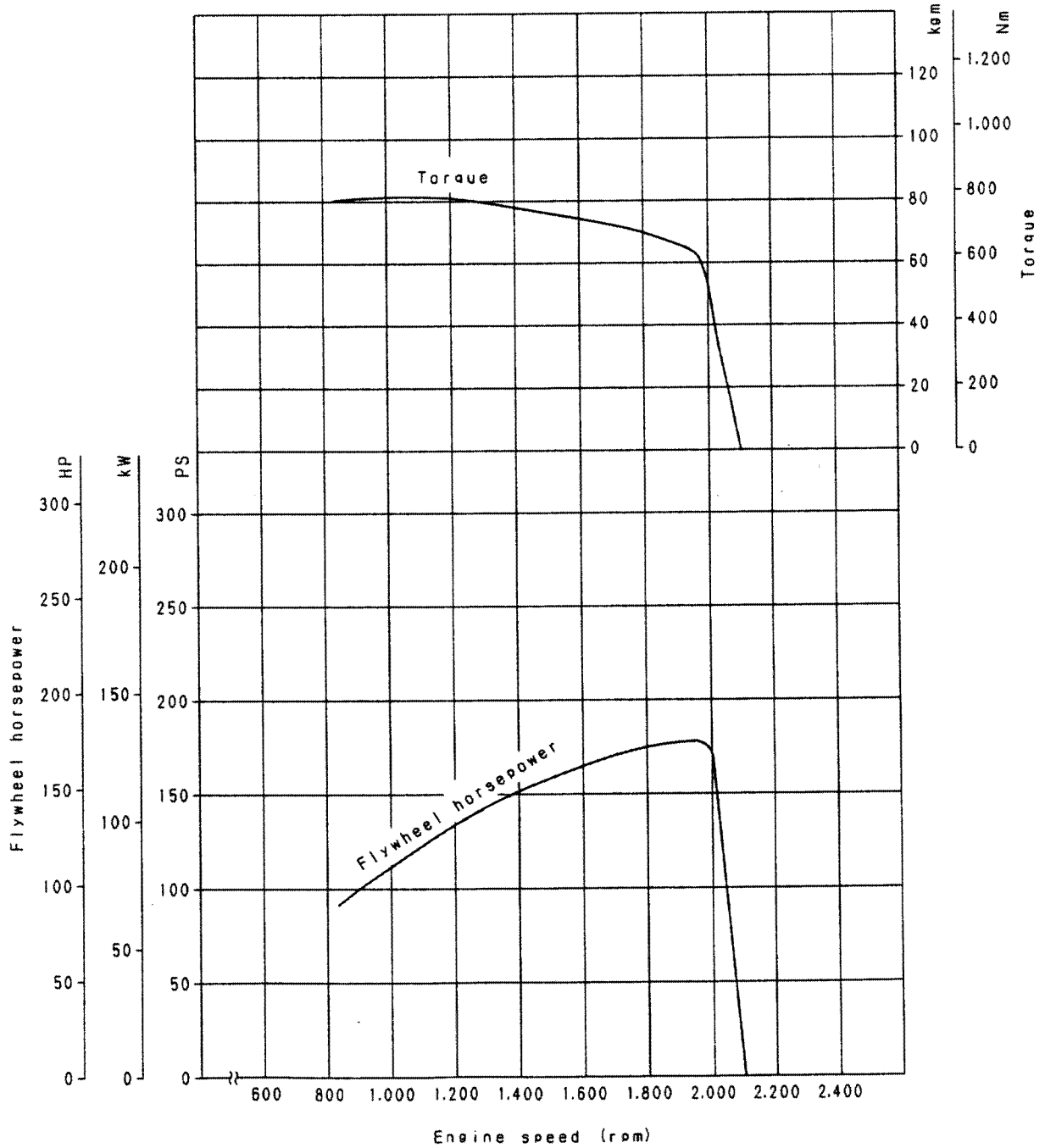
SWE01352

615002

6D125-2 (D65E-12, D70LE-12)

Flywheel horsepower: 131 kW (175 HP)/1,950 rpm (Net)

Maximum torque: 799 Nm (81.5 kgm)/1,100 rp (Net)



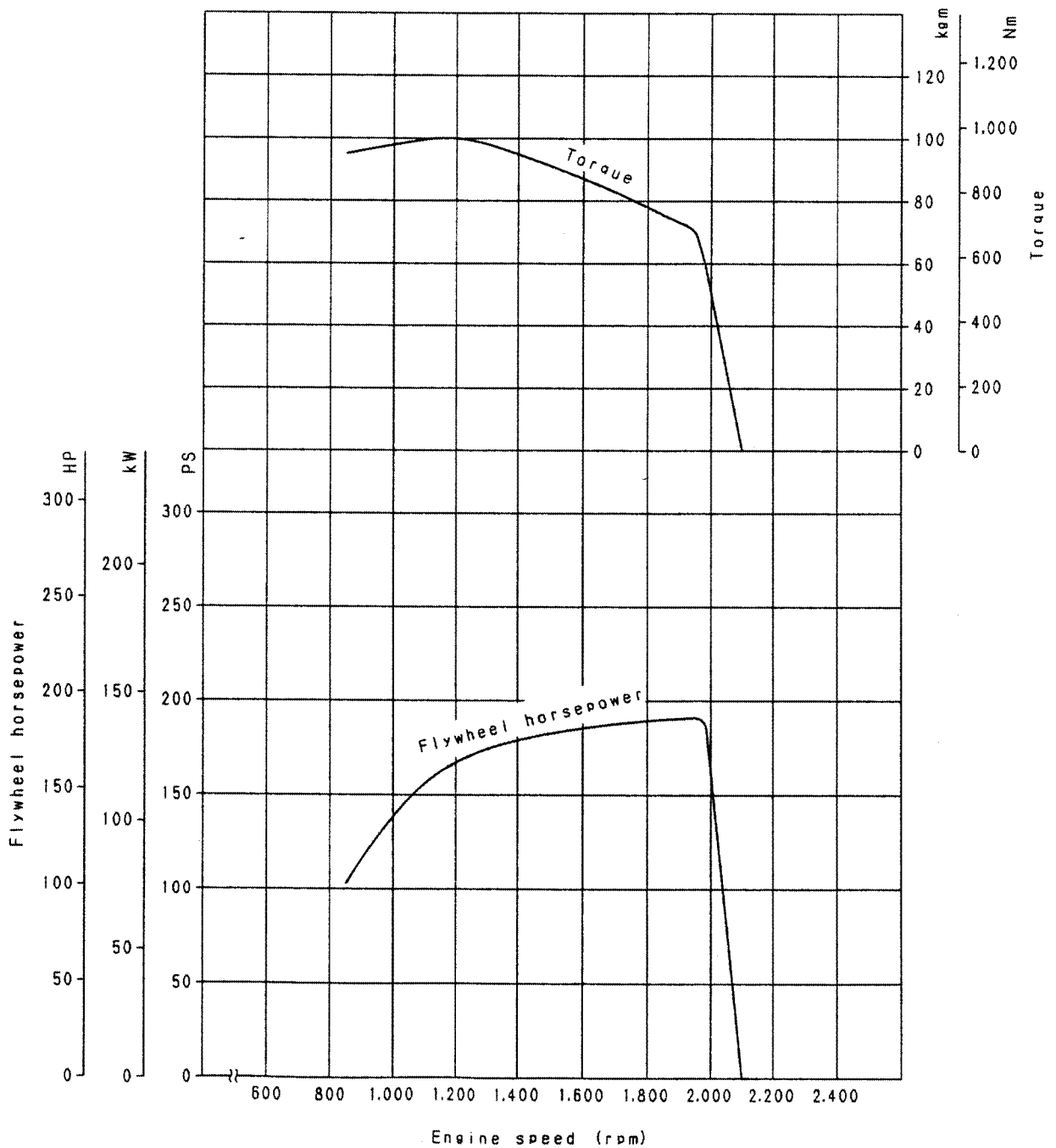
615002

SJE01751

**S6D125-2 (D60P-12, D65P, PX-12, D65EX-12)**

Flywheel horsepower: 140 kW (188 HP)/1,950 rpm (Net)

Maximum torque: 981 Nm (100 kgm)/1,200 rpm (Net)



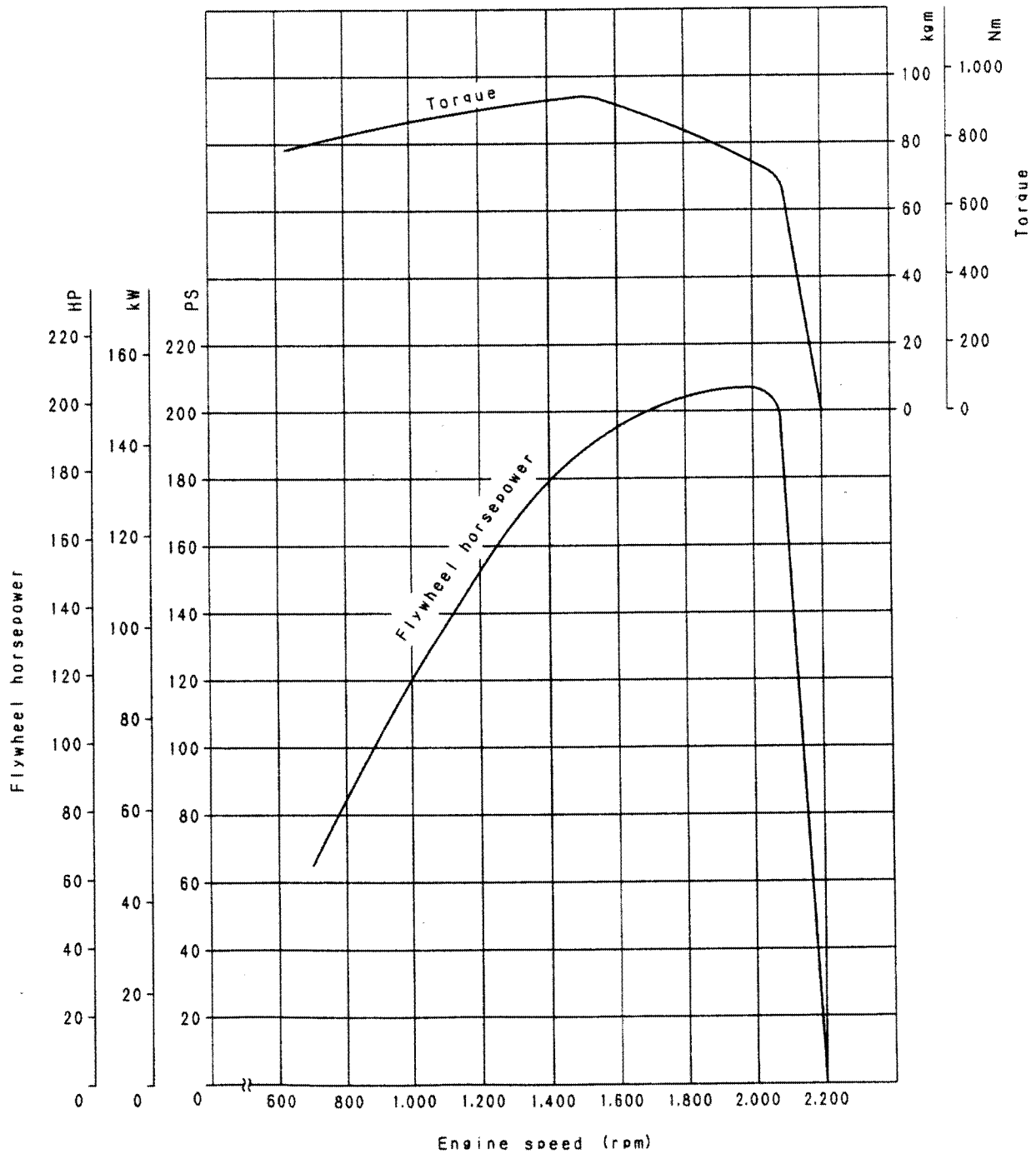
615002

SJE01752

**S6D125-2 (D75S-5)**

Flywheel horsepower: 152 kW (203 HP)/2,000 rpm (Net)

Maximum torque: 921 Nm (94.0 kgm)/1,500 rpm (Net)



615002

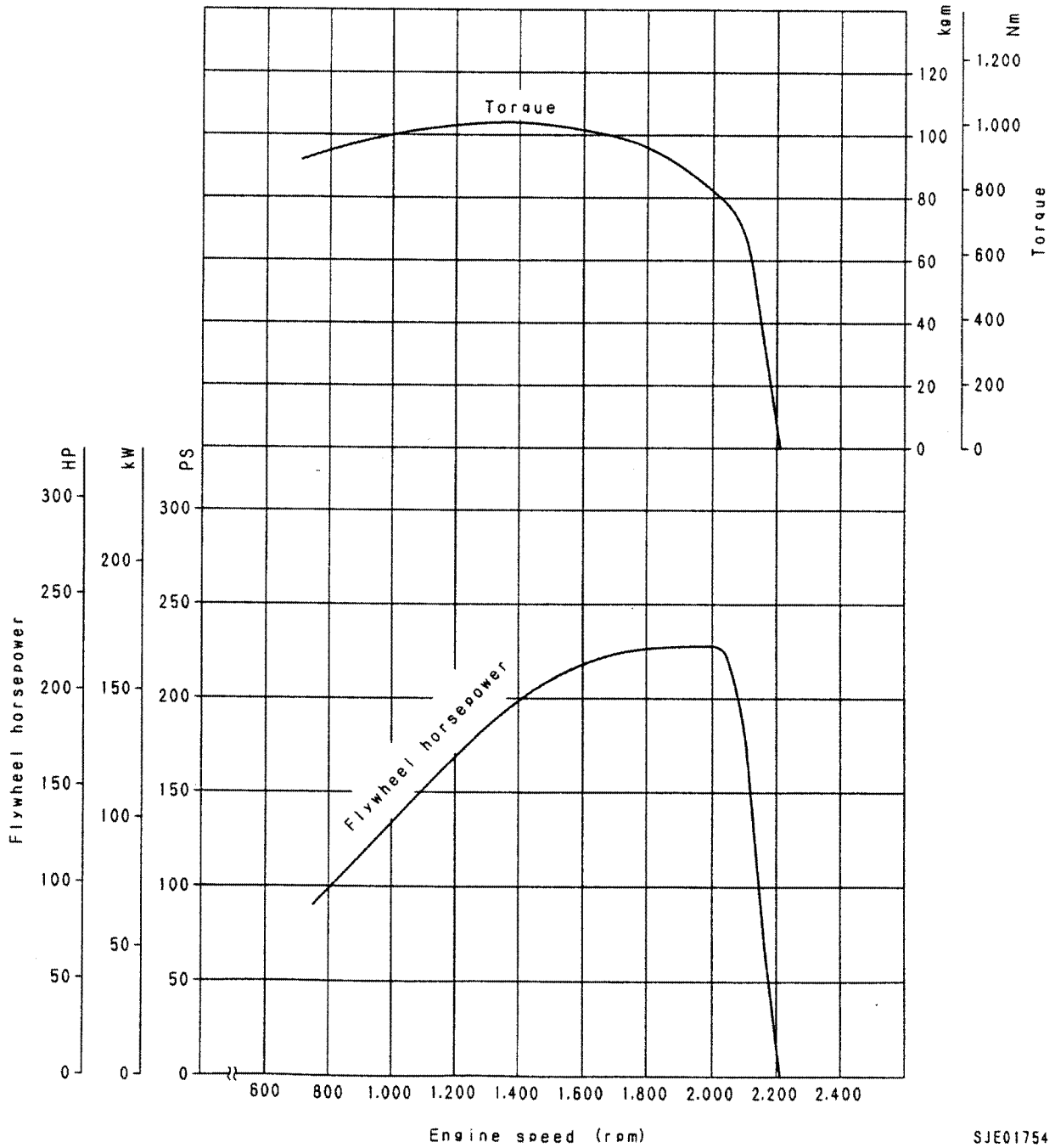
SJE01753



**S6D125-2 (D85A-21, 21S, 21B, 21D, D85E, P, C-21)**

Flywheel horsepower: 168 kW (225 HP)/2,000 rpm (Net)

Maximum torque: 1,020 Nm (104 kgm)/1,400 rpm (Net)



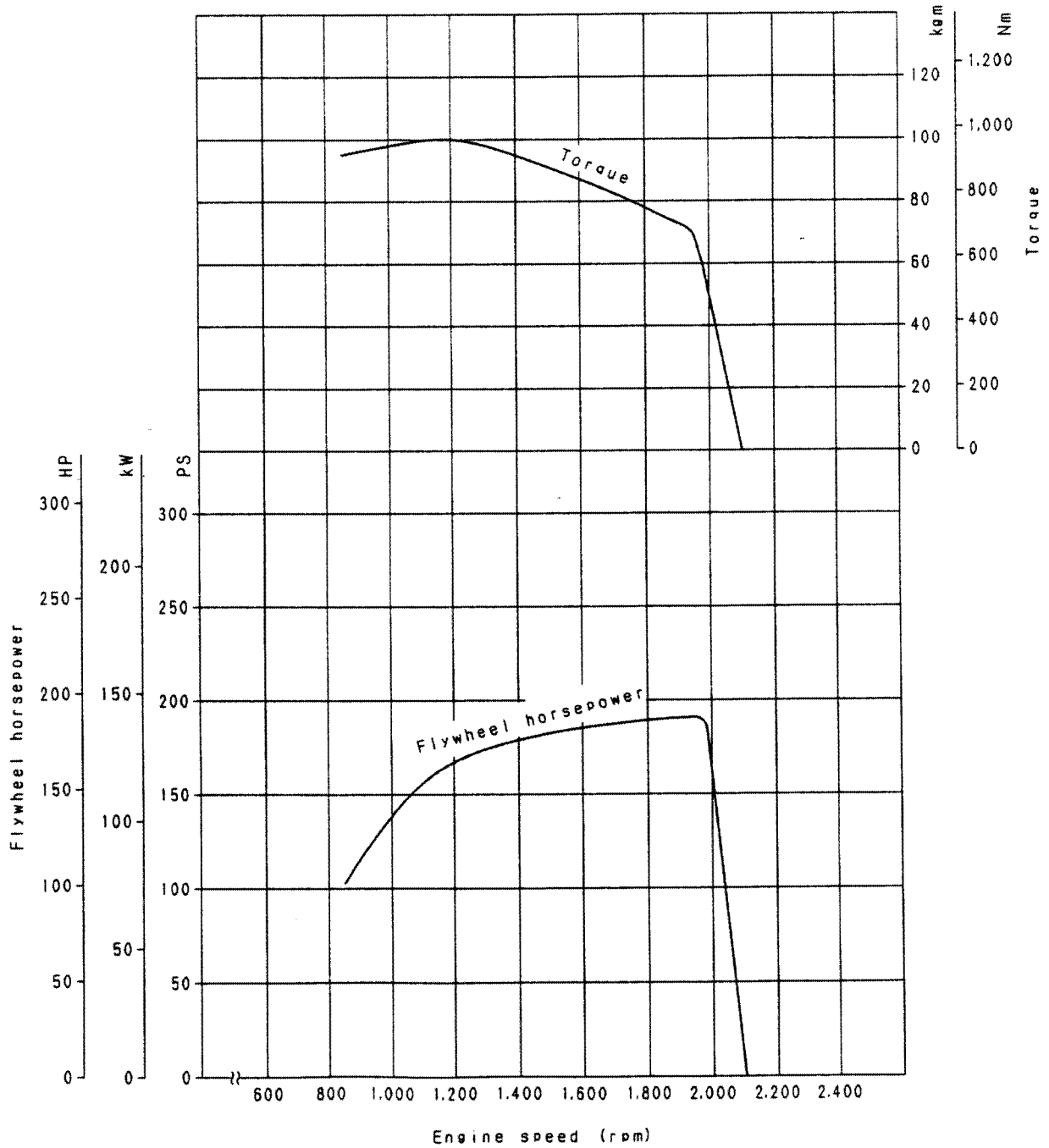
615002

SJE01754

**S6D125-2 (D85E-SS-2, D85E-SS-2A)**

Flywheel horsepower: 140 kW (188 HP)/1,950 rpm (Net)

Maximum torque: 981 Nm (100 kgm)/1,200 rpm (Net)

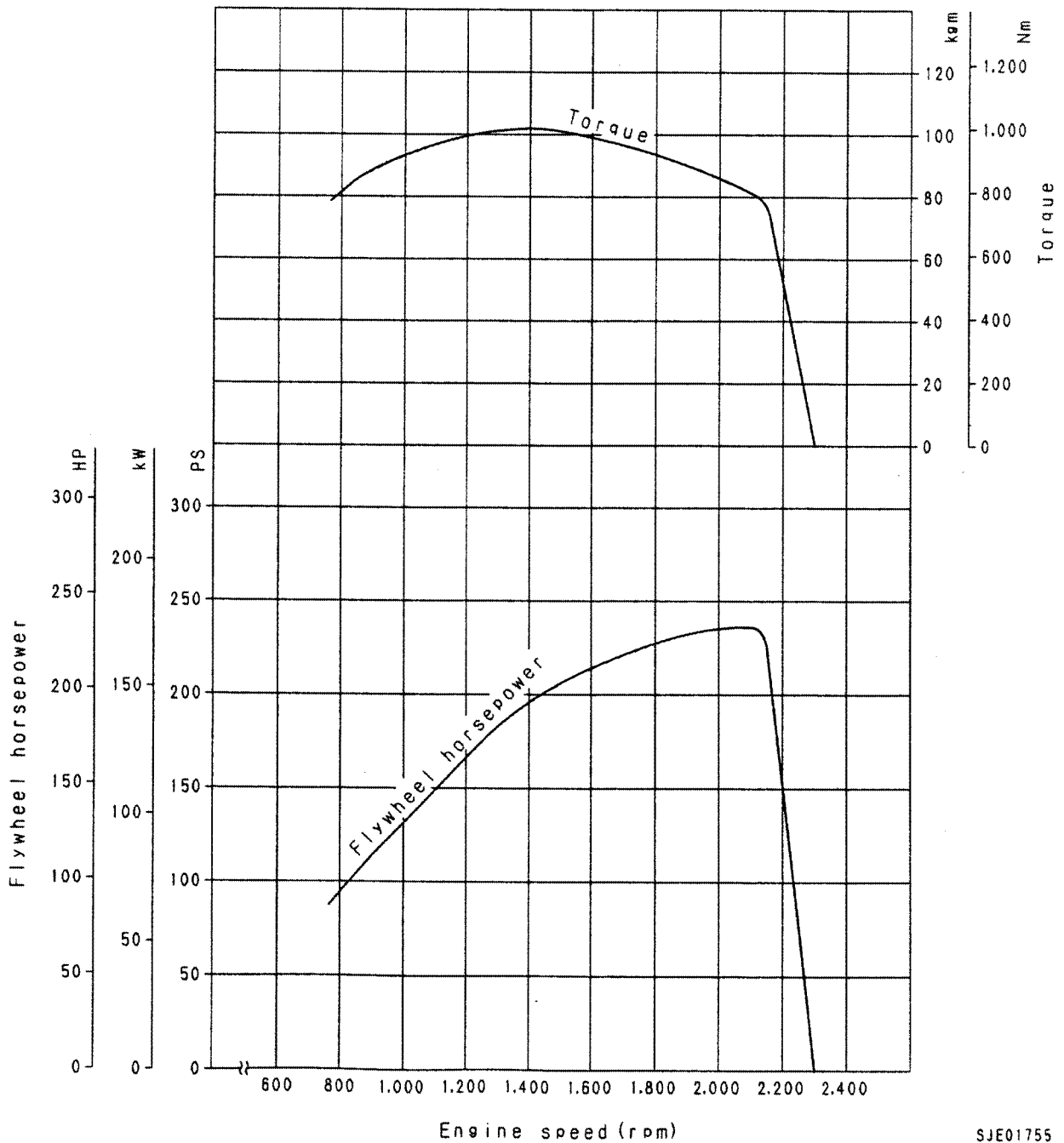


615002

SJE01752

**S6D125-2 (D87E, P-2)**

Flywheel horsepower: 174 kW (233 HP)/2,100 rpm (Net)  
Maximum torque: 999 Nm (102 kgm)/1,400 rpm (Net)

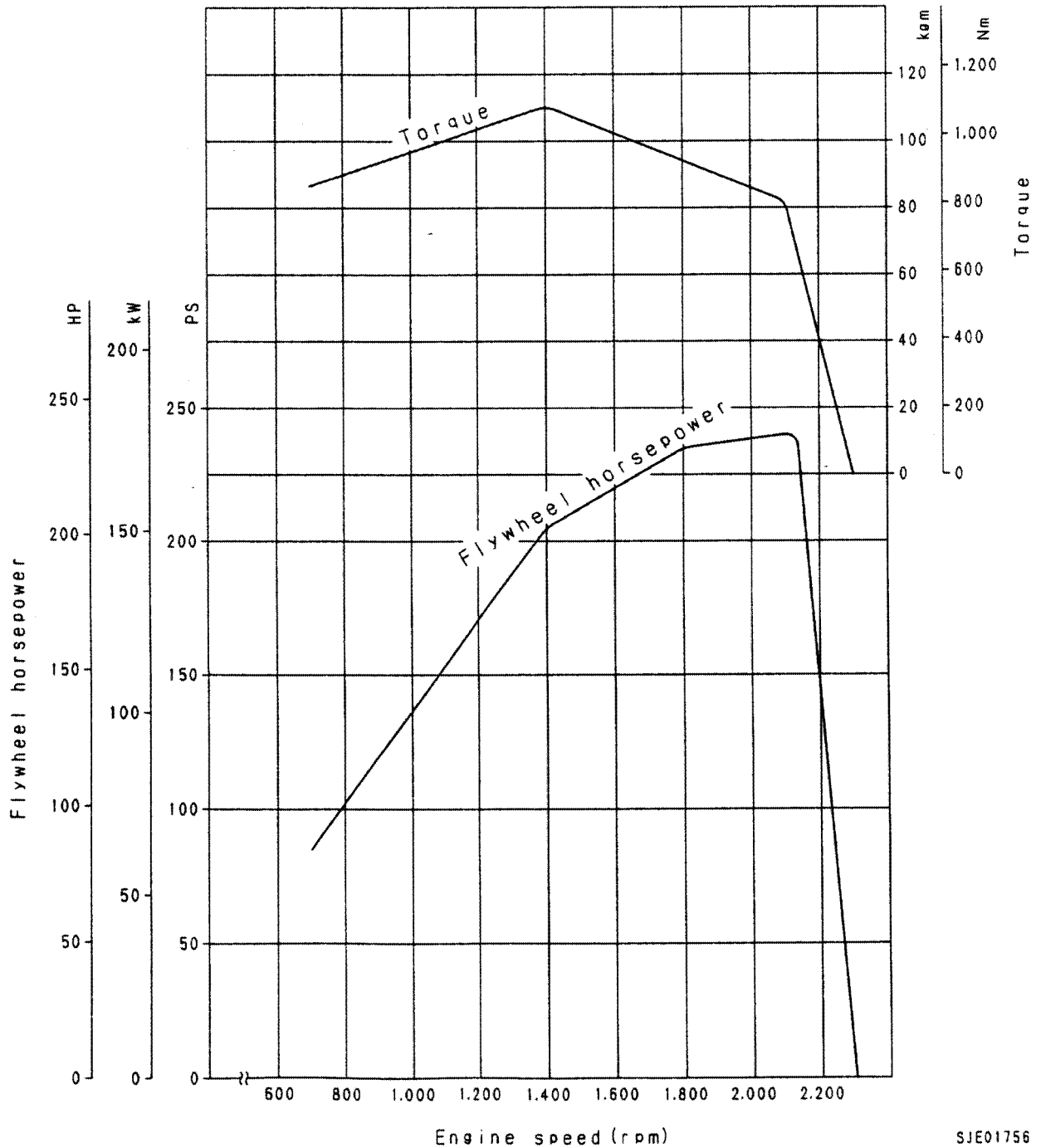


615002

SJE01755

**S6D125-2 (LW250-5)**

Flywheel horsepower: 177 kW (237 HP)/2,100 rpm (Net)  
Maximum torque: 1,080 Nm (110 kgm)/1,400 rpm (Net)

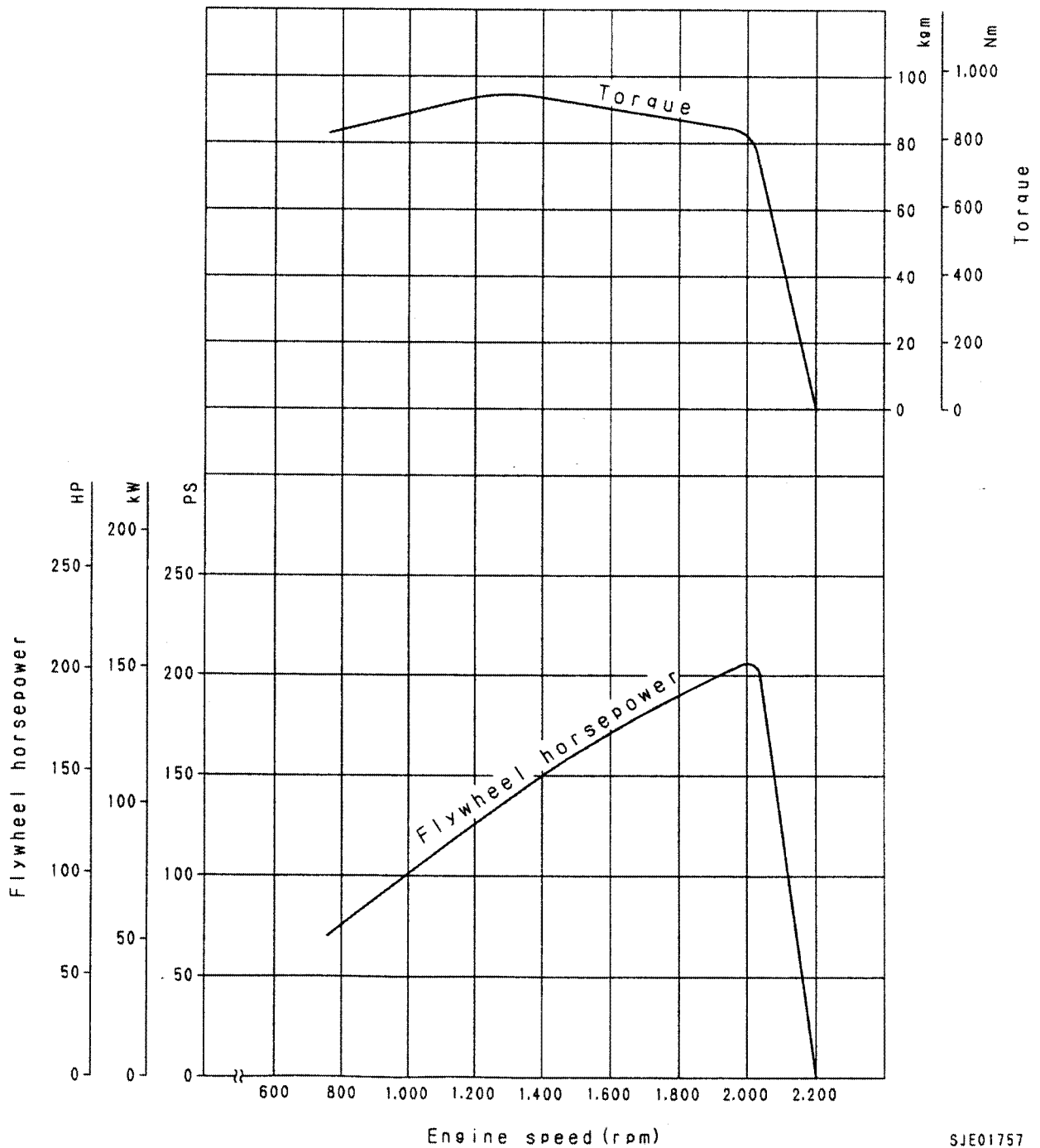


615002

SJE01756

**S6D125-2 (CS210-1)**

Flywheel horsepower: 152 kW (203 HP)/2,000 rpm (Net)  
Maximum torque: 926 Nm (94.5 kgm)/1,300 rpm (Net)

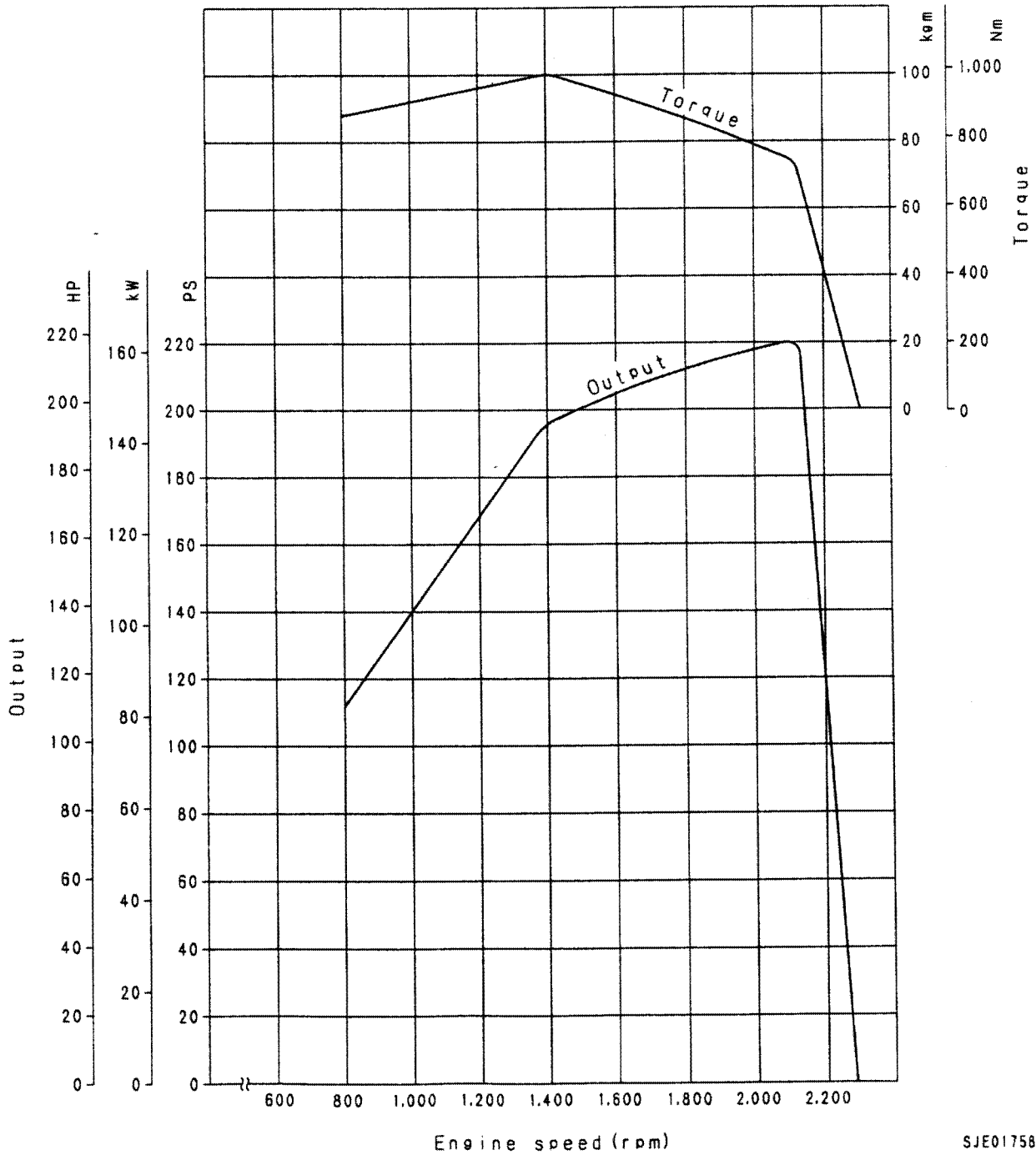


615002

SJE01757

**S6D125-2 (FD250-2)**

Flywheel horsepower: 162 kW (217 HP)/2,100 rpm (Net)  
Maximum torque: 981 Nm (100 kgm)/1,400 rpm (Net)



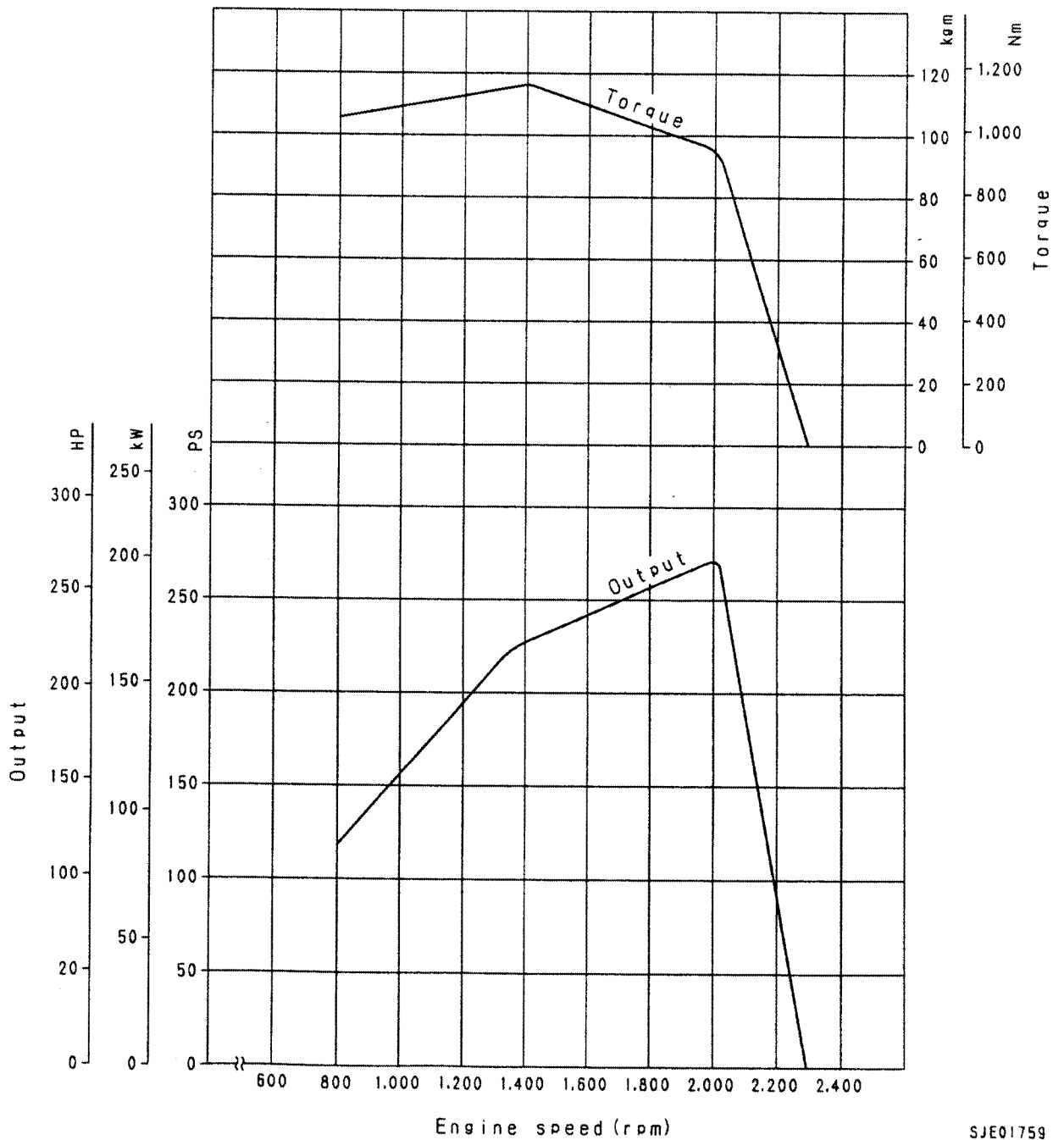
615002

SJE01758

**S6D125-2 (FD400-2)**

Flywheel horsepower: 199 kW (266 HP)/2,000 rpm (Net)

Maximum torque: 1,140 Nm (116 kgm)/1,400 rpm (Net)



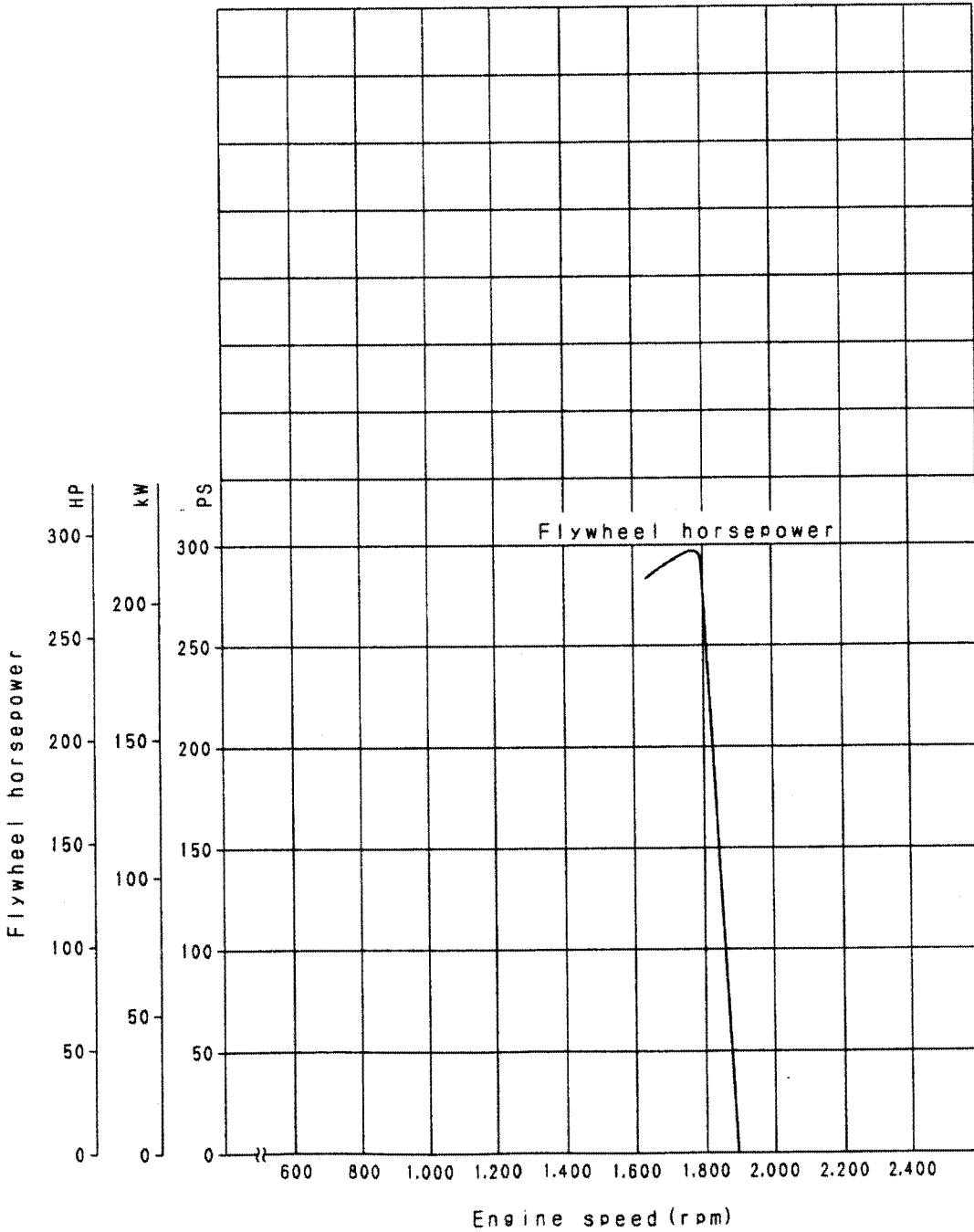
615002

SJE01759

**S6D125-2 (For MQ generator DCA-220SSK)**

Flywheel horsepower: 204 kW (273 HP)/1,800 rpm (Net, 60 Hz)

615002



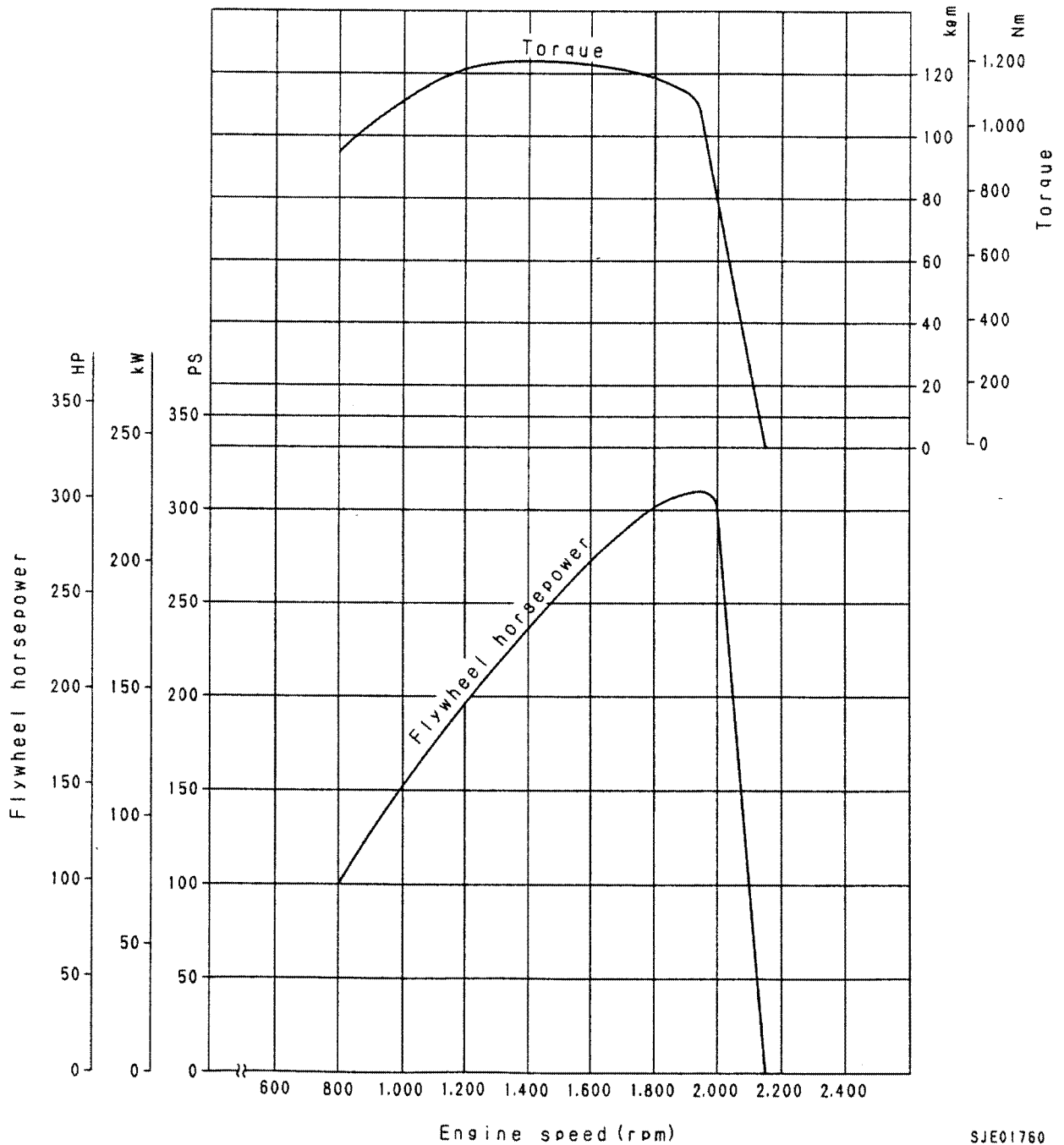
SWE01368



**SA6D125-2 [PC400-6 (EXCEL), PC400LC-6 (EXCEL), PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1]**

Flywheel horsepower: 228 kW {306 HP}/1,950 rpm (Net)

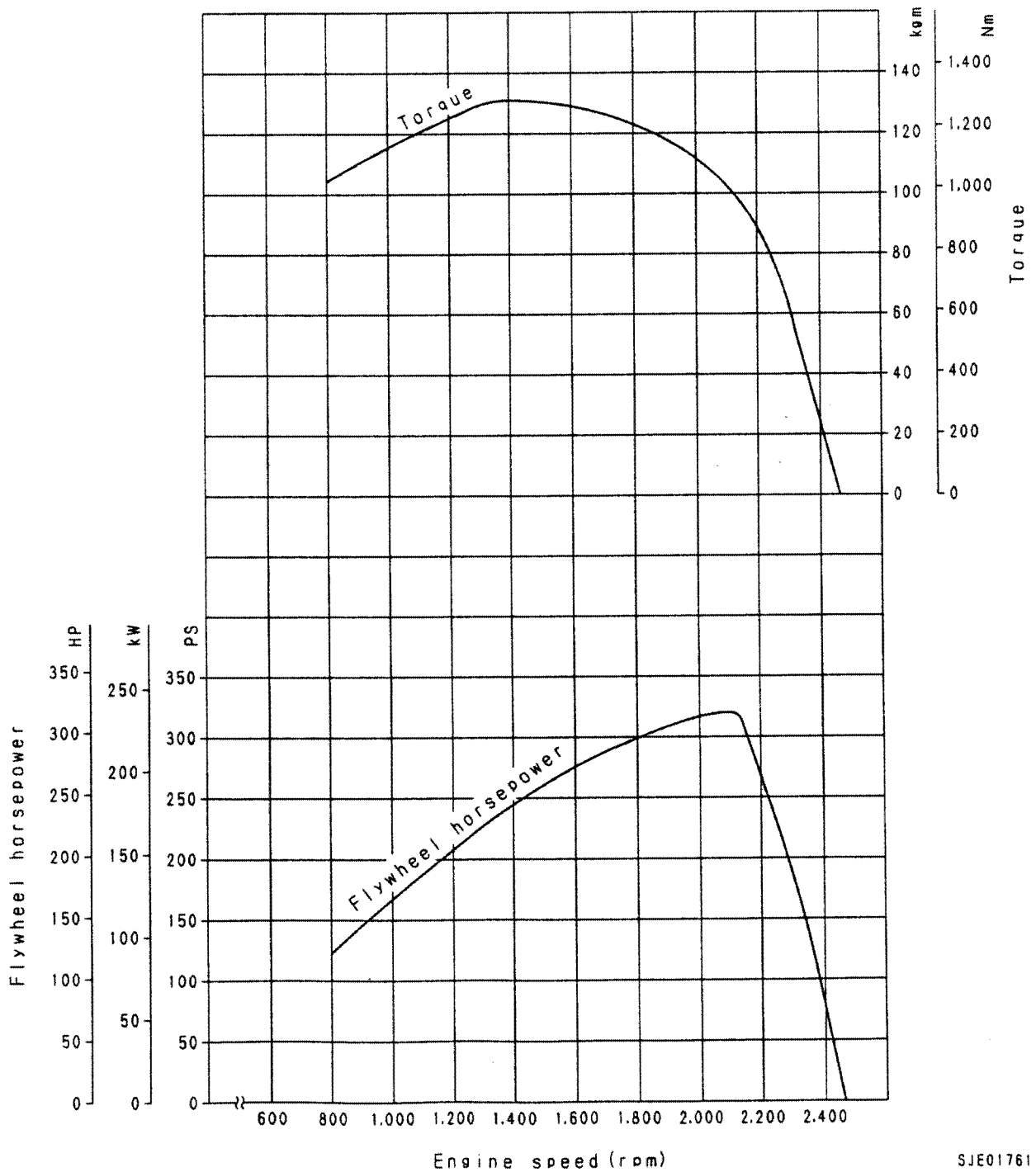
Maximum torque: 1,210 Nm {123 kgm}/1,400 rpm (Net)



615002

**SA6D125-2 (HD255-5)**

Flywheel horsepower: 235 kW {315 HP}/2,100 rpm (Net)  
Maximum torque: 1,280 Nm {131 kgm}/1,400 rpm (Net)

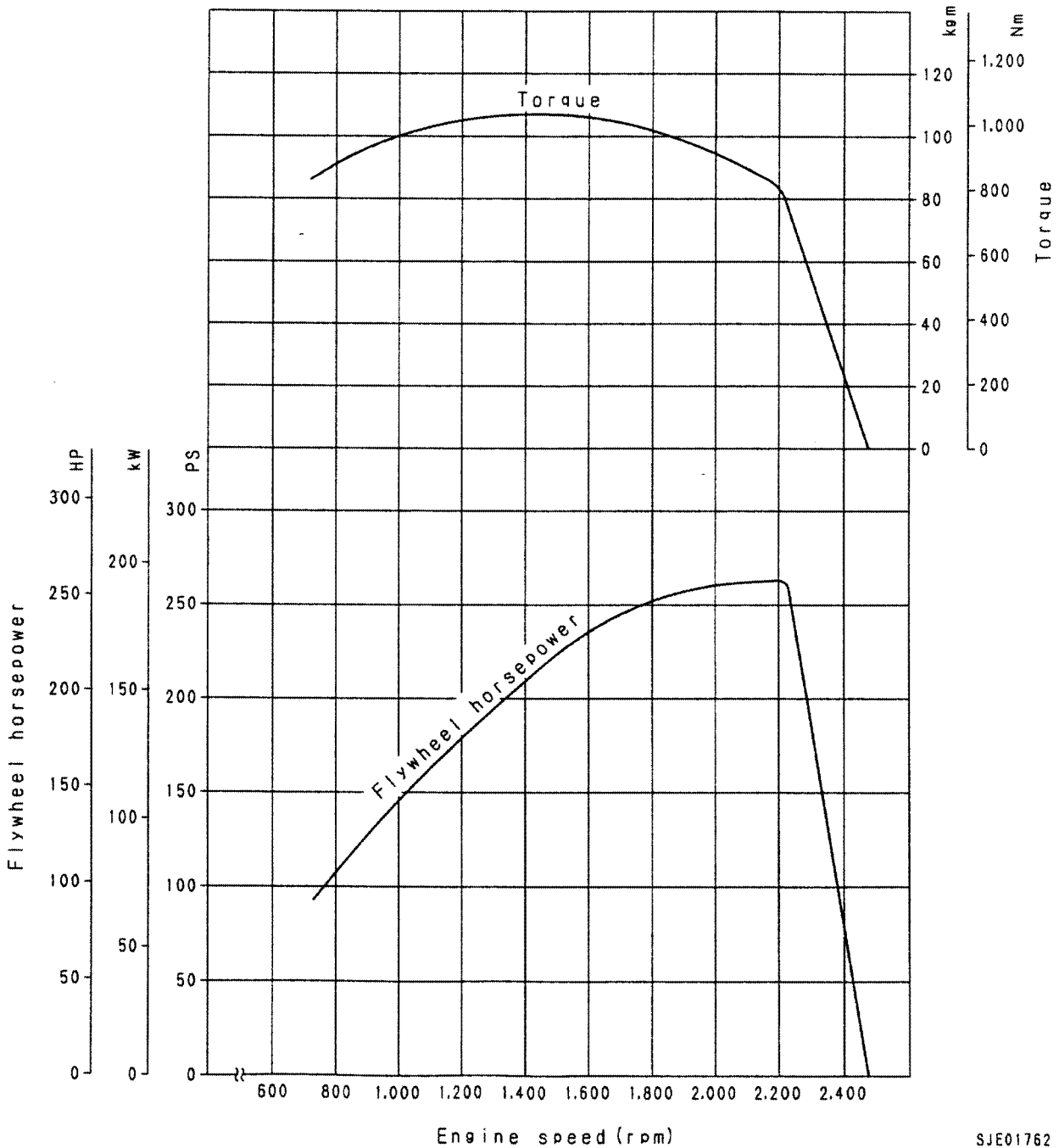


615002

SJE01761

**SA6D125-2 [WA470-3, WA450-3 (USA)]**

Flywheel horsepower: 194 kW {260 HP}/2,200 rpm  
Maximum torque: 1,049 Nm {107 kgm}/1,400 rpm  
Minimum fuel consumption ratio: 198 g•kWh {148 g/HPH}

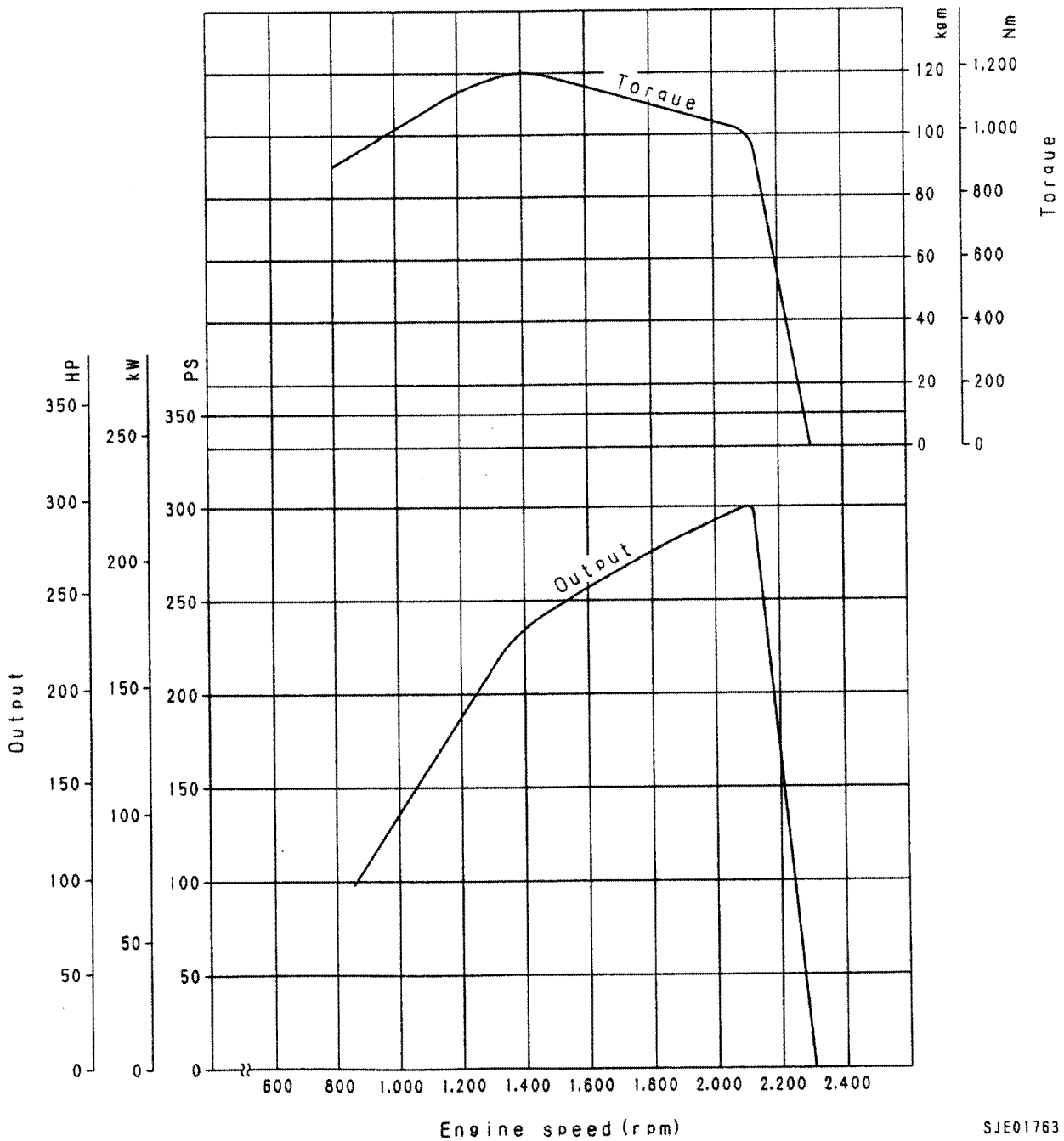


615002

SJE01762

**SA6D125-2 (FD430-2)**

Flywheel horsepower: 221kW (296 HP)/2,100 rpm (Net)  
Maximum torque: 1,180 Nm (120 kgm)/1,400 rpm (Net)

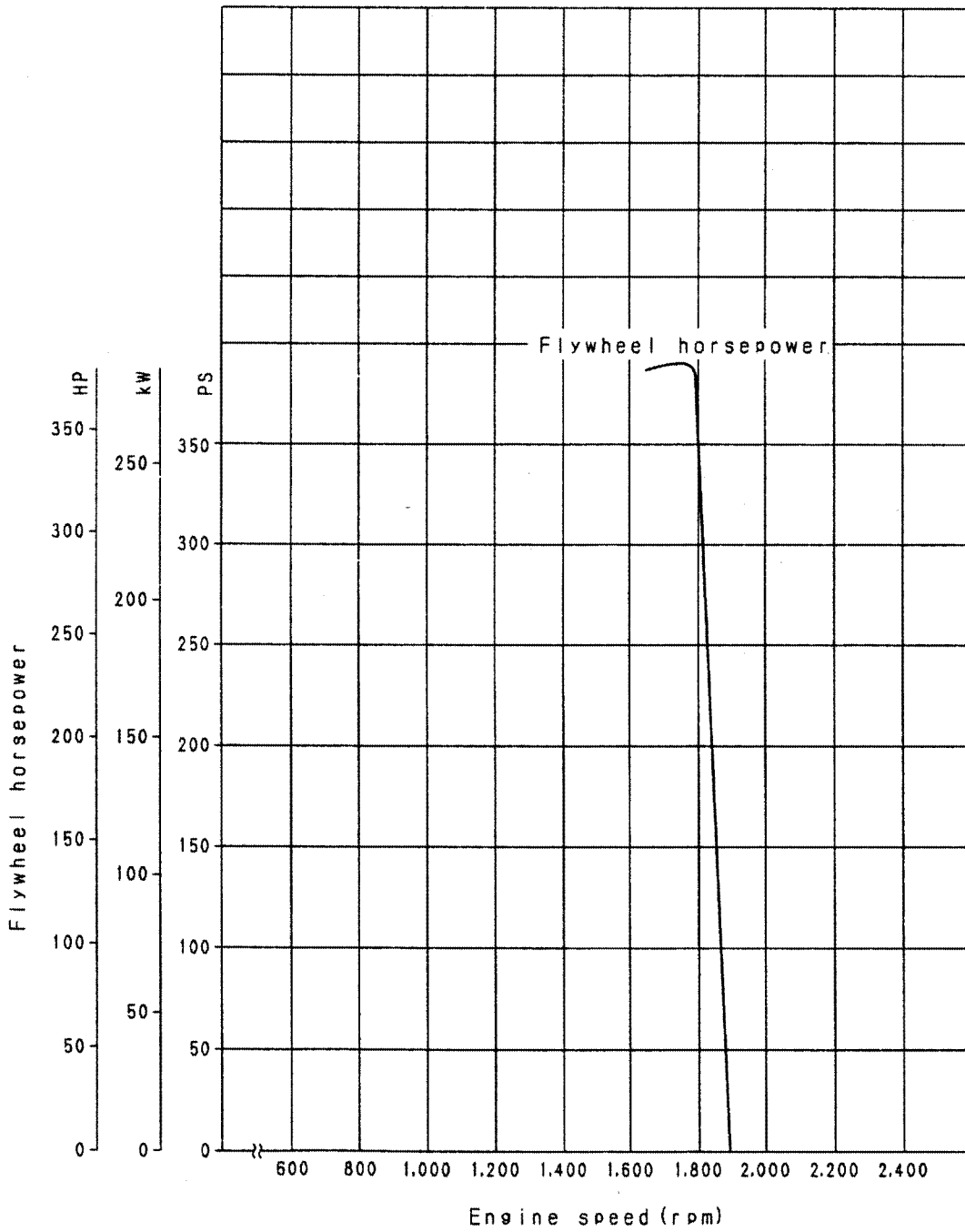


615002

SJE01763

**SA6D125-2 (For MQ generator DCA-300SSK)**

Flywheel horsepower: 257 kW (345 HP)/1,800 rpm (Net, 60 Hz)



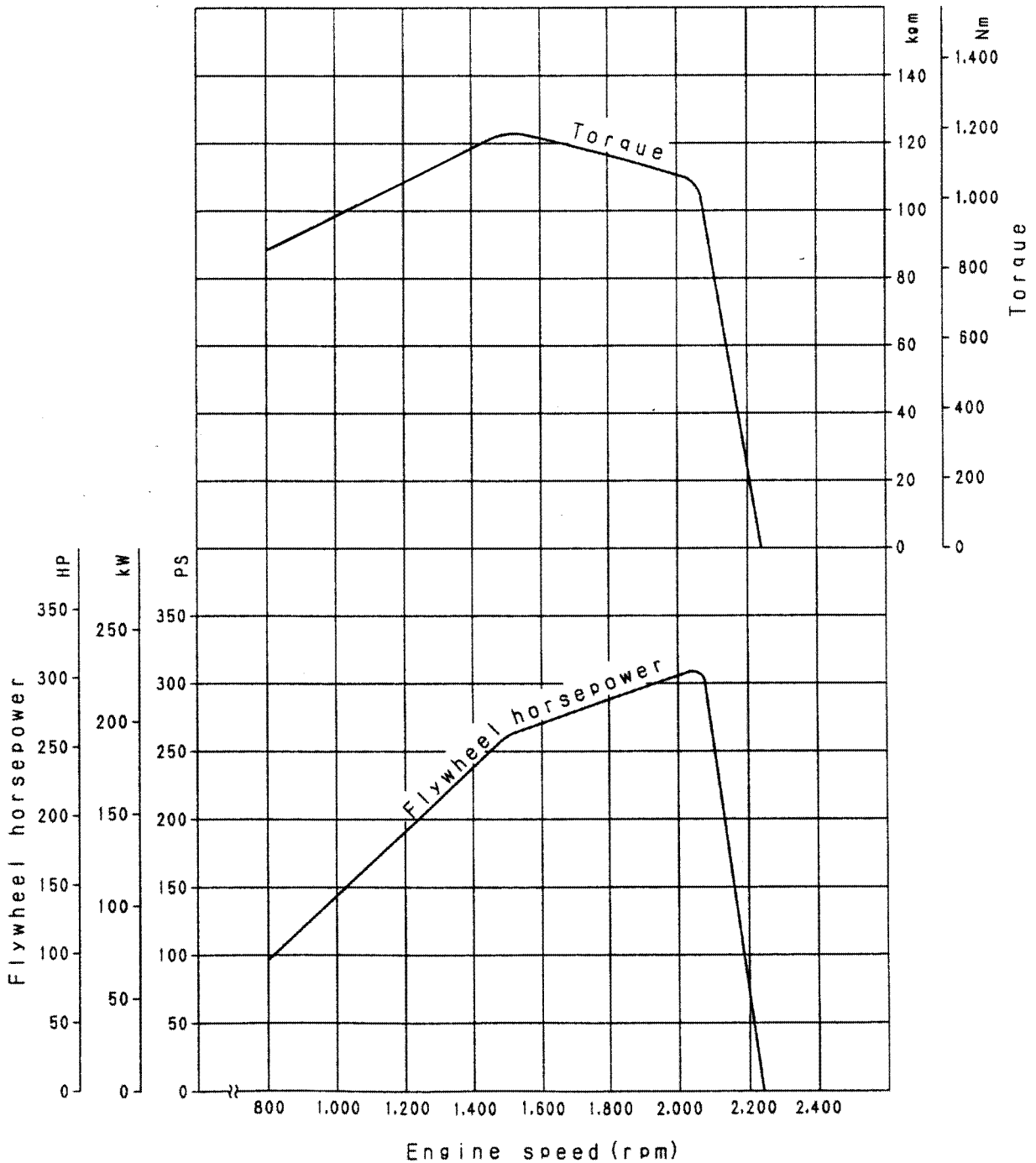
615002

SWE01369

**SAA6D125-2[PC400AC-6] [PC400-6 • PC450-6 (USA), BR550JG-1]**

Flywheel horsepower: 228 kW (306 HP)/2,050 rpm

Maximum torque: 1,210 Nm (123.7 kgm)/1,500 rpm



615002

SXE01513

## WEIGHT TABLE

This weight table is guided for use when transporting or handling components.

Unit: kg

No.	Item	Components		6D125-2	S6D125-2	SA6D125-2	SAA6D125-2
1	Turbocharger	SCHWITZER	S3A	-	16.0	16.0	16.0
		GARRET	TO4E	-	9.0		
				-			
2	Cylinder head assembly	Cylinder head, valve, rocker arm, valve spring		16.0 x 6	16.0 x 6	16.0 x 6	16.0 x 6
3	Cylinder block assembly	Cylinder block, main bearing cap, cylinder liner		264	264	264	264
4	Front cover			21.3	21.3	21.3	21.3
5	Engine oil pan			21.4 (★1)	21.4 (★3)	17.9 (★5)	17.9 (★6)
				15.0 (★2)	20.0 (★4)	20.0 (HD255-5)	25.0 (★7)
					20.0 (D75S-5)		
					18.0 (LW250-5)		
6	Flywheel assembly	Flywheel, ring gear		55.4 (★1)	55.4 (★3)	49.0 (★5)	55.4 (★6)
				48.0 (★2)	59.4 (★4)	33.0 (HD255-5)	123 (★7)
					65.0 (D75S-5)		
					28.0 (LW250-5)		
7	Flywheel housing			54.0 (★1)	54.0 (★3)	54.0 (★5)	51.3 (★6)
				28.0 (★2)	54.0 (★4)	47.0 (HD255-5)	58.0 (★7)
					75.0 (D75S-5)		
					38.0 (LW250-5)		
8	Crankshaft assembly	Crankshaft, crankshaft gear		104	104	104	104
9	Camshaft assembly	Camshaft, camshaft gear, thrust plate		16.0	16.0	16.0	16.0
10	Piston, connecting rod assembly	Piston, piston ring, piston pin, connecting rod		6.8 x 6	6.8 x 6 (AI) 7.6 x 6 (FCD)	7.6 x 6	7.6 x 6
11	Oil pump			5.0	5.0	5.0	5.0
12	Fuel injection pump	DENSO	NB (EP9)	20.0	20.0	-	-
		ZEXEL	PE-P (PS3S)		27.0	27.0	27.0
			PE-P (PS3000)	-	27.0	-	-
13	Water pump			9.5	9.5	9.5	9.5
14	Aftercooler assembly			-	-	27.0	18.0 (★6) 30.0 (★7)

★1 ..... D65E-12, D70LE-12

★2 ..... D53A, P-17, D58E, P-1

★3 ..... D65EX, P, PX-12, D60P-12, D85E-SS-2, D85E-SS-2A

★4 ..... D85A-21, 21S, D85A-21B, D85A-21D, D85E-21, D85P-21, D85C-21

★5 ..... PC400-6 (CUSTOM), PC400LC-6 (CUSTOM), PC450-6 (MIGHTY), PC450LC-6 (MIGHTY), BR500JG-1

★6 ..... PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1

★7 ..... Generator

---

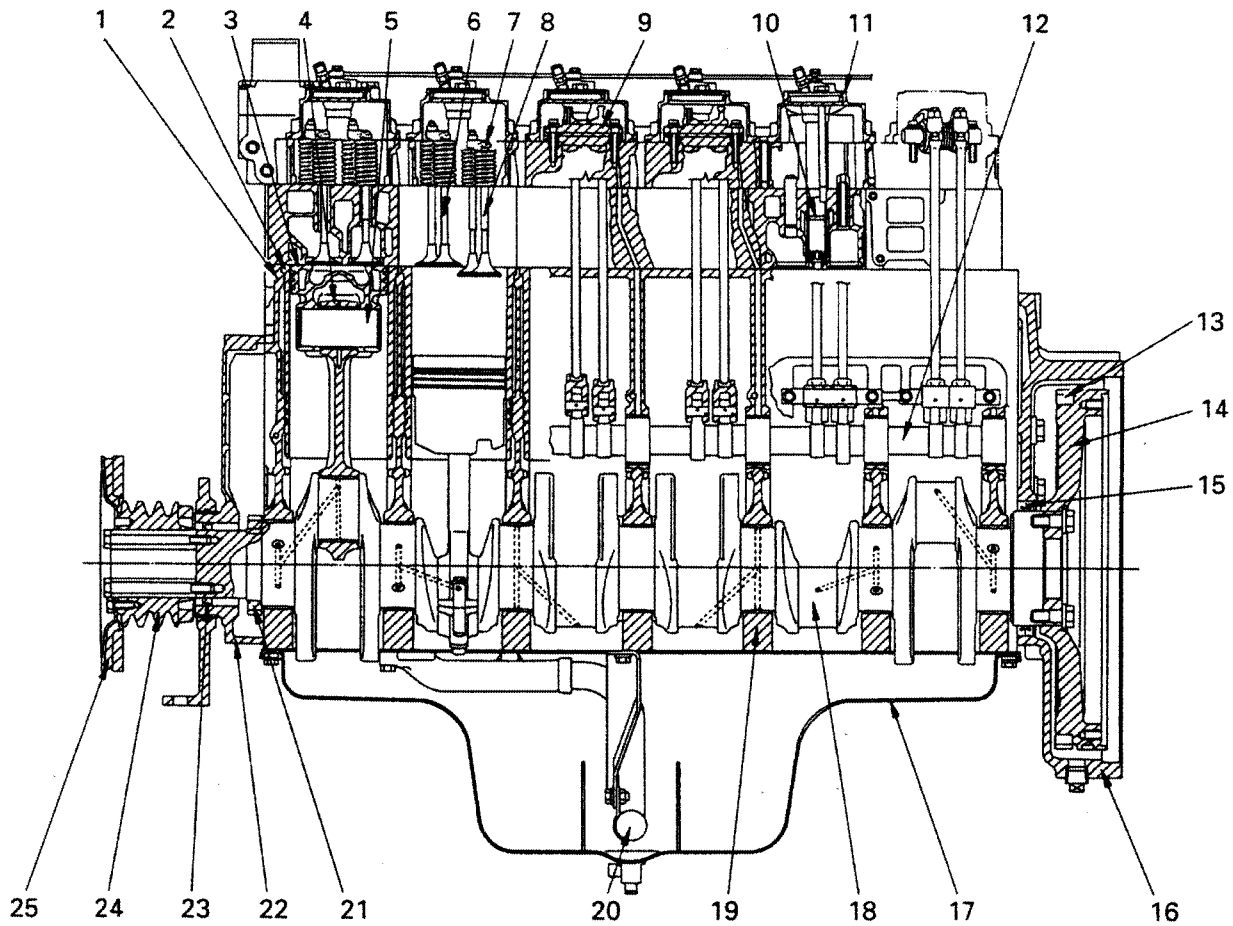
# 11 STRUCTURE AND FUNCTION

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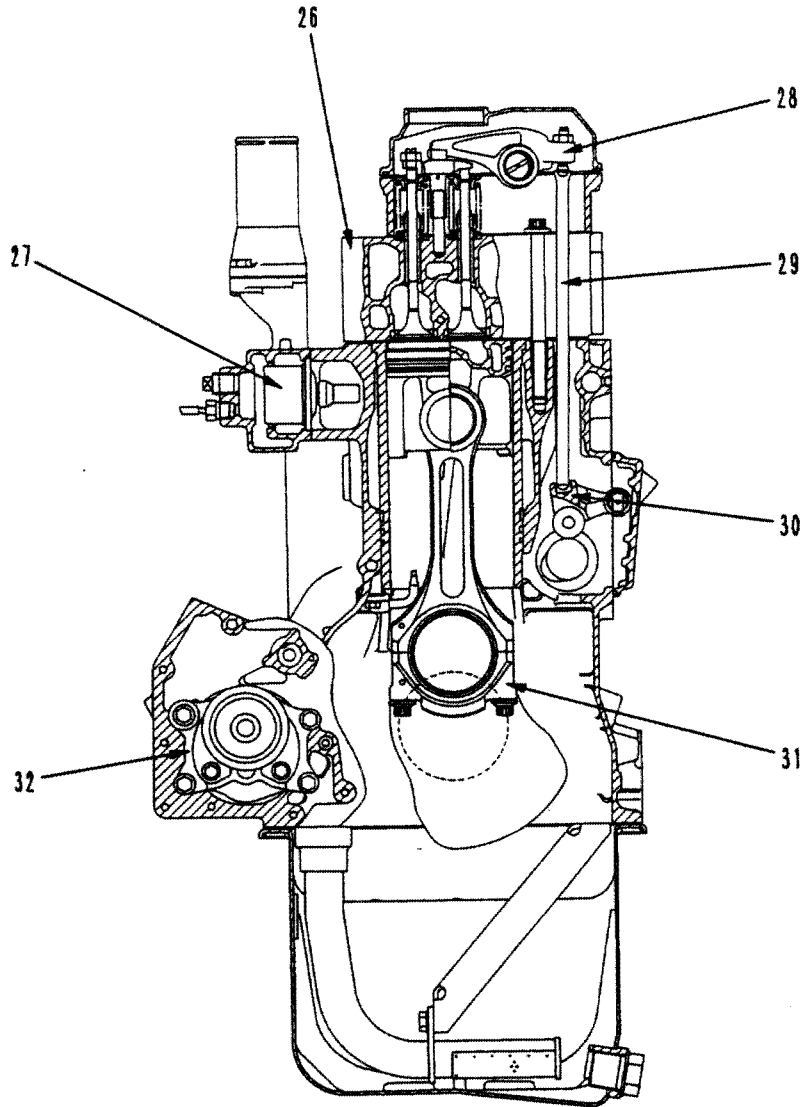
# GENERAL STRUCTURE



615002

SEE00041

- |                     |                           |                       |
|---------------------|---------------------------|-----------------------|
| 1. Cylinder block   | 10. Fuel injection nozzle | 19. Main bearing cap  |
| 2. Cylinder liner   | 11. Cylinder head cover   | 20. Oil strainer      |
| 3. Piston           | 12. Camshaft              | 21. Crankshaft gear   |
| 4. Connecting rod   | 13. Ring gear             | 22. Front cover       |
| 5. Piston pin       | 14. Flywheel              | 23. Front seal        |
| 6. Intake valve     | 15. Rear seal             | 24. Crankshaft pulley |
| 7. Crosshead        | 16. Flywheel housing      | 25. Vibration damper  |
| 8. Exhaust valve    | 17. Oil pan               |                       |
| 9. Rocker arm shaft | 18. Crankshaft            |                       |



615002

SWE01743

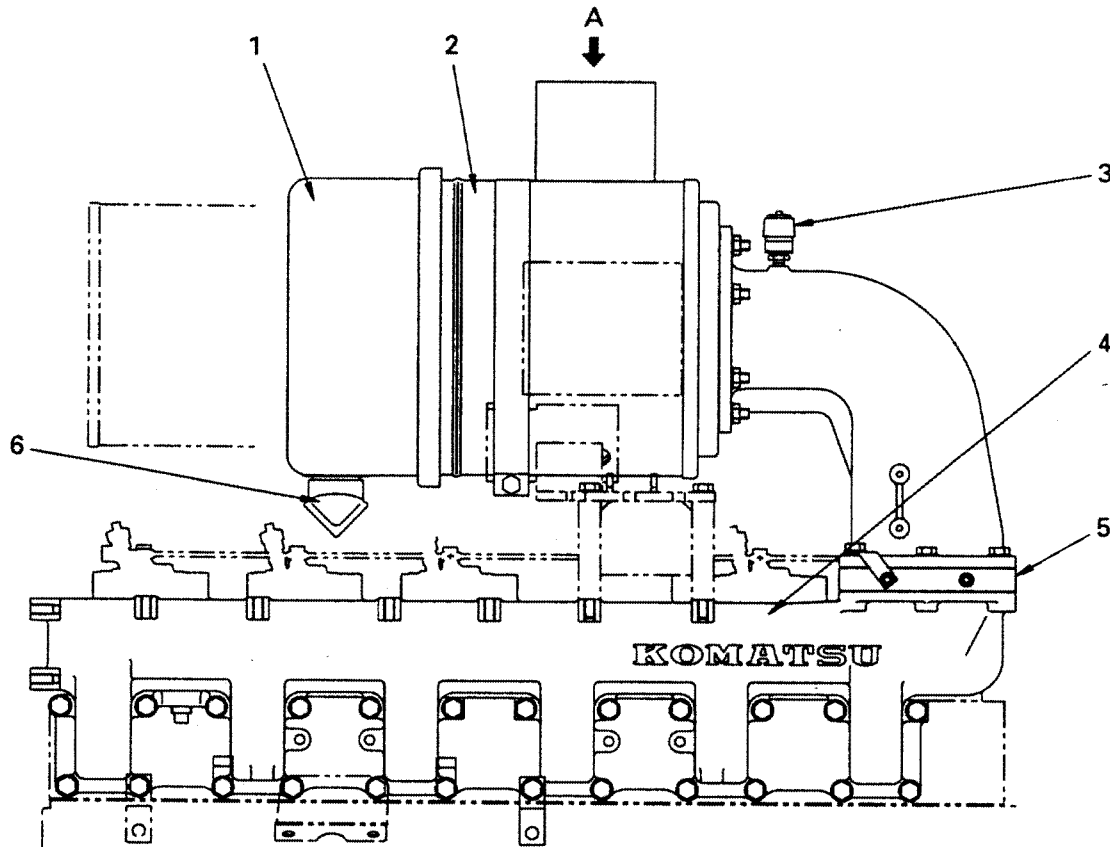
- 26. Cylinder head
- 27. Thermostat
- 28. Rocker arm
- 29. Push rod
- 30. Cam follower
- 31. Connecting rod cap
- 32. Oil pump

Engine: 6D125-2  
 S6D125-2 (with turbocharger)  
 SA6D125-2 (with turbocharger  
 and after-cooler)  
 SAA6D125-2 (with turbocharger and  
 air cooled after-cooler)

Type: In-line, 6-cylinders, water-cooled, direct  
 fuel injection, 4-cycle diesel engine

# INTAKE AND EXHAUST SYSTEM

6D125-2 (D60E-12, D65E-12)

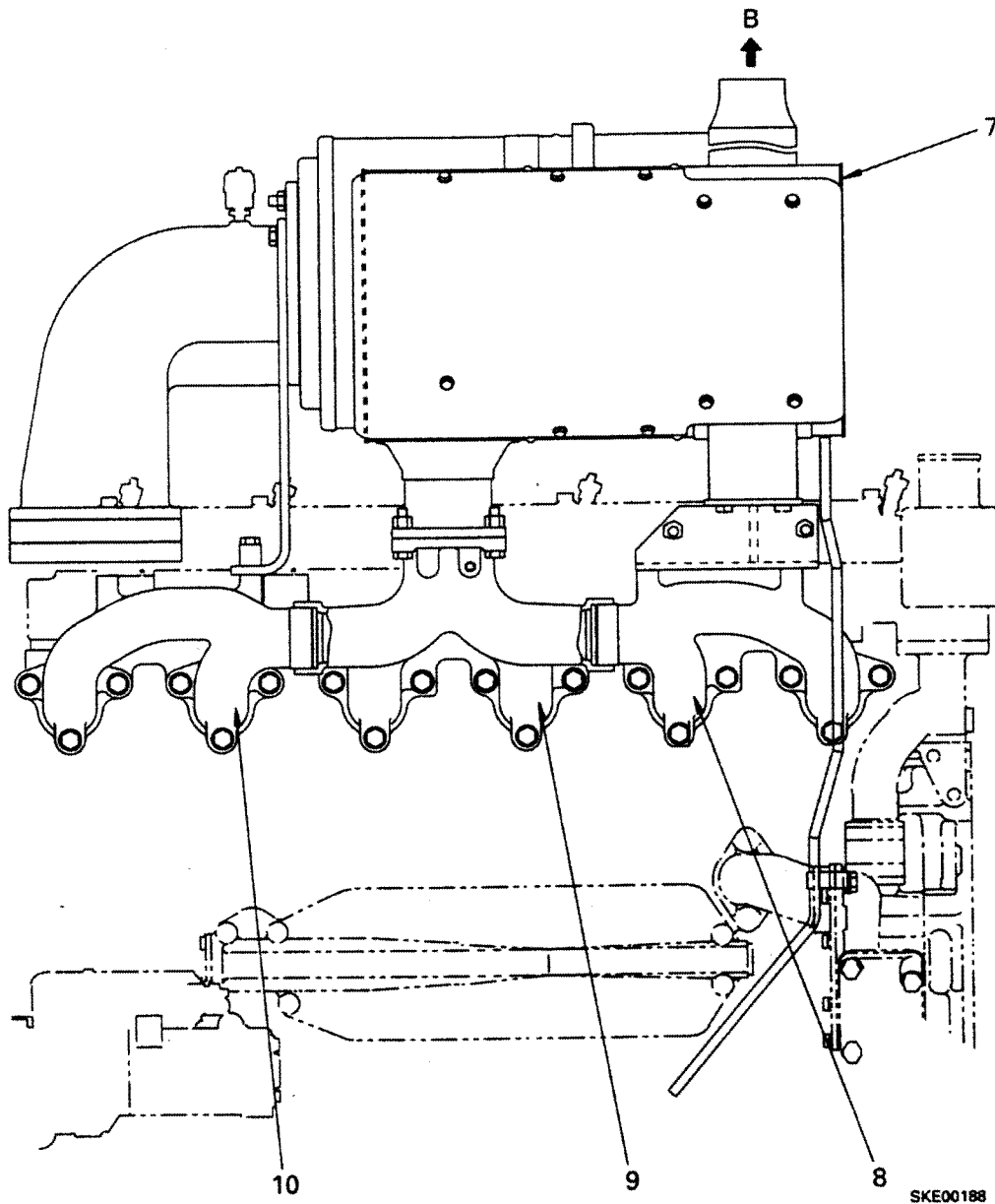


SKE00187

- 1. Air cleaner dust pan
- 2. Air cleaner body
- 3. Dust indicator
- 4. Intake manifold
- 5. Electrical intake air heater
- 6. Vacuator valve

A. Intake inlet port

615002

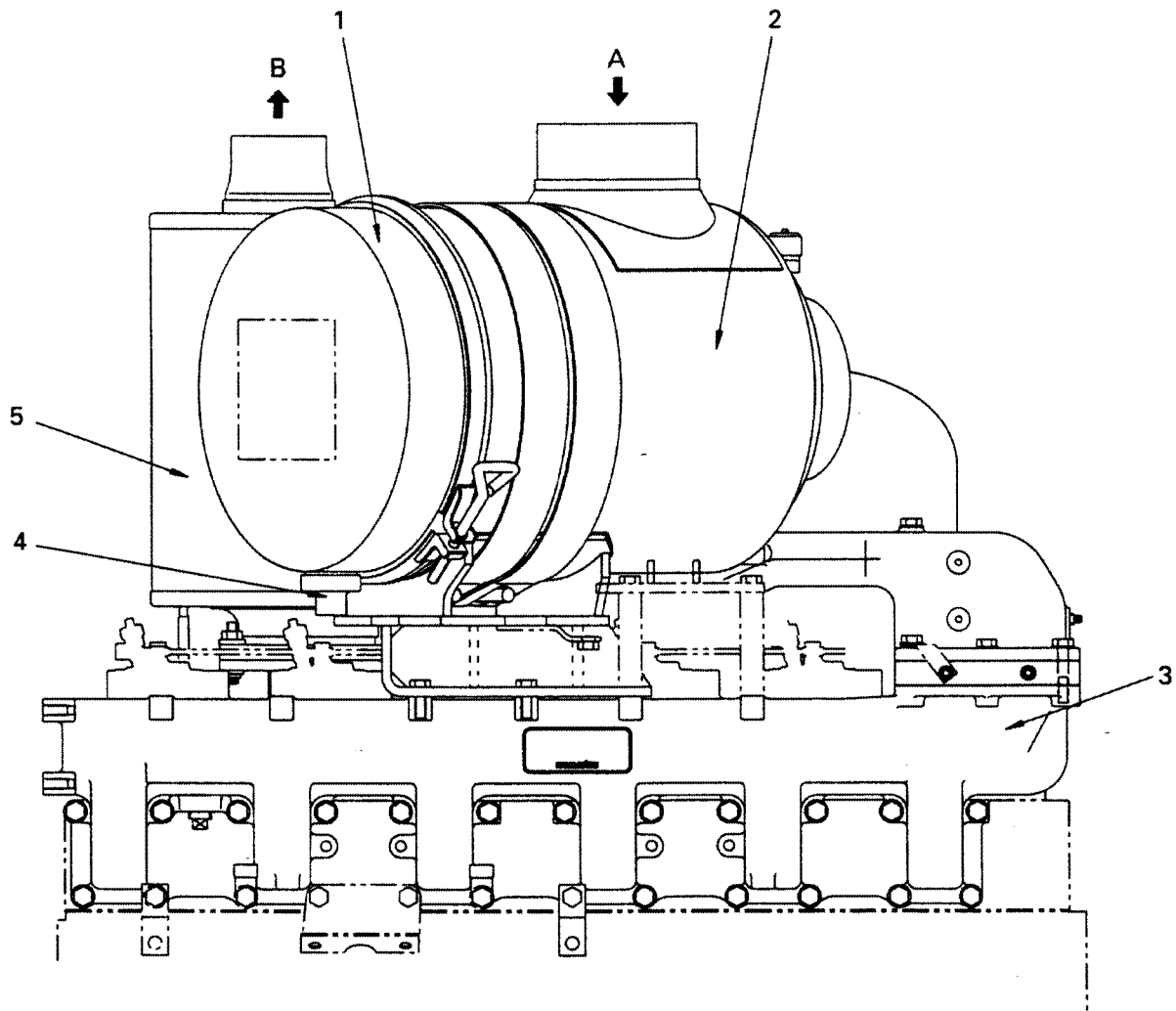


615002

- 7. Muffler
- 8. Exhaust manifold (front)
- 9. Exhaust manifold (center)
- 10. Exhaust manifold (rear)

B. Exhaust outlet port

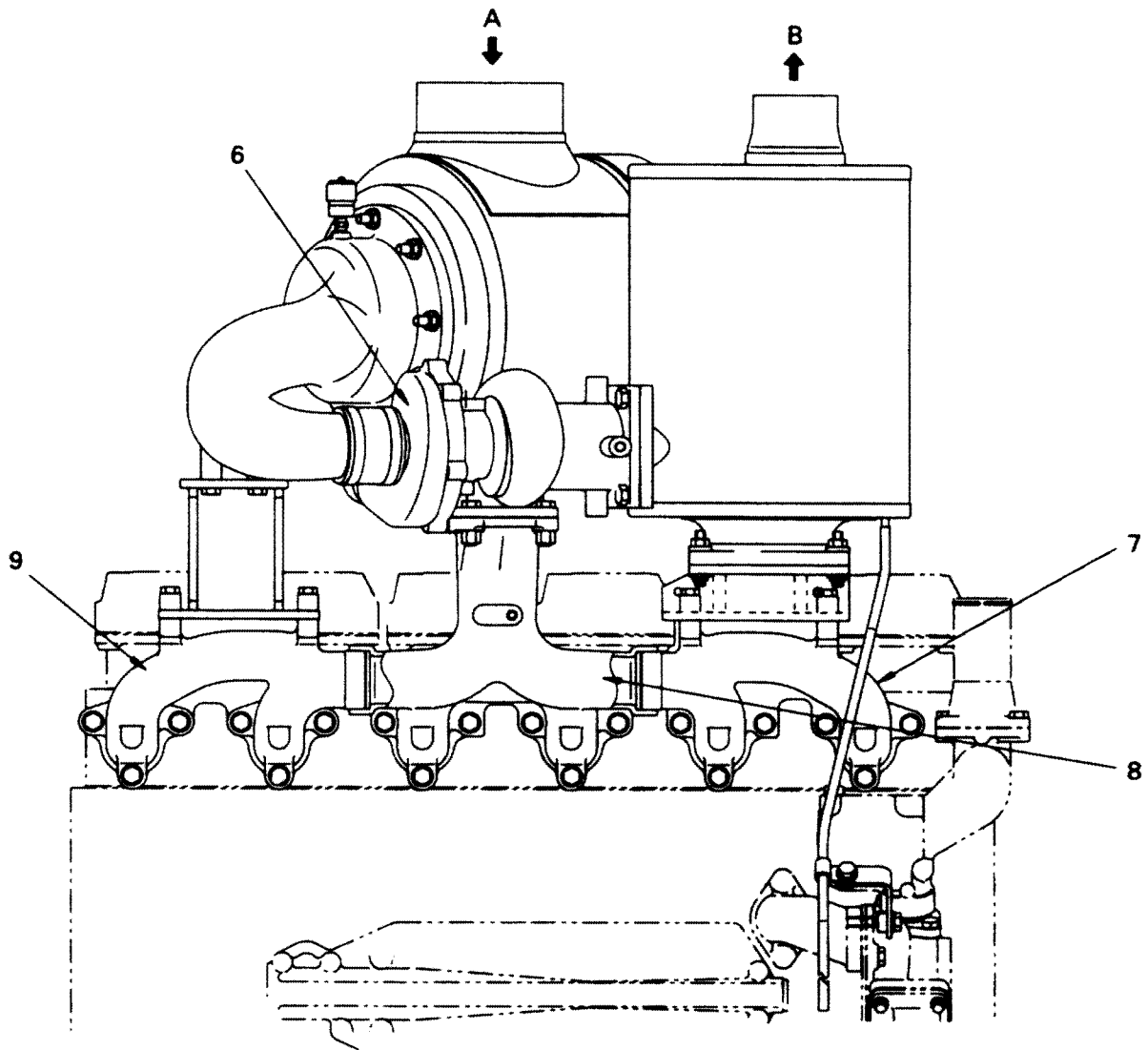
SA6D125-2 (D60P-12, D65EX-12, D65PX-12, D65P12, D85E-SS-2, D85E-SS-2A)



615002

SKE00189

- 1. Air cleaner dust pan
- 2. Air cleaner body
- 3. Intake manifold
- 4. Vacuator valve
- 5. Muffler

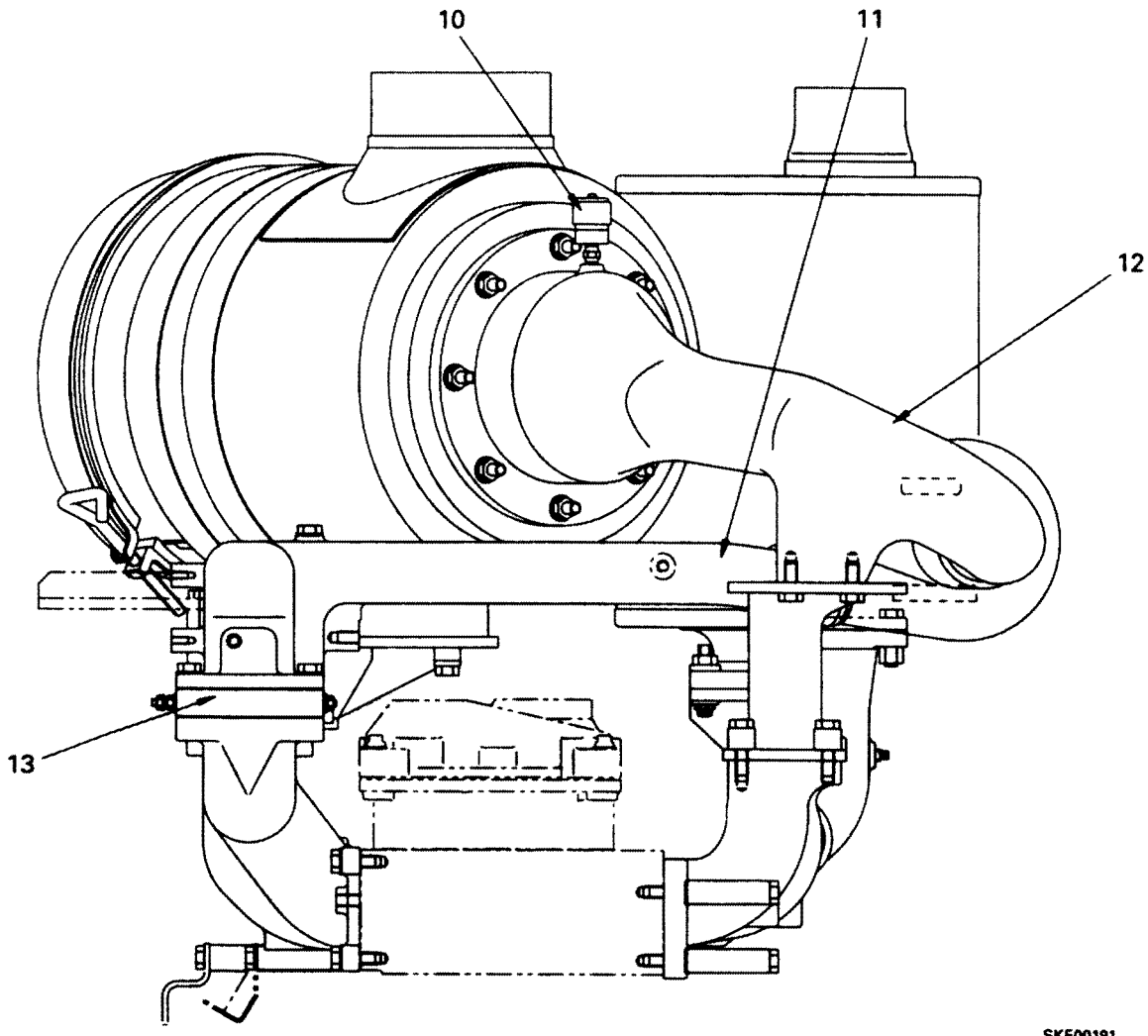


615002

SKE00130

- 6. Turbocharger
- 7. Exhaust manifold (front)
- 8. Exhaust manifold (center)
- 9. Exhaust manifold (rear)

- A. Intake inlet port
- B. Exhaust outlet port

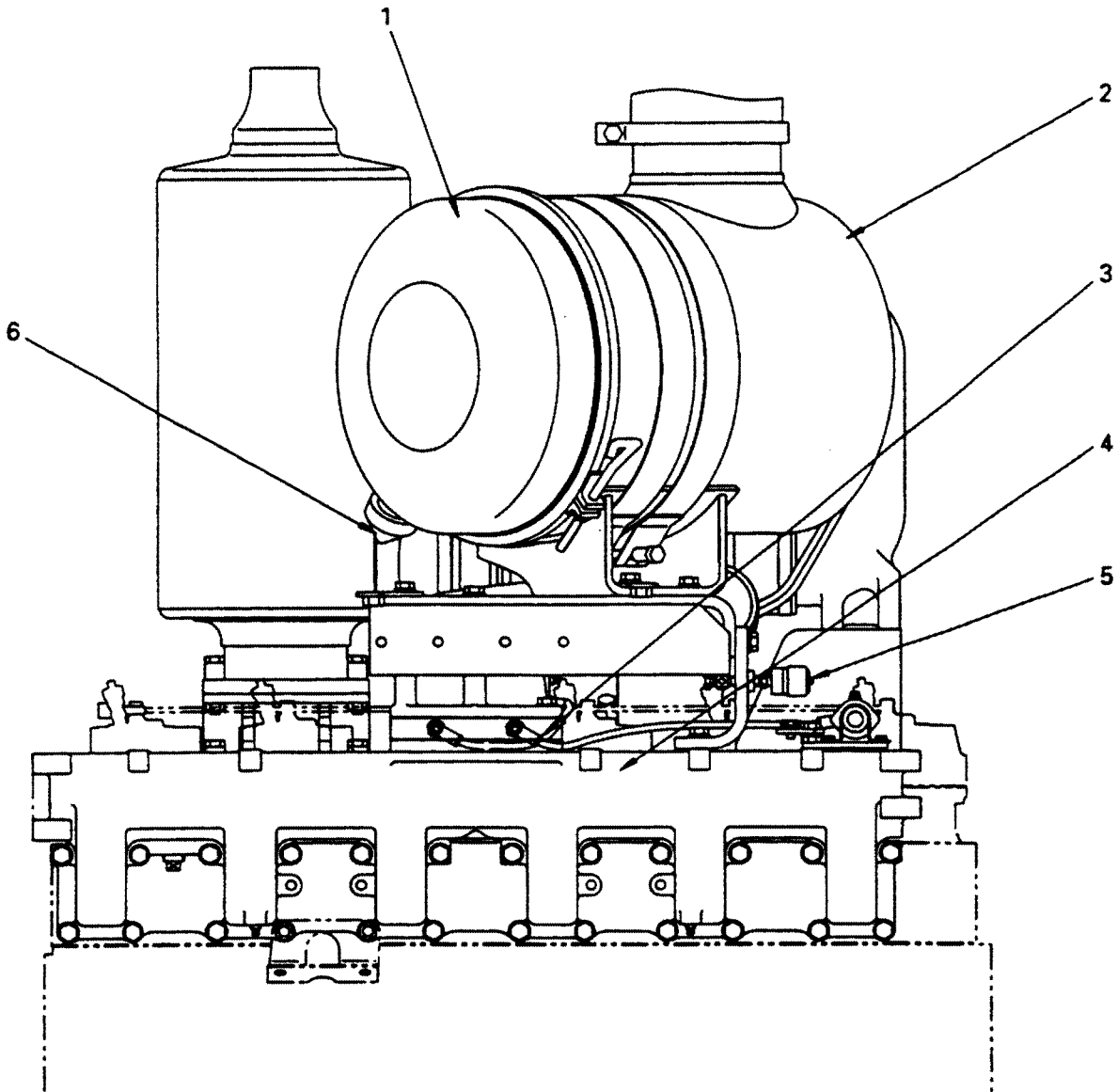


615002

SKE00191

- 10. Dust indicator
- 11. Crossover (blower outlet port-intake manifold)
- 12. Intake connector (air cleaner-blower inlet port)
- 13. Electrical intake air heater

S6D125-2 (D85A, P, E-21, D87E, P-2)

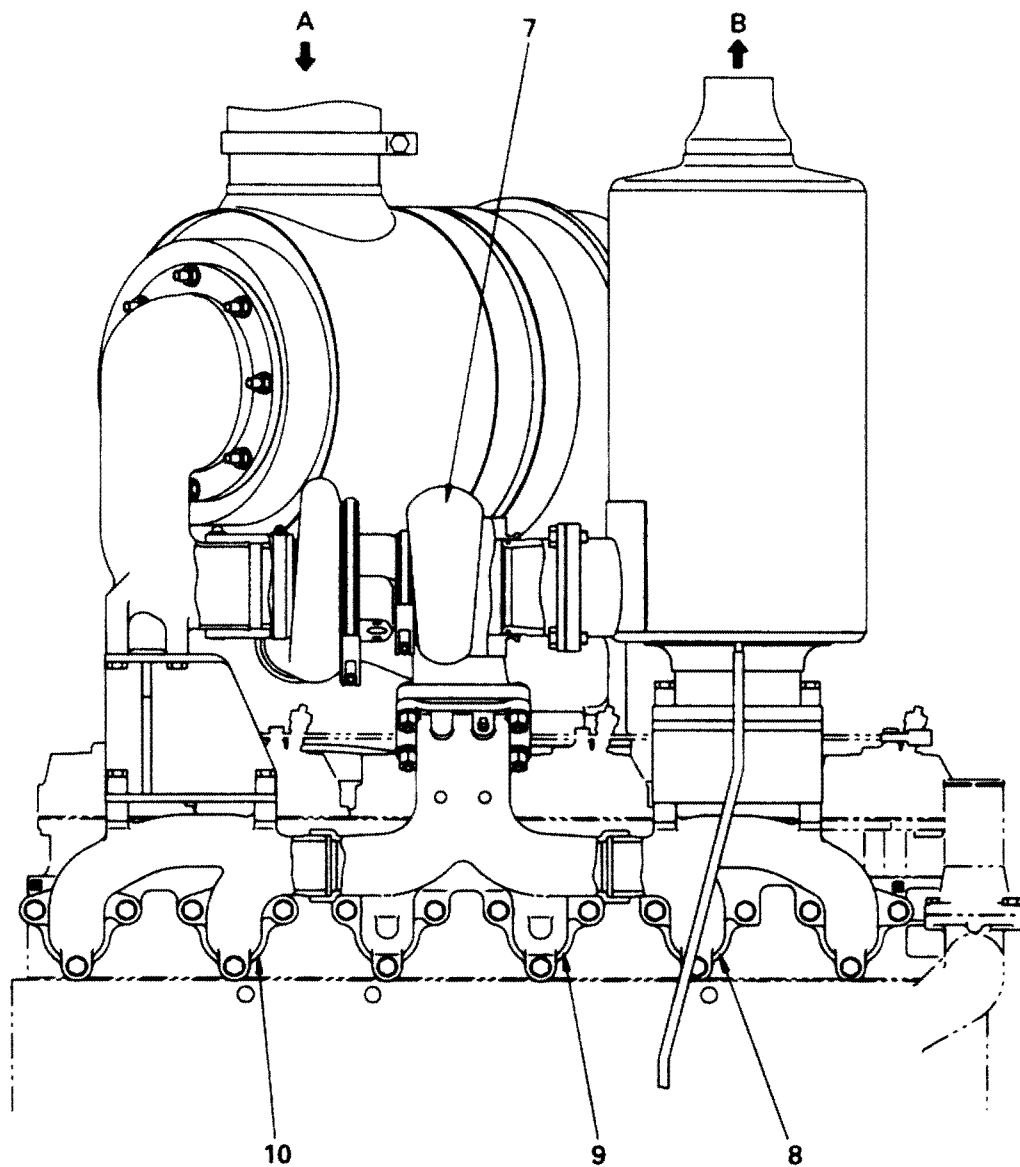


- 1. Air cleaner dust pan
- 2. Air cleaner body
- 3. Electrical intake air heater
- 4. Intake manifold
- 5. Dust indicator
- 6. Vacuator valve

SKE00192

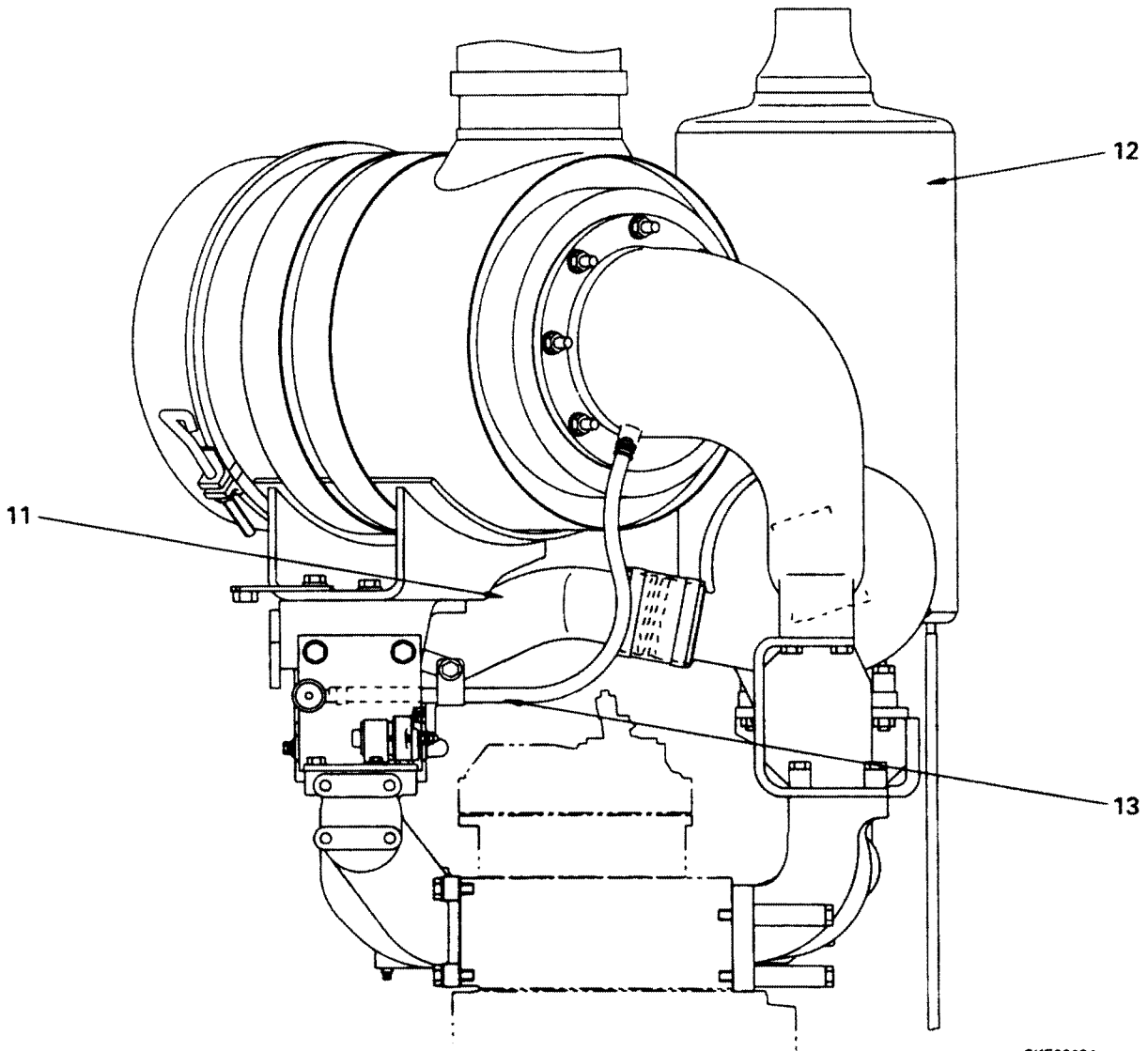
615002





- 7. Turbocharger
- 8. Exhaust manifold (front)
- 9. Exhaust manifold (center)
- 10. Exhaust manifold (rear)

- A. Intake inlet port
- B. Exhaust outlet port

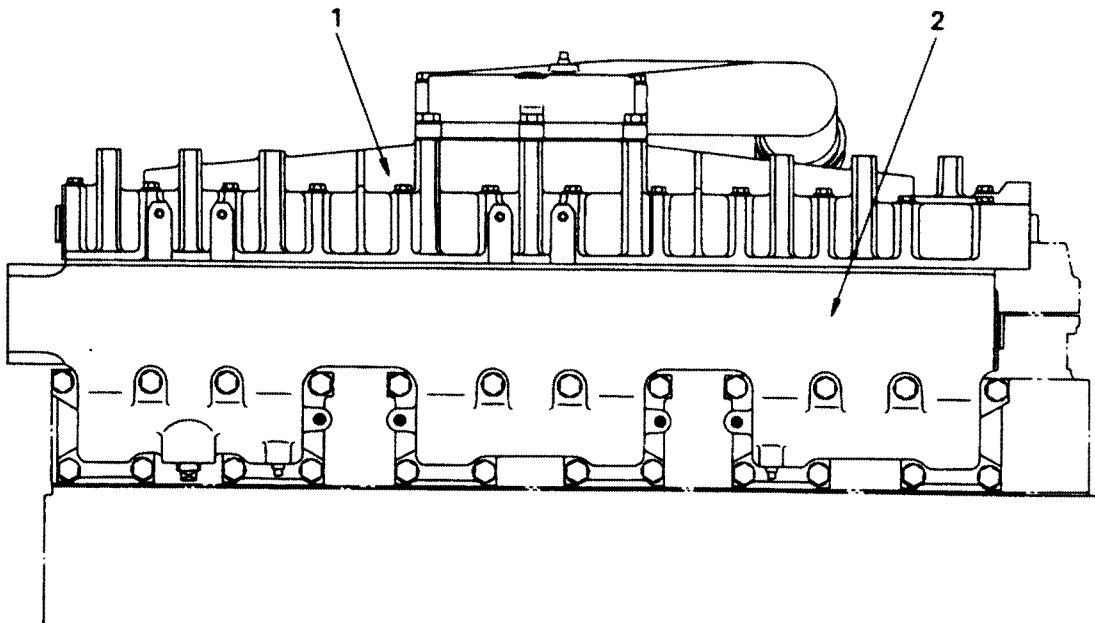


SKE00194

615002

- 11. Crossover (blower outlet port-intake manifold)
- 12. Muffler
- 13. Dust indicator hose

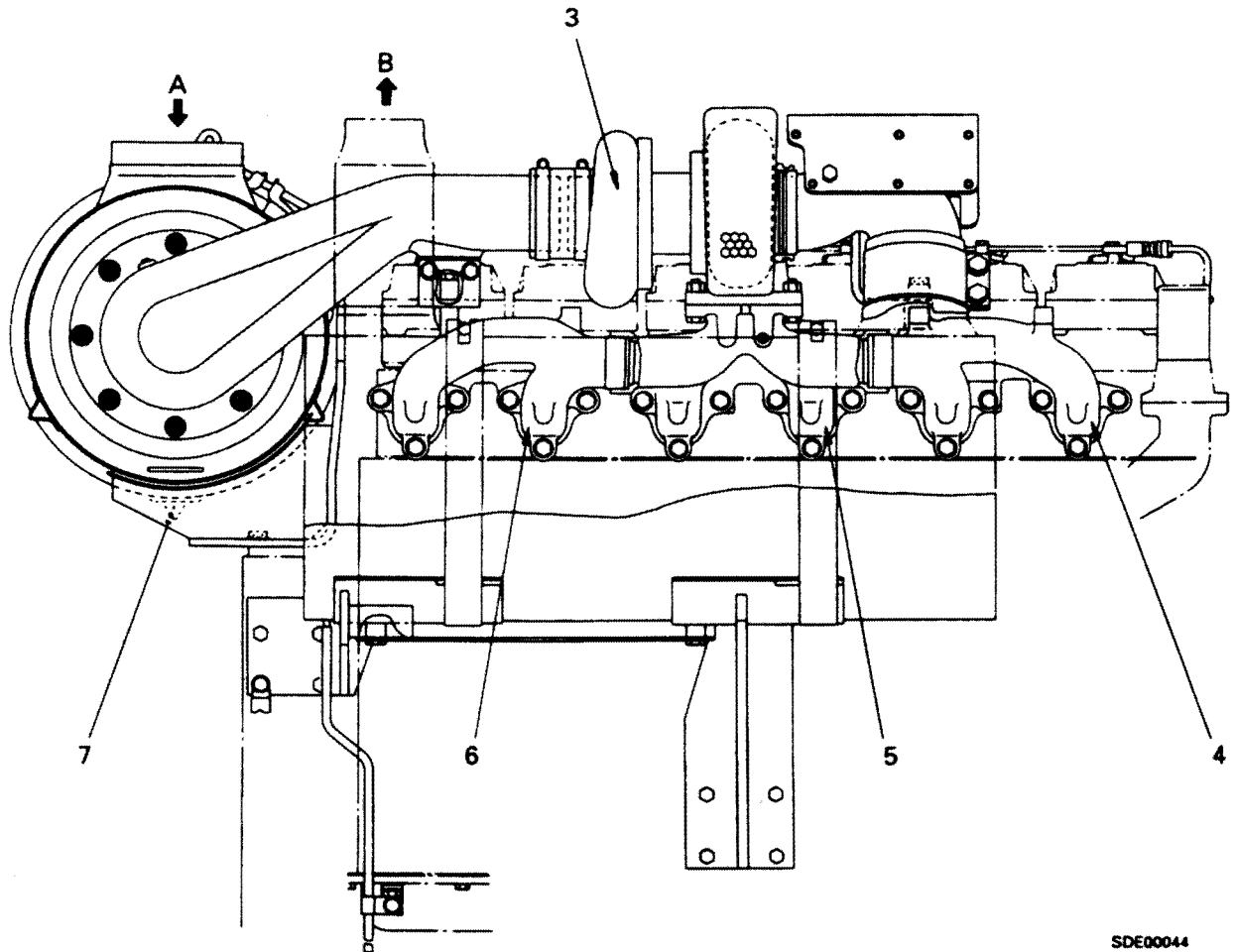
**SA6D125-2 (PC400-6)**



615002

SDE00043

- 1. Aftercooler cover
- 2. Aftercooler (intake manifold)

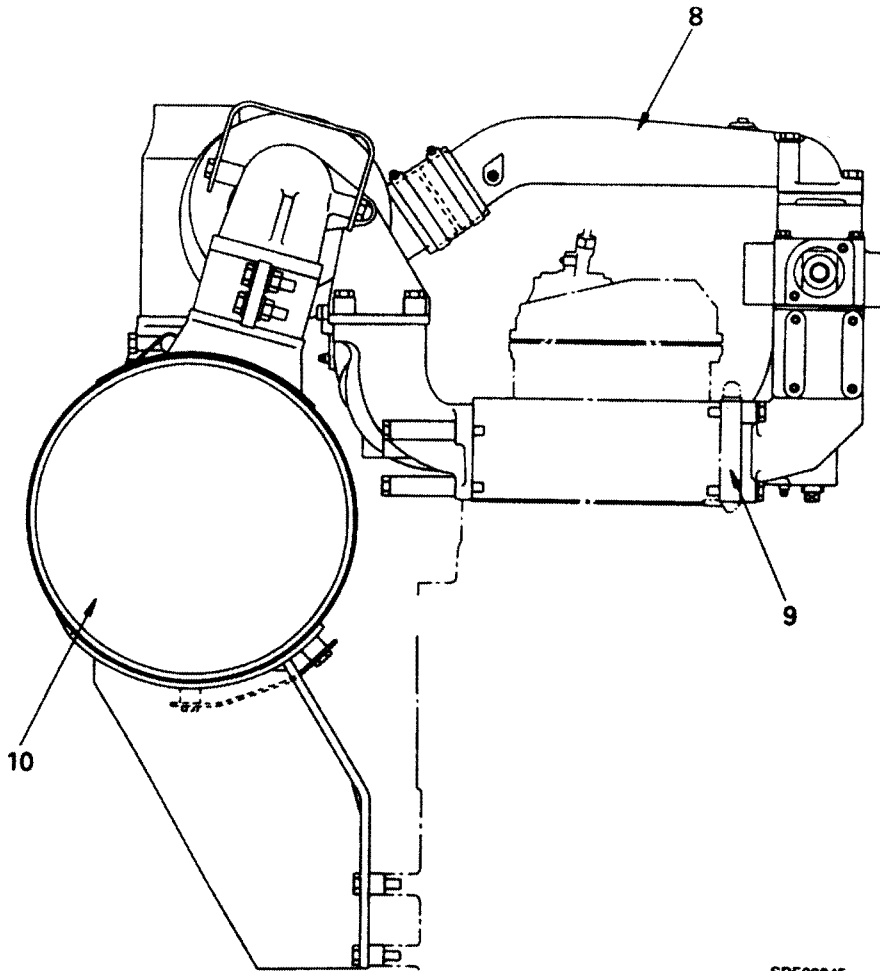


615002

SDE00044

- 3. Turbocharger
- 4. Exhaust manifold (rear)
- 5. Exhaust manifold (center)
- 6. Exhaust manifold (front)
- 7. Evacuator valve

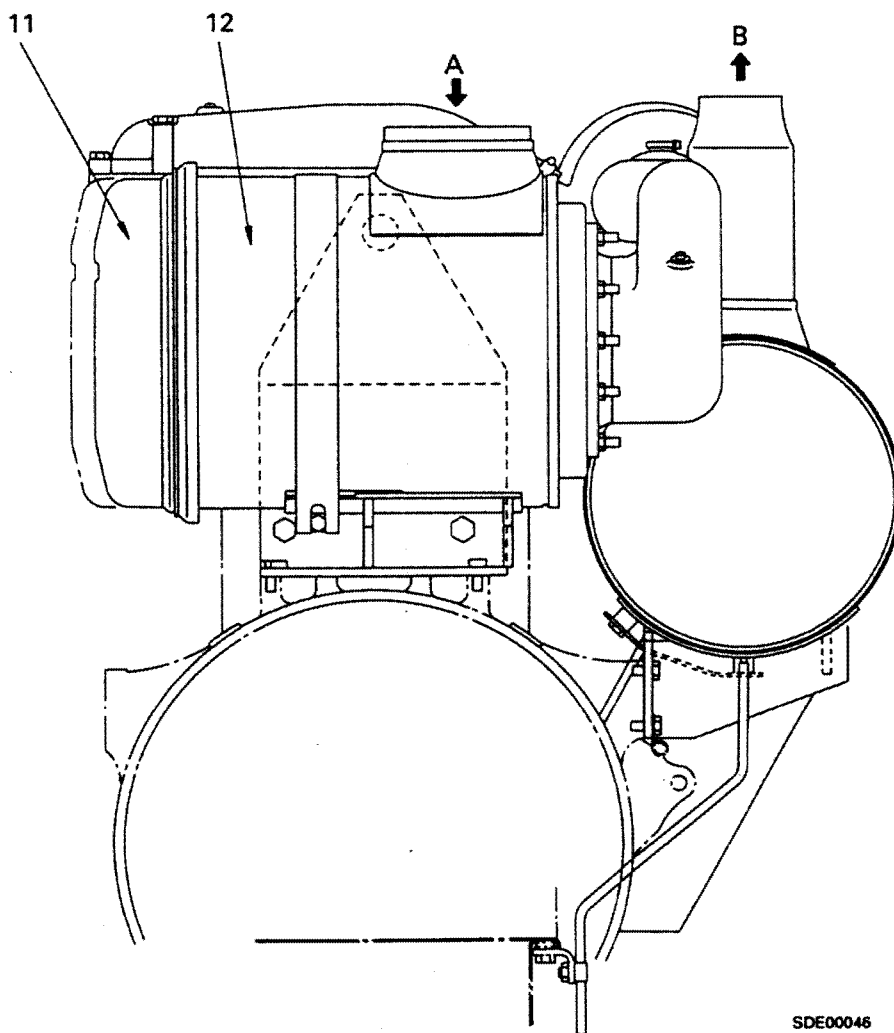
- A. Air intake
- B. Gas exhaust



615002

SDE00045

- 8. Crossover (blower outlet port - aftercooler)
- 9. Electrical intake air heater
- 10. Muffler

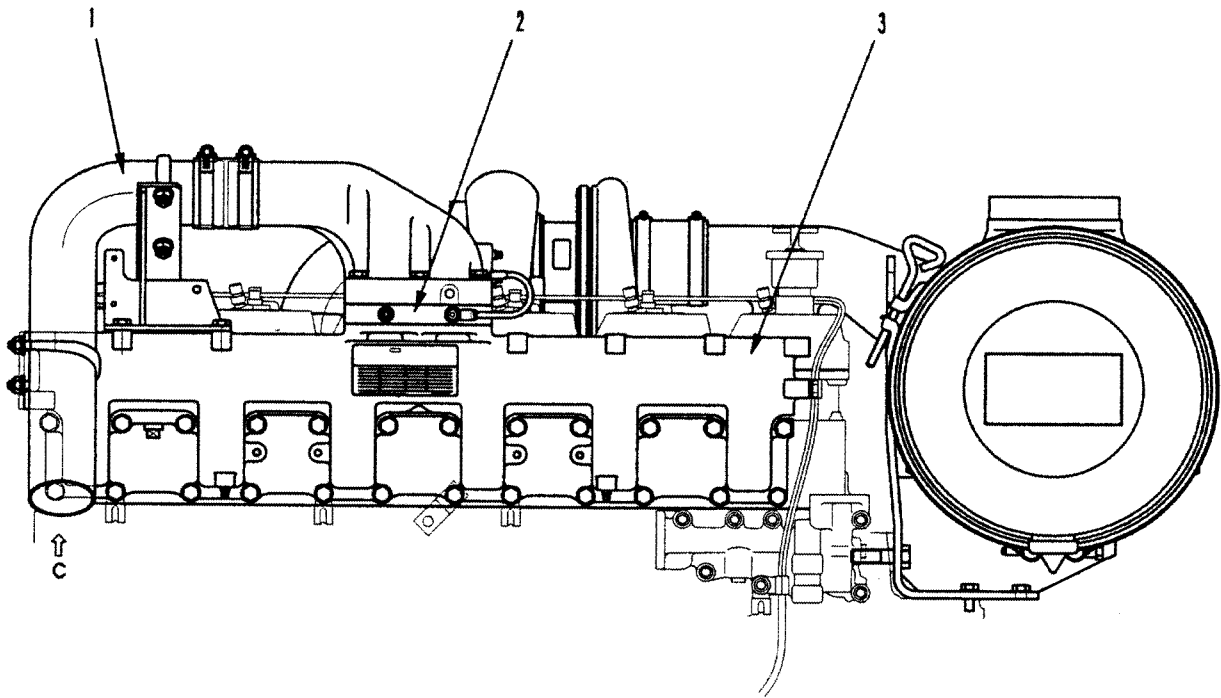


615002

SDE00046

- 11. Air cleaner cover
- 12. Air cleaner body
- A. Air intake
- B. Gas exhaust

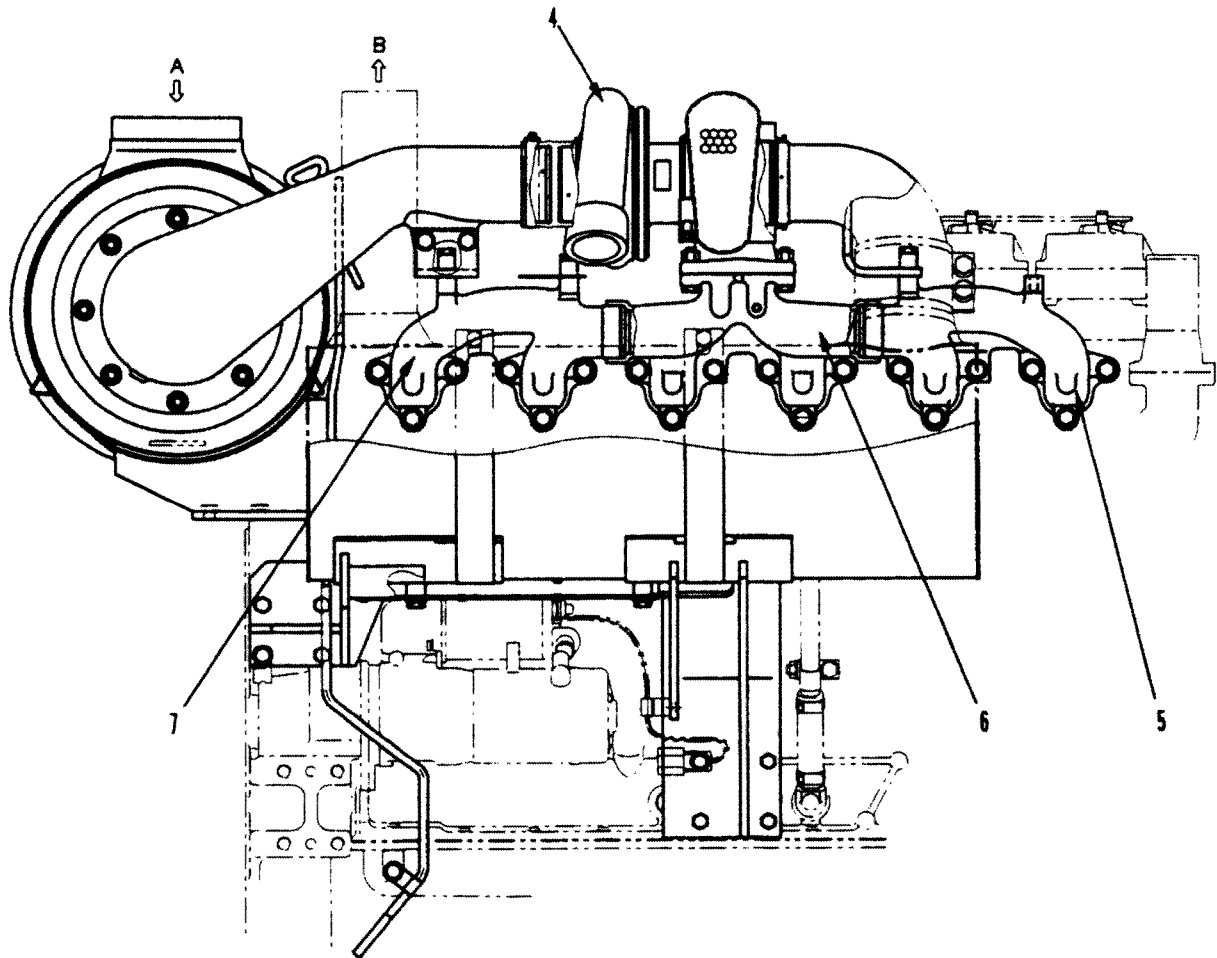
SAA6D125-2 [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]



SXE01514

- 1. Air connector
- 2. Electrical intake air heater
- 3. Intake manifold

C. To intake manifold

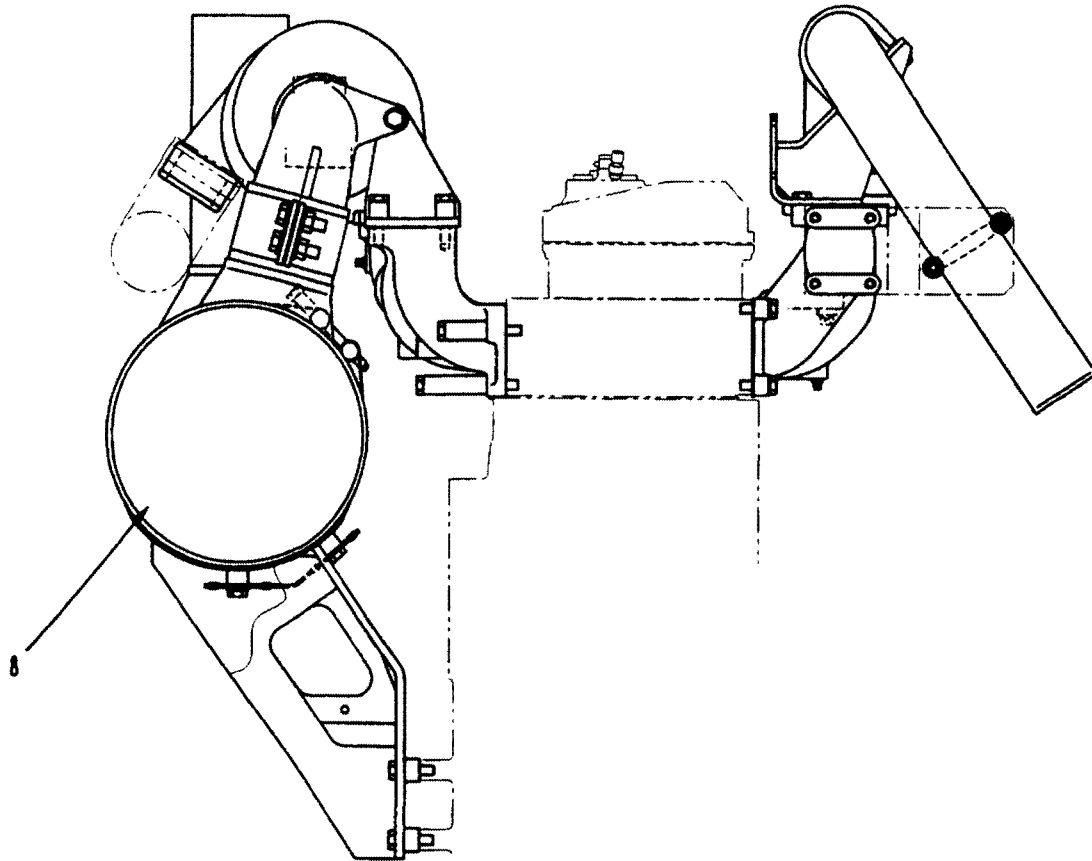


SXE01515

- 4. Turbocharger
- 5. Exhaust manifold (front)
- 6. Exhaust manifold (center)
- 7. Exhaust manifold (rear)

- A. Air intake
- B. Gas exhaust

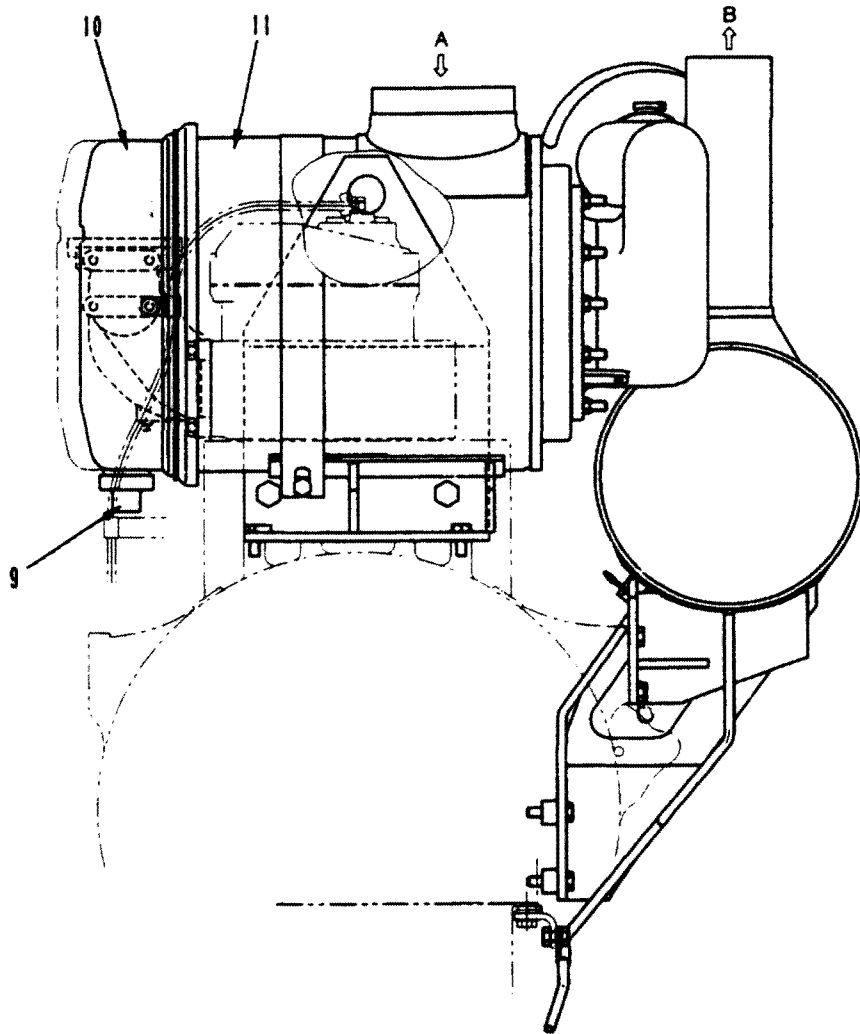




615002

SXE01516

8. Muffler



615002

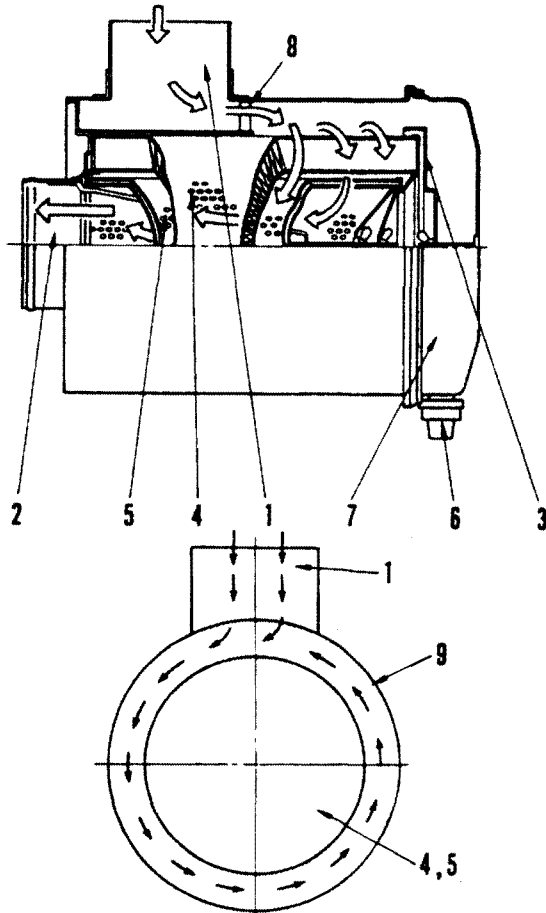
SXE01517

- 9. Evacuator valve
- 10. Air cleaner cover
- 11. Air cleaner body

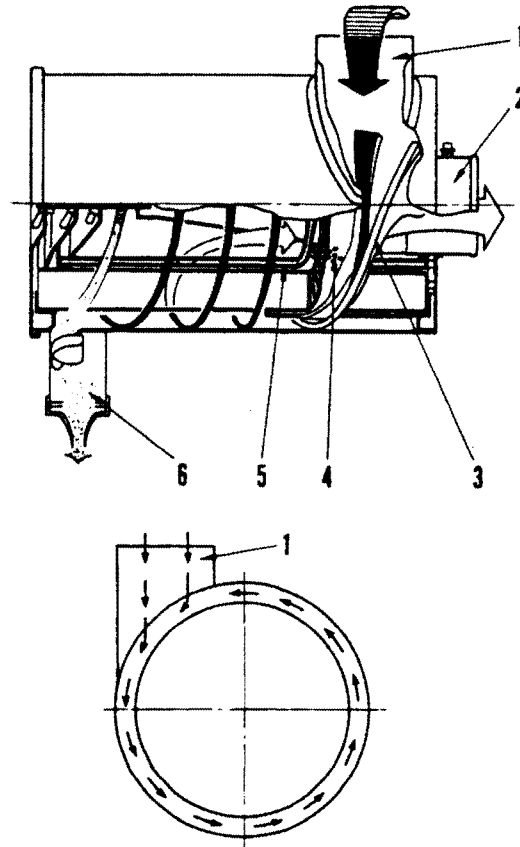
- A. Air intake
- B. Gas exhaust

# AIR CLEANER

Current type (FHG)



FTG type



- |               |                    |                            |
|---------------|--------------------|----------------------------|
| 1. Inlet      | 4. Primary element | 7. Dust pan                |
| 2. Outlet     | 5. Safety element  | 8. Diffusion vane (sleeve) |
| 3. Guide vane | 6. Vacuator        | 9. Body                    |

### ADVANTAGES

- The diameter of the element is the same but the outside diameter of the body is smaller. The inlet is placed in the direction of connection, so ample centrifugal force can be obtained from a simple spiral guide vane, without using a diffusion vane.
- There is no dust pan of diffusion vane, so the structure is simple.

### STRUCTURE

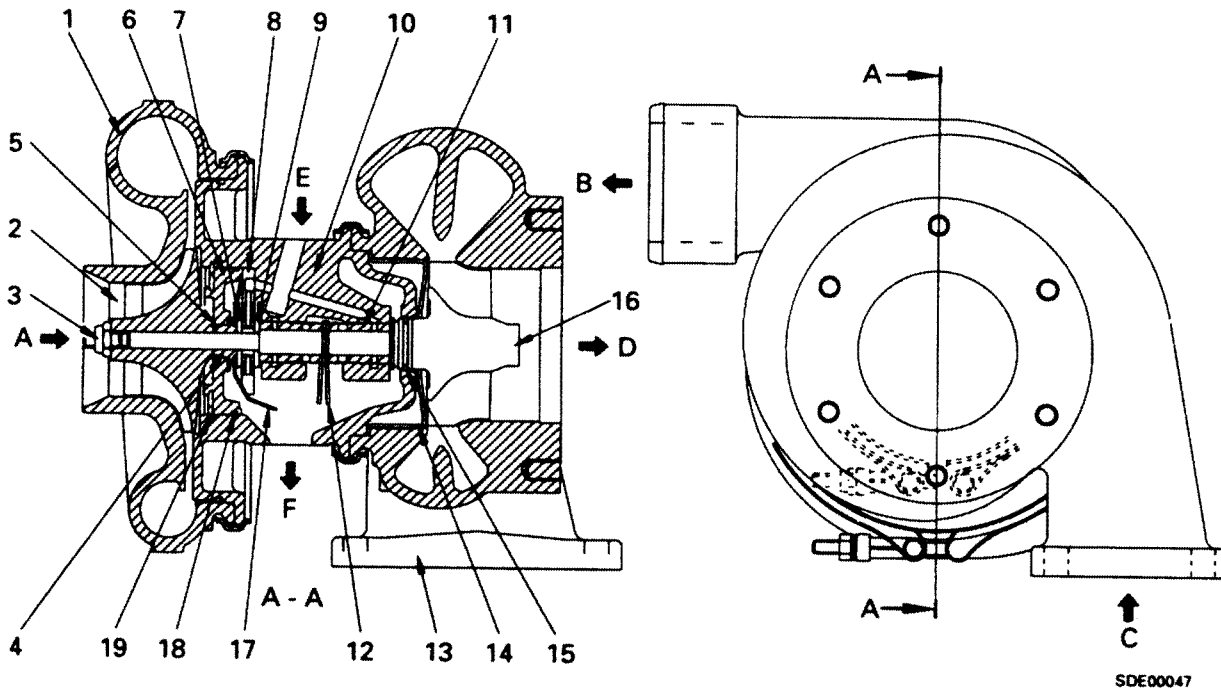
- Air containing dust is sucked in from inlet (1) at a tangent, and the dust is separated by the centrifugal force of guide vane (3). More than 99.9% of the remaining dust is removed by primary element (4), and the cleaned air then passes through safety element (5) and outlet (2), and is sucked into the engine.  
The dust and moisture that is separated by the guide vane (3) rotates around the inside wall of body (9), and goes inside vacuator (6), where is discharged automatically to the outside.

6137F009-10

615002

# TURBOCHARGER

## SCHWITZER S3A



- |                     |                          |
|---------------------|--------------------------|
| 1. Blower housing   | 15. Piston ring          |
| 2. Blower impeller  | 16. Turbine impeller     |
| 3. Locknut          | 17. Oil deflector        |
| 4. Flinger          | 18. O-ring               |
| 5. Piston ring      | 19. Snap ring            |
| 6. Insert           |                          |
| 7. Thrust ring      | A. Air intake            |
| 8. Thrust bearing   | B. Air output            |
| 9. Spacer           | C. Exhaust (inlet port)  |
| 10. Center housing  | D. Exhaust (outlet port) |
| 11. Journal bearing | E. Oil (inlet port)      |
| 12. Clip            | F. Oil (outlet port)     |
| 13. Turbine housing |                          |
| 14. Back plate      |                          |

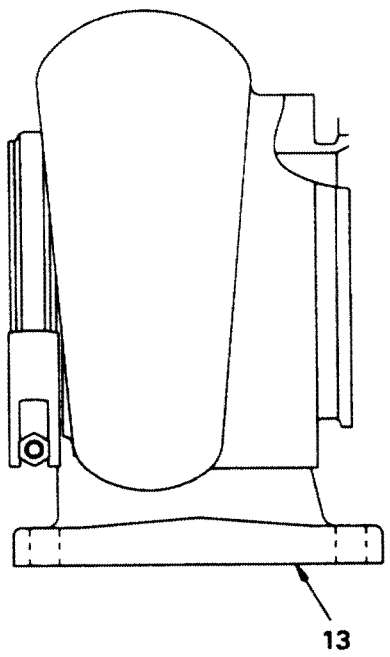
### Turbocharger specifications

- |                       |                                   |
|-----------------------|-----------------------------------|
| Type                  | : Schwitzer S3A                   |
| Overall length        | : 274.3 mm                        |
| Overall width         | : 277.8 mm                        |
| Overall height        | : 225.3 mm                        |
| Weight                | : 16 kg                           |
| Direction of rotation | : Clockwise (as seen from blower) |

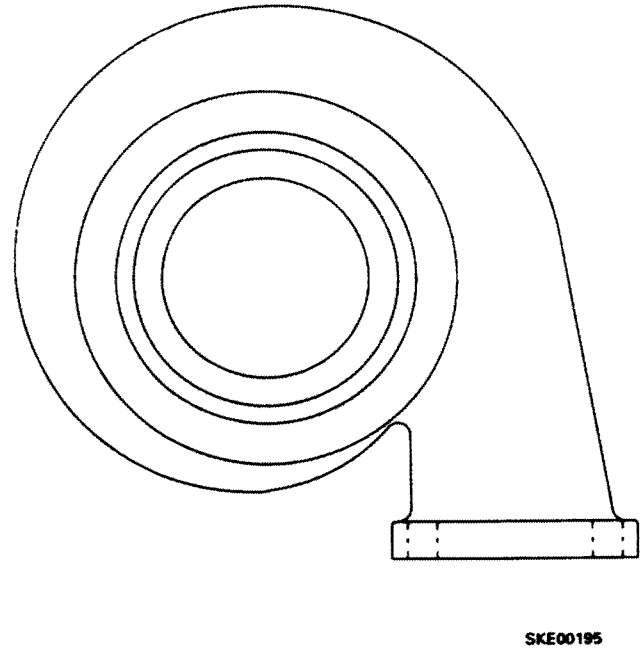
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SDE00047

615002



→ D

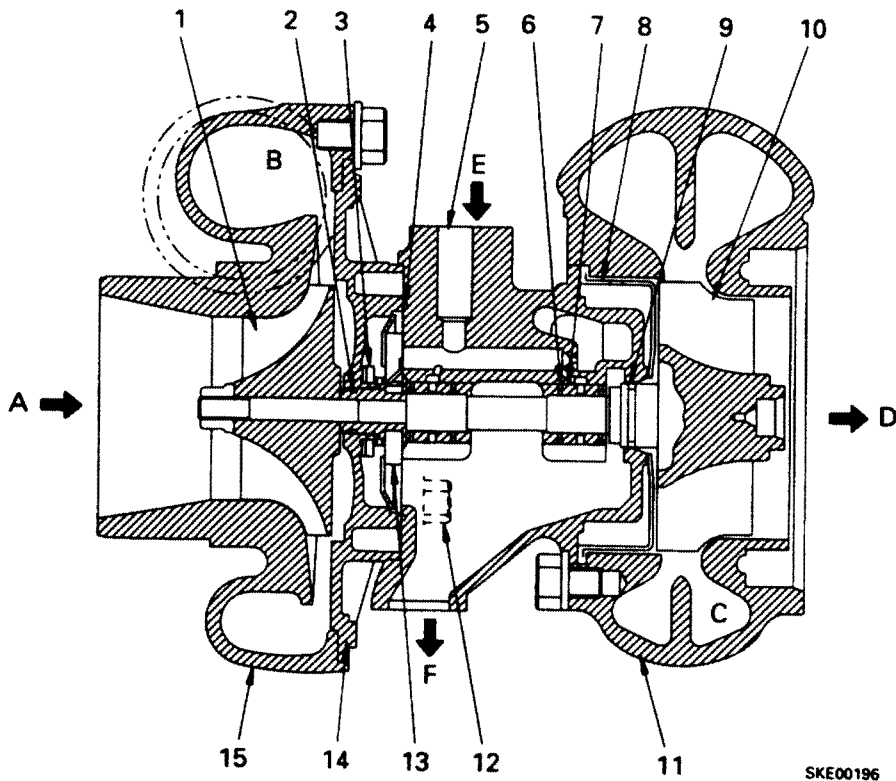


Turbocharger exhaust port: Seal ring type

D. Exhaust outlet port

SKE00195

GARRET TO4E



615002

- 1. Blower impeller
- 2. Seal ring (piston ring)
- 3. Thrust collar
- 4. Seal ring
- 5. Center housing
- 6. Snap ring (retaining)
- 7. Journal bearing
- 8. Heat shroud
- 9. Seal ring (piston ring)
- 10. Shaft and turbine impeller
- 11. Turbine housing
- 12. Bolt
- 13. Thrust bearing
- 14. Back plate
- 15. Blower housing

- A. Intake inlet port
- B. Air supply outlet port
- C. Exhaust inlet port
- D. Exhaust outlet port
- E. Oil inlet port
- F. Oil outlet port

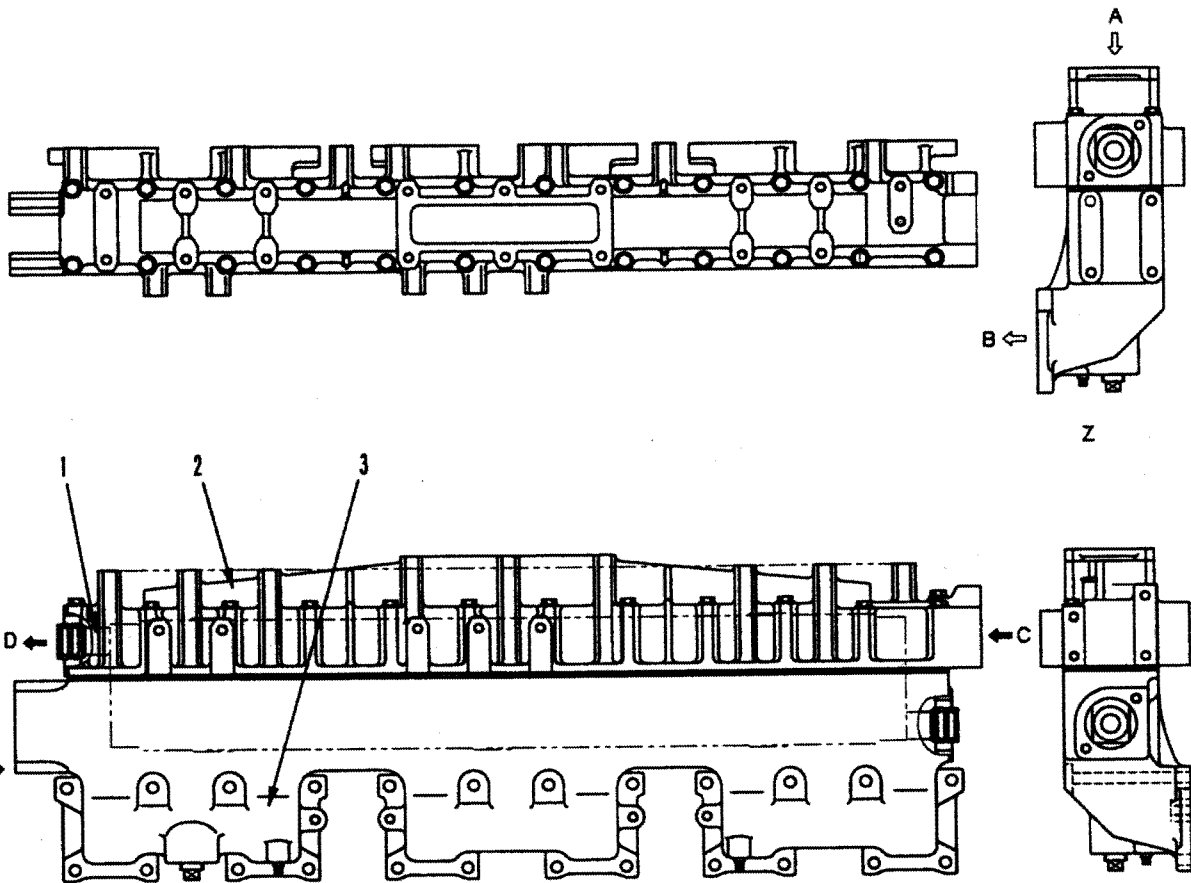
**Turbocharger**

Type: Garret TO4E  
 Overall length: 229 mm  
 Overall width: 222 mm  
 Overall height: 185 mm  
 Weight: 9 kg  
 Direction of rotation: Right (as seen from blower)

# AFTERCOOLER

Water-cooled type  
SA6D125-2

★ The specifications may be different from the following figure, depending on the type of machine.



615002

SXE01518

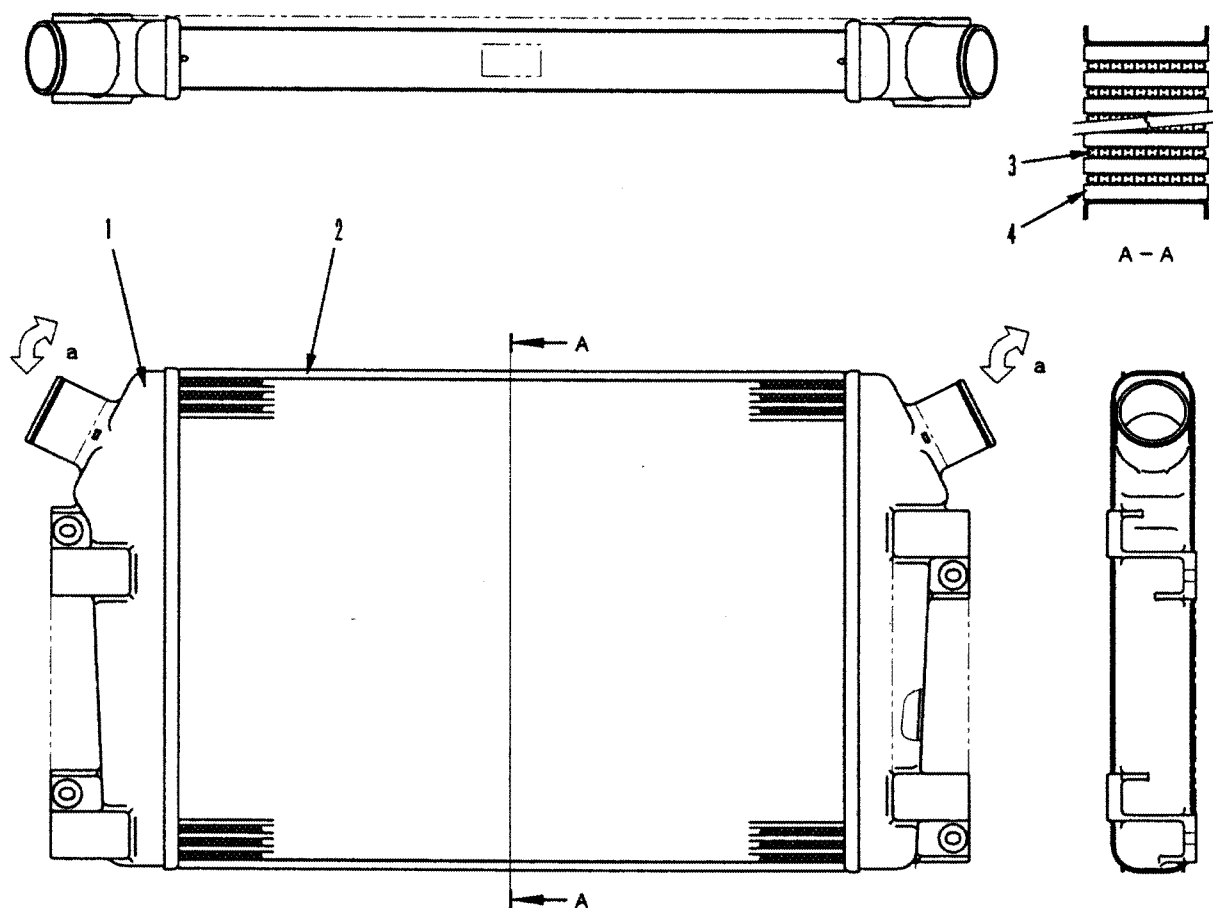
- 1. Aftercooler core
- 2. Aftercooler cover
- 3. Intake manifold

- A. Intake air inlet
- B. Intake air outlet
- C. Water inlet (from cylinder head)
- D. Water outlet (to thermostat)

**Air-cooled type**

SAA6D125-2 [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]

★ The specifications are subject to change according to modification, etc.



SXE01519

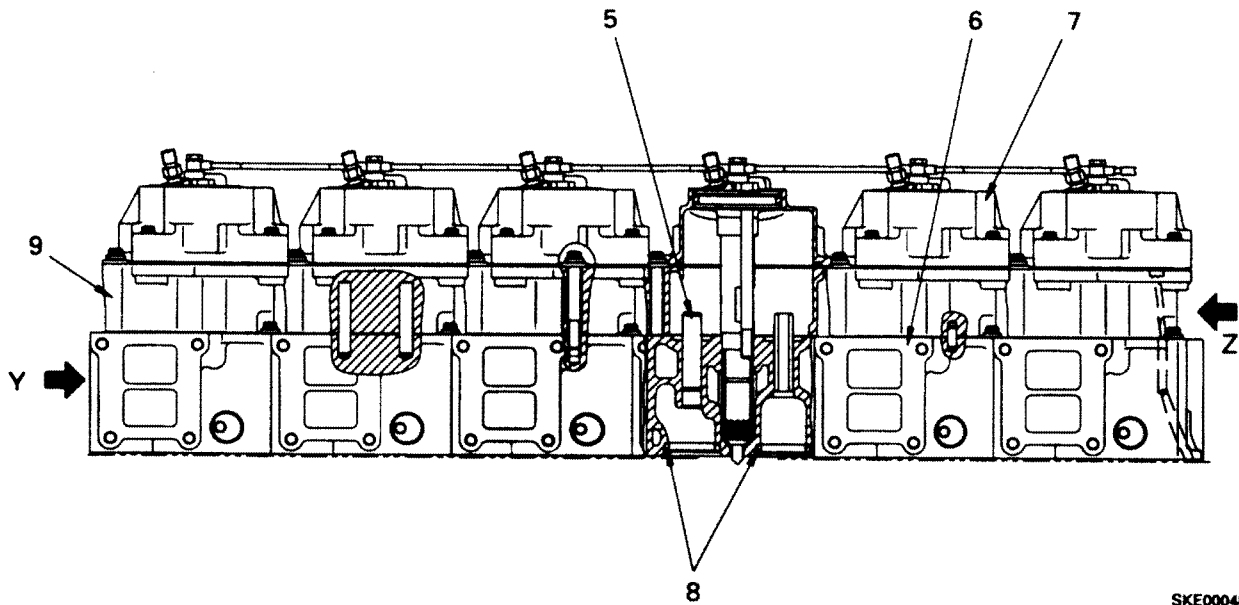
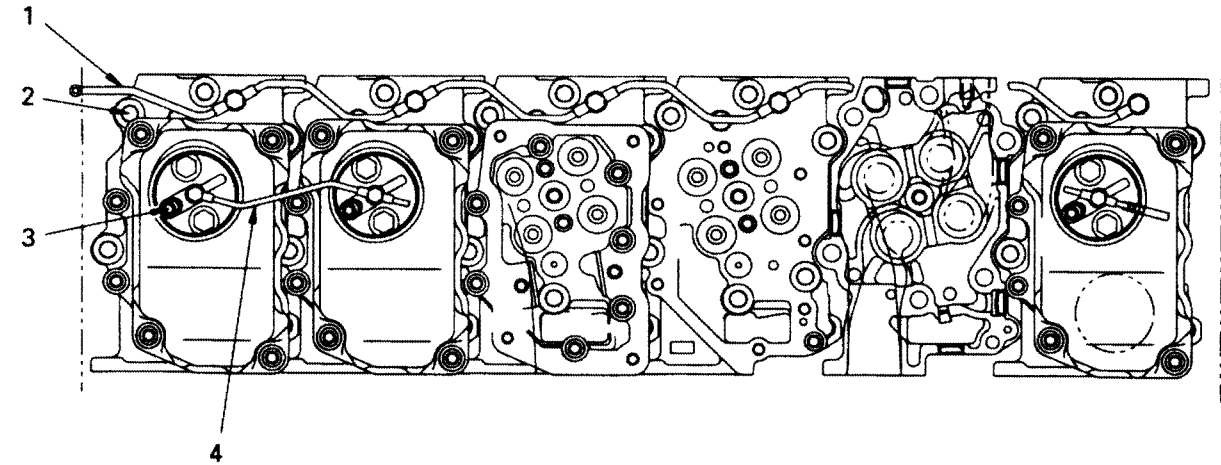
- 1. Tank
- 2. Side support
- 3. Tube
- 4. Fin

- a. Intake air port  
(Turbocharger ↔ intake manifold)



# ENGINE BODY CYLINDER HEAD

★ The locations are different for the vertical and horizontal engines.  
(The diagram shows the vertical engine.)



615002

- 1. Cooling water air tube
- 2. Cylinder head bolt
- 3. Nozzle holder
- 4. Fuel spill tube
- 5. Valve guide
- 6. Cylinder head
- 7. Cylinder head cover
- 8. Valve seat insert
- 9. Rocker arm housing

SKE00048

**CYLINDER HEAD**

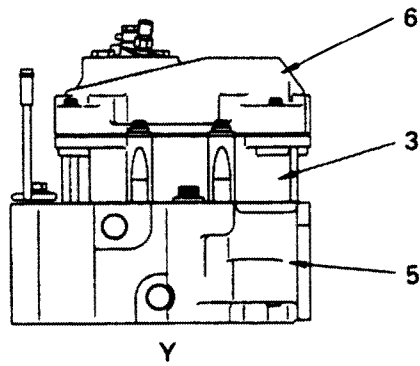
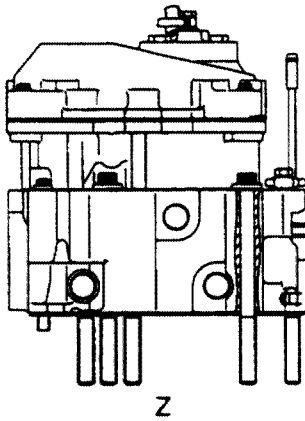
- Direct fuel injection
- 4 valve
- Injection nozzle assembled in cylinder head
- Divided type  
(1 cylinder head for 1 cylinder)

**VALVE SEAT**

- Press-fitted insert for intake and exhaust

**CYLINDER HEAD COVER**

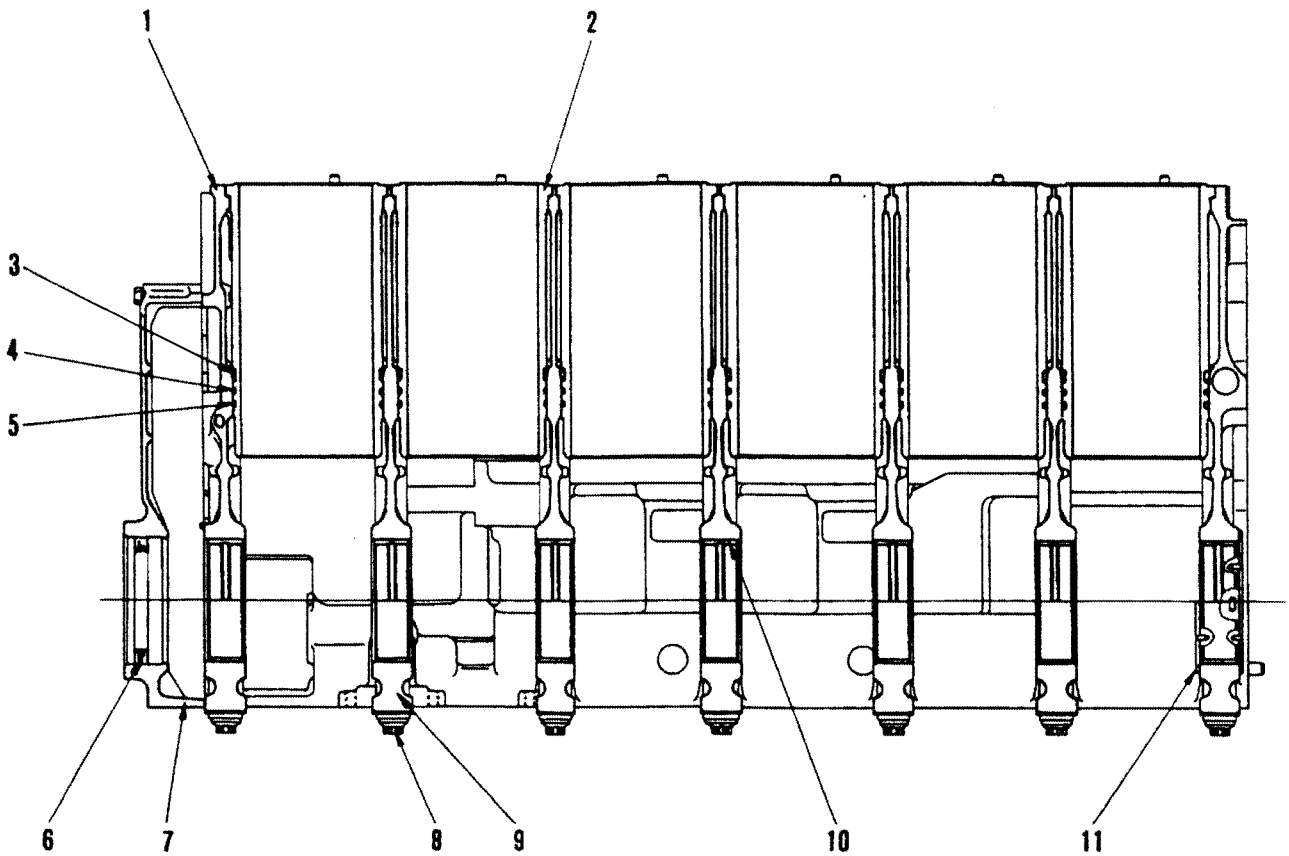
- Floating type seal



SDE00049

615002

CYLINDER BLOCK

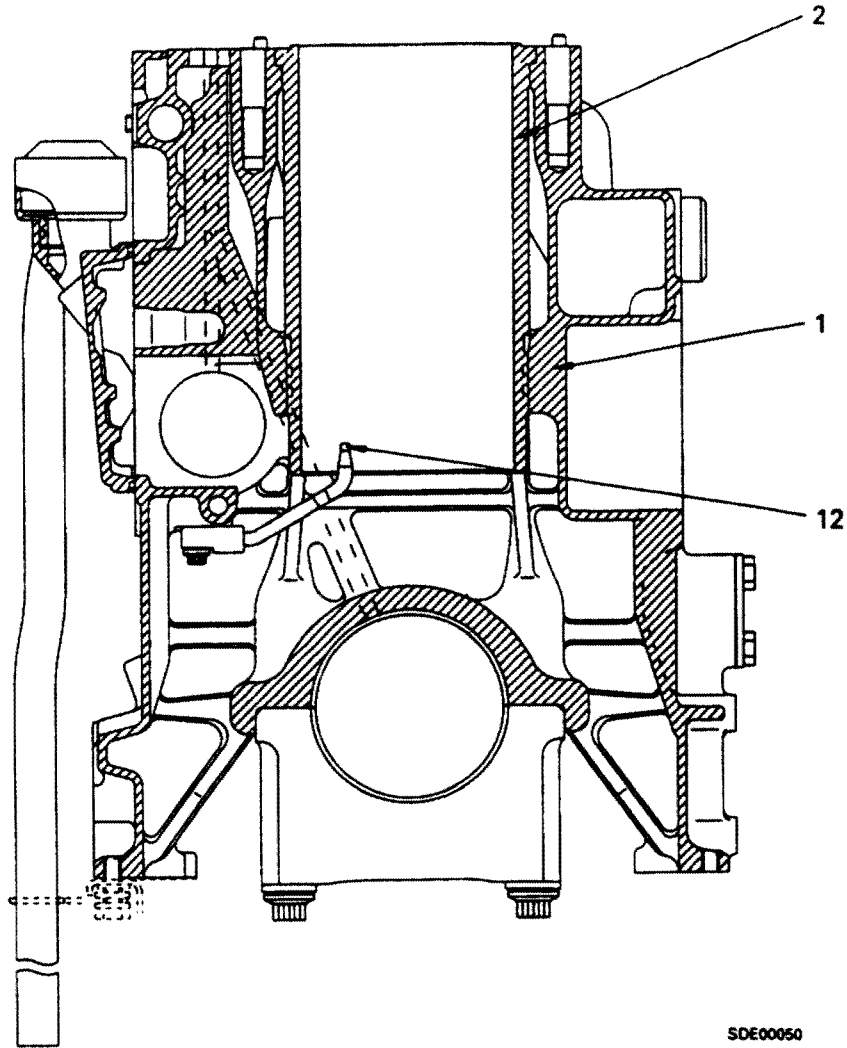


615002

6150F108

- 1. Cylinder block
- 2. Cylinder liner
- 3. Crevice seal
- 4. Liner seal (Ethylene propylene rubber)
- 5. Liner seal (Silicon rubber)
- 6. Front seal

- 7. Front cover
- 8. Main bearing cap bolt
- 9. Main bearing cap
- 10. Main bearing
- 11. Thrust bearing
- 12. Piston cooling nozzle  
(S6D125-2, SA6D125-2, SAA6D125-2)



615002

SDE00050

**CYLINDER BLOCK**

- Crankshaft: 7 bearings
- Camshaft: 7 bearings

**FRONT SEAL**

- Single lip with dust seal

**PISTON COOLING**

- With piston cooling nozzle  
(S6D125-2, SA6D125-2, SAA6D125-2)

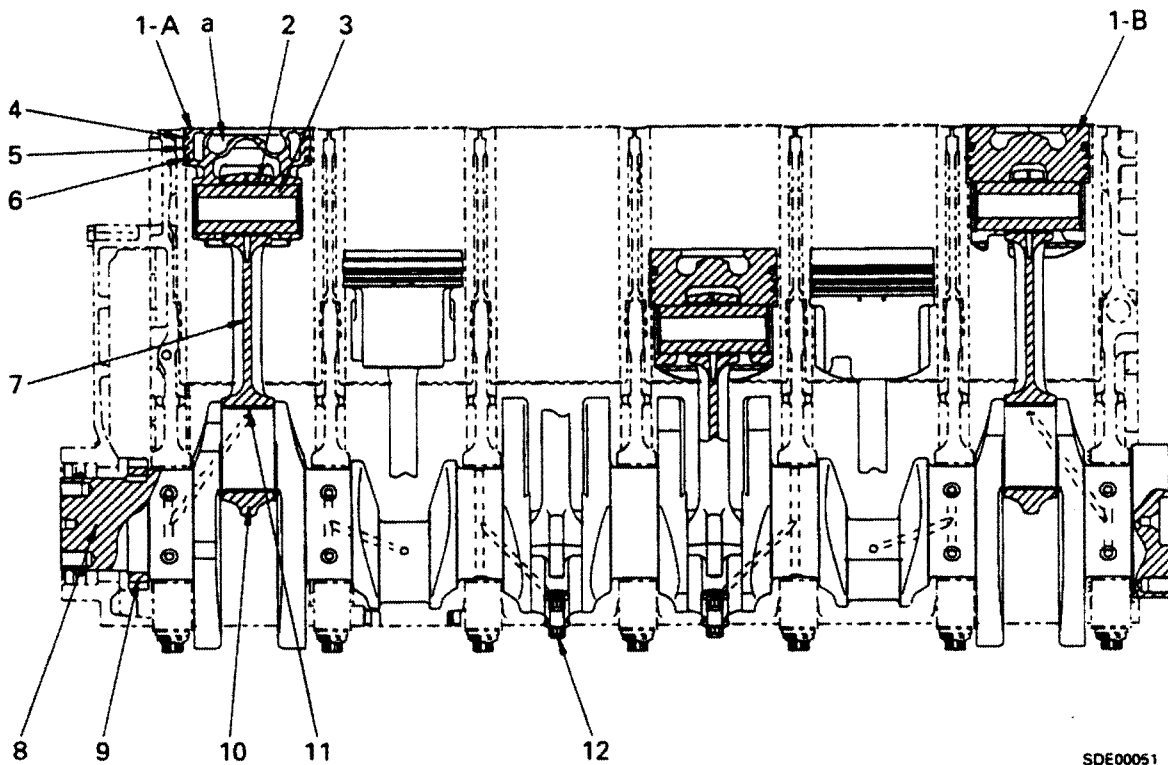
**CYLINDER LINER**

- Wet type
- Treatment: Plateau honing finish  
Gas soft nitriding  
(S6D125-2, SA6D125-2,  
SAA6D125-2)

**LINER SEAL**

- Top: Clevis seal
- Middle: O-ring (Ethylene propylene rubber)
- Bottom: O-ring (Silicon rubber)

## MAIN CIRCULATION PART



- 1-A. Piston (FCD piston)  
(S6D125-2, SA6D125-2, SAA6D125-2)
- 1-B. Piston (Aluminum alloy piston)  
(6D125-2, S6D125-2)
- 2. Connecting rod bushing
- 3. Piston pin
- 4. Top ring
- 5. Second ring
- 6. Oil ring




- 7. Connecting rod
- 8. Crankshaft
- 9. Crankshaft gear
- 10. Connecting rod cap
- 11. Connecting rod bearing
- 12. Connecting rod cap bolt
- a. Re-entrant combustion chamber

615002

SDE00051

615002

**PISTON RING**

Top ring	Second ring	Oil ring
 <p>SEE00631</p>	 <p>SWE01158</p>	 <p>SEE00633</p>
<p>Both faces keystone Barrel face Hard chrome plating</p>	<p>Keystone inner cut Tapered face Hard chrome plating</p>	<p>Hard chrome plating with coil expander</p>

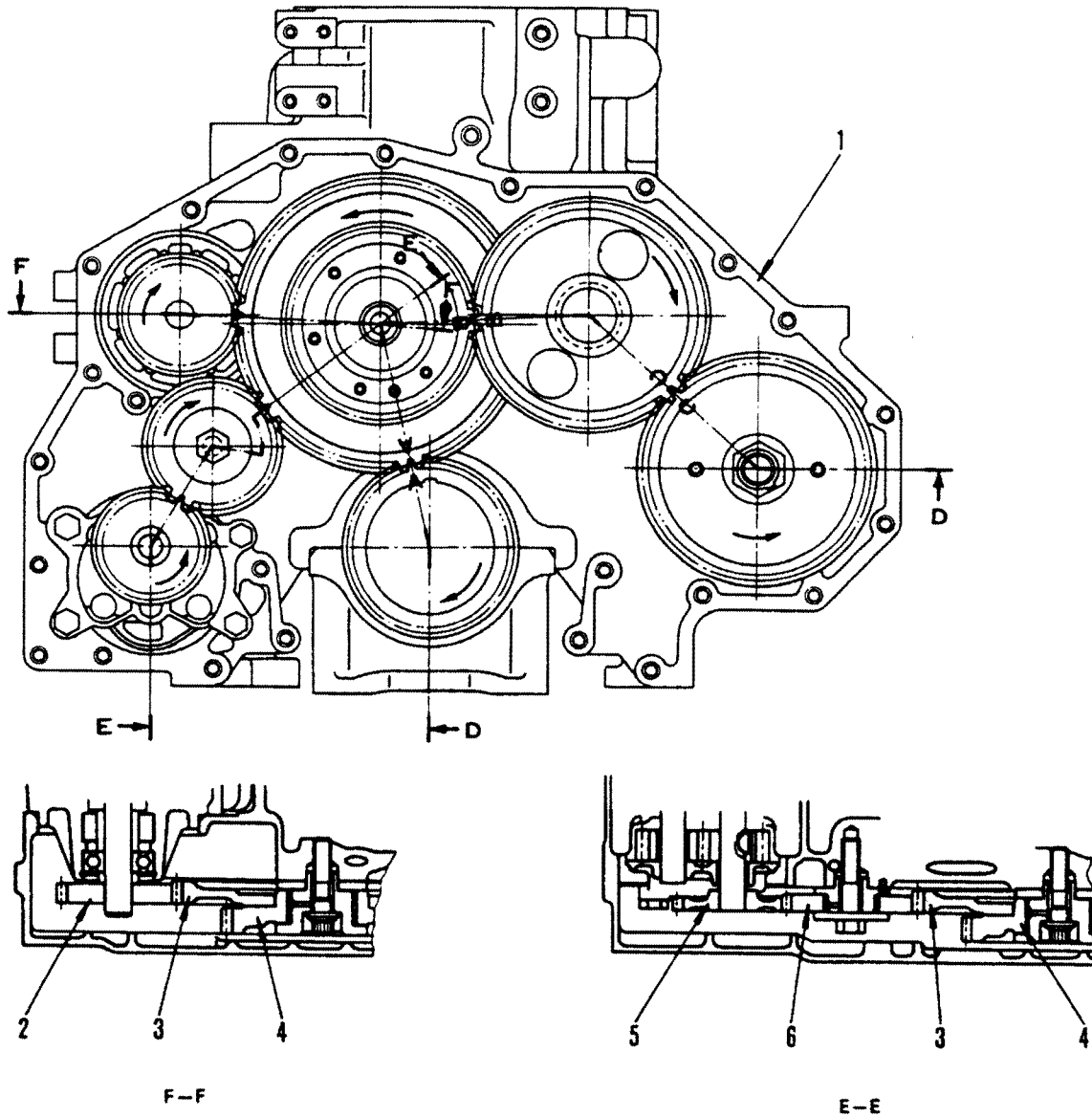
**CRANKSHAFT** : Stamp forging  
 6D125-2 : Induction hardening on journal portion  
 S6D125-2, SA6D125-2, SAA6D125-2 } : Induction hardening on journal portion and fillet portion

**PISTON**  
 Material  
 6D125-2, S6D125-2 : Aluminum alloy (Re-entrant combustion chamber)  
 S6D125-2, SA6D125-2, SAA6D125-2 } : FCD piston (Thin ductile cast iron structure, re-entrant combustion chamber)

**CONNECTING ROD LUBE OIL HOLE**  
 Not provided : 6D125-2 (blocked by bearing, do not use)  
 Provided : S6D125-2, SA6D125-2, SAA6D125-2

**PISTON COOLING FROM CONNECTING ROD TIP**  
 Not provided : 6D125-2, S6D125-2 (Models using aluminum alloy piston)  
 Provided : S6D125-2, SA6D125-2, SAA6D125-2 (models using FCD piston)

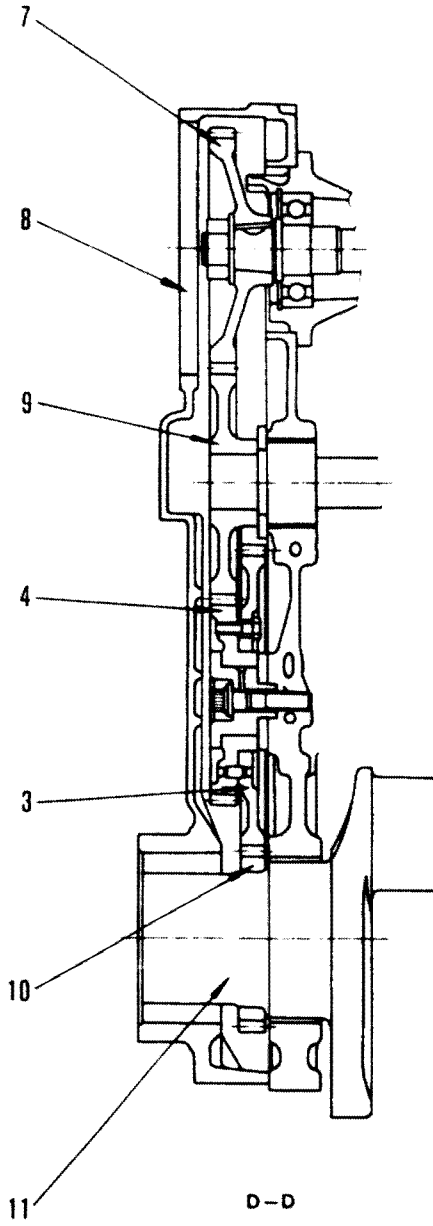
# TIMING GEAR



615002

6150F112A

- |   |  |   |
|---|--|---|
| 1. Cylinder block                             |  | 7. Injection pump drive gear (No. of teeth: 44) |
| 2. Water pump drive gear (No. of teeth: 22)   |  | 8. Timing gear cover                            |
| 3. Main idler gear (No. of teeth: 57)         |  | 9. Camshaft gear (No. of teeth: 44)             |
| 4. Main idler gear (No. of teeth: 38)         |  | 10. Crankshaft gear (No. of teeth: 33)          |
| 5. Oil pump drive gear (No. of teeth: 21)     |  | 11. Crankshaft                                  |
| 6. Idler gear for oil pump (No. of teeth: 25) |  | A, B, C: Match marks for timing gears           |

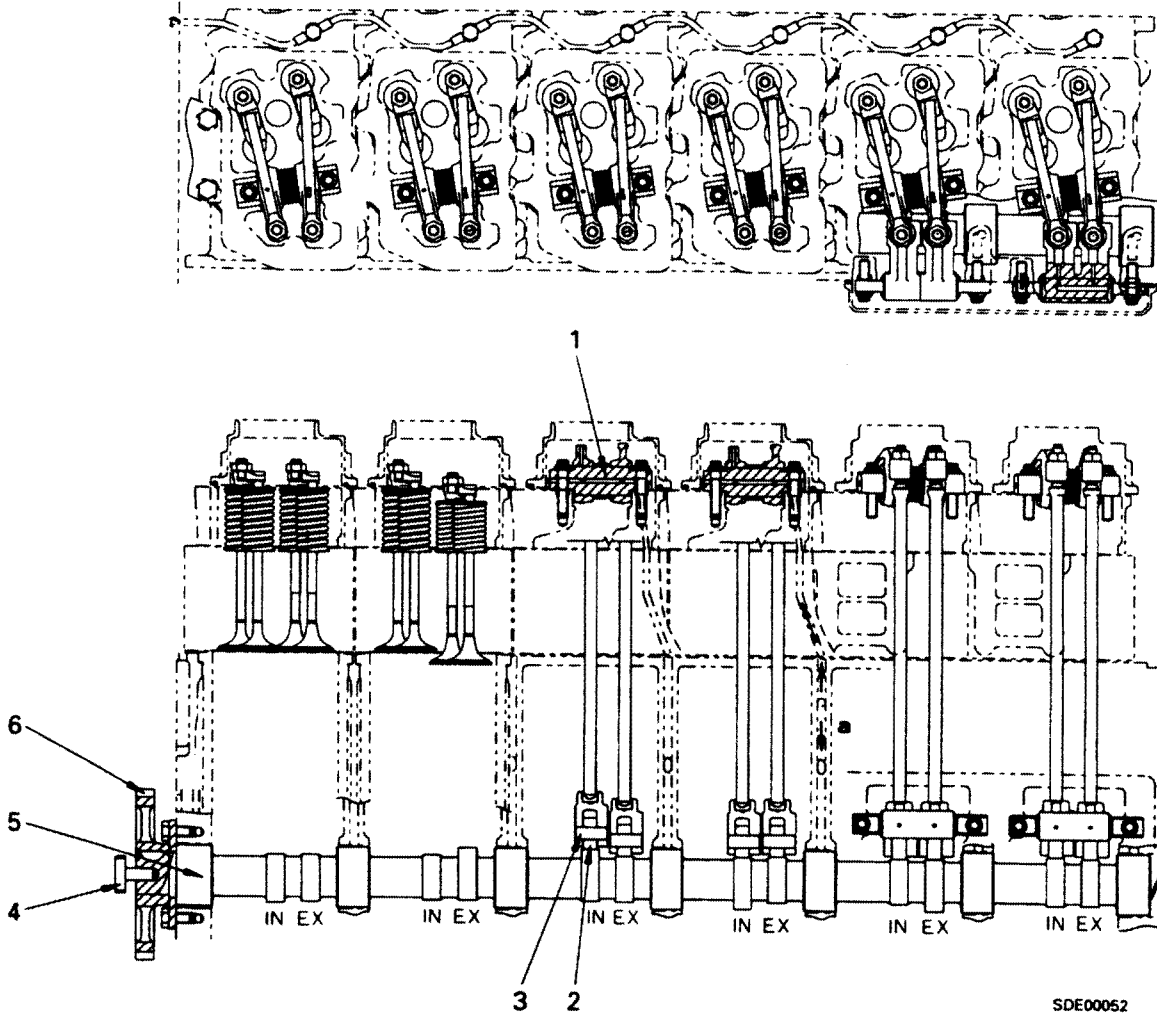


6150F112A

615002

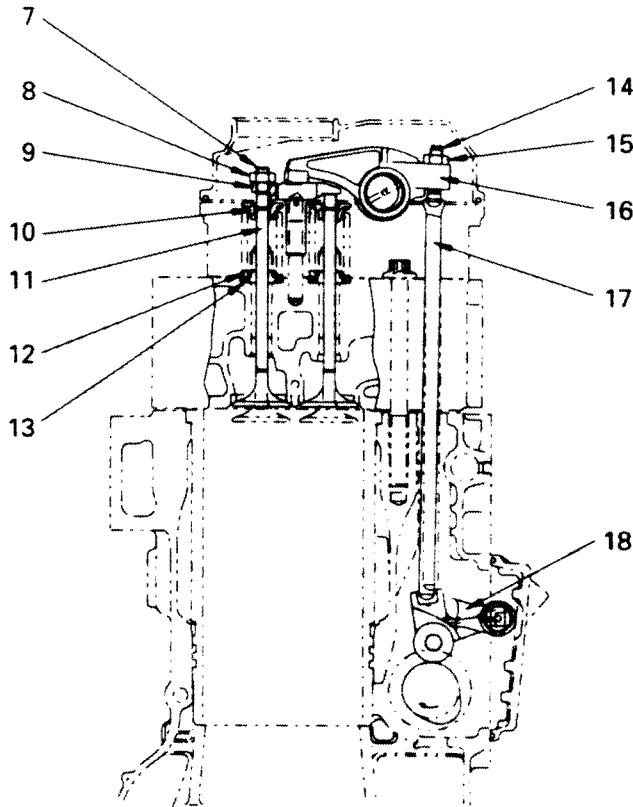


VALVE SYSTEM

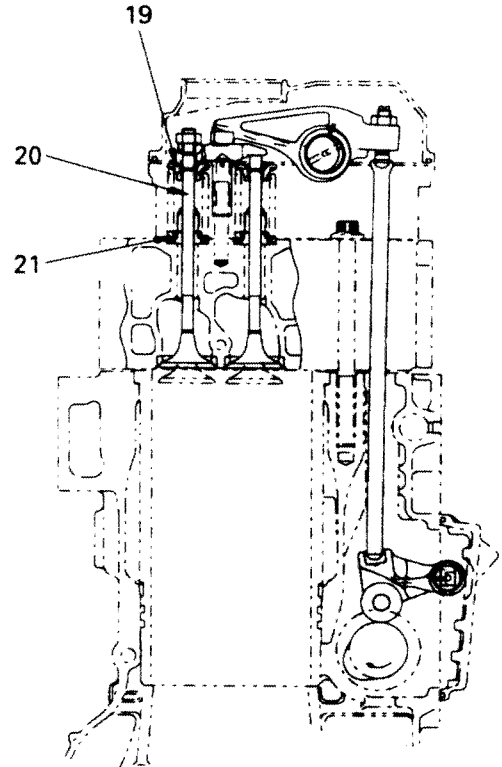


615002

- |  |   |  |
|--|---|--|
| 1. Rocker arm shaft                                | 8. Locknut  | 14. Adjustment screw                   |
| 2. Cam roller                                      | 9. Crosshead  | 15. Locknut                            |
| 3. Cam roller pin                                  | 10. Upper valve spring seat                         | 16. Rocker arm                         |
| 4. Air compressor drive gear<br>(No. of teeth: 14) | 11. Intake valve                                    | 17. Push rod                           |
| 5. Camshaft  | 12. Valve spring                                    | 18. Cam follower                       |
| 6. Camshaft gear<br>(No. of teeth: 44)             | 13. Lower valve spring seat<br>(Intake and exhaust) | 19. Valve cotter                       |
| 7. Adjustment screw                                |   | 20. Exhaust valve                      |
|  |   | 21. Valve seal (Intake<br>and exhaust) |



No.1 cylinder intake side



No.1 cylinder exhaust side

615002

SDE00053

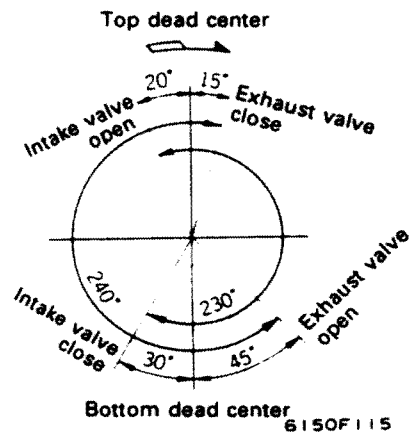
**CAMSHAFT**

- Stamp forging
- Journal portion, cam portion:  
Induction hardening

**VALVE TIMING**

List of part (related to valve) to be set in place

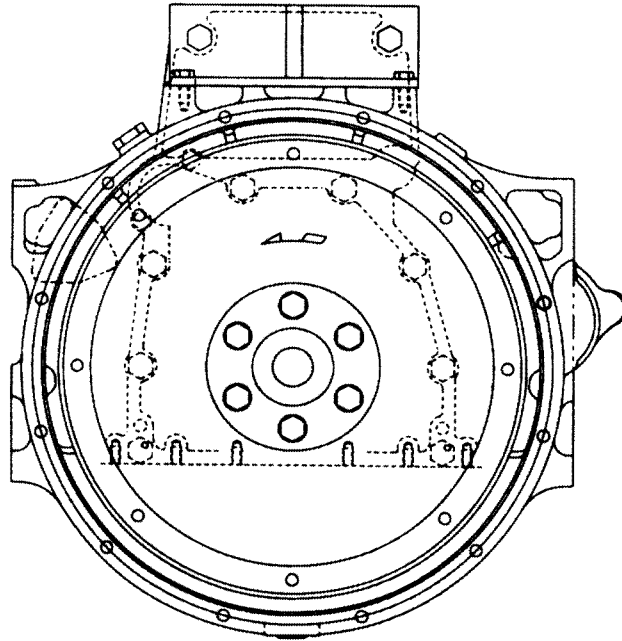
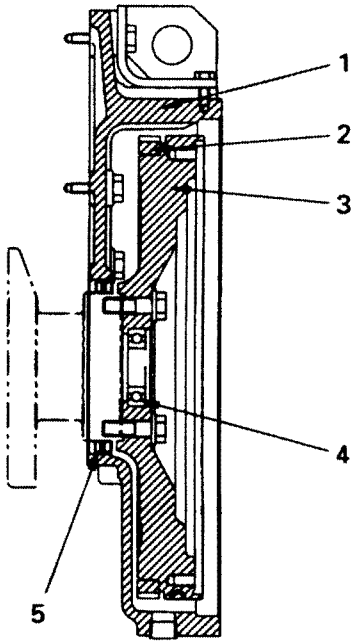
Engine	SA6D125-2	
	IN	EX
Parts set in		
Crosshead	6150-42-5610	6150-42-5610
Valve	6150-42-4110	6150-42-4210
Valve spring (Color code)	6150-41-4550 (White)	6150-41-4550 (White)
Spring seat (Lower)	6150-41-4430	6150-41-4430
Valve guide	6150-11-1370	6150-11-1370
Stem seal	6150-41-4570	6150-41-4570



6150F115

# FLYWHEEL AND FLYWHEEL HOUSING

WITHOUT PTO



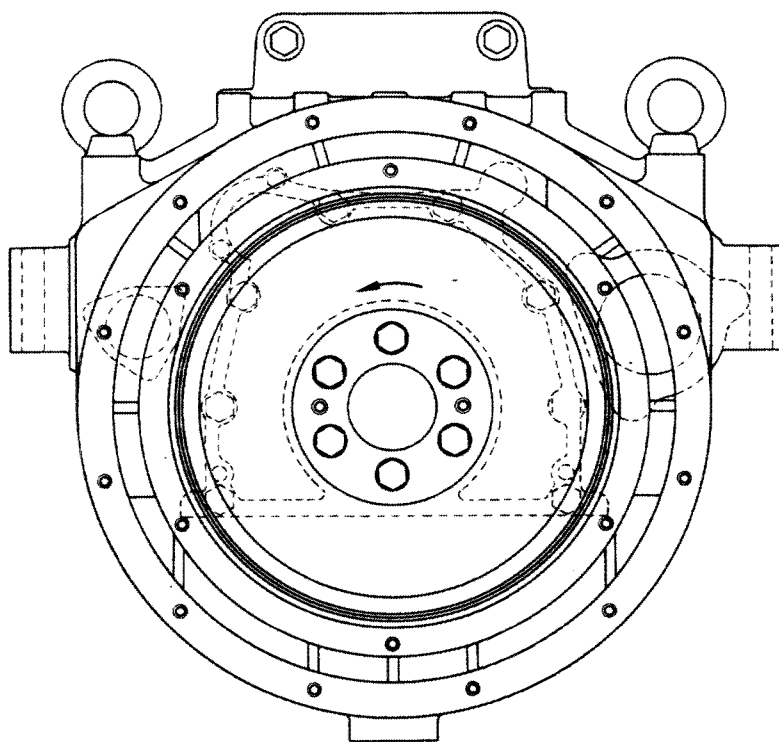
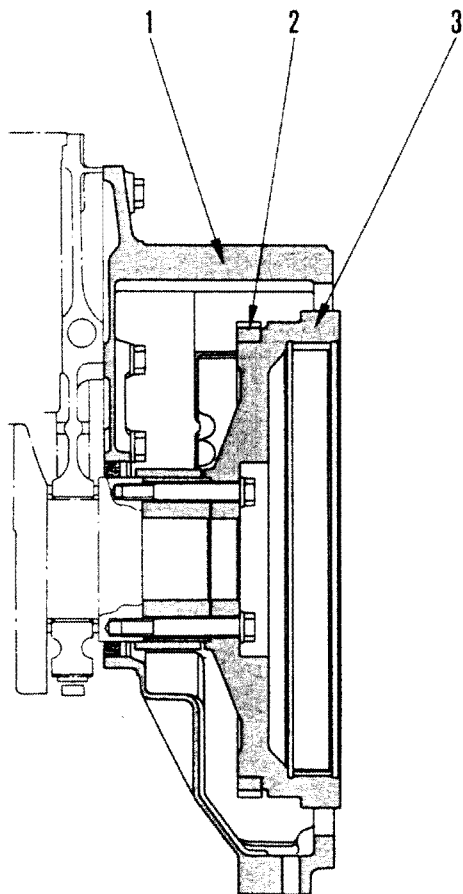
SKE00197

615002

- 1. Flywheel housing
- 2. Ring gear
- 3. Flywheel
- 4. Bearing
- 5. Rear seal

Machine model	No. of teeth on ring gear	No. of internal teeth on flywheel	Remarks
D60E-12	148	-	-
D65E-12			
D65EX-12			
D65P, PX-12			
D70LE-12			
D85ESS-2			
D85ESS-2A			

WITHOUT PTO type



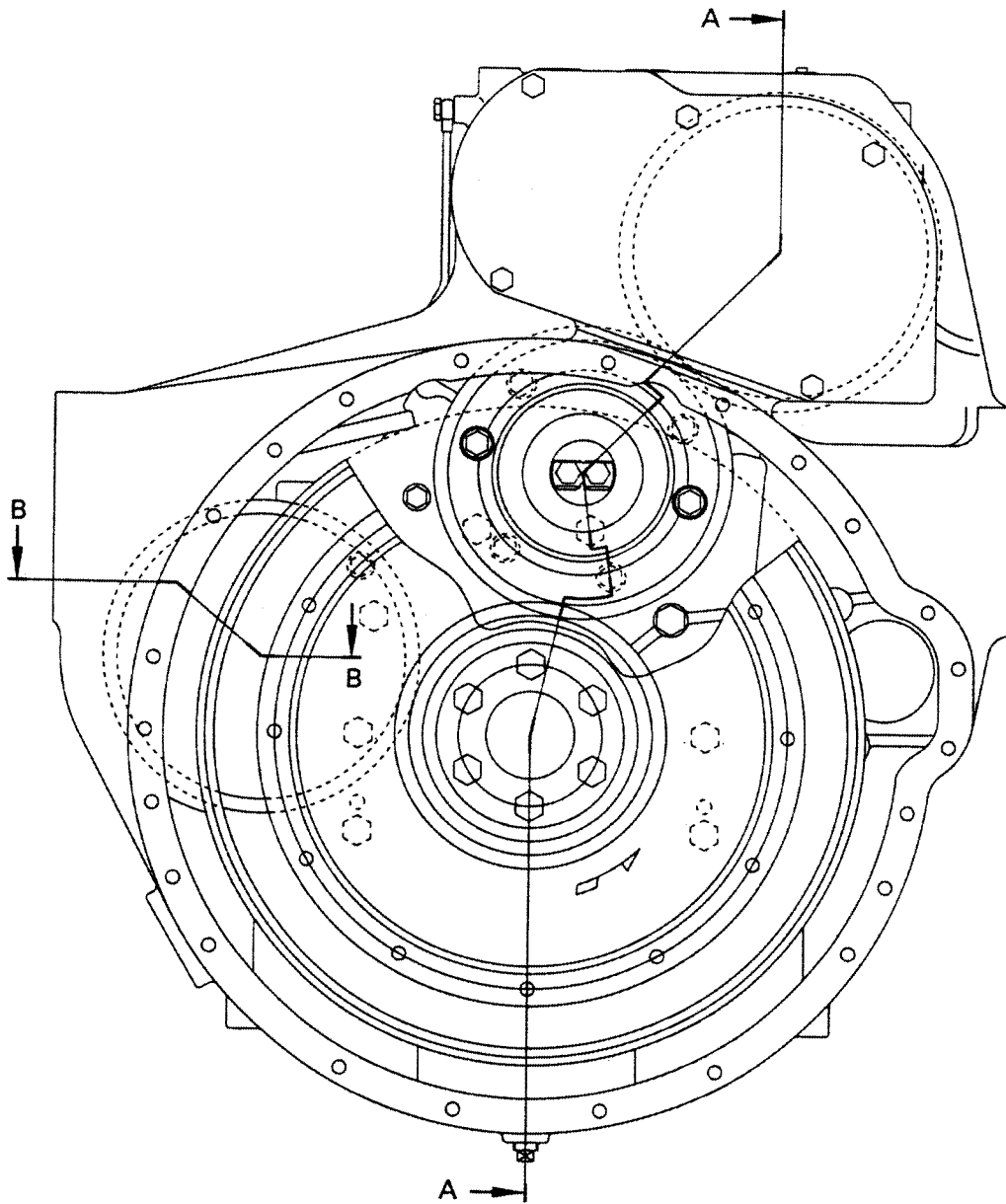
615002

6150F119

- 1. Flywheel housing
- 2. Ring gear
- 3. Flywheel

Applicable machine	No. of teeth	
	Ring gear	Flywheel inner gear
PC400-6 PC450-6 BR500JG-1 BR550JG-1	148	-
D75S-5	137	131
WA470-3	137	-

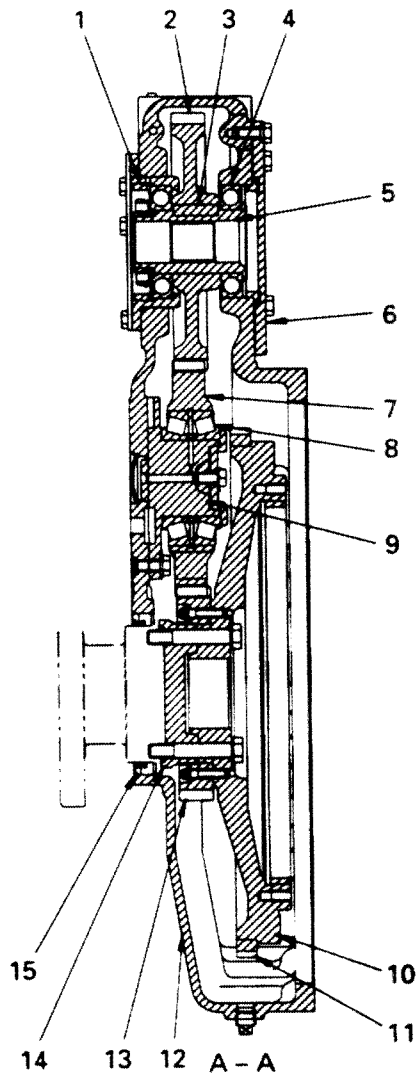
WITH PTO



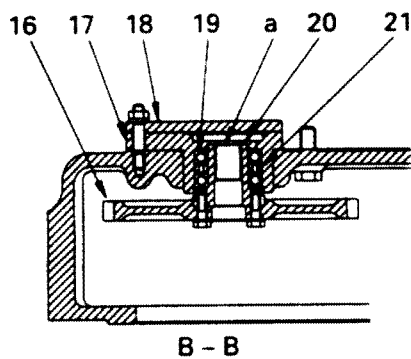
SKE00198

615002

615002



- 1. Bearing case
  - 2. PTO drive gear (No. of teeth: 47)
  - 3. Key
  - 4. Ball bearing
  - 5. PTO drive shaft
  - 6. PTO cover
  - 7. Idler gear
  - 8. Roller bearing
  - 9. Idler shaft
  - 10. Flywheel
  - 11. Ring gear
  - 12. Flywheel housing
  - 13. Crankshaft gear (No. of teeth on PTO drive gear: 39)
  - 14. Spacer
  - 15. Rear seal
  - 16. Pump drive gear (No. of teeth: 46)
  - 17. Bearing case
  - 18. Cover
  - 19. Ball bearing
  - 20. Bearing shaft
  - 21. Spacer
- a. Pump pickup port

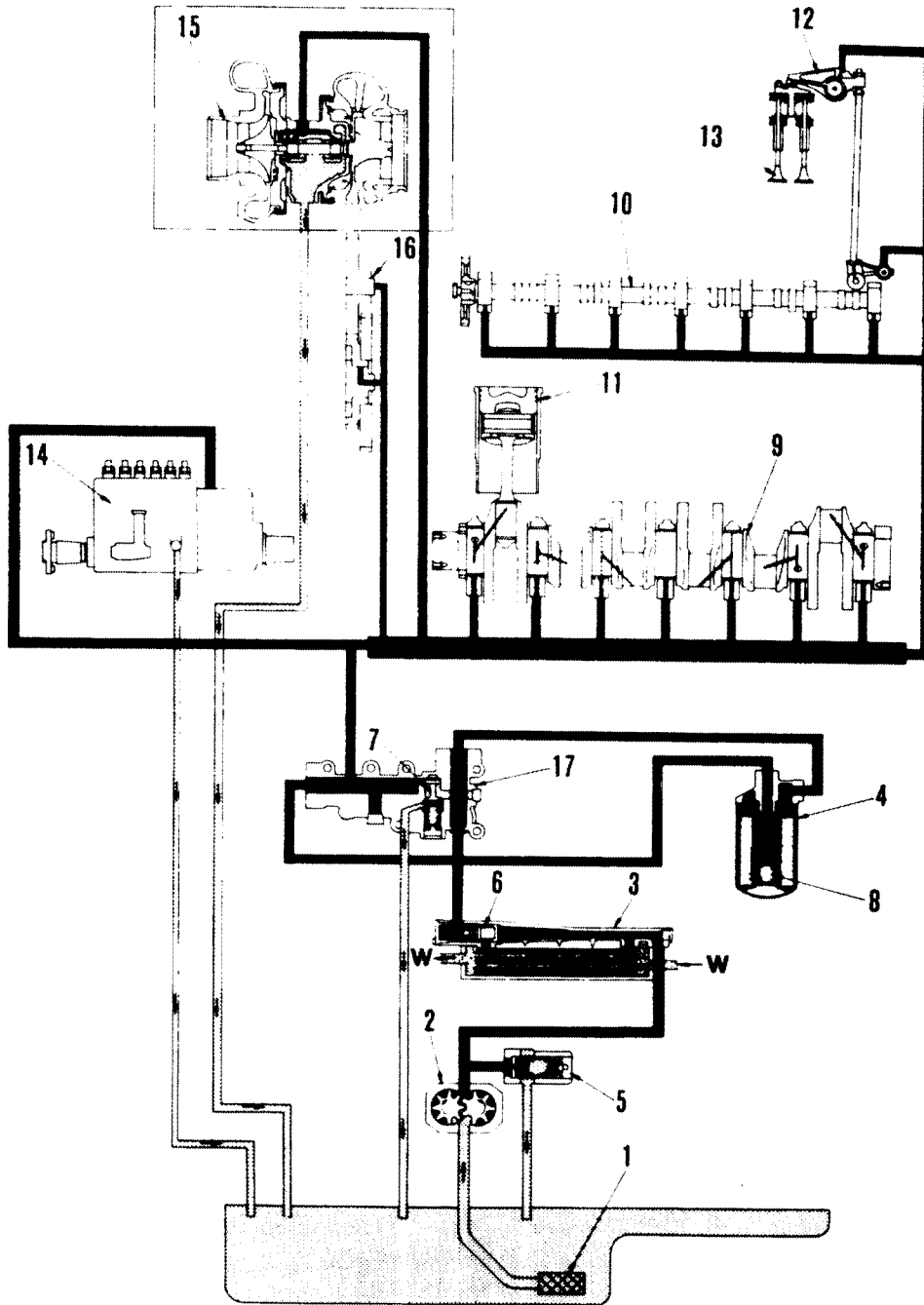


SKE00199

# LUBRICATION SYSTEM

## LUBRICATION SYSTEM CHART

6D125-2

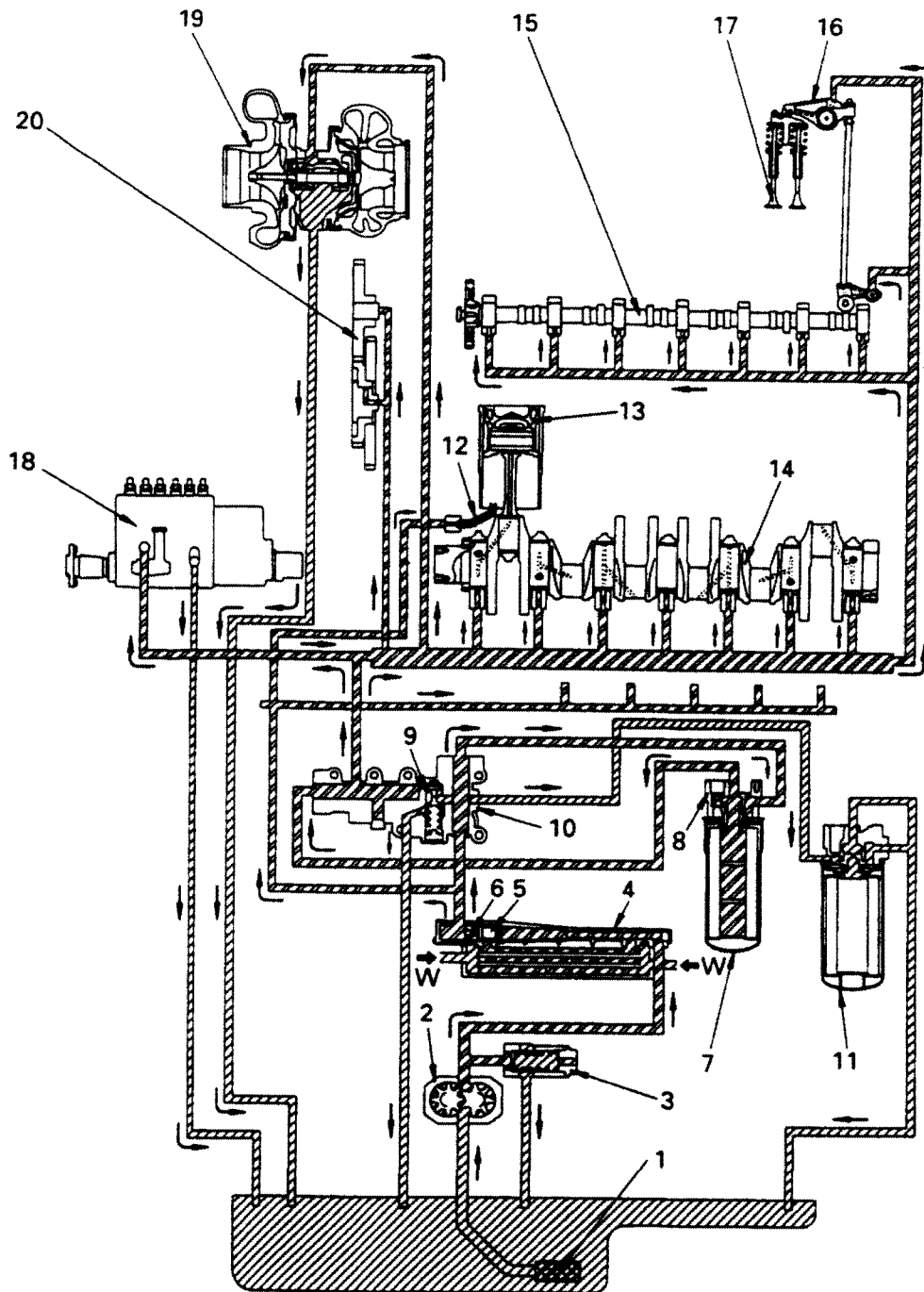


6150F165

- |                      |                           |  |
|----------------------|---------------------------|--|
| 1. Oil strainer      | 8. Safety valve           | 15. Turbocharger (option specification only) |
| 2. Oil pump          | 9. Crankshaft             | 16. Timing gear                              |
| 3. Oil cooler        | 10. Camshaft              | 17. Adapter                                  |
| 4. Oil filter        | 11. Piston                |  |
| 5. Main relief valve | 12. Rocker arm            |  |
| 6. Thermo valve      | 13. Intake, exhaust valve |  |
| 7. Regulator valve   | 14. Fuel injection pump   |  |
- W: Cooling water

615002

S6D125-2, SA6D125-2  
SAA6D125-2



SEE00054

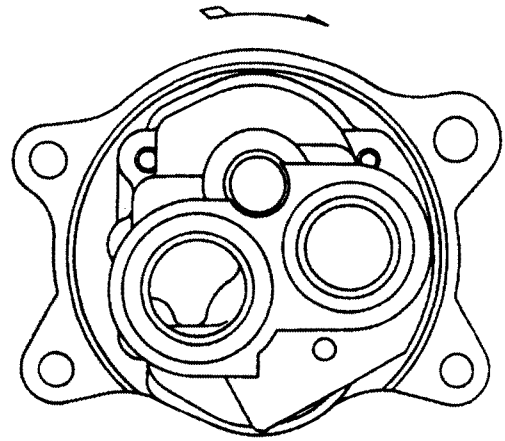
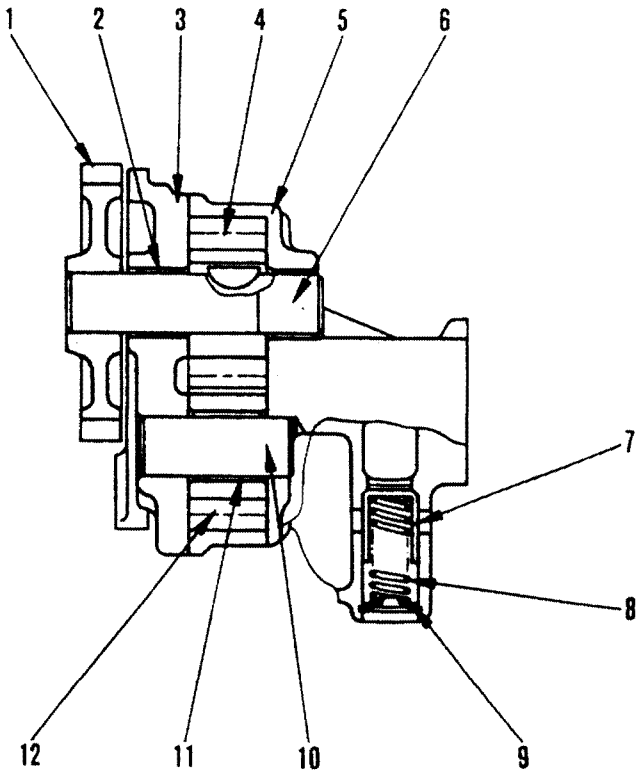
- |                      |                           |                              |
|----------------------|---------------------------|------------------------------|
| 1. Oil strainer      | 8. Safety valve           | 15. Camshaft                 |
| 2. Oil pump          | 9. Regulator valve        | 16. Rocker arm               |
| 3. Main relief valve | 10. Adapter               | 17. Intake and exhaust valve |
| 4. Oil cooler        | 11. Bypass filter         | 18. Fuel injection pump      |
| 5. Thermostat        | 12. Piston cooling nozzle | 19. Turbocharger             |
| 6. Strainer          | 13. Piston                | 20. Timing gear              |
| 7. Oil filter        | 14. Crankshaft            | W: Cooling water             |

615002



# OIL PUMP

6D125-2



615002

6150F121

- 1. Pump drive gear (No. of teeth: 21)
- 2. Bushing
- 3. Pump cover
- 4. Drive gear
- 5. Pump body
- 6. Drive shaft
- 7. Main relief valve
- 8. Valve spring
- 9. Retainer
- 10. Driven shaft
- 11. Bushing
- 12. Driven gear

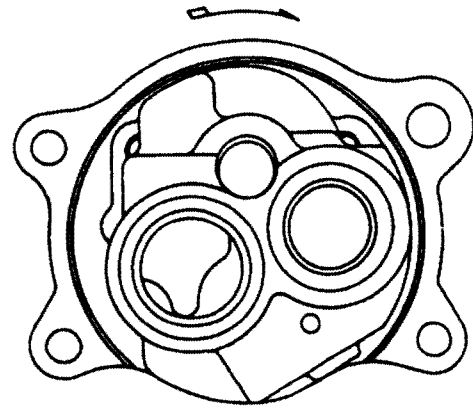
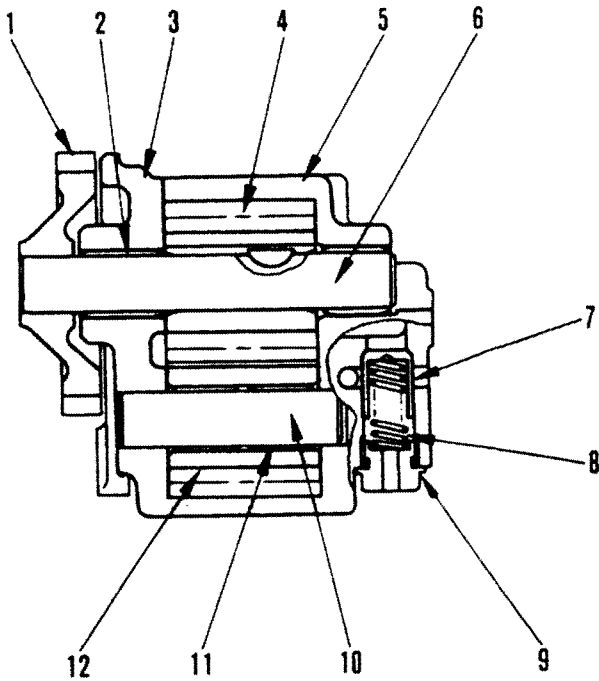
## OIL PUMP

- Type: Gear pump
- Pump speed: Engine speed x 1.571

## MAIN RELIEF VALVE

- Set pressure:  $0.7^{+0.1}_0$  MPa  
( $7^{+1}_0$  kg/cm<sup>2</sup>)

S6D125-2, SA6D125-2, SAA6D125-2



615002

6150F122A

- 1. Pump drive gear (No. of teeth: 21)
- 2. Bushing
- 3. Pump cover
- 4. Drive gear
- 5. Pump body
- 6. Drive shaft
- 7. Main relief valve
- 8. Valve spring
- 9. Retainer
- 10. Driven shaft
- 11. Bushing
- 12. Driven gear

**OIL PUMP**

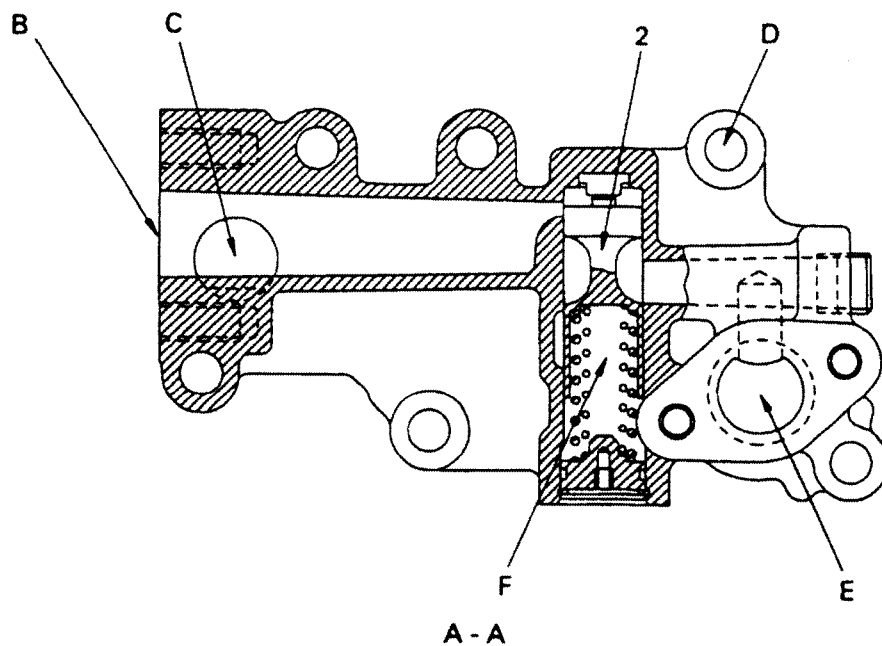
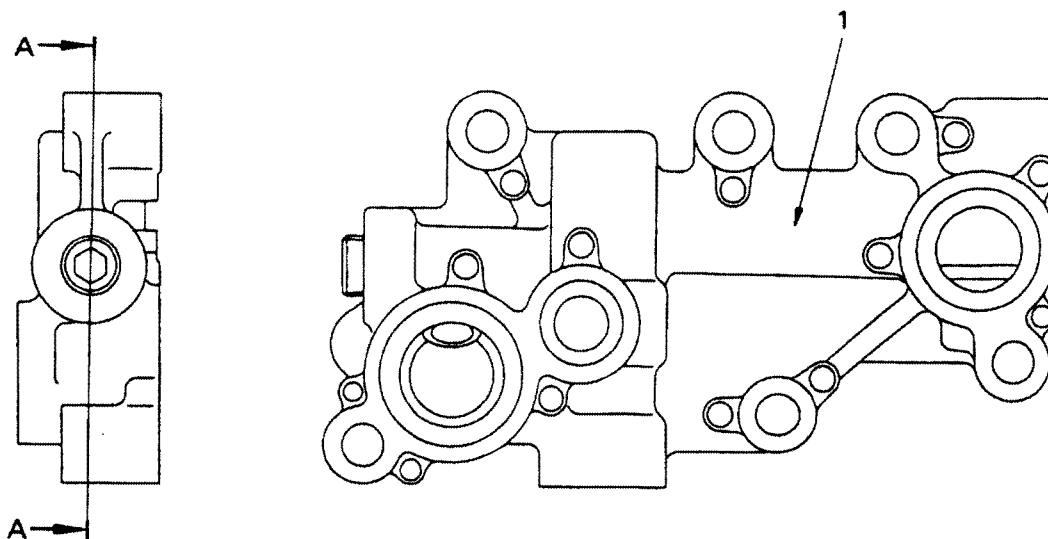
- Type: Gear pump
- Pump speed: Engine speed x 1.571

**MAIN RELIEF VALVE**

- Set pressure:  $0.7^{+0.1}_0$  MPa ( $7^{+1}_0$  kg/cm<sup>2</sup>)

# REGULATOR VALVE

For oil filter remote mount



SEE00055

- 1. Adapter
- 2. Regulator valve

- B. From oil filter
- C. To engine each part
- D. To oil filter
- E. From oil pump
- F. To oil pan

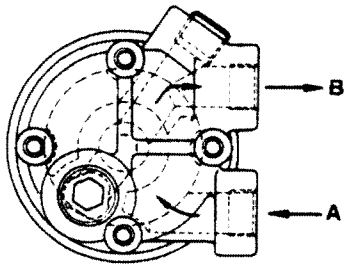
### REGULATOR VALVE

- Set pressure:  $0.36 \pm 0.15$  MPa  
 $(3.75 \pm 0.15 \text{ kg/cm}^2)$

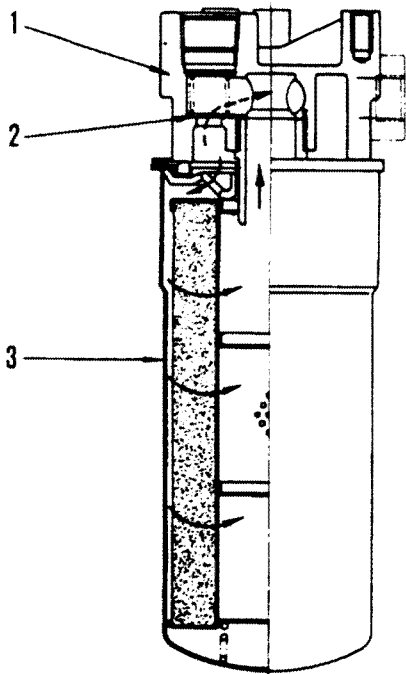
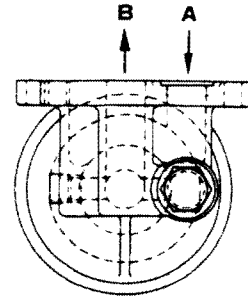
615002

# OIL FILTER

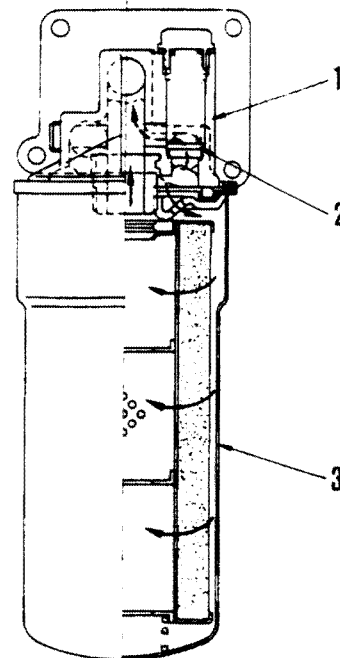
Remote mounting type



Direct mounting type



6150F124



6150F124-1

- 1. Bracket
- 2. Safety valve
- 3. Cartridge

- A. Oil inlet
- B. Oil outlet

## OIL FILTER

• Filtration area: 0.84 m<sup>2</sup>

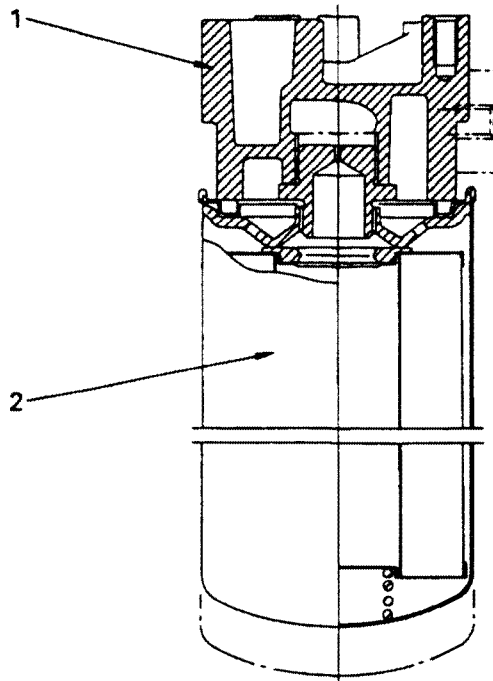
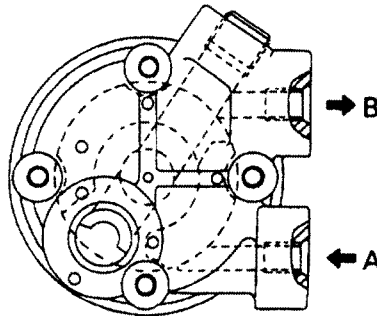
## SAFETY VALVE

• Set pressure: 0.2 ± 0.02 MPa  
(2.0 ± 0.2 kg/cm<sup>2</sup>)

615002

# BYPASS FILTER

S6D125-2, SA6D125-2, SAA6D125-2



SEE00056

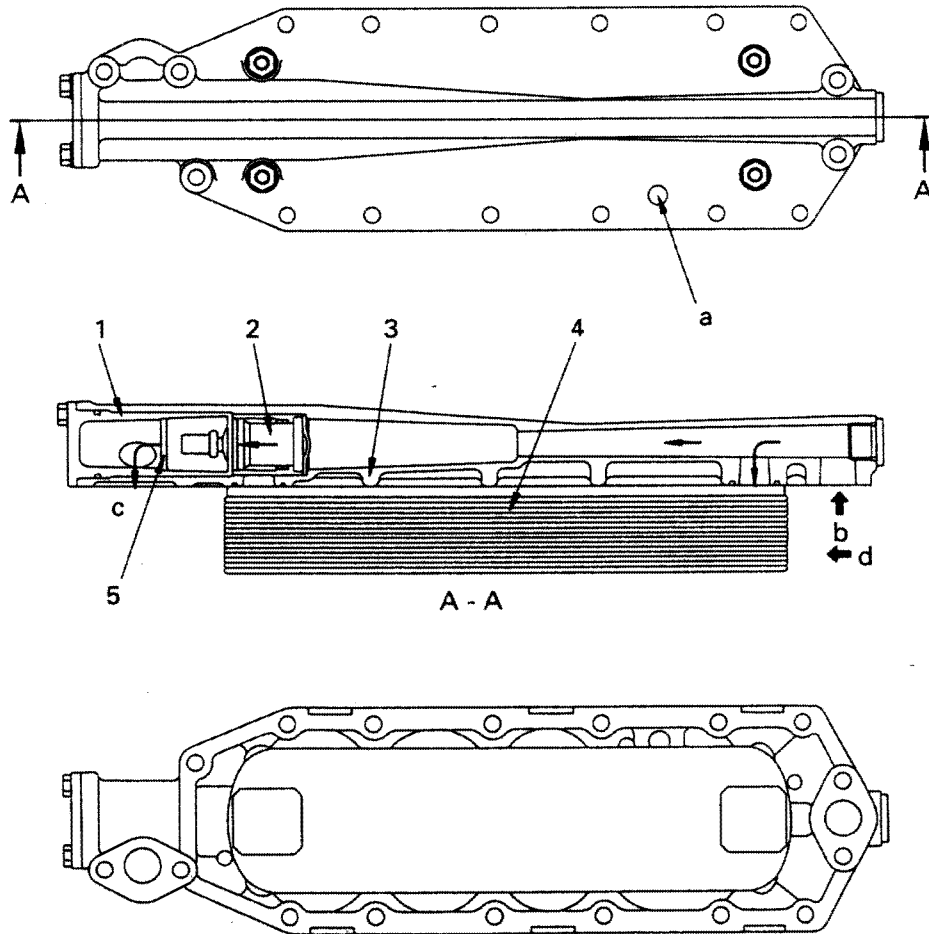
- 1. Bracket
- 2. Cartridge

- A. Oil inlet
- B. Oil outlet

**OIL FILTER**  
• Filtration area: 1.3 m<sup>2</sup>

615002

# OIL COOLER



615002

SEE00057

- 1. Thermostat housing
- 2. Thermostat
- 3. Cooler cover
- 4. Cooler element
- 5. Strainer

- a. Water drain port
- b. Oil inlet
- c. To engine each part
- d. Water inlet

### THERMOSTAT FUNCTION

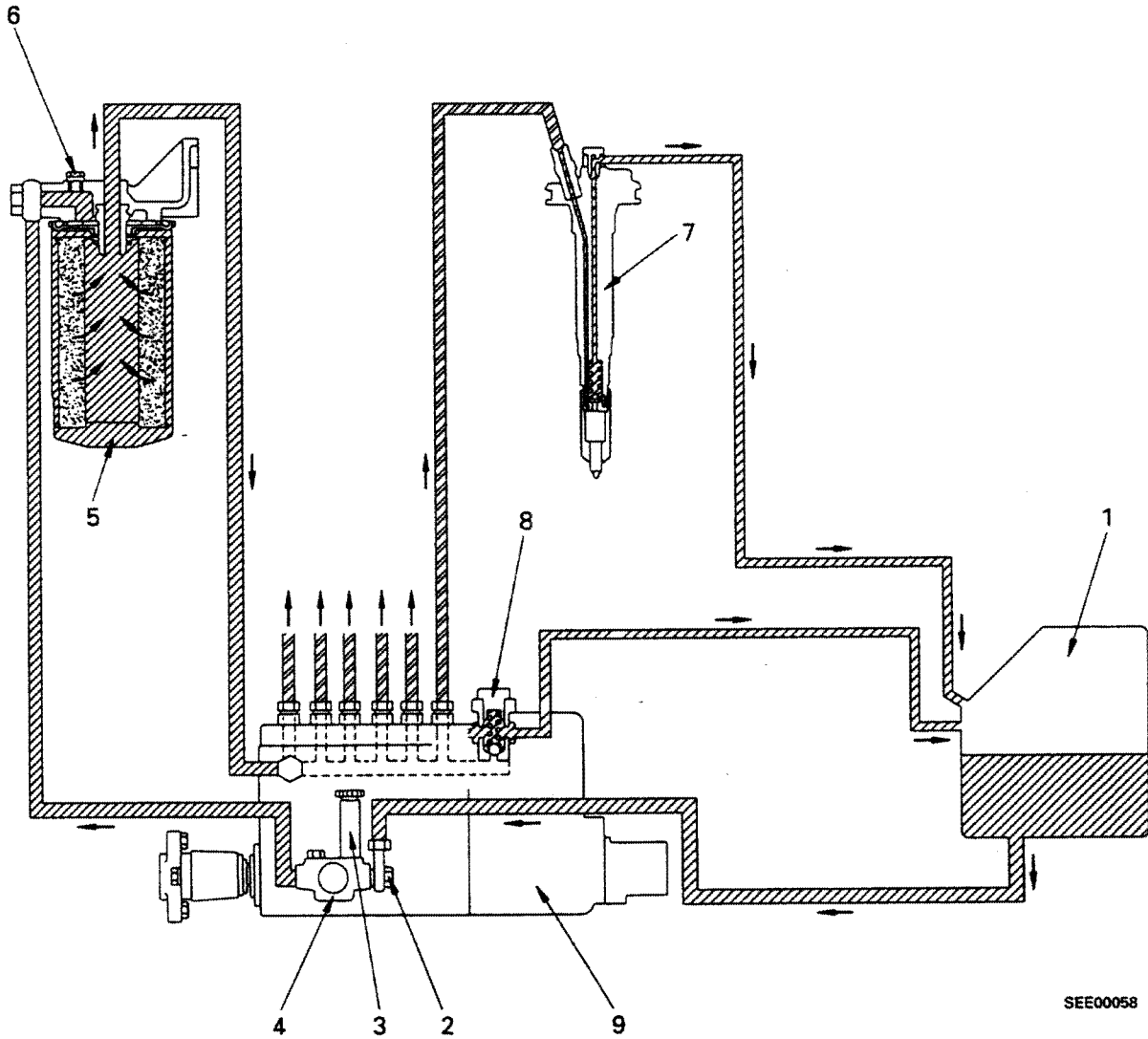
- Valve cracking temperature:  $85 \pm 1.5^\circ\text{C}$
- Full opening temperature:  $100^\circ\text{C}$
- Full opening lift: Min. 8 mm

### OIL COOLER

- Effective area
- |             |                      |
|-------------|----------------------|
| 6D125-2:    | 0.218 m <sup>2</sup> |
| S6D125-2:   | 0.504 m <sup>2</sup> |
| SA6D125-2:  | 0.575 m <sup>2</sup> |
| SAA6D125-2: | 0.575 m <sup>2</sup> |

# FUEL SYSTEM

## FUEL SYSTEM CHART



615002

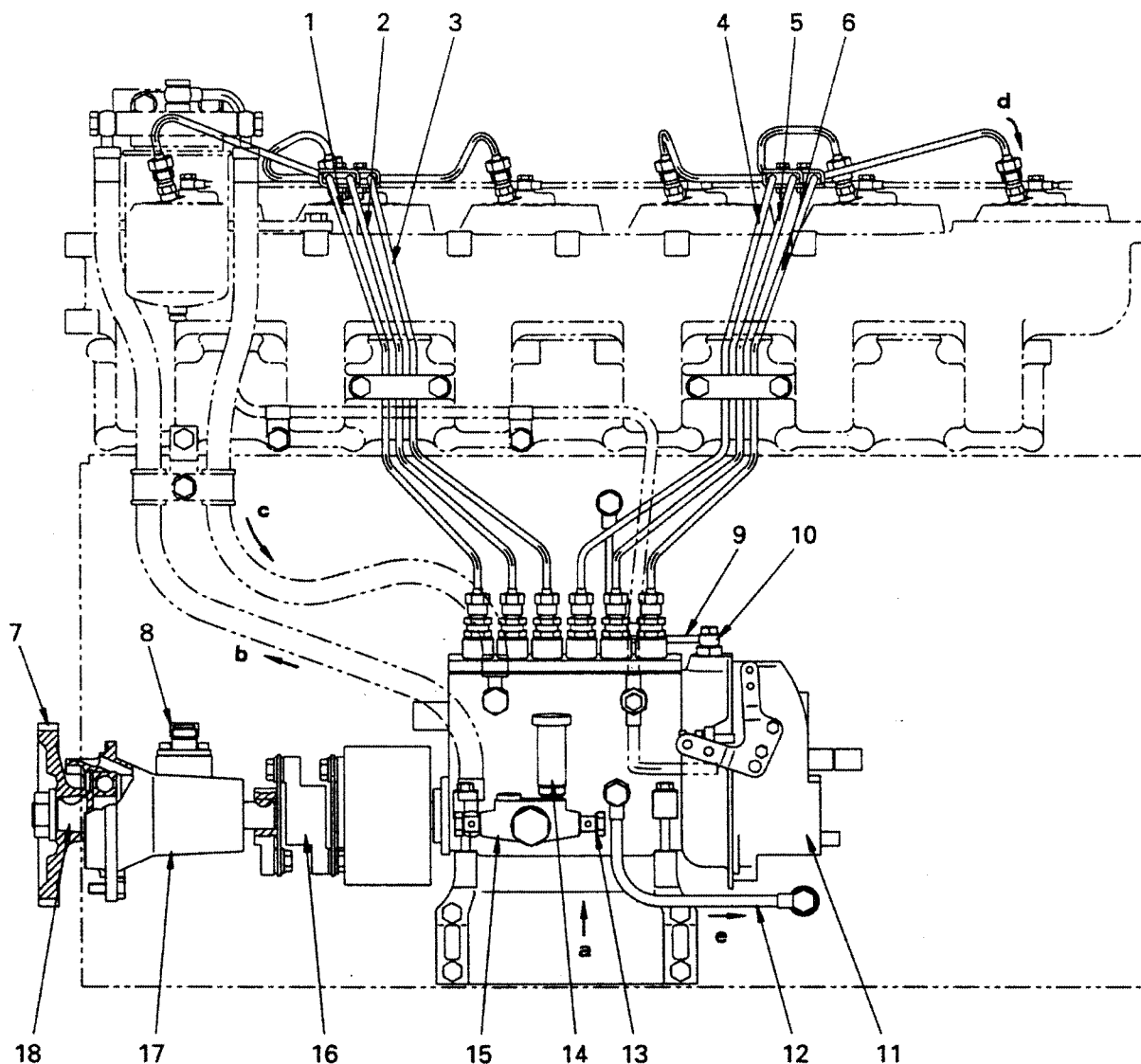
- 1. Fuel tank
- 2. Gauze filter
- 3. Priming pump
- 4. Feed pump
- 5. Fuel filter
- 6. Air bleed plug
- 7. Fuel injection nozzle
- 8. Over-flow valve
- 9. Governor and fuel injection pump

SEE00058

# FUEL INJECTION PUMP

6D125-2 (D60E-12, D65E-12, D70LE-12)

S6D125-2 (D60P-12, D65EX-12, D65P, PX-12, D85E-SS-2, D85E-SS-2A)



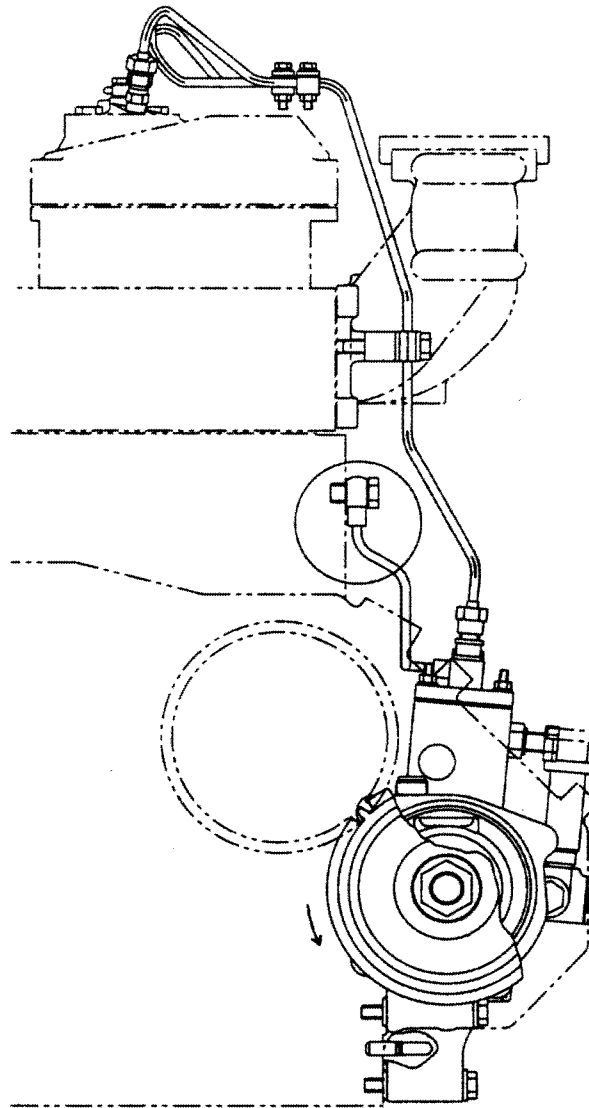
SKE00200

- |   |                         |
|---|-------------------------|
| 1. Fuel injection pipe No. 1                            | 10. Overflow valve      |
| 2. Fuel injection pipe No. 2                            | 11. Fuel injection pump |
| 3. Fuel injection pipe No. 3                            | 12. Oil tube (OUT)      |
| 4. Fuel injection pipe No. 4                            | 13. Gauze filter        |
| 5. Fuel injection pipe No. 5                            | 14. Priming pump        |
| 6. Fuel injection pipe No. 6                            | 15. Feed pump           |
| 7. Fuel injection pump drive gear<br>(No. of teeth: 44) | 16. Coupling            |
| 8. Rotation pick-up                                     | 17. Drive case          |
| 9. Oil tube (IN)  | 18. Drive shaft         |

615002



615002



SKE00201

- a. Fuel inlet port
- b. To fuel filter
- c. From fuel filter
- d. To fuel injection nozzle
- e. To oil pan (oil)

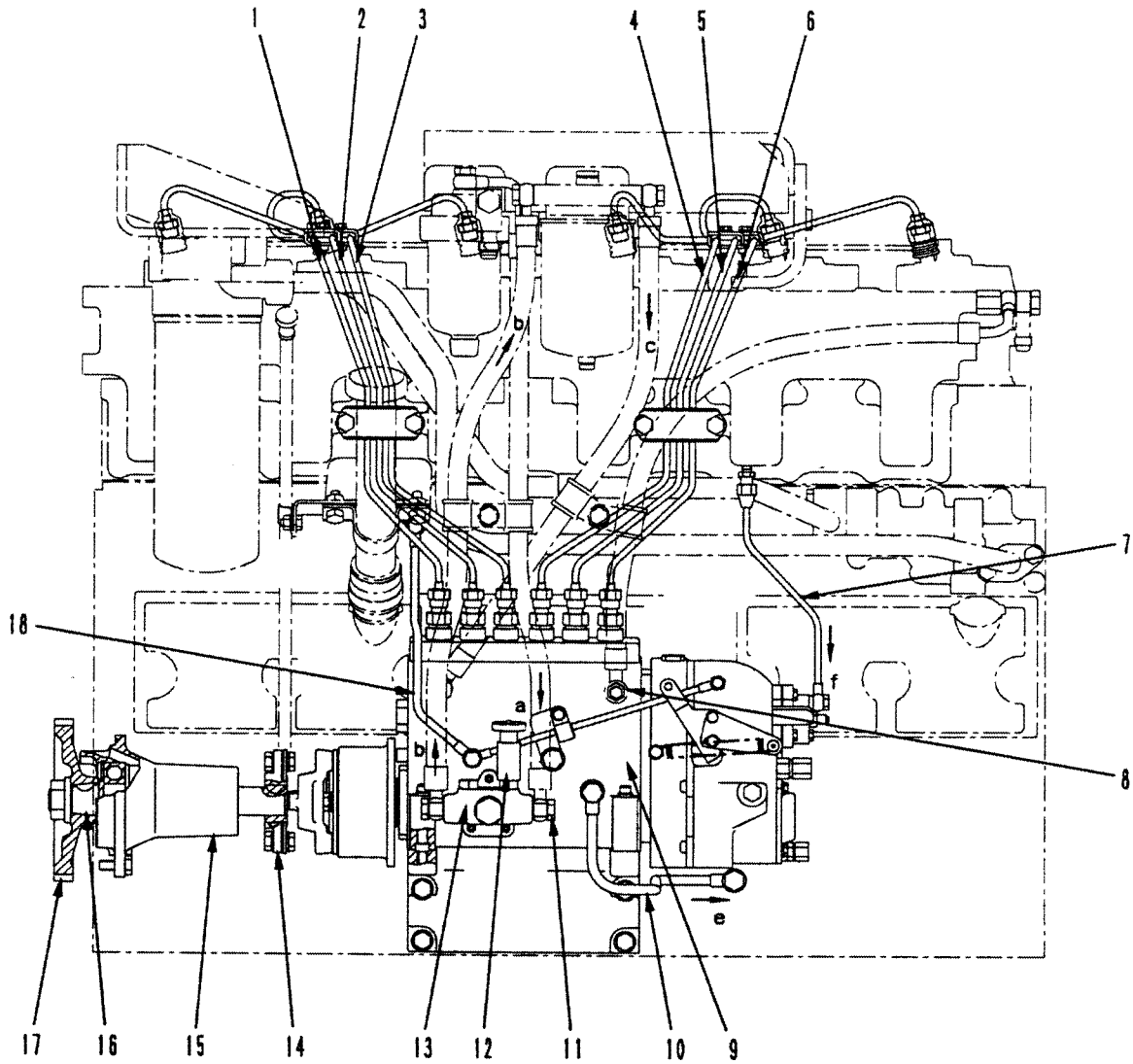
**Fuel injection pump**

Type: Nippondenso NB  
 Lubrication method: Forced lubrication using engine oil

**Governor**

Type: Nippondenso RSV  
 Centrifugal type all-speed governor

S6D125-2 (D85A, P, E-21, D87E, P-2)  
(with boost compensator device)

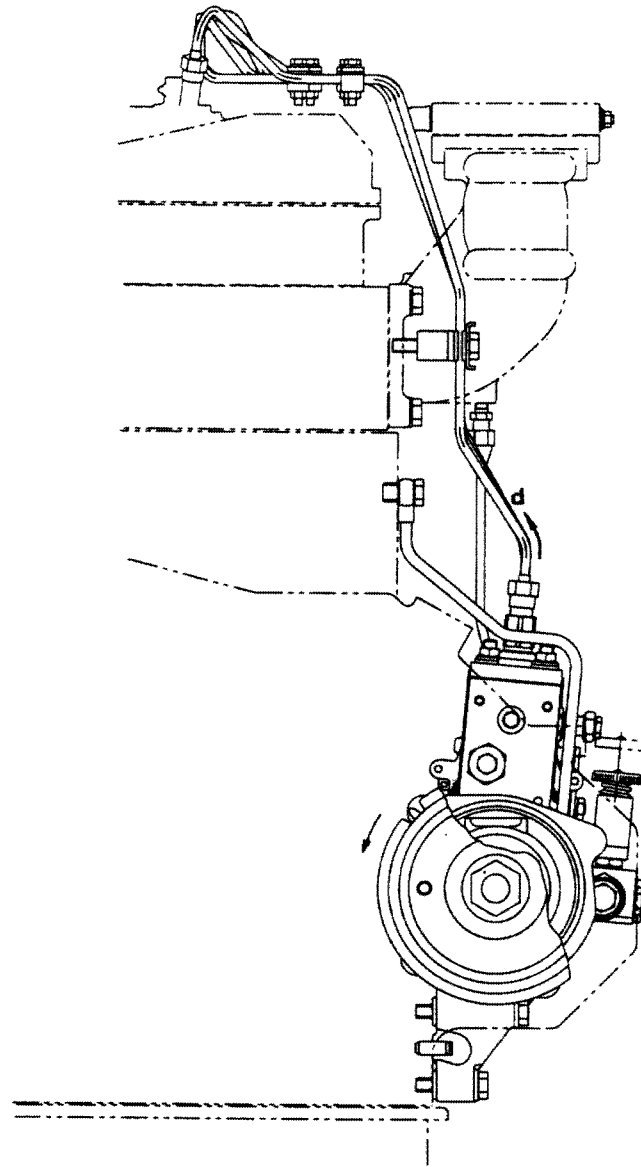


615002

SWE01744

- |                                 |  |
|---------------------------------|--|
| 1. Fuel injection pipe No. 1    | 10. Oil tube (OUT)                                       |
| 2. Fuel injection pipe No. 2    | 11. Gauze filter   |
| 3. Fuel injection pipe No. 3    | 12. Priming pump   |
| 4. Fuel injection pipe No. 4    | 13. Feed pump  |
| 5. Fuel injection pipe No. 5    | 14. Coupling   |
| 6. Fuel injection pipe No. 6    | 15. Drive case   |
| 7. Air pipe (boost compensator) | 16. Drive shaft  |
| 8. Overflow valve               | 17. Fuel injection pump drive gear<br>(No. of teeth: 44) |
| 9. Fuel injection pimp          | 18. Oil tube (IN)  |

615002



SKE00203

- a. Fuel inlet port
- b. To fuel filter
- c. From fuel filter
- d. To fuel nozzle
- e. Oil pan
- f. To fuel injection pump (boost pressure)

**Fuel injection pump**

Type:

Bosch PE-P type (PS3S)

Lubrication method:

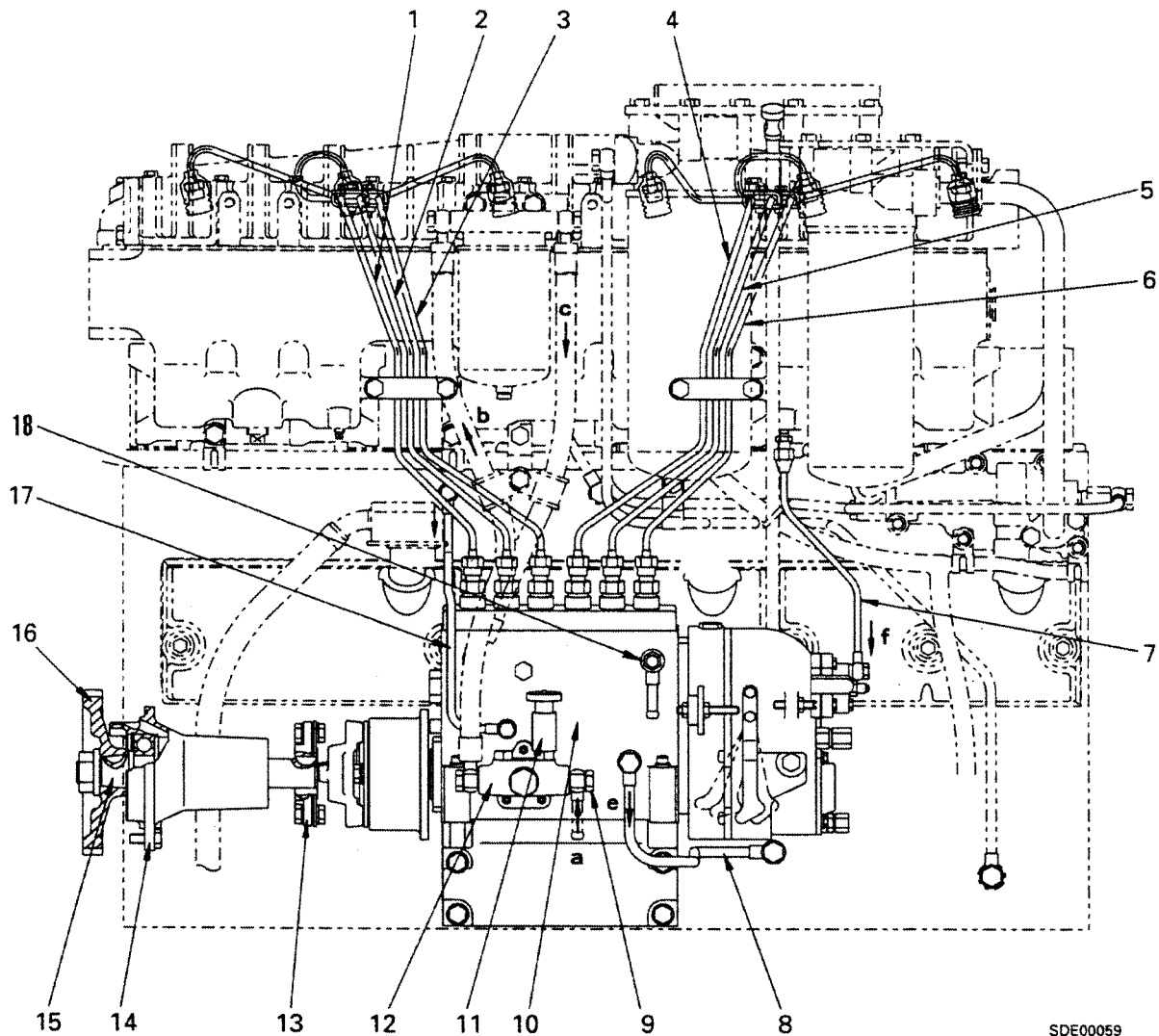
Forced lubrication using engine oil

**Governor**

Type:

Bosch RSV type Centrifugal type all-speed governor (with boost compensator)

SA6D125-2 WITH MECHANICAL GOVERNOR [PC400-6, PC450-6, WA470-3]  
 SAA6D125-2 WITH MECHANICAL GOVERNOR [PC400AC-6, PC400-6 • PC450-6 (USA),  
 BR550JG-1]

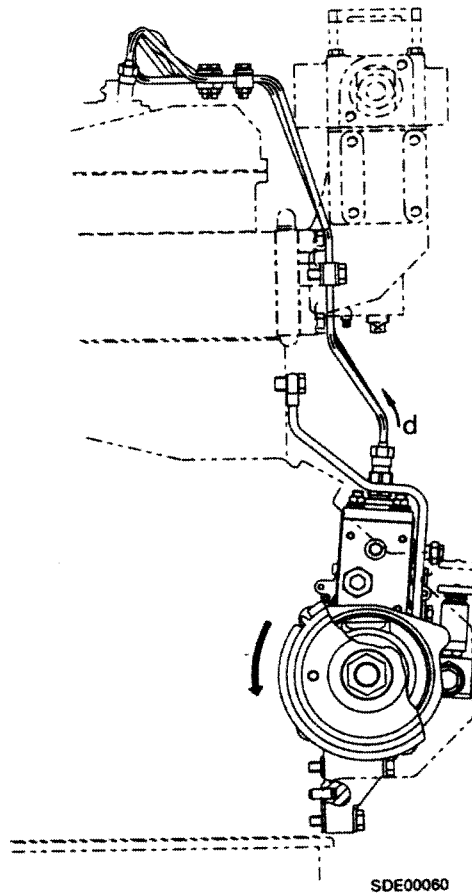


SDE00059

- |  |  |
|--|--|
| 1. Fuel injection pipe (No. 1)           | 10. Fuel injection pump                                  |
| 2. Fuel injection pipe (No. 2)           | 11. Priming pump   |
| 3. Fuel injection pipe (No. 3)           | 12. Feed pump  |
| 4. Fuel injection pipe (No. 4)           | 13. Coupling   |
| 5. Fuel injection pipe (No. 5)           | 14. Drive case   |
| 6. Fuel injection pipe (No. 6)           | 15. Drive shaft  |
| 7. Air pipe (Boost compensator)          | 16. Fuel injection pump drive gear<br>(No. of teeth: 44) |
| 8. Oil tube (outlet) (Boost compensator) | 17. Oil tube (inlet)                                     |
| 9. Gauze filter                          | 18. Overflow valve                                       |

615002

615002



- a. Fuel inlet
- b. To fuel filter
- c. From fuel filter
- d. To fuel injection nozzle
- e. To oil pan (oil)
- f. To fuel injection pump (boost pressure)

**FUEL INJECTION PUMP**

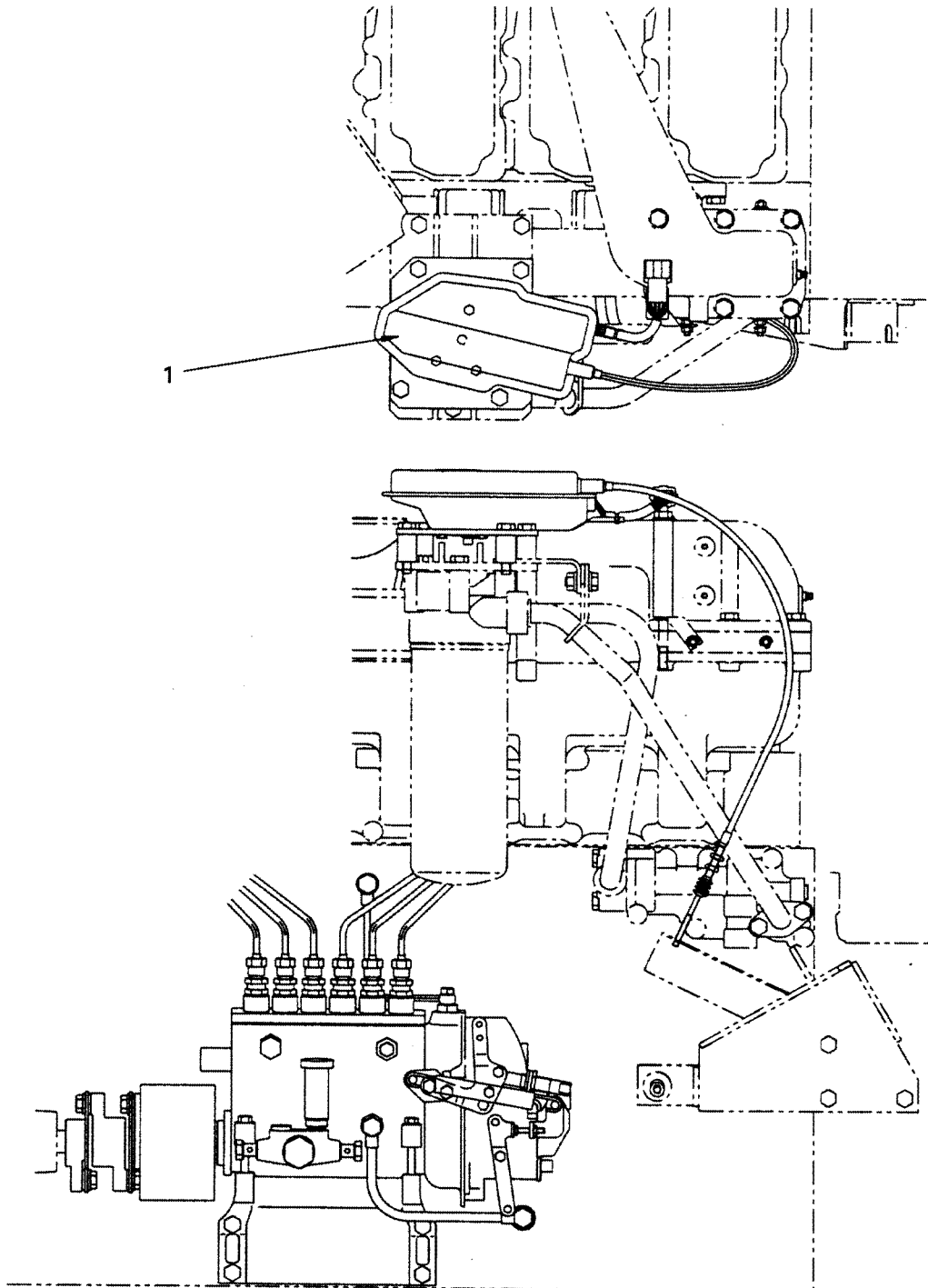
- Maker: Bosch PE-NB
- Type: Bosch PE-NB
- Lubrication method: Forced lubrication with engine oil.

**GOVERNOR**

- Type: RSV Centrifugal, all-speed type.

# FUEL 2-STAGE SET CONTROL MOTOR MOUNT

6D125-2 (D60P-12)

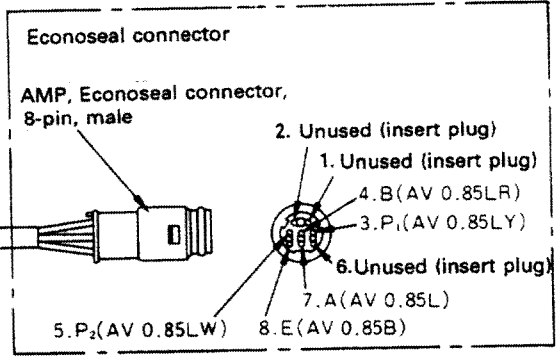
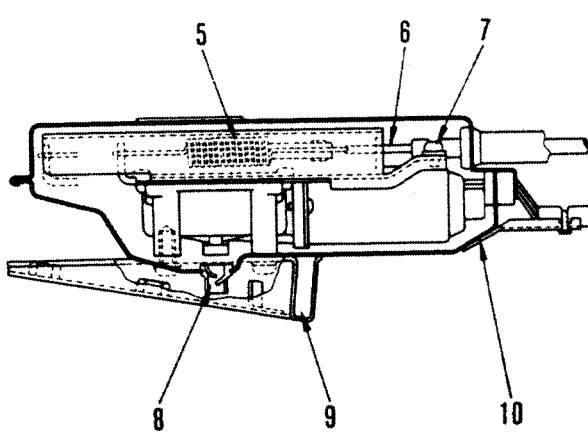
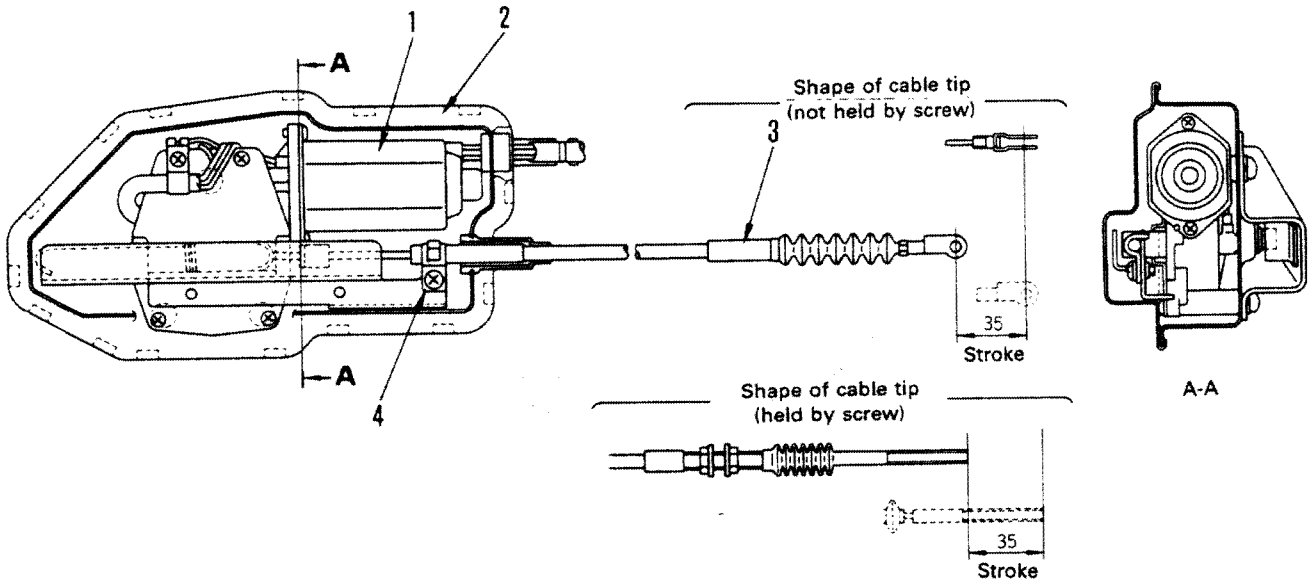


615002

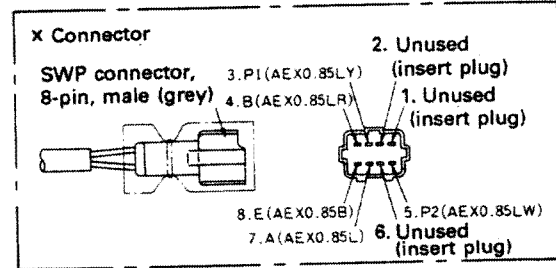
SKE00204

1. Control motor

# ENGINE STOP MOTOR 2-STAGE SET CONTROL MOTOR (D60P-12)



6210F124



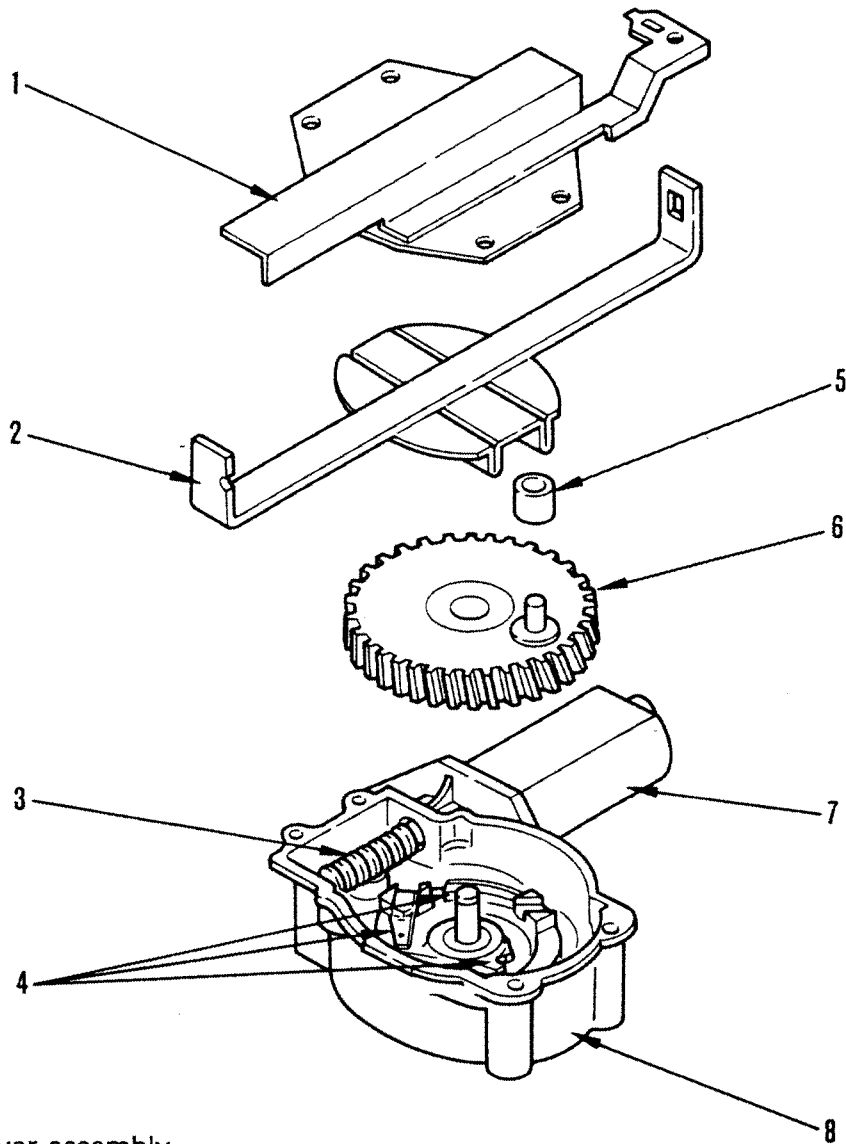
6215F081

1. Motor assembly
2. Cover
3. Cable assembly
4. Cable clamp
5. Coil spring
6. Cable
7. Screw
8. Breather
9. Bracket assembly
10. Cover assembly

- Engine stop motor**
- Maker: Jidosha Denki Kogyo
  - Rated voltage: DC 24V
  - Actuation pressure: Above 15 kg
  - Stroke: 35 mm
  - Weight: 1.2 kg

615002

Structural diagram (1)

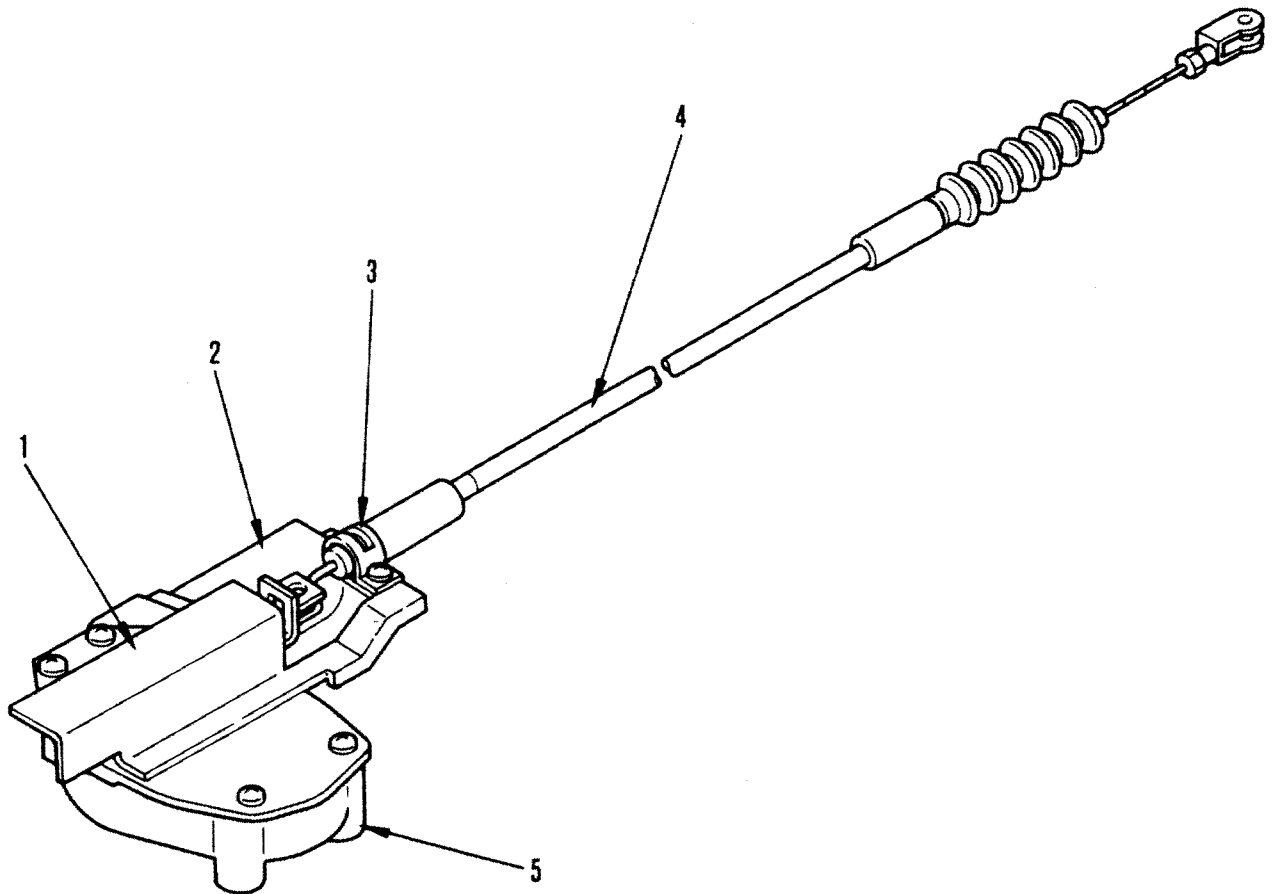


- 1. Gear cover assembly
- 2. Slider assembly
- 3. Armature shaft
- 4. Contactor assembly
- 5. Roller
- 6. Worm wheel assembly
- 7. Motor assembly
- 8. Gear case assembly

615002



Structural diagram (2)

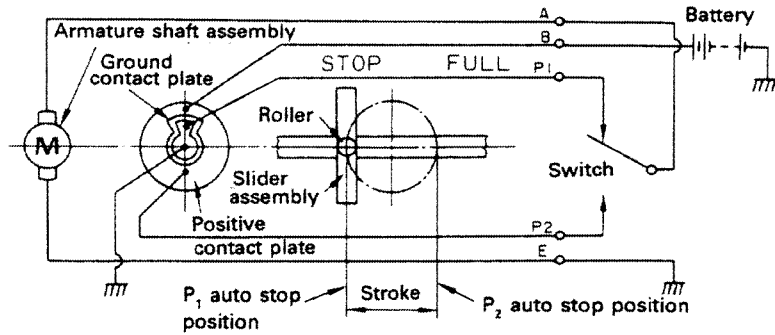


615002

- 1. Gear cover assembly
- 2. Motor assembly
- 3. Cable clamp
- 4. Cable assembly
- 5. Gear case assembly

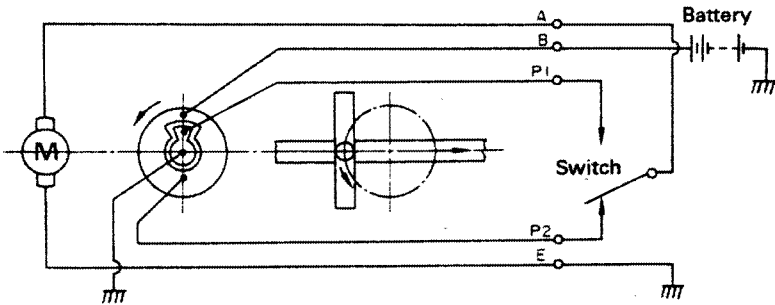
**Explanation of operation and circuits**

**1. STOP condition (0° or 360°)**



A closed circuit is formed and it is set to the stop condition. The slider assembly stops at the P1 auto stop position.

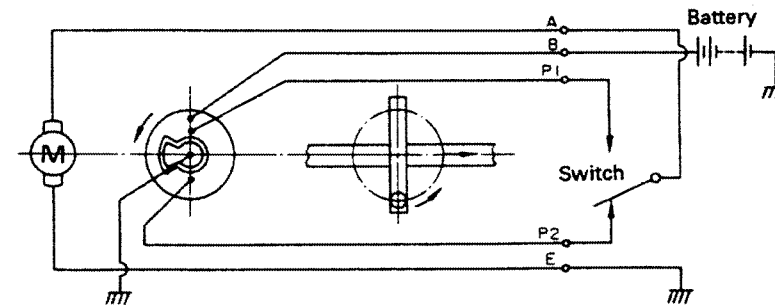
**2. When switch is operated (when motor is started)**



When the switch is operated to the P2 side, electric current flows to the armature shaft assembly from the positive contact plate through the P2 auto switch terminal and the switch, and

the motor starts. At the same time as the roller moves, the slider assembly starts to move in the direction of the arrow.

**3. Rotating (90° in diagram)**

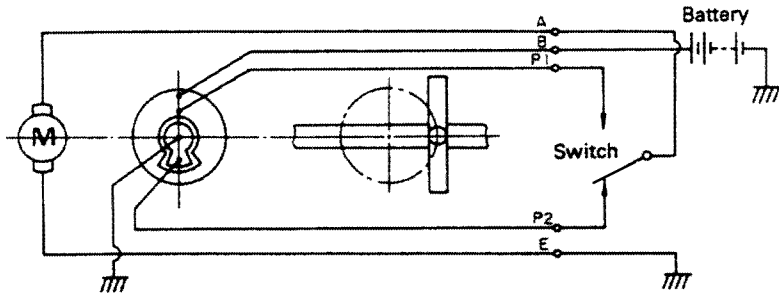


Electric current continues to flow in the armature shaft assembly, and the motor continues to rotate.

Because of the rotation of the roller, the slider assembly also continues to move in the direction of the arrow.

615002

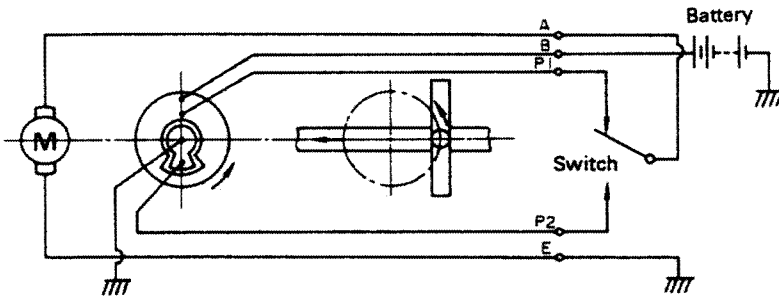
4. STOP condition (180°)



The P2 auto stop terminal mounts the negative contact plate and forms a closed circuit, so the

motor stops suddenly. The slider assembly also stops.

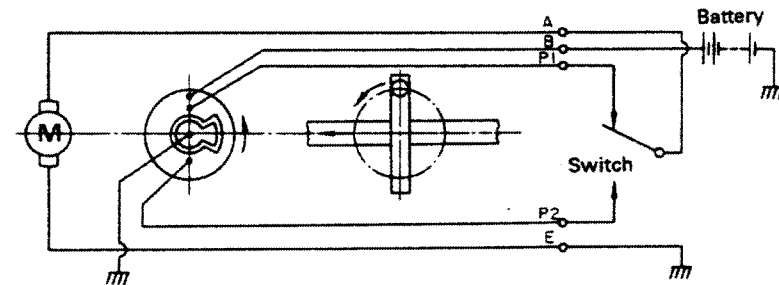
5. When switch is operated (when motor is started)



When the switch is operated to the P1 side, electric current flows to the armature shaft assembly from the positive contact plate through the P1 auto switch terminal and the switch, and

the motor starts. At the same time as the roller moves, the slider assembly starts to move in the direction of the arrow.

6. Rotating (270° in diagram)



Electric current continues to flow in the armature shaft assembly, and the motor continues to rotate.

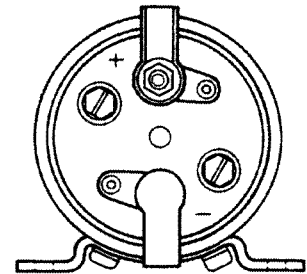
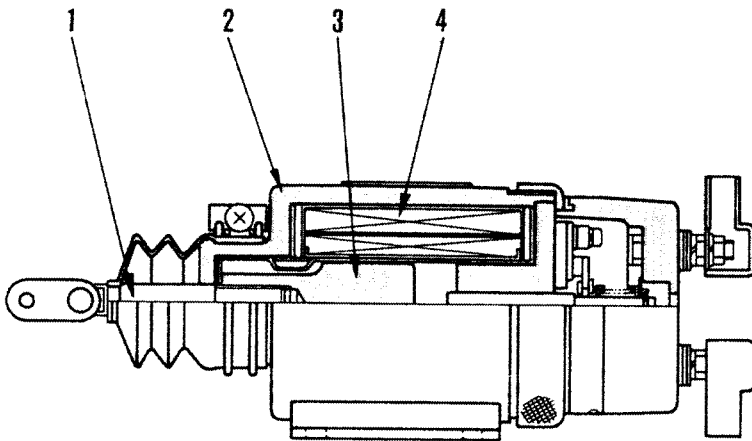
The slider assembly also continues to move in the direction of the arrow. Following this, it returns to the stop condition.

615002

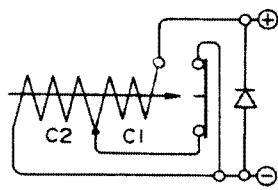
# MAGNETIC SWITCH AND FUEL SOLENOID

## MAGNETIC SWITCH

B contact (electricity flows in ordinary operations) method



6150F134



Inner wiring

C1: Pull-in coil  
C2: Holding coil

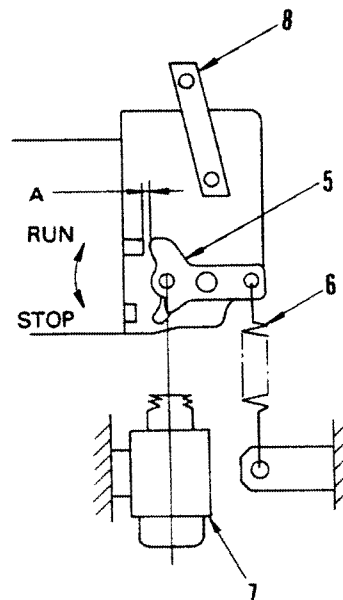
- |           |                       |
|-----------|-----------------------|
| 1. Shaft  | 5. Stop lever         |
| 2. Case   | 6. Return spring      |
| 3. Piston | 7. Solenoid           |
| 4. Coil   | 8. Fuel control lever |

### MAGNETIC SWITCH

- |                      |  |
|----------------------|--|
| • Maker:             | NIKKO DENKI                                  |
| • Type:              | Sealed                                       |
| • Rated voltage:     | DC24 V                                       |
| • Operating current: | Maximum: 35 A max.<br>Continuity: 0.5 A max. |
| • Stroke:            | 12 ± 0.3 mm                                  |
| • Weight:            | 3.3 kg                                       |

### FUNCTION

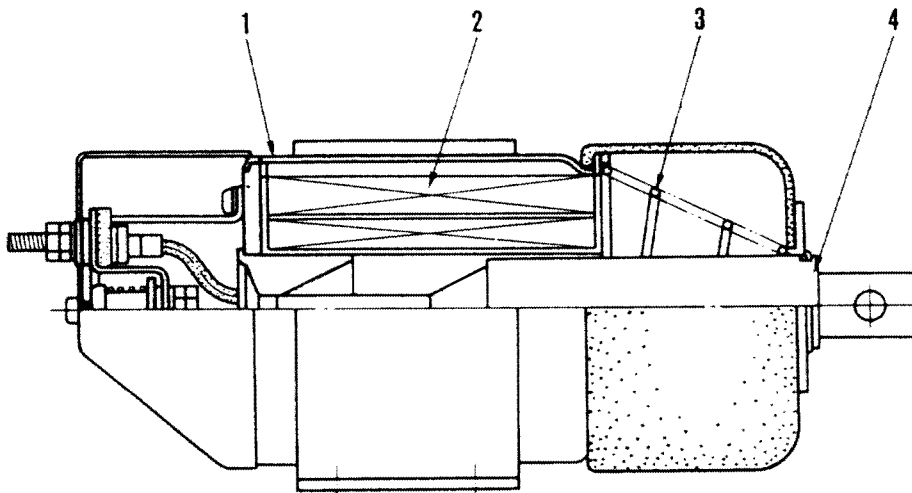
- **Starting engine**  
When the starting key is turned on, the solenoid is energized. Solenoid shaft (1) is electrically attracted, pulling injection pump stop lever (5) and fixing it in the RUN position.
- **Stopping engine**  
When the starting key is turned off, the solenoid is de-energized. Injection pump stop lever (5) is returned to STOP position (non-injection position) by return spring (6).
- **During operation**, the amount of fuel injection is controlled by fuel control lever (8).
- When installing the fuel solenoid, adjust clearance A referring to TESTING AND ADJUSTING.



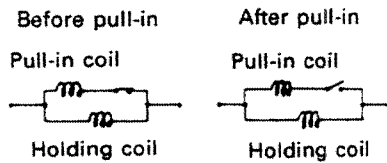
6162F151

**FUEL SOLENOID**

A contact (electricity flows when stopped) method



O2F082



Inner wiring

O2F081

- 1. Case
- 2. Coil
- 3. Return spring
- 4. Plunger

**FUNCTION**

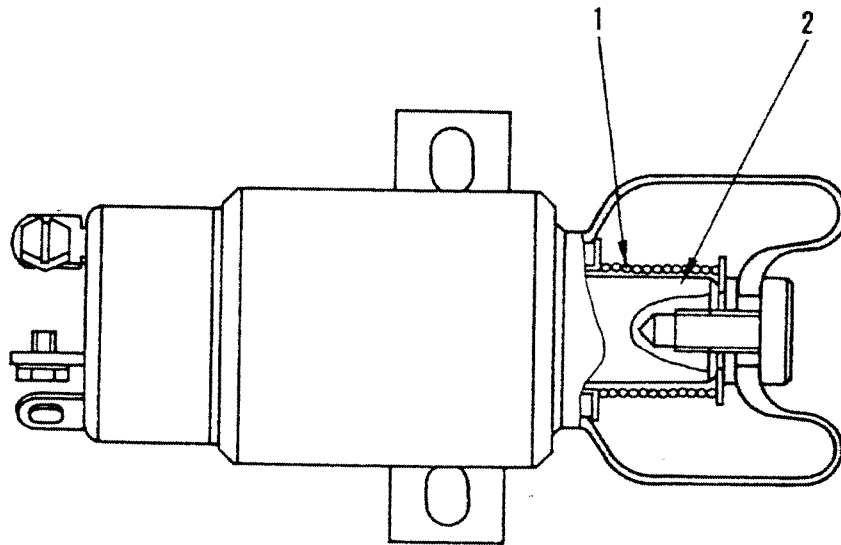
When stopping the engine, the solenoid is energized, the solenoid plunger is electrically attracted, and the stop lever of the injection pump is moved by a rod to the stop (non-injection) position. As a result, the fuel is cut off and the engine is brought to a stop. Accordingly, this solenoid is used only when the engine is being stopped; it is in free condition during ordinary operations.

**FUEL SOLENOID**

- Maker: Nippondenso
- Type: Sealed
- Rated voltage: DC24 V
- Operating current
  - Pull-in coil: 20 A max.
  - Holding coil: 5 A max.
- Stroke: 27 mm

615002

A contact (electricity flows when stopped) method



6150F191

615002

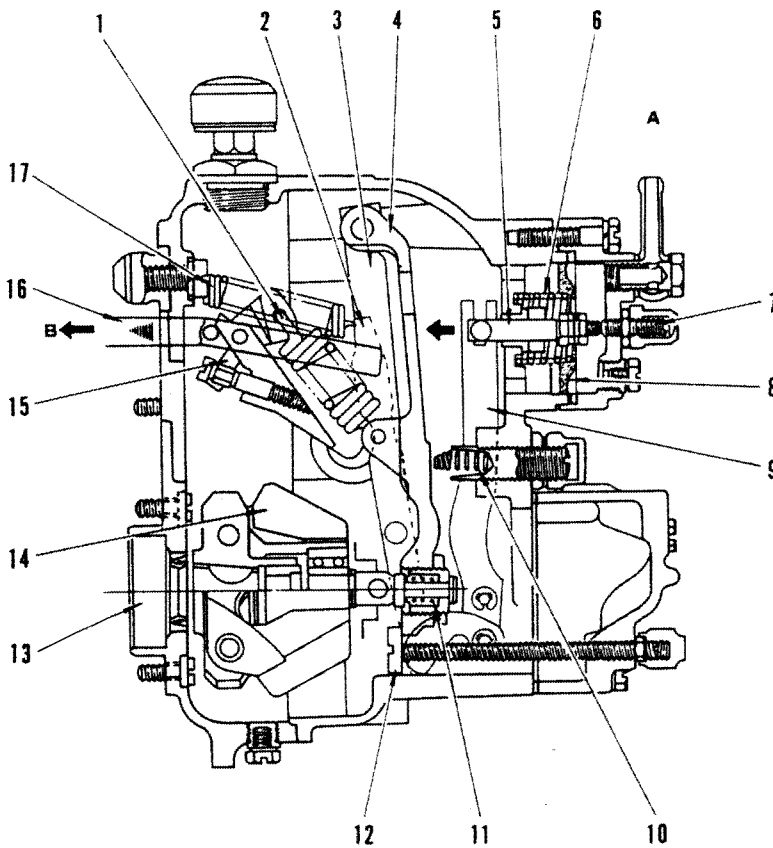
#### FUNCTION

- When stopping the engine, the solenoid is energized, the solenoid plunger is electrically attracted, and the stop lever of the injection pump is moved by a rod to the stop (non-injection) position. As a result, the fuel is cut off and the engine is brought to a stop. Accordingly, this solenoid is used only when the engine is being stopped; it is in free condition during ordinary operations.
- No electricity goes to the solenoid when the engine is running. The solenoid has no magnetic force, so the shaft of the solenoid is pulled back by the return spring.

#### FUEL SOLENOID

- Maker: SYNCHROSTART
- Type: Sealed
- Rated voltage: DC24 V
- Operating current
  - Pull-in coil: 25 A max.
  - Holding coil: 0.5 A max.
- Stroke: 25.4 mm

## BOOST COMPENSATOR



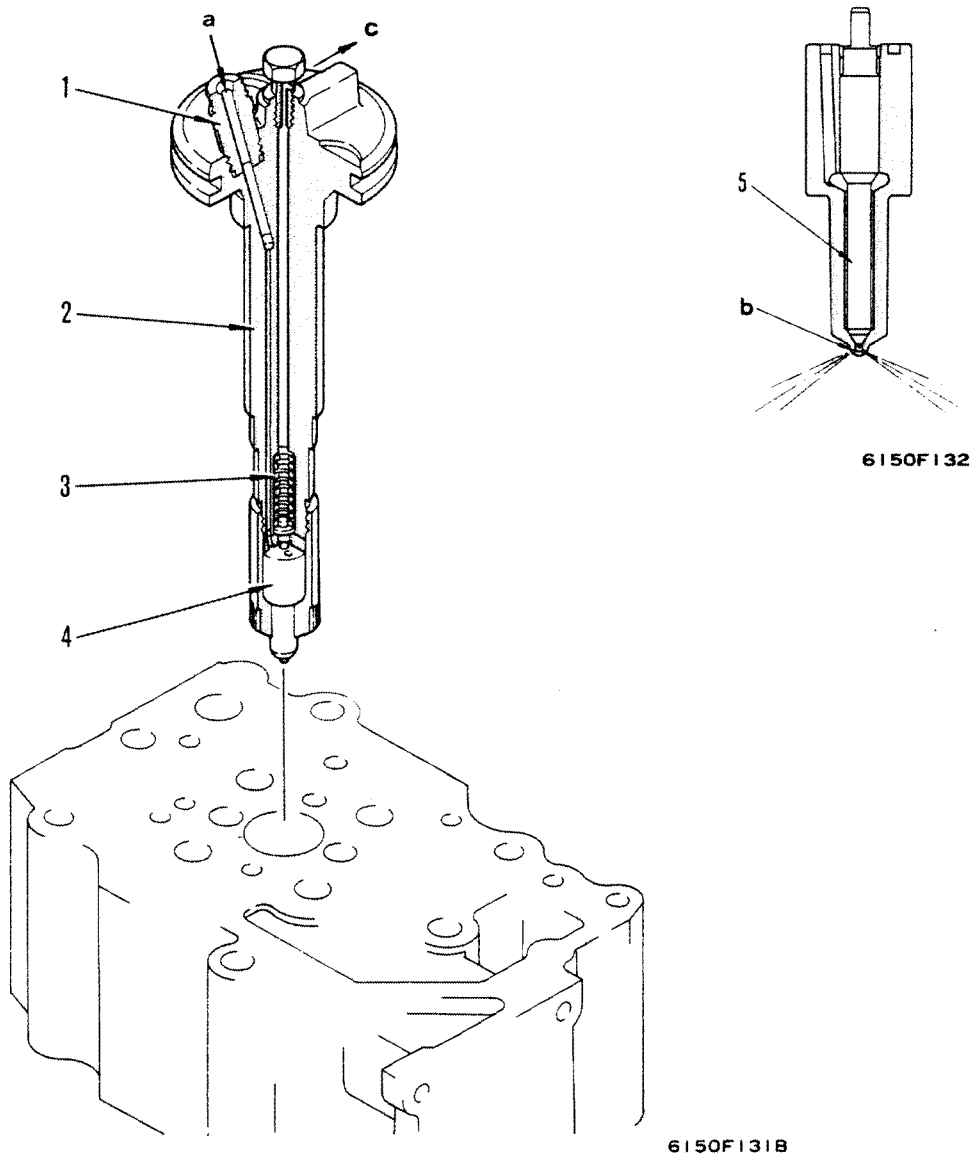
1. Governor spring
  2. Floating lever
  3. Guide lever
  4. Tension lever
  5. Push rod
  6. Boost compensator spring
  7. Adjustment screw
  8. Diaphragm
  9. Boost compensator lever
  10. Idling sub spring
  11. Angleich spring
  12. Full load stopper
  13. Camshaft
  14. Flyweight
  15. Swivel lever
  16. Control rack
  17. Start spring
- A: Air supply pressure (boost pressure)  
B: Direction to increase fuel

611F109

### FUNCTION

- The boost compensator is actuated by the air supply pressure (boost pressure) of the turbocharger. It acts through a different line from the governor to increase the fuel injection amount when there is high speed and high load.
- On engines equipped with a turbocharger, because of the inertia of the turbocharger, the increase in the fuel injection when the fuel control lever is operated comes earlier than the increase in the amount of air, so the exhaust color is poor when accelerating.
- As a result, on engines equipped with a turbocharger, the fuel setting is made so that the performance of the turbocharger is limited, or so the exhaust gas color is poor, or an intermediate point is chosen.
- The boost compensator improves this situation: the exhaust gas color does not become poor when accelerating and the turbocharger can display its full performance.
- If the fuel setting is made the same as for an engine without boost compensator when the boost compensator is actuated, the fuel injection at low speed (when the boost compensator is not actuated) or when accelerating becomes smaller, so the exhaust color can be greatly improved. It is used frequently for this purpose on engines operating inside tunnels or on ships.
- When the boost pressure becomes above a certain pressure, diaphragm (8) is pushed in, pushes push rod (5), and moves boost compensator lever (9) and floating lever (2) to move control rack (16) in the direction to increase the fuel.
- The actuation pressure and actuation amount are determined by the tension of boost compensator spring (6), and can be adjusted by adjustment screw (7).

# FUEL INJECTION NOZZLE



- 1. Inlet connector
- 2. Nozzle holder
- 3. Nozzle spring
- 4. Nozzle
- 5. Needle valve

- a. From injection pump
- b. Nozzle hole
- c. To fuel tank

## FUEL INJECTION NOZZLE

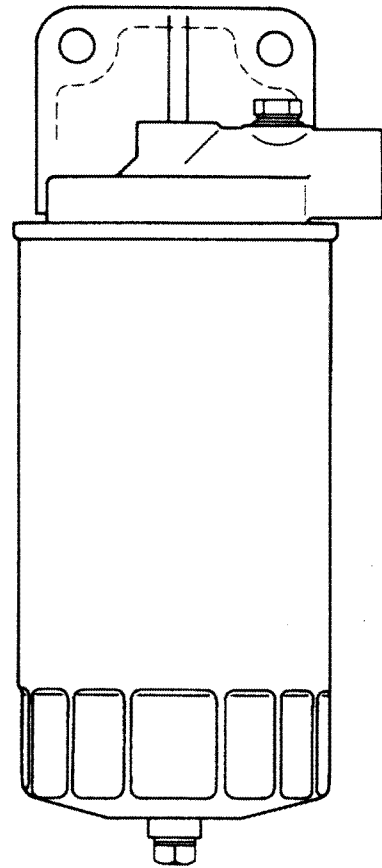
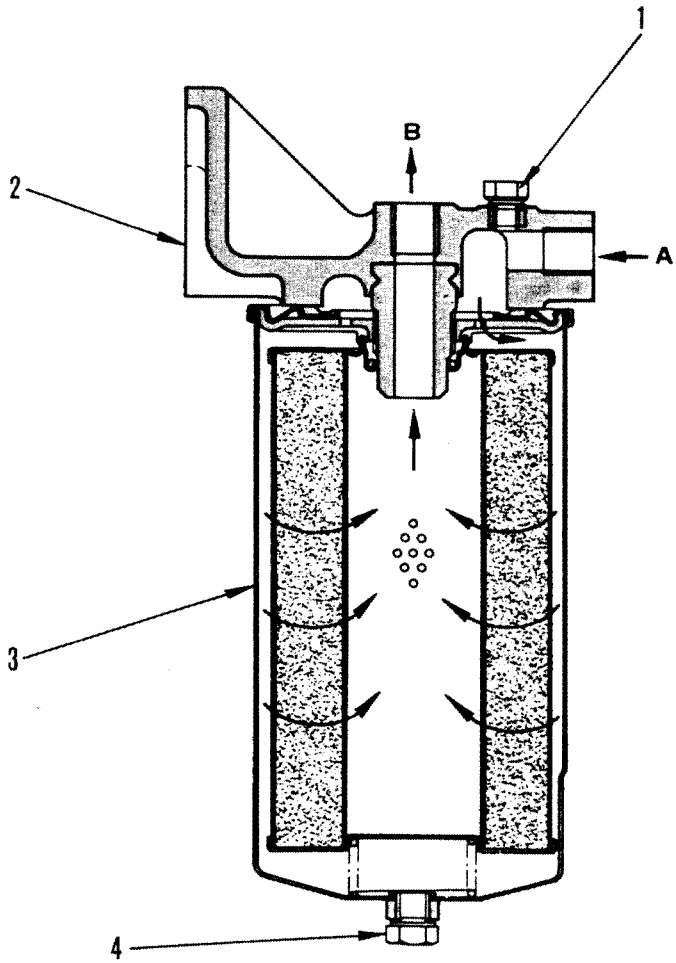
- Type
  - 6D125-2, S6D125-2:  
Made by NIPPON DENSO  
Multi-hole type
  - S6D125-2, SA6D125-2  
SAA6D125-2:  
Made by ZEXEL  
Multi-hole type
- Injection pressure  
For details, see TESTING AND ADJUSTING, ADJUSTING FUEL INJECTION AMOUNT.

- Adjusting injection pressure:  
Shim adjusting type  
Adjusting value  
(per shim thickness 0.1 mm)
  - 6D125-2:     Approx. 1.57 MPa (16 kg/cm<sup>2</sup>)
  - S6D125-2:   Approx. 1.37 MPa (14 kg/cm<sup>2</sup>)
  - SA6D125-2:  Approx. 1.37 MPa (14 kg/cm<sup>2</sup>)
  - SAA6D125-2: Approx. 1.37 MPa (14 kg/cm<sup>2</sup>)
- Adjusting shims  
(at intervals of 0.025 mm)
  - 6D125-2:     0.7 – 1.5 mm
  - S6D125-2:   0.5 – 1.975 mm
  - SA6D125-2:  0.5 – 1.975 mm
  - SAA6D125-2: 0.5 – 1.975 mm

615002



FUEL FILTER



615002

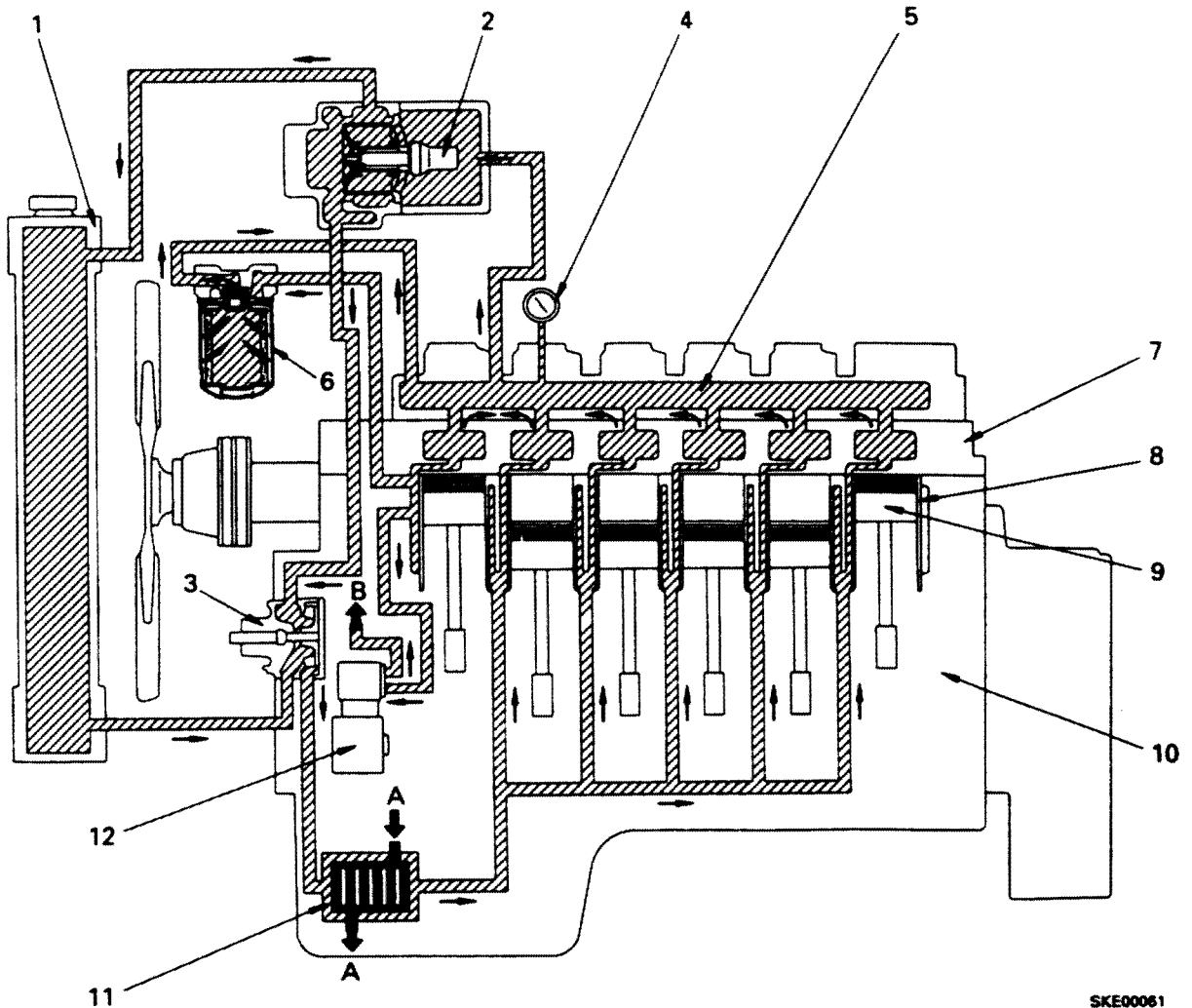
6150F133

- 1. Air bleed plug
- 2. Bracket
- 3. Cartridge
- 4. Water drain plug
- A. Fuel inlet
- B. Fuel outlet

**FUEL FILTER**  
 • Filtration area: 0.3 m<sup>2</sup>

# COOLING SYSTEM

## COOLING SYSTEM CHART



615002

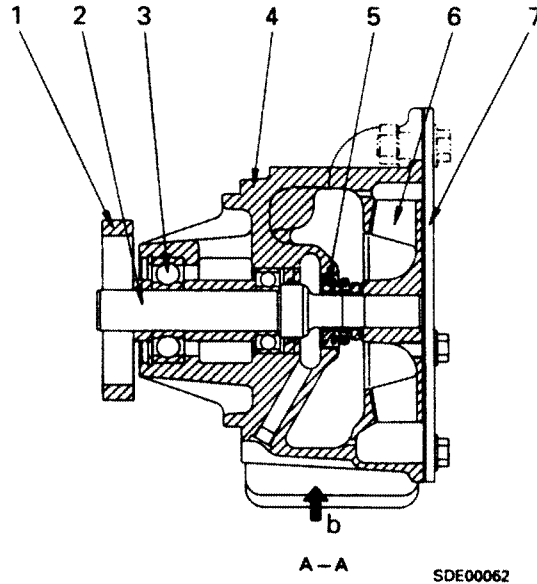
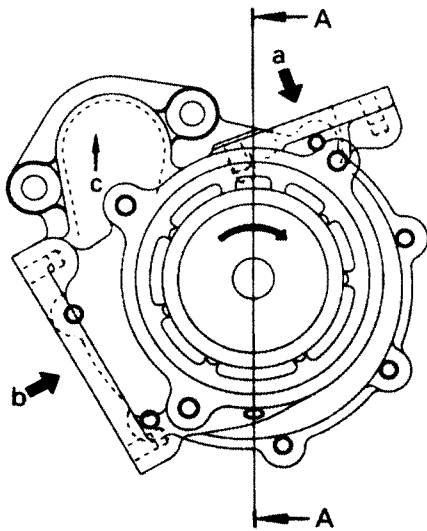
SKE00061

- 1. Radiator
- 2. Thermostat
- 3. Water pump
- 4. Water temperature gauge
- 5. Water manifold (Integrated with cylinder block)
- 6. Corrosion resistor

- 7. Cylinder head
- 8. Cylinder liner
- 9. Piston
- 10. Cylinder block
- 11. Oil cooler
- 12. Air compressor

- A. Lubrication oil
- B. Cooling water (water manifold to cylinder block)

# WATER PUMP



- 1. Water pump drive gear  
(No. of teeth: 22)
- 2. Pump shaft
- 3. Ball bearing
- 4. Pump body
- 5. Water seal
- 6. Impeller
- 7. Pump cover

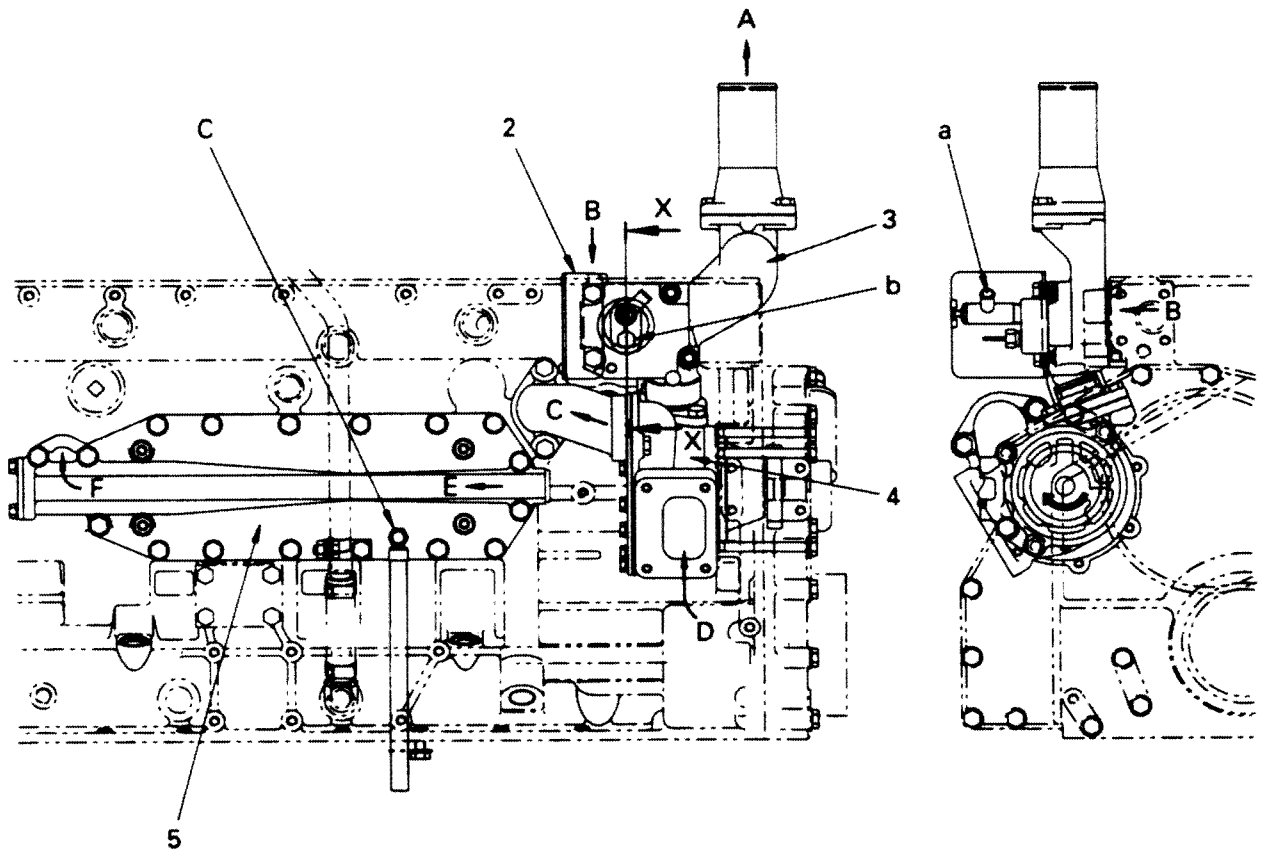
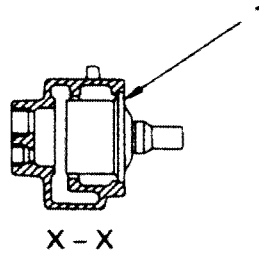
- A. From thermostat
- B. From radiator
- C. To engine each part

## WATER PUMP

- Type: Centrifugal gear drive.
- Pump speed: Engine speed x 1.5

615002

MOUNTING



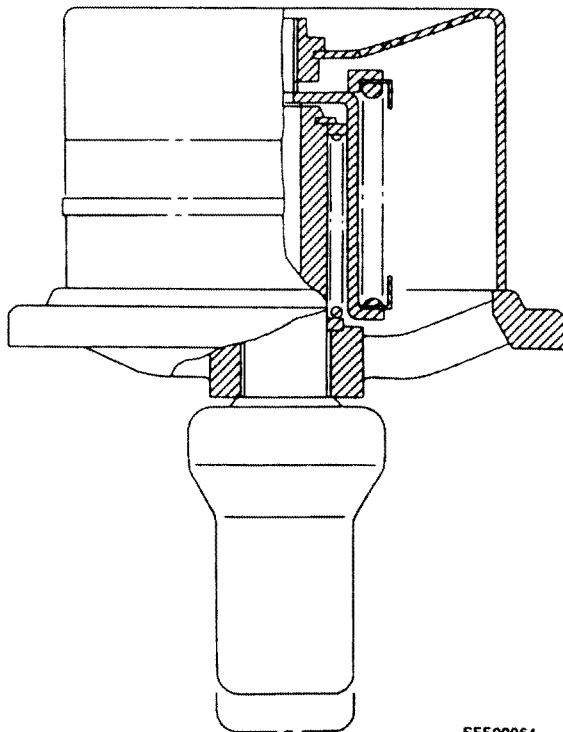
615002

SKE00063

- 1. Thermostat
- 2. Housing cover
- 3. Thermostat housing
- 4. Water pump
- 5. Oil cooler

- A. To radiator (coolant)
- B. From engine each part (coolant)
- C. To engine each part thru oil cooler (coolant)
- D. From radiator (coolant)
- E. From oil pump (oil)
- F. To engine each part (oil)
- a. Outlet for car heater
- b. Water temperature gauge pick-up
- c. Coolant drain plug

# THERMOSTAT



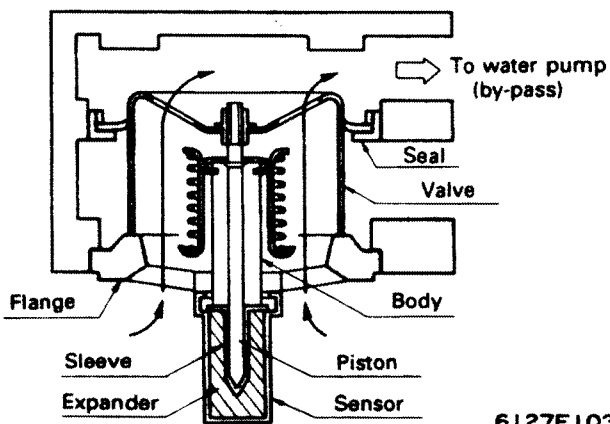
- 1. Seal
- 2. V-notch
  
- A. From engine
- B. To water pump
- C. To radiator

SEE00064

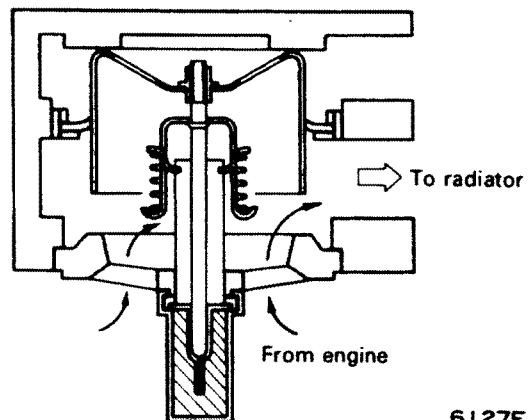
615002

**Operation**  
Cool (full close)

**Warm (full open)**



6127F103

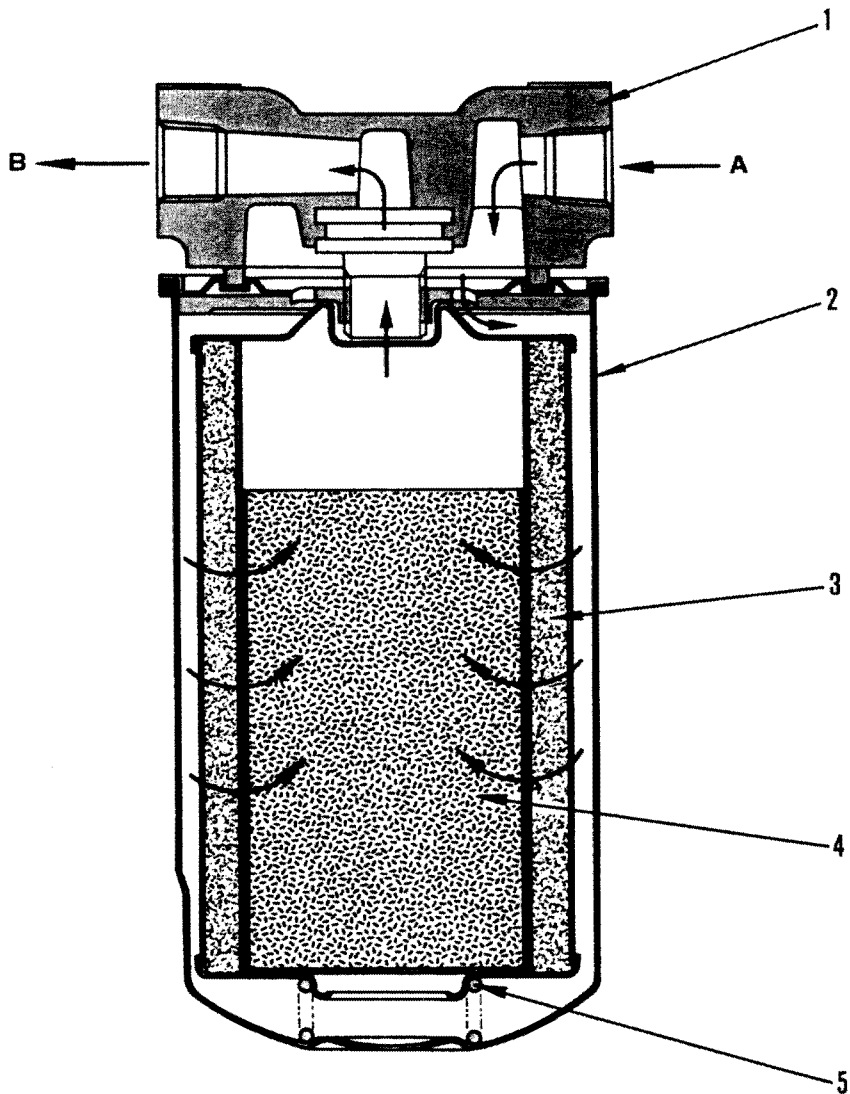


6127F104

**Function**

- Opening temperature :74.5 – 78.5°C
- Full opening temperature :90°C
- Valve lift :Minimum 10 mm

**CORROSION RESISTOR**



615002

6150F139

- 1. Head
- 2. Cartridge
- 3. Element (Paper)
- 4. Element (Chemicals)
- 5. Spring

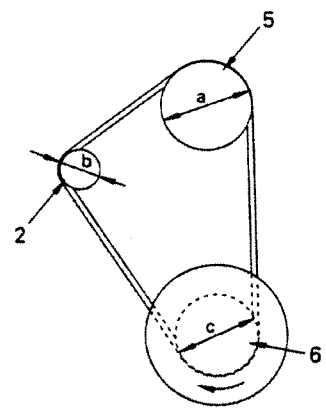
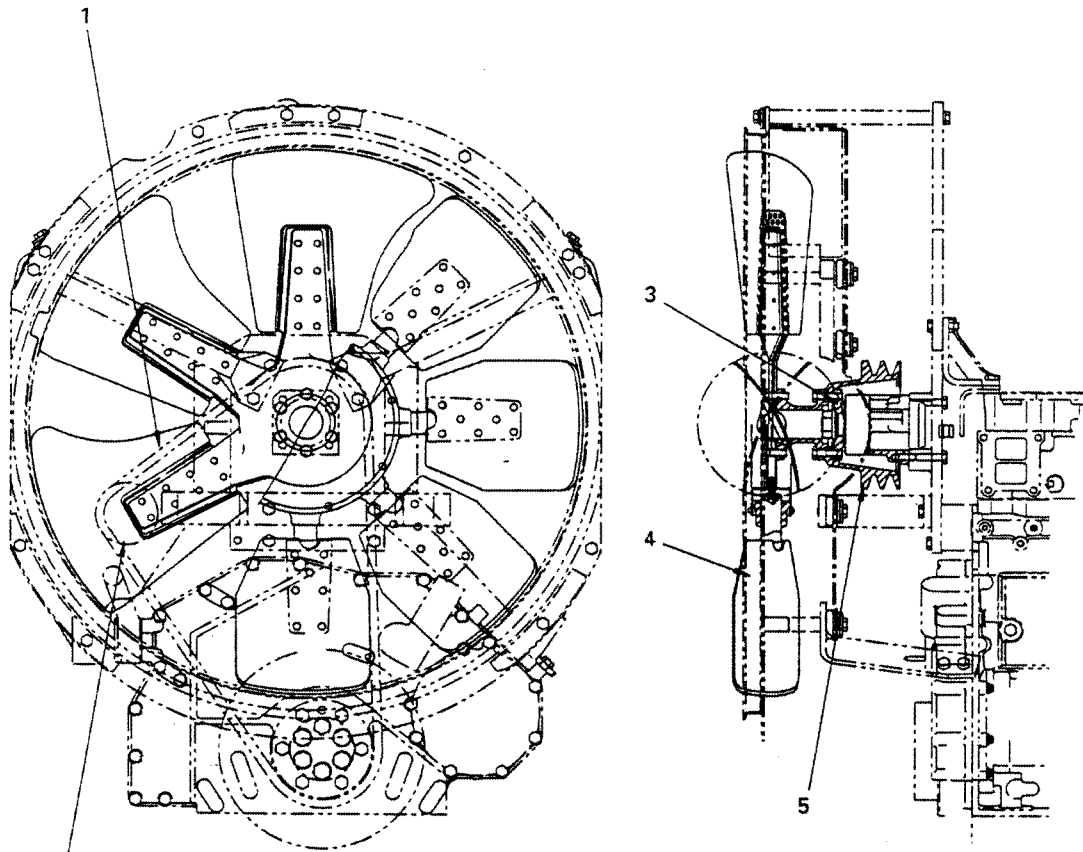
- A. Water inlet
- B. Water outlet

**CORROSION RESISTOR**  
 • Filtration area: 0.5 m<sup>2</sup>

# FAN DRIVE

6D125-2 (D65E-12)

S6D125-2 (D60P-12, D65EX-12, D65P, PX-12, D85E-SS-2, D85E-SS-2A)



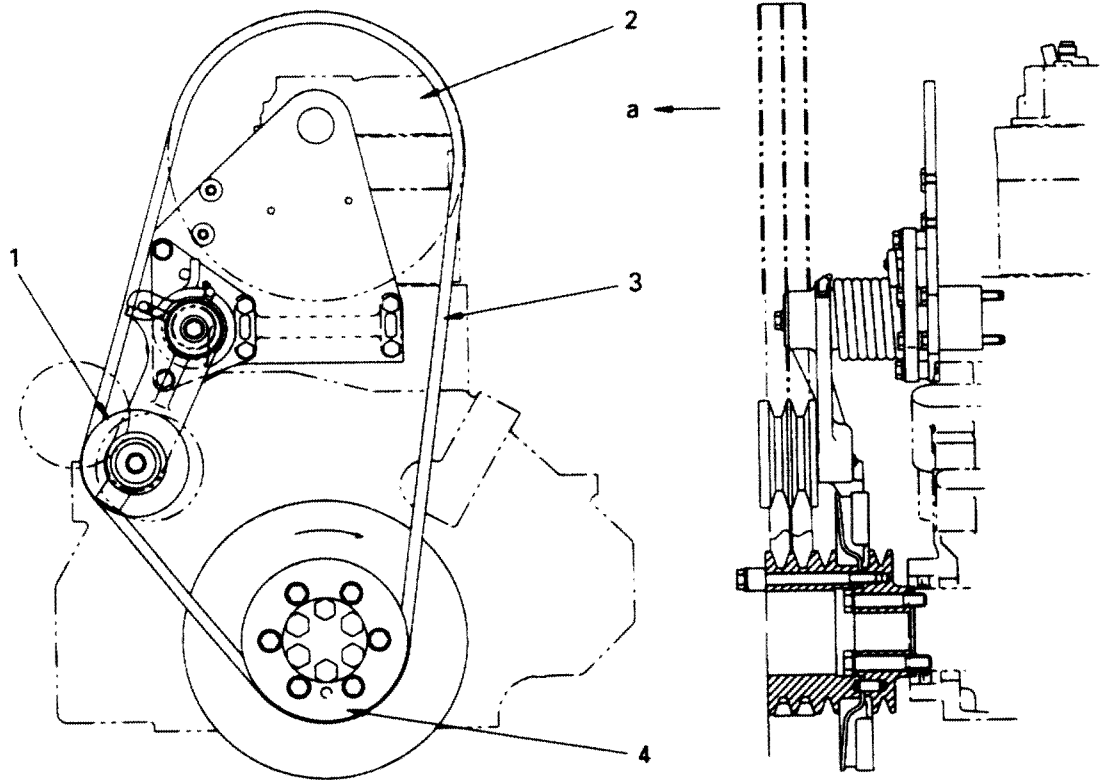
- 1. Fan belt
- 2. Alternator pulley
- 3. Fan hub
- 4. Fan
- 5. Fan pulley
- 6. Crankshaft pulley

- a. Pitch diameter of fan pulley: 200
- b. Pitch diameter of alternator pulley: 95
- c. Pitch diameter of crankshaft pulley: 182

SKE00205

615002

S6D125-2 (D85A, P, E-21)



- 1. Tension pulley (pitch diameter: 120 mm)
- 2. Fan pulley
- 3. Fan belt
- 4. Crankshaft pulley (pitch diameter: 182 mm)

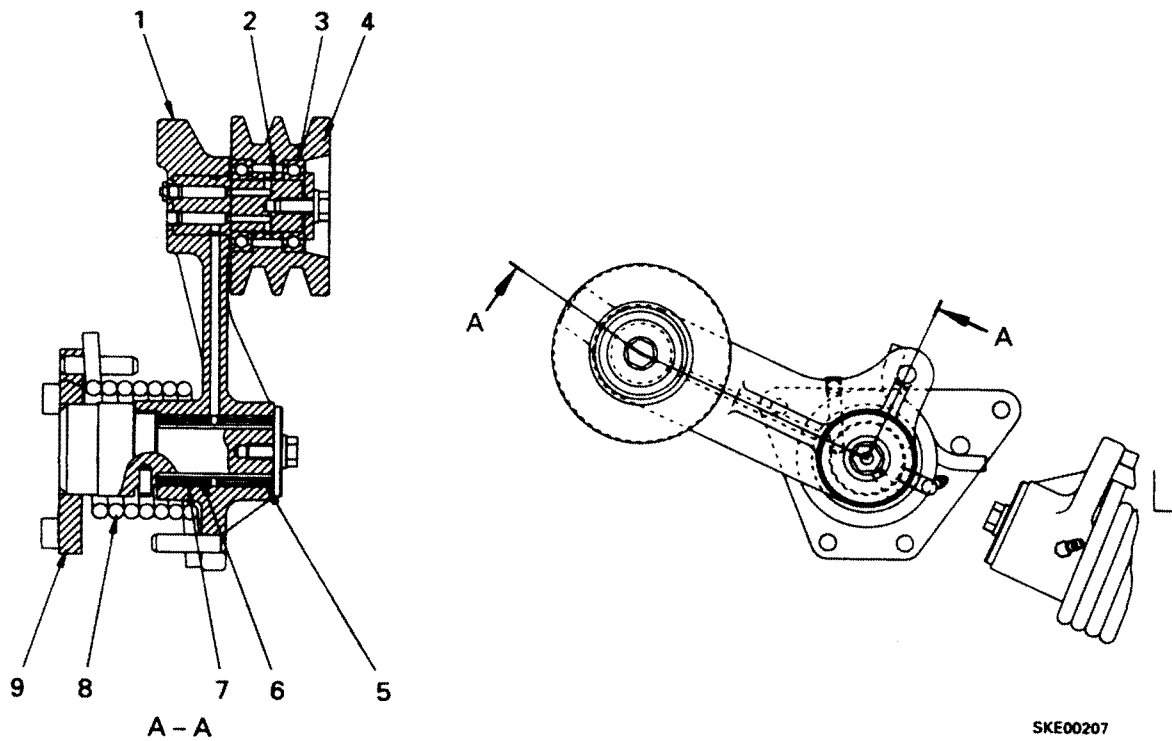
a. Wind direction

Pitch diameter (mm)	Applicable model
323	D85A, P, E-21



TENSION PULLEY

S6D125-2 (D85A, P, E-21)

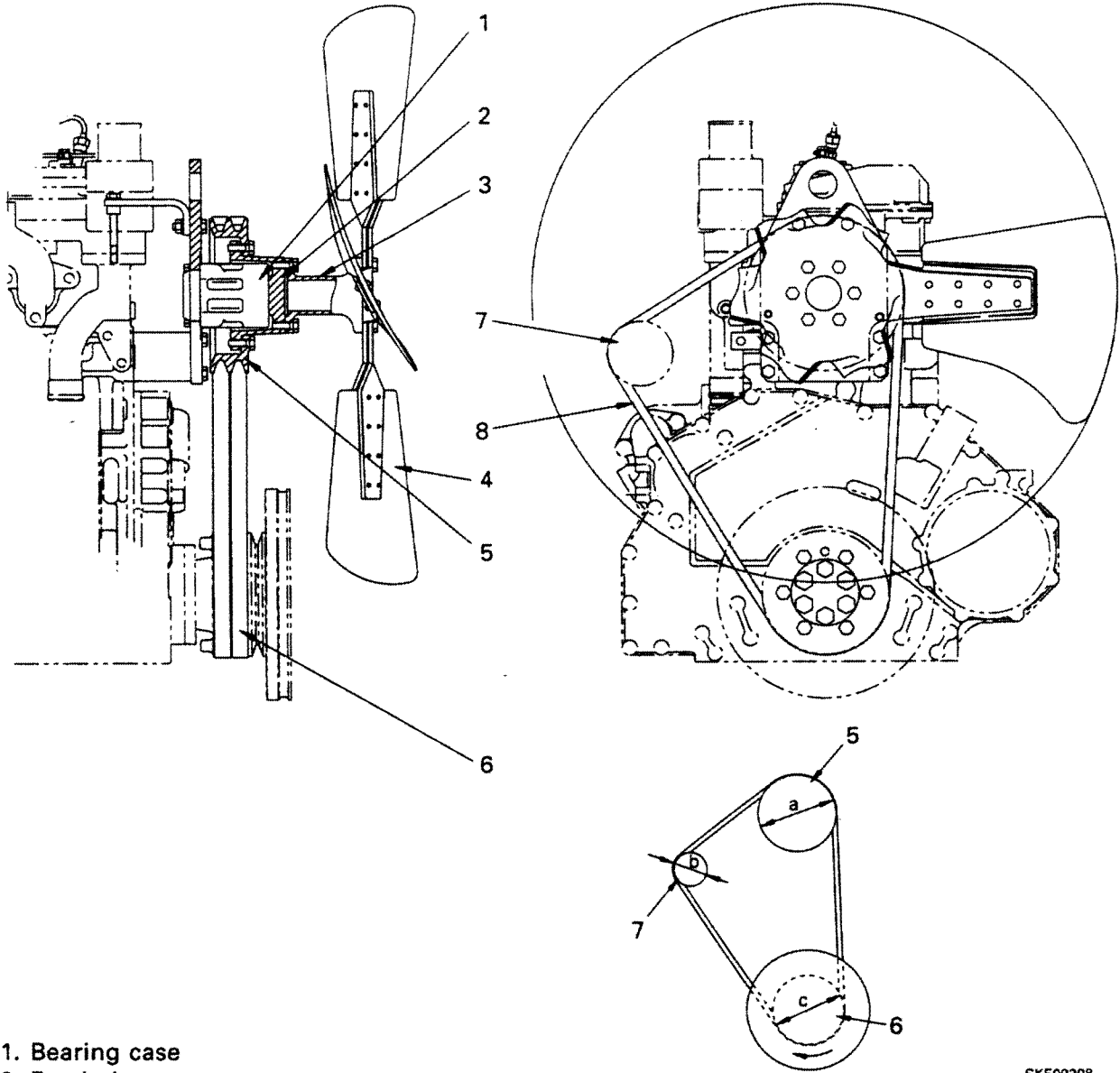


SKE00207

- 1. Bracket
- 2. Spacer
- 3. Ball bearing
- 4. Tension pulley (pitch diameter:  
120 mm)
- 5. Oil seal
- 6. Inner race
- 7. Needle bearing
- 8. Coil spring
- 9. Tension shaft

615002

S6D125-2 (D87E, P-2)  
SA6D125-2 (WA470-3)



- 1. Bearing case
- 2. Fan hub
- 3. Spacer
- 4. Fan
- 5. Fan pulley
- 6. Crankshaft pulley
- 7. Alternator pulley
- 8. Fan belt

- a. Outside diameter of fan pulley
- b. Outside diameter of alternator pulley
- c. Outside diameter of crankshaft pulley

SKE00208

• Outside diameter of pulley

Engine	Machine model	Outside diameter of pulley		
		a	b	c
S6D125-2	D87E, P-2	226	93	180
SA6D125-2	WA470-3	226	93	180

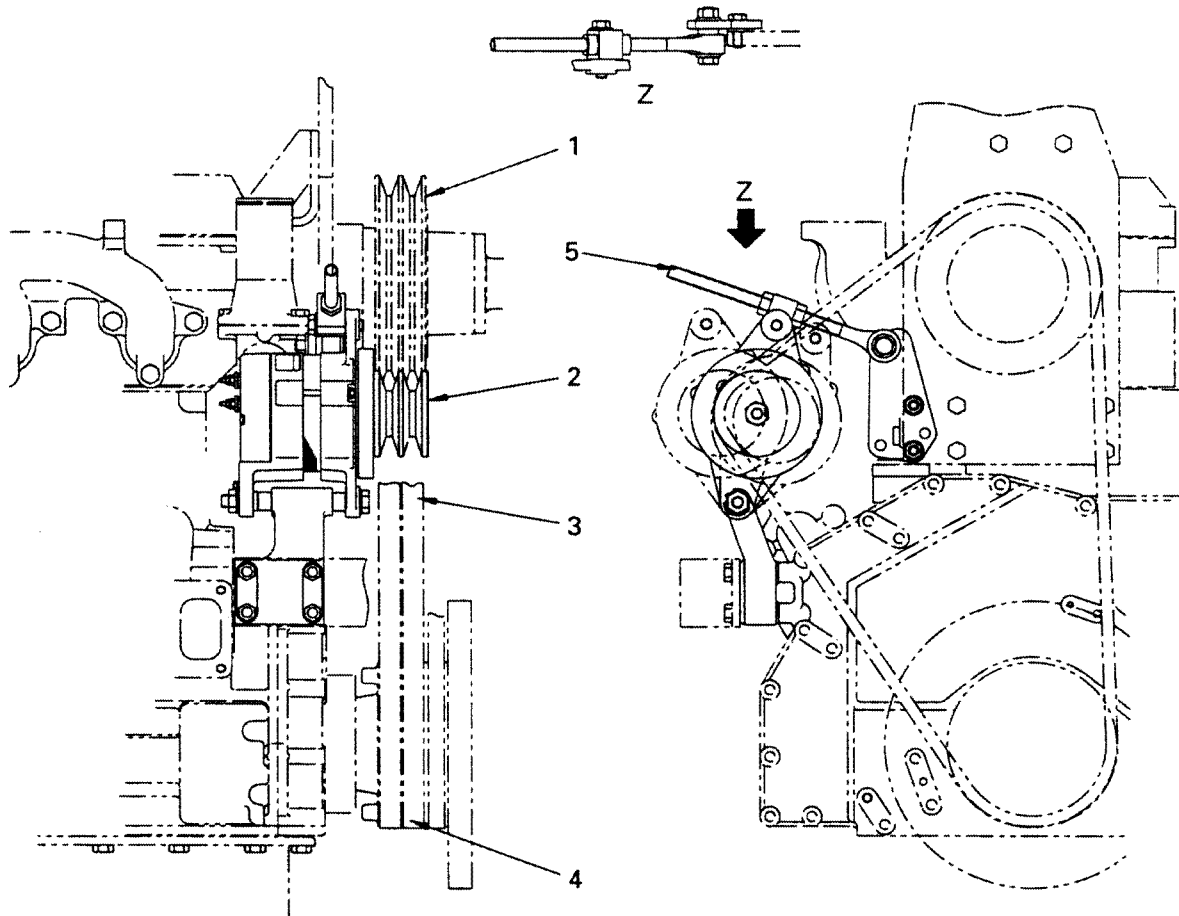
615002

# ELECTRICAL SYSTEM

## ALTERNATOR

### Mounting

6D125-2 (D60E-12, D65E-12, D70LE-12)  
 S6D125-2 (D60P-2, D65EX-12, D65P, PX-12, D85E-SS-2, D85E-SS-2A, D85A, P, E-21, D87E, P-2)  
 SA6D125-2 (WA470-3)



SKE00209

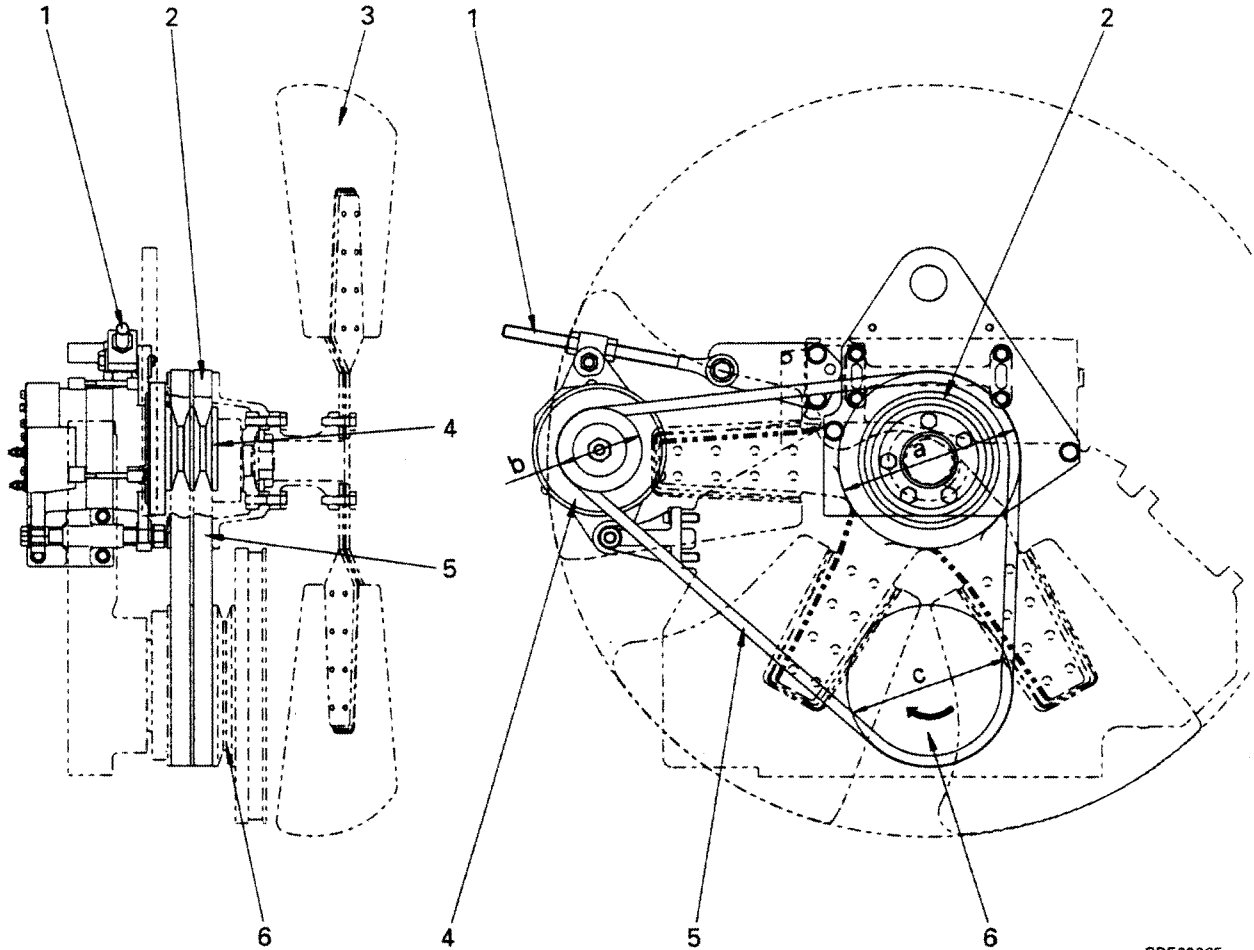
- 1. Fan pulley
- 2. Alternator, pulley
- 3. Fan belt
- 4. Crankshaft pulley
- 5. Adjustment bolt

615002

**Mounting**

SA6D125-2 [PC400-6, PC450-6]

SAA6D125-2 [PC400AC-6, PC400-6 • PC450-6 (USA), BR550JG-1]



SDE00065

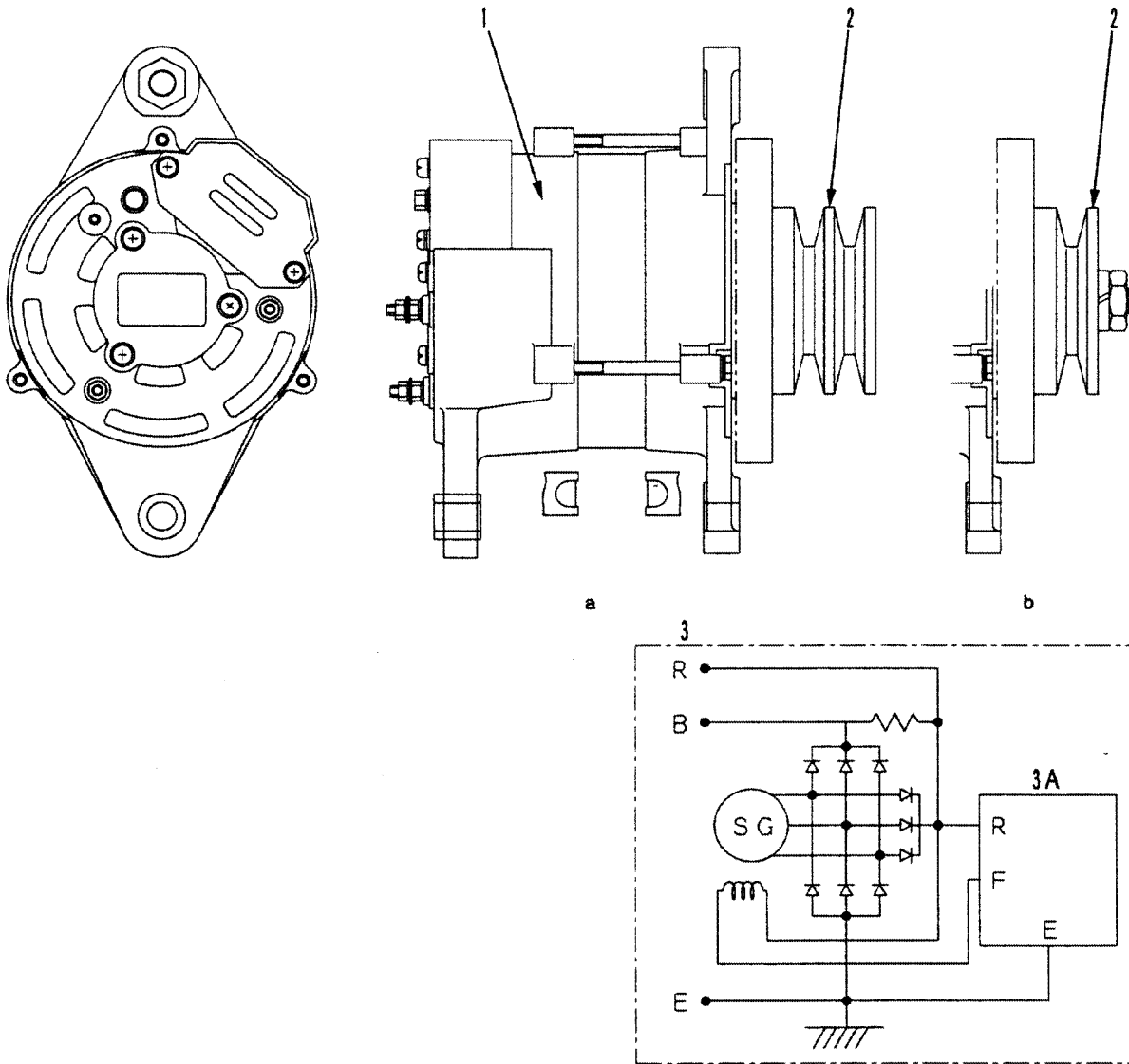
615002

- 1. Adjustment bolt
- 2. Fan pulley
- 3. Fan
- 4. Alternator pulley
- 5. Fan belt
- 6. Crankshaft pulley
  
- a. Fan pulley O.D.
- b. Alternator pulley O.D.
- c. Crankshaft pulley O.D.

• Pulley O.D.

Engine Model	Applicable machine	Pulley O.D. (mm)		
		a	b	c
SA6D125-2	PC400-6, PC450-6	200	95	182
SAA6D125-2	PC400AC-6 PC400-6 • PC450-6 (USA) BR550JG-1	200	95	182

Alternator with built-in regulator (open type)



- 1. Alternator
- 2. Alternator pulley
- 3. Internal connection diagram
- 3A. Regulator

- a. 2-stage pulley
- b. 3-stage pulley

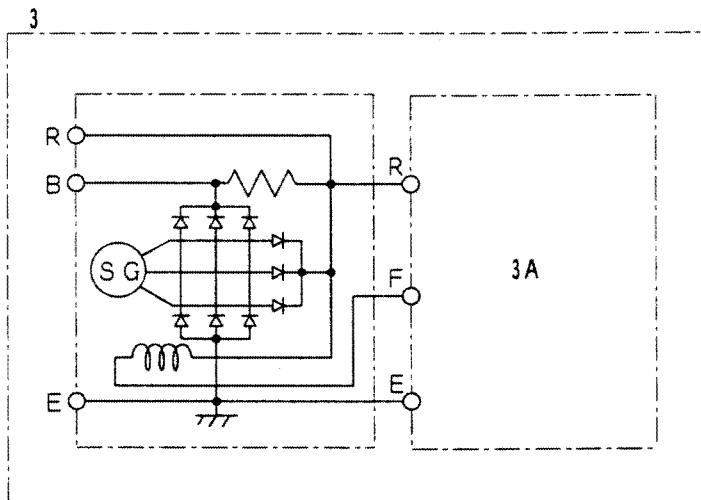
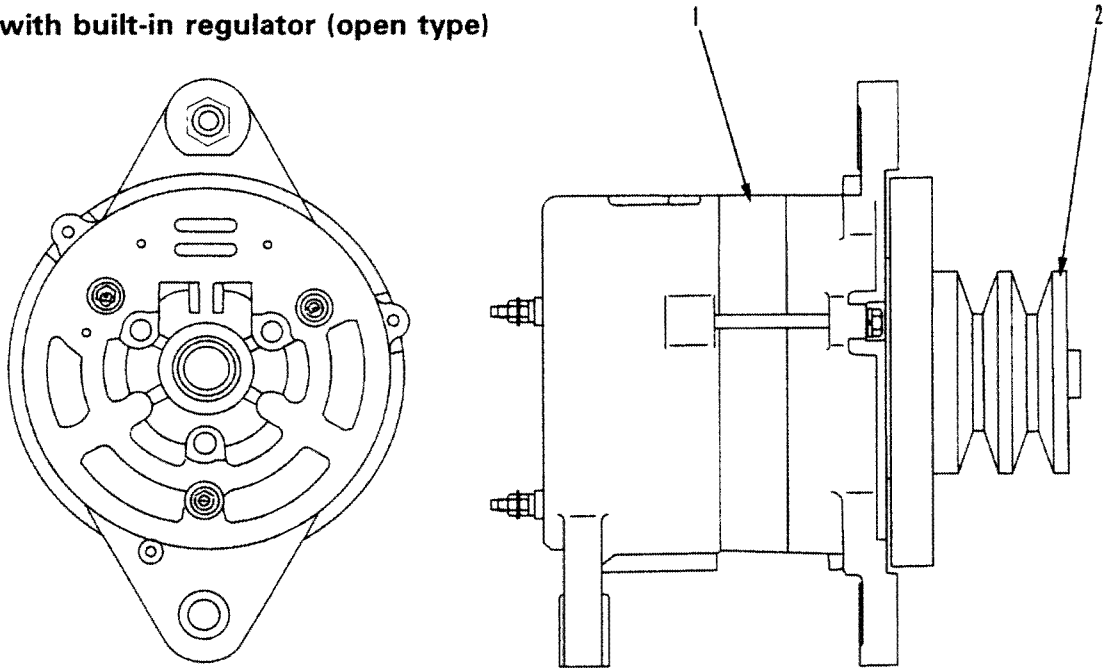
B, E, R, F: Terminals

SJE01766

615002

Engine	Machine model	Type	Specification	Pulley		Weight (kg)
				No. of steps	Outside diameter (mm)	
SA6D125-2	PC400-6, PC450-6	Nikko Denki, open type	24 V, 35 A	2	93	9.0

Alternator with built-in regulator (open type)



615002

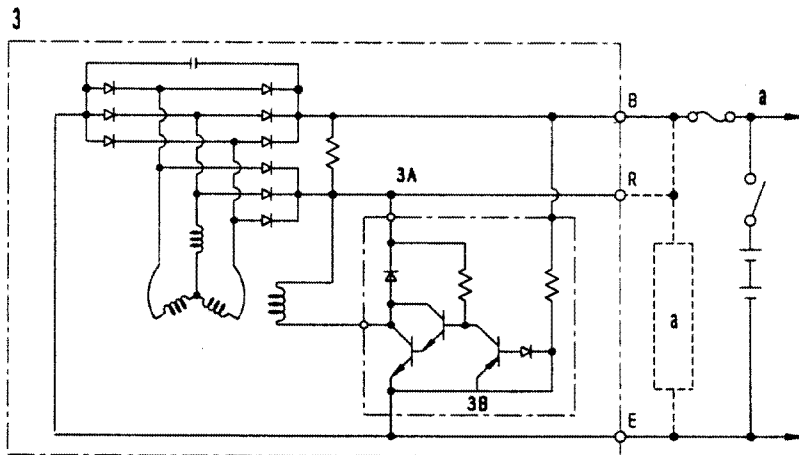
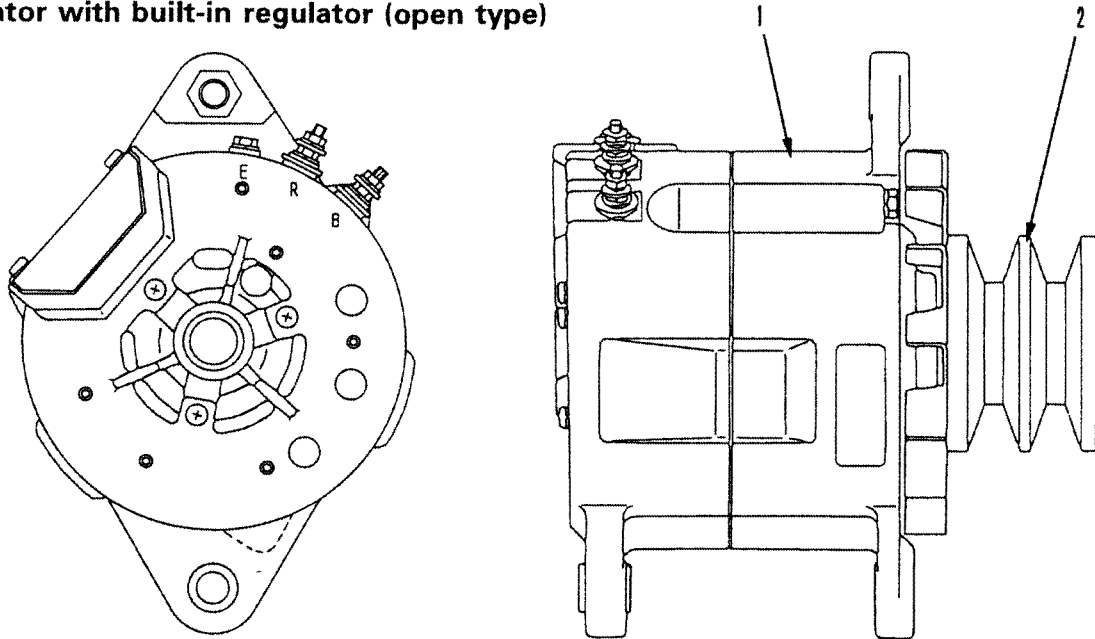
- 1. Alternator
- 2. Alternator pulley
- 3. Internal connection diagram
- 3A. Regulator

B, E, R, F: Terminals

SJE01767

Engine	Machine model	Type	Specification	Outside diameter (mm)	Weight (kg)
6D125-2	D60E-12, D65E-12	Nikko Denki, open type	24 V, 35 A	95	10
S6D125-2	D65EX-12 D65P, PX-12, D60P-12		24 V, 35 A	95	10
	D85A, P, E-21		24 V, 35 A	75	10
	D85E-SS-2 D85E-SS-2A		24 V, 35 A	95	10

Alternator with built-in regulator (open type)



B, R, E: Terminals

- 1. Alternator
- 2. Alternator pulley
- 3. Internal connection diagram
  - 3A. Alternator
  - 3B. Regulator

SJE01764

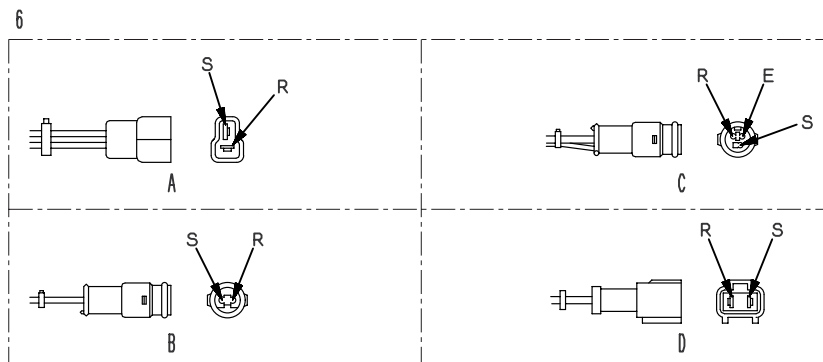
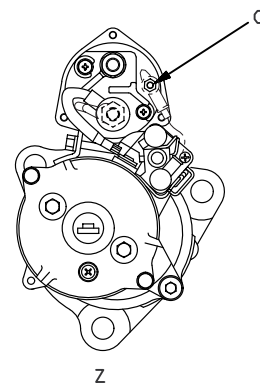
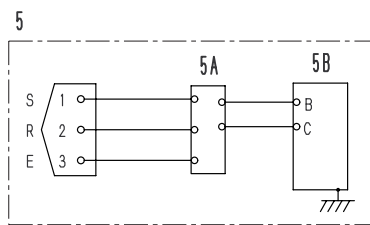
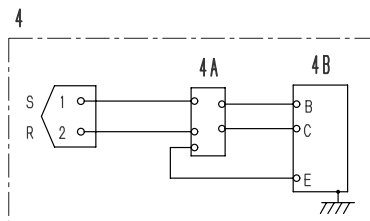
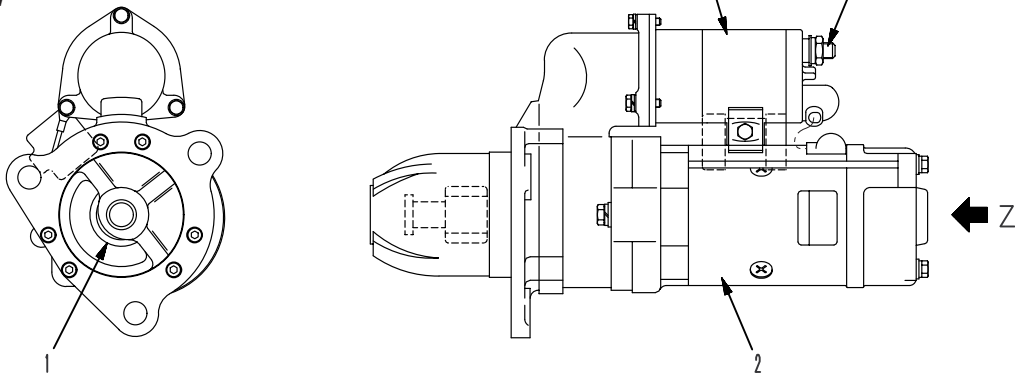
a. Load

Engine	Machine model	Type	Specification	Outside diameter (mm)	Weight (kg)
SA6D125-2	WA470-3	Sawafuji Denki, open type	24 V, 50 A	95	10
SAA6D125-2	PC400AC-6 PC400-6, PC450-6 BR550JG-1	Sawafuji Denki, open type	24 V, 50 A	95	10

★ The shape may differ according to the machine model.

# STARTING MOTOR

For 7.5 kW



SJE01765

- 1. Pinion gear
  - 2. Body
  - 3. Magnetic switch
  - 4. External wiring diagram [2-pin connector type (male)]
    - 4A. Safety relay portion
    - 4B. Starting motor portion
  - 5. External wiring diagram [3-pin connector type (male)]
    - 5A. Safety relay portion
    - 5B. Starting motor portion
  - 6. Connector specification
    - A-type: 2P connector (male)
    - B-type: 2P drip-proof connector (male)
    - C-type: 3P drip-proof connector (male)
    - D-type: 2P connector (male)
- B, C, R, S: Terminals

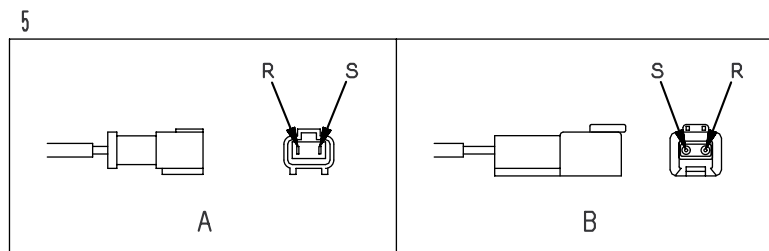
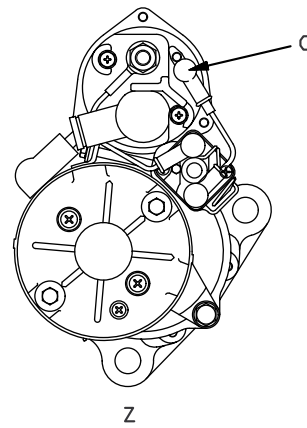
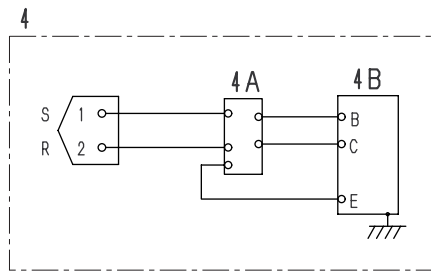
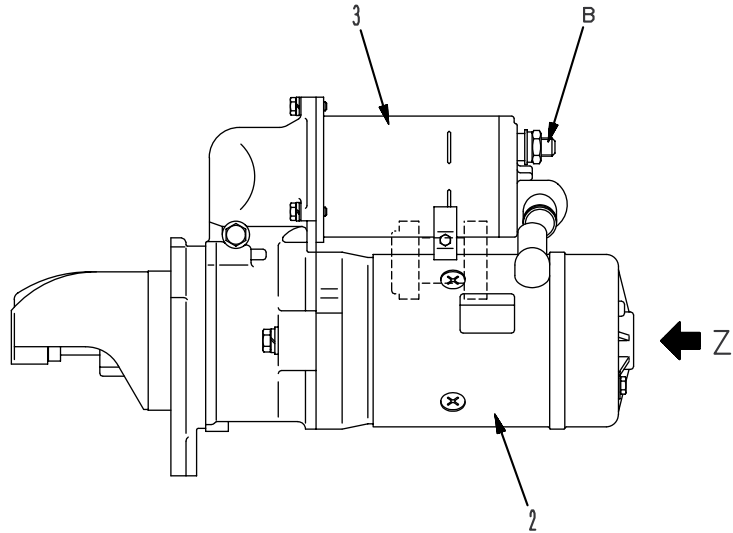
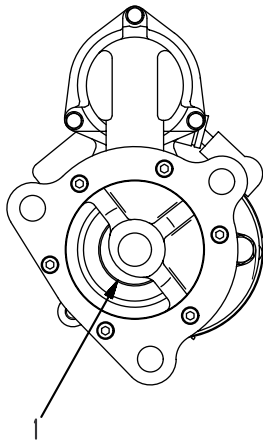
Engine model	Applicable machine	Type	Specification	Number of pinion teeth	Weight (kg)	Connector specification
6D125-2	Standard (All machine)	Maker: Nikko Denki Type: Sealed	24 V, 7.5 kW	12	18	D
S6D125-2	Standard (All machine)		24 V, 7.5 kW	12	18	D
SA6D125-2	Standard (All machine)		24 V, 7.5 kW	12	18	D

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★ The shape may differ according to the machine model.

For 11 kW



- 1. Pinion gear
- 2. Body
- 3. Magnetic switch
- 4. External wiring diagram
  - 4A. Safety relay portion
  - 4B. Starting motor portion

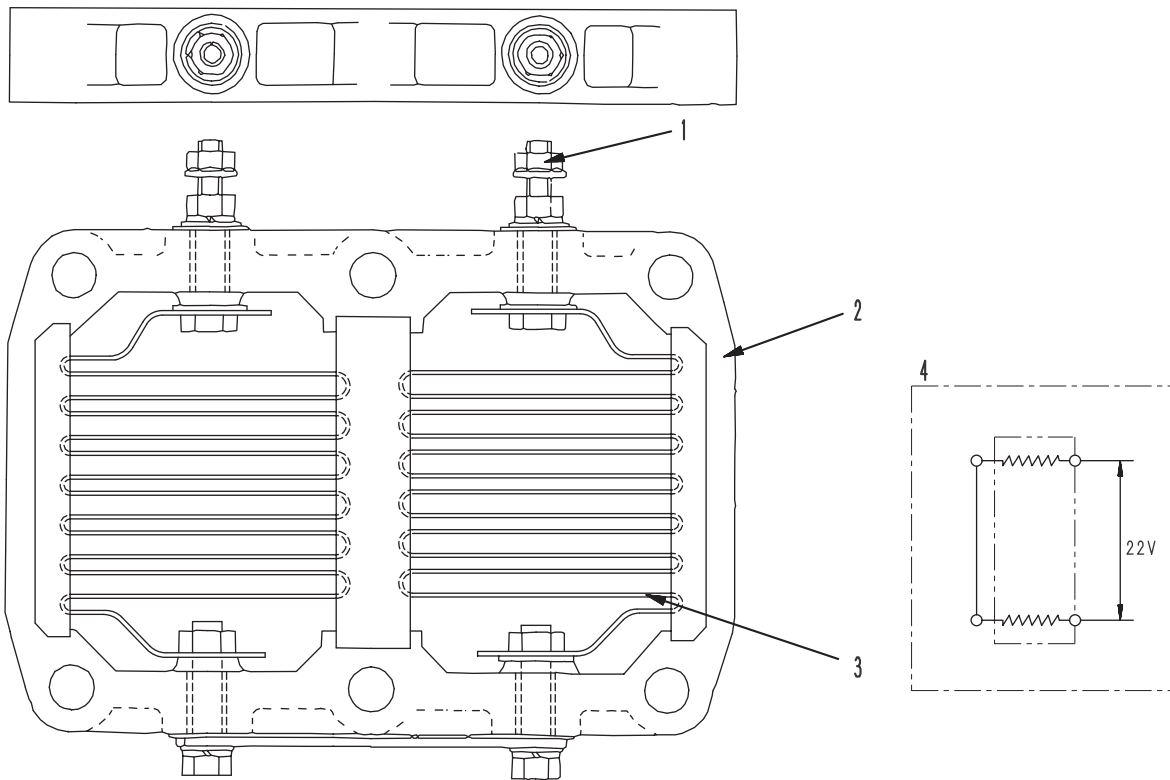
- 5. Connector specification
  - A-type: 2P connector (male)
  - B-type: 2P drip-proof connector (male)

SWE01750  
B, C, R, S: Terminals

Engine model	Applicable machine	Type	Specification	Number of pinion teeth	Weight (kg)	Connector specification
6D125-2 S6D125-2 SA6D125-2	All machine (if equipped)	Maker: Nikko Denki Type: Sealed	24 V, 11 kW	12	18	—
SAA6D125-2			BR550JG-1	24 V, 11kW	12	18

# ELECTRICAL INTAKE AIR HEATER

6D125-2, S6D125-2, SAA6D125-2  
 ELECTRICAL INTAKE AIR HEATER



1. Terminal
2. Body
3. Heater coil
4. Connection circuit diagram

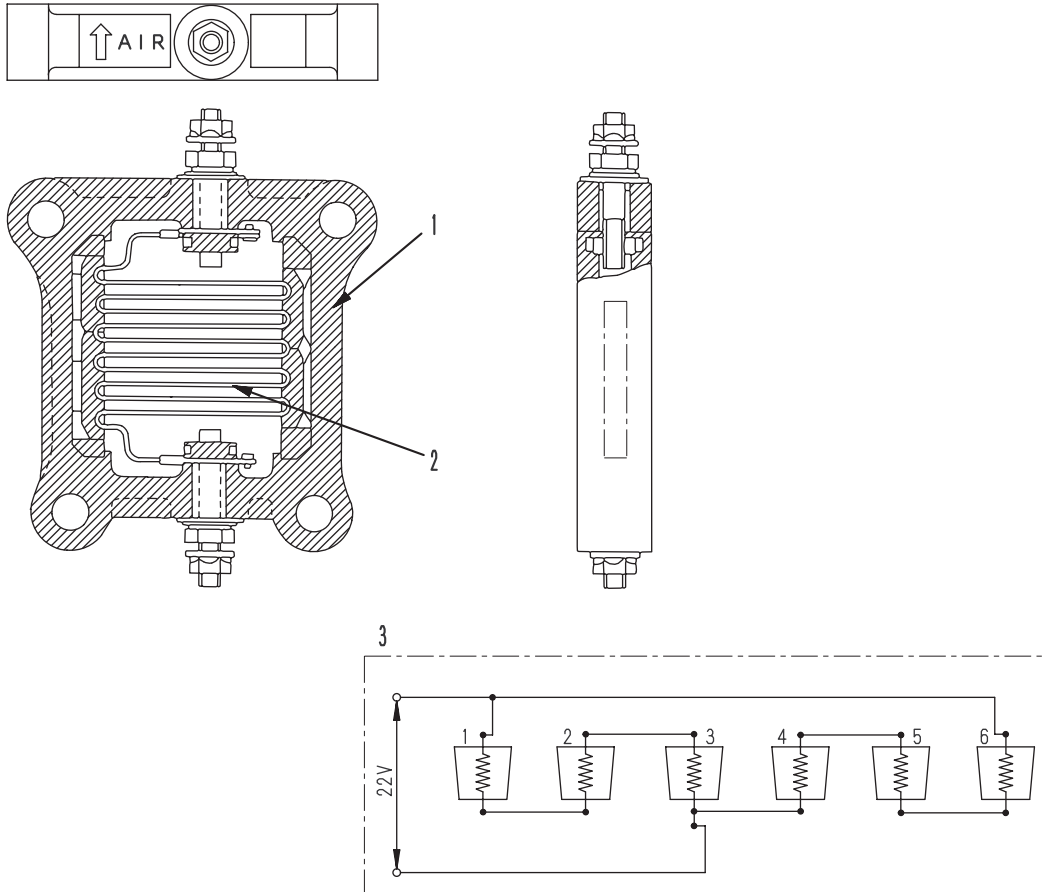
## ELECTRICAL INTAKE AIR HEATER

- Rated voltage: DC22 V
- Rated current: 111 A

SJE02360

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**SA6D125-2  
ELECTRICAL INTAKE AIR HEATER**



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SJE02190

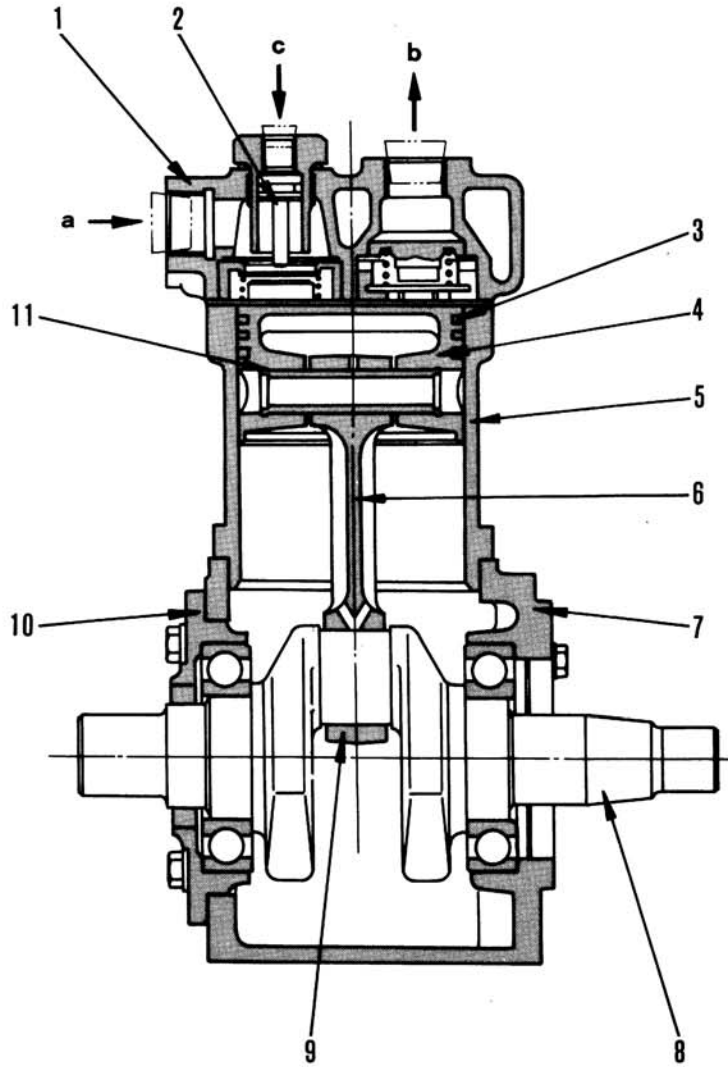
1. Body
2. Heater coil
3. Connection circuit diagram (using 6 heaters)

**ELECTRICAL INTAKE AIR HEATER**

- Rated voltage: DC22 V
- Rated current: 27.3 A  
(total: 164A with 6)

# ACCESSORY

## AIR COMPRESSOR

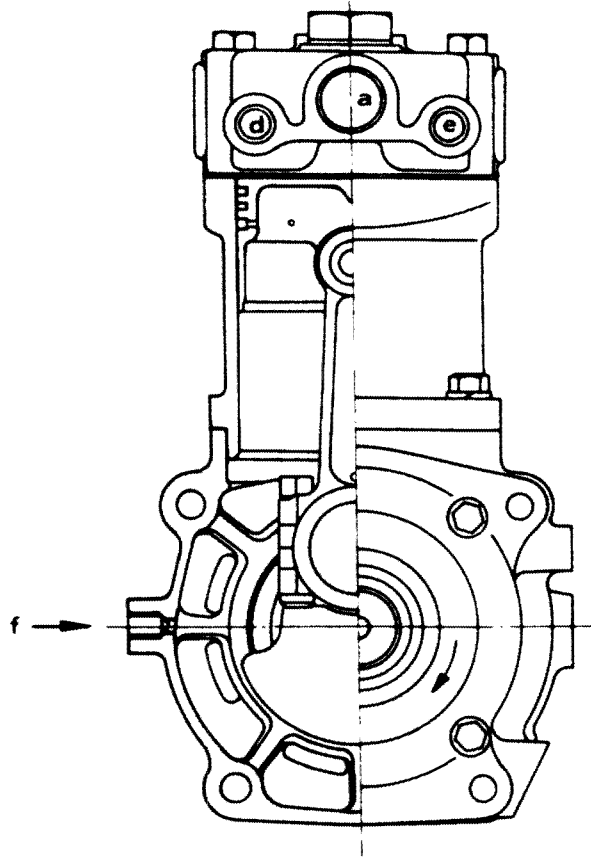


- 1. Cylinder head
- 2. Unloader valve
- 3. Piston ring
- 4. Piston
- 5. Cylinder block
- 6. Connecting rod
- 7. Crankcase
- 8. Crankshaft
- 9. Connecting rod cap

- 10. Bearing cover
- 11. Piston pin
- a. Air intake
- b. Air exhaust
- c. Unloader
- d. Cooling water inlet
- e. Cooling water outlet
- f. Oil inlet

6150F140

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6150F141

**AIR COMPRESSOR**

- Maker: ZEXEL
- Type: Single cylinder, double acting
- Discharge volume: 340 cc/rev.
- Air pressure: 0.83 MPa (8.5 kg/cm<sup>2</sup>) (at full load)
- Weight: 11 kg

**UNLOADER VALVE**

- Valve opening pressure: 0.62 MPa (6.3 kg/cm<sup>2</sup>)
- Valve shutting pressure: 0.53 MPa (5.4 kg/cm<sup>2</sup>)

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# 12 TESTING AND ADJUSTING

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Adjusting engine speed sensor ..... 12- 3

## ENGINE BODY

Adjusting valve clearance ..... 12- 4

Measuring compression pressure ..... 12- 5

## FUEL SYSTEM

Checking and adjusting  
fuel injection timing ..... 12- 6

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TESTING AND ADJUSTING DATA ..... 12-127

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## TESTING AND ADJUSTING

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- ⚠** When carrying out testing and adjusting, or troubleshooting, stop the machine on level ground, fit safety pins, block the wheels, and apply the parking brake.
- ⚠** When carrying out operations with two or more workers, always use signals, and do not allow any unauthorized person near the machine.
- ⚠** When checking the water level, if the radiator cap is removed when the engine is hot, boiling water will spurt out and may cause burns, so always wait for the engine to cool down before checking the water level.
- ⚠** Be extremely careful not to touch any hot parts.
- ⚠** Be extremely careful not to get caught in the fan or any other rotating parts.
- ⚠** When removing the plugs or caps from places under hydraulic pressure, water pressure, or air pressure, release the internal pressure first. Fit the measuring tools securely before carrying out any testing, adjusting, or troubleshooting.
- ★ When using the standard values table for judgement in testing, adjusting or troubleshooting, it is necessary to be careful of the following points.
  1. The standard values for the new machines in the standard values table are values given as reference from the standards for new machines and machines shipped from the factory. They should be used as values for estimating wear during operation or as target values when carrying out repairs.
  2. The failure judgement standard values in the standard values table are values using estimated values based on the results of various tests and standard values for machines shipped from the factory. Use these values for reference together with the repair and operation history of the machine when judging failures.
  3. Do not use this standard values table as a standard for judging claims.

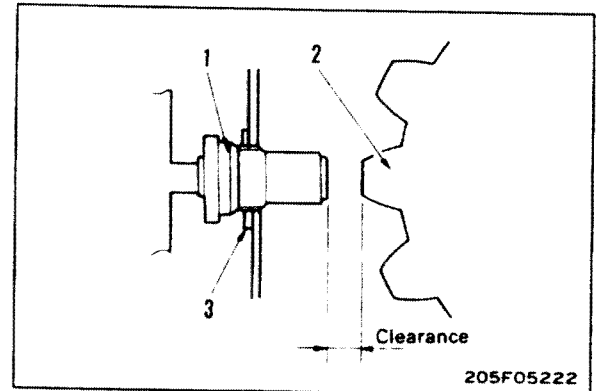
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## ADJUSTING ENGINE SPEED SENSOR

Adjusting clearance from ring gear contact surface

SA6D125-2 (PC400-6, PC450-6)

1. Screw in until the tip of sensor (1) contacts ring gear (2).
2. When sensor (1) contacts ring gear (2), turn the sensor back one turn.
3. Tighten locknut (3).
  - ★ Be careful to arrange the sensor wiring so that there is no excessive force brought to bear on the wiring.
  - ★ Be careful not to scratch the tip of the sensor or let iron particles stick to it.



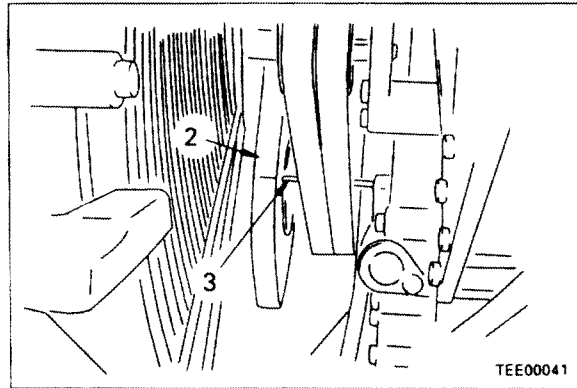


# ENGINE BODY

## ADJUSTING VALVE CLEARANCE

### ADJUSTMENT PROCEDURE

1. Remove the cylinder head cover.
2. Rotate the crankshaft in the normal direction, and set the No. 1 cylinder to the compression top dead center. While doing this, watch the movement of the intake valves of No. 6 cylinder. Align pointer (3) with the 1.6 TOP line on the vibration damper (2).
  - ★ When the No. 1 cylinder comes near the top dead center of the compression stroke, the No. 6 intake valve will start to move (open).
3. Adjust the valve clearance for valves marked ● in the valve arrangement chart.
4. Rotate the crankshaft in the normal direction by one revolution and adjust the valve clearance for the remaining valves marked ●.



TEE00041

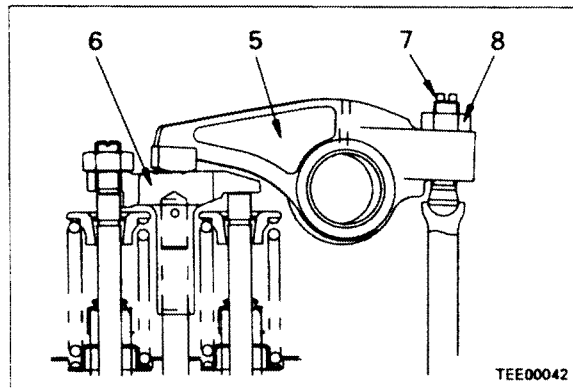
Valve arrangement

Cylinder No.	1	2	3	4	5	6
Exhaust valve	●	○	●	○	●	○
Intake valve	●	●	○	●	○	○

T0000723


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- ★ To adjust the valve clearance, loosen lock nut (8) on adjustment screw (7), insert Feeler gauge H corresponding to the specified clearance between crosshead (6) and rocker arm (5), and adjust the clearance with the adjustment screw until the thickness gauge can slide lightly.

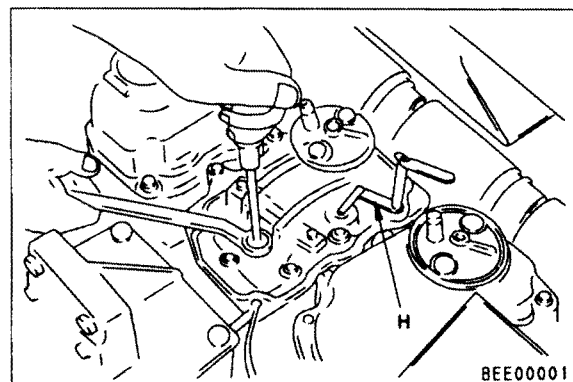


TEE00042

5. After the clearance is properly adjusted, tighten the lock nut to secure the adjustment screw.

 Lock nut: 58.8 ± 5.9 Nm (6.0 ± 0.6 kgm)

- ★ The engine firing order is 1 - 5 - 3 - 6 - 2 - 4.
- ★ Intake and exhaust valve clearances may be adjusted for each cylinder in the firing order by rotating the crankshaft 120° at a time in the normal direction.
- ★ For details about valve clearance, see TESTING AND ADJUSTING DATA.



BEE00001

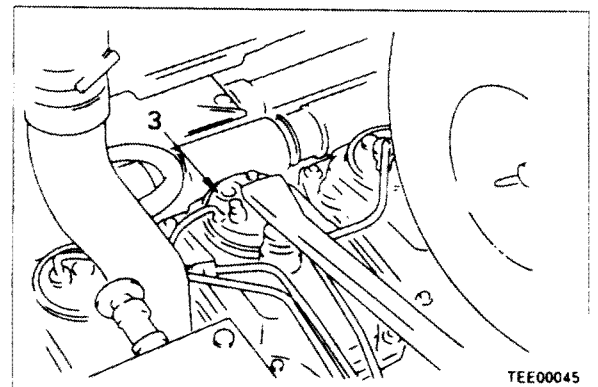
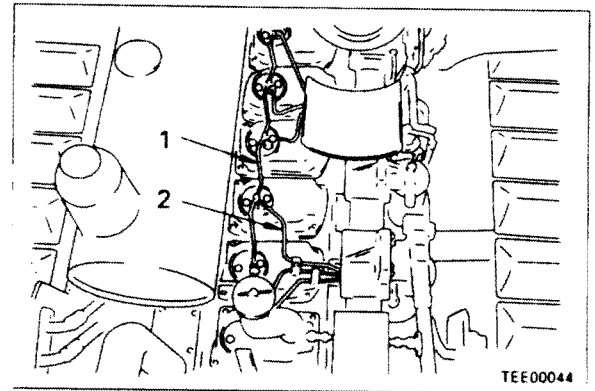
## MEASURING COMPRESSION PRESSURE

### MEASUREMENT PROCEDURE


**⚠** While measuring the compression pressure, take care not to burn yourself on the exhaust manifold or muffler, and be careful not to get caught in any revolving part of the engine.

★ Measure the compression pressure while the engine is warm.  
(Oil temperature: 40 – 60°C)

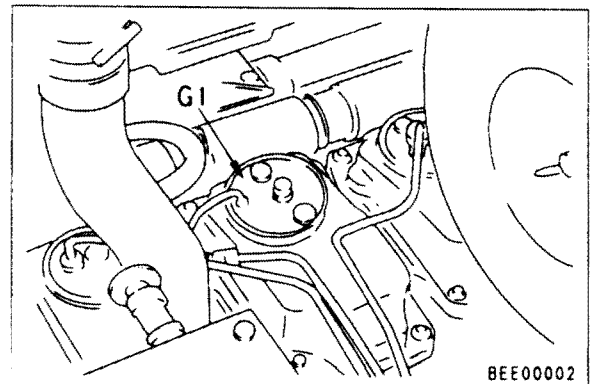
1. Adjust the valve clearance properly. For details, see ADJUSTING VALVE CLEARANCE.
2. Remove spill tube (1) and disconnect fuel injection pipe (2).
3. Remove nozzle holder assembly (3) for each cylinder.
  - ★ Remove the nozzle holder assembly by prying it with two mounting bolts.
  - ★ Take care not to let any dirt or foreign matter get into the cylinder.



4. Install adapter **G1** to the nozzle holder mounting section of the cylinder to be measured, and tighten the adapter to the specified torque.

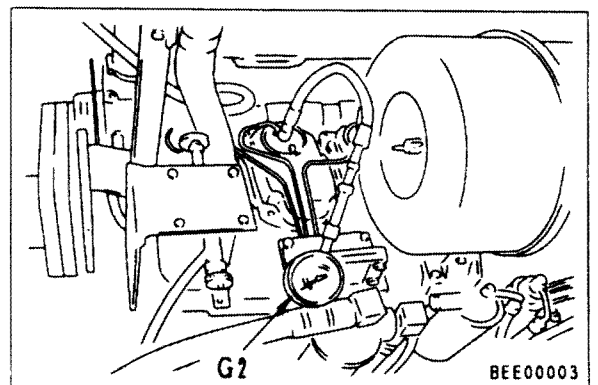
 Torque:  $21.6 \pm 2.9 \text{ Nm}$  ( $2.2 \pm 0.3 \text{ kgm}$ )

5. Connect compression gauge **G2** to the adapter.
6. Place the fuel control lever in NO INJECTION position, crank the engine with the starting motor, and read the gauge when the pointer is stabilized.



**⚠** If you do not put the fuel control lever in NO INJECTION position, fuel will blow out.

- ★ Most compression leakage can be prevented by applying a small amount of oil to the mounting section of the adapter.
- ★ For the reference values of the compression pressure, see TESTING AND ADJUSTING DATA.



# FUEL SYSTEM

## TESTING AND ADJUSTING FUEL INJECTION TIMING

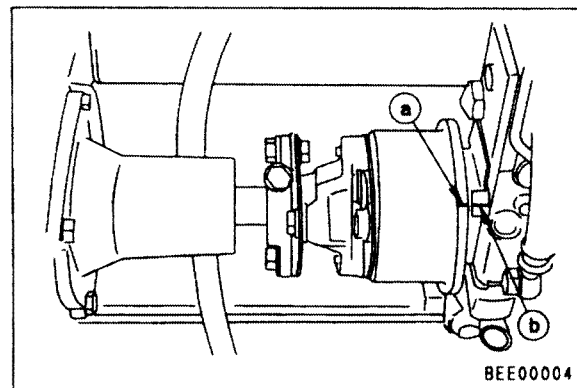
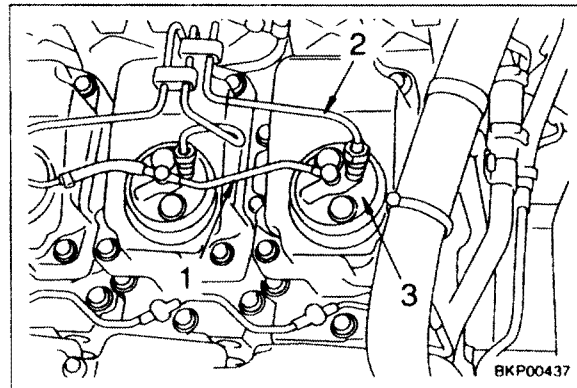
There are the following methods for testing and adjusting the fuel injection timing of the injection pump.

- When assembling to the same engine without repairing the injection pump, adjust by aligning the match marks.
- When replacing with a new injection pump, or when installing a repaired injection pump, adjust using the delivery valve method.
- ★ If the delivery valve method is used, the copper gasket and O-ring for the delivery valve must be replaced with new parts, so have new parts available when using this method.
- ★ Set the No. 1 cylinder to the compression top dead center before testing and adjusting.

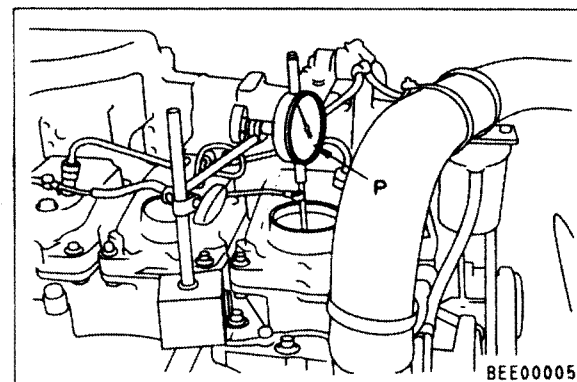
### ● Testing and adjusting fuel injection timing by aligning match marks

#### 1. Testing fuel injection timing by aligning match marks

- 1) Disconnect spill tube (1) and delivery tube (2) of the No. 1 piston, then remove No. 1 nozzle holder assembly (3).
- 2) Align No. 1 cylinder with the compression top dead center line (1:6).
  - When doing this, check that fuel injection timing line (a) on the fuel injection pump is near line (b) on the fuel injection pump body.



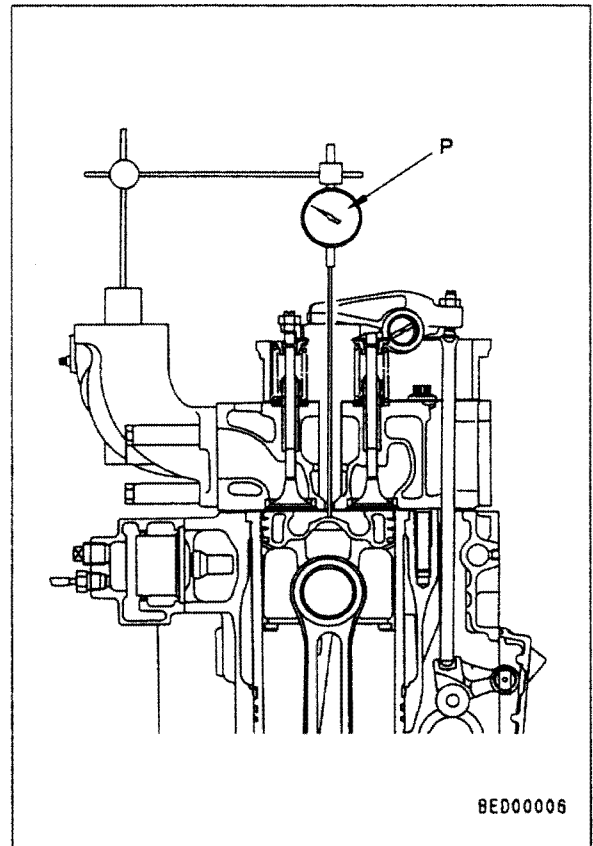
- 3) Set dial gauge P to the nozzle holder hole where the nozzle holder assembly has been removed.



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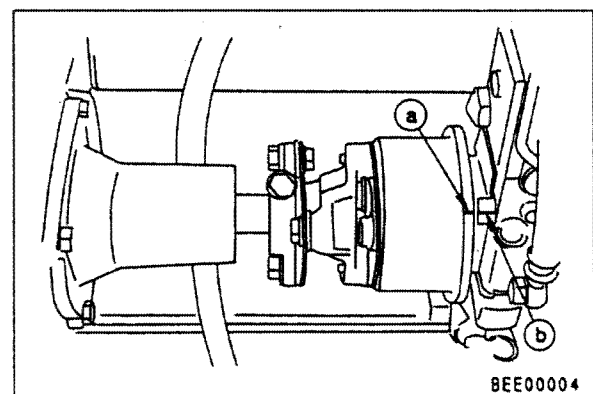
- 4) Put the tip of dial gauge **P** in contact with the top center of the piston, then set the scale on dial gauge **P** to 0 when the piston is at the top dead center.
  - ★ Rotate the crankshaft in the normal direction and in the reverse direction to align the top dead center.
  - ★ Record the value indicated by the short indicator on dial gauge **P**.
- 5) Rotate the crankshaft approx. 45° in the reverse direction from the No. 1 cylinder TOP position.
- 6) Rotate the crankshaft again slowly in the normal direction and set to the specified dimension (piston displacement).
  - ★ Always rotate the crankshaft in the normal direction to align the position.
  - ★ For details of the specified dimension (piston displacement), see the table below.
  - ★ For details of the fuel injection timing, see TESTING AND ADJUSTING, Standard values for testing, adjusting, and troubleshooting.



Piston displacement for each injection timing for 125-2 engine


Injection timing	Piston position (mm)
BTDC9°	1.21 ± 0.20
BTDC12°	2.15 ± 0.20
BTDC13°	2.52 ± 0.20
BTDC14°	2.91 ± 0.20
BTDC15°	3.34 ± 0.20
BTDC16°	3.80 ± 0.20

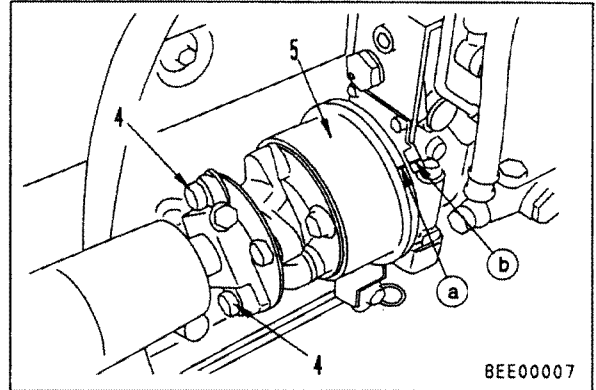
- 7) Check that fuel injection timing line **a** on the fuel injection pump is aligned with line **b** on the fuel injection pump body.



**2. Adjusting fuel injection timing**

If the lines are not aligned, loosen mounting bolt (4) and move coupling (5) to align lines (a) and (b), then tighten bolt (4).

 Bolt (4):  $88.3 \pm 4.9 \text{ Nm}$  ( $9 \pm 0.5 \text{ kgm}$ )



● **Testing and adjusting fuel injection timing with delivery valve method**

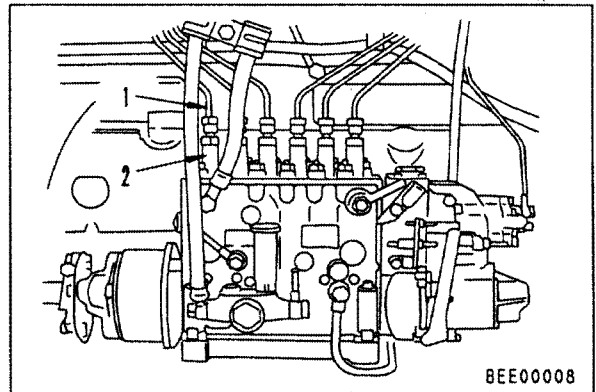
★ If the delivery valve method is used, the copper gasket and O-ring for the delivery valve must be replaced with new parts, so have new parts available when using this method.

**1. Testing fuel injection timing with delivery valve method**

1) Set with the No. 1 cylinder at the TOP position, then rotate the crankshaft 30 – 40° in the reverse direction.

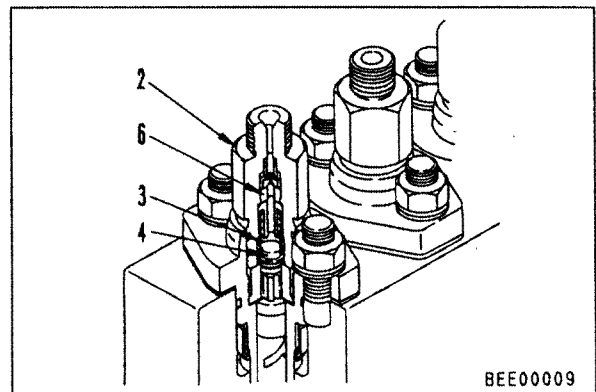
2) Disconnect fuel injection tube (1) of No. 1 cylinder.

3) Remove delivery valve holder (2).



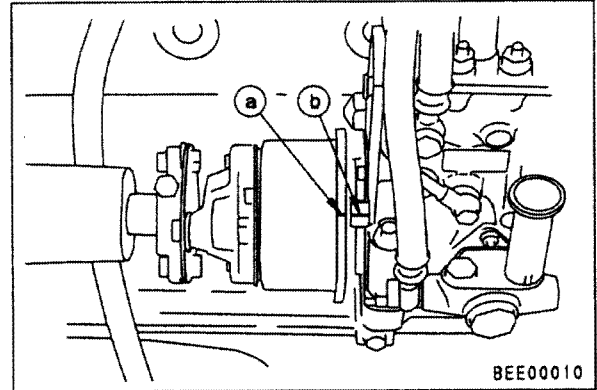
4) Remove spring (3), delivery valve (4), and stopper (6) from delivery valve holder (2), then assemble delivery valve holder (2) again.

5) Set the fuel control lever at the FULL position, then operate the priming pump and rotate the crankshaft slowly in the normal direction. Check the point where the fuel stops flowing from the delivery valve holder.



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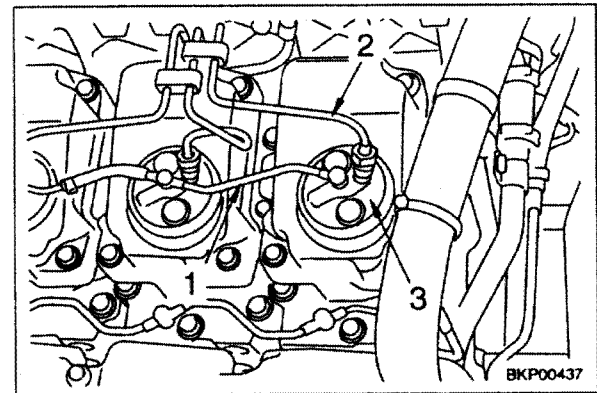
- 6) Check that fuel injection timing line (a) on the fuel injection pump is aligned with line (b) on the fuel injection pump body at the point where the fuel stops flowing.
- ★ BEYOND injection timing line:  
Timing RETARDED
  - ★ BEFORE injection timing line:  
Timing ADVANCED



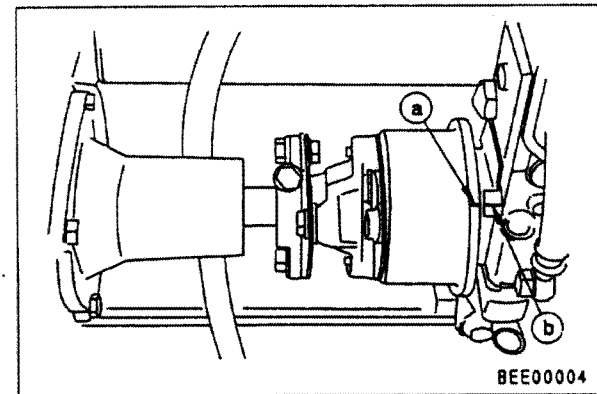
**2. Adjusting fuel injection timing with delivery valve method**

If the results of the test show that the fuel injection timing is incorrect, adjust the fuel injection timing as follows.

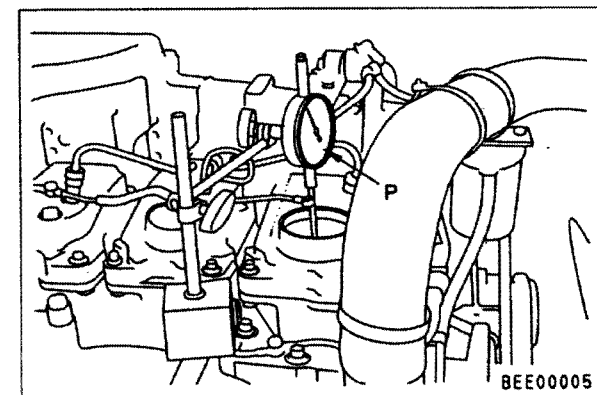
- 1) Disconnect spill tube (1) and delivery tube (2) of the No. 1 piston, then remove No. 1 nozzle holder assembly (3).



- 2) Align No. 1 cylinder with the compression top dead center line (1 : 6).
- When doing this, check that fuel injection timing line (a) on the fuel injection pump is near line (b) on the fuel injection pump body.

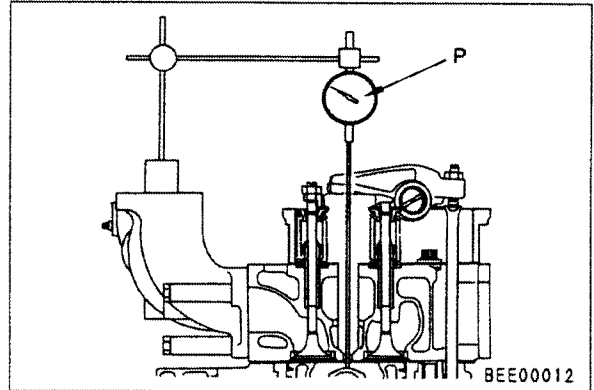


- 3) Set dial gauge P to the nozzle holder hole where the nozzle holder assembly has been removed. (See the diagram.)



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- 4) Put the tip of dial gauge **P** in contact with the top center of the piston, then set the scale on dial gauge **P** to 0 when the piston is at the top dead center.
  - ★ Rotate the crankshaft in the normal direction and in the reverse direction to align the top dead center.
  - ★ Record the value indicated by the short indicator on dial gauge **P**.
- 5) Rotate the crankshaft approx. 45° in the reverse direction from the No. 1 cylinder TOP position.
- 6) Rotate the crankshaft again slowly in the normal direction and set to the specified dimension (piston displacement).
  - ★ Always rotate the crankshaft in the normal direction to align the position.
  - ★ For details of the specified dimension (piston displacement), see the table below.
  - ★ For details of the fuel injection timing, see TESTING AND ADJUSTING, Standard values for testing, adjusting, and troubleshooting.

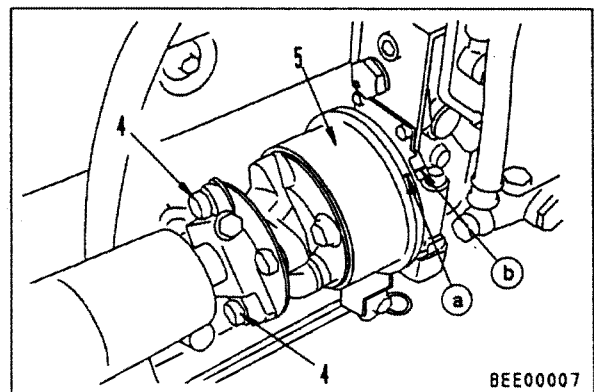


Piston displacement for each injection timing for 125-2 engine

Injection timing	Piston displacement
BTDC9°	1.21 ± 0.20
BTDC12°	2.15 ± 0.20
BTDC13°	2.52 ± 0.20
BTDC14°	2.91 ± 0.20
BTDC15°	3.34 ± 0.20
BTDC16°	3.80 ± 0.20

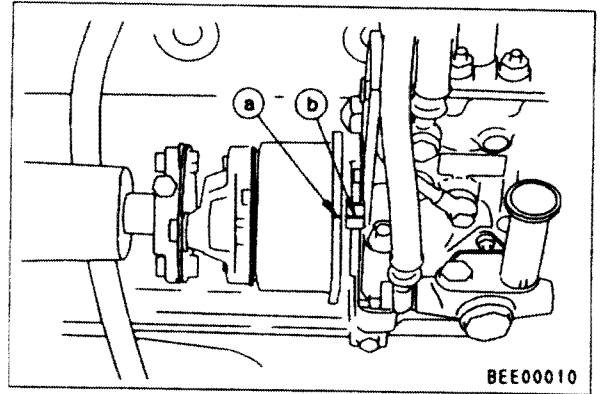
- 7) Loosen mounting bolt (4), move coupling (5) to align lines **a** and **b**, then tighten bolt (4).
 

 Bolt (4): 88.3 ± 4.9 Nm (9 ± 0.5 kgm)
- 8) Set with the No. 1 cylinder at the TOP position, then rotate the crankshaft 30 – 40° in the reverse direction. Set the fuel control lever at the FULL position, then operate the priming pump and rotate the crankshaft slowly in the normal direction. Check the point where the fuel stops flowing from the delivery valve holder.



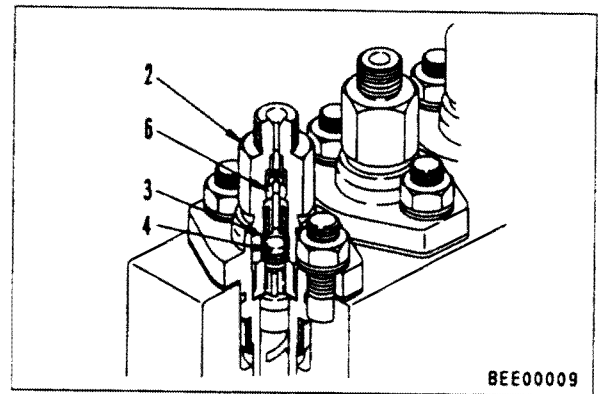
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- ★ Check that fuel injection timing line **a** on the fuel injection pump is aligned with line **b** on the fuel injection pump body at the point where the fuel stops flowing.
- 9) Repeat Steps 1) – 5) of “Adjusting fuel injection timing with delivery valve method” to check that the fuel stops flowing from the delivery valve holder.





- 10) Remove delivery valve holder (2), assemble delivery valve (4), spring (3), and stopper (6), then assemble the delivery valve holder to the fuel injection pump again.

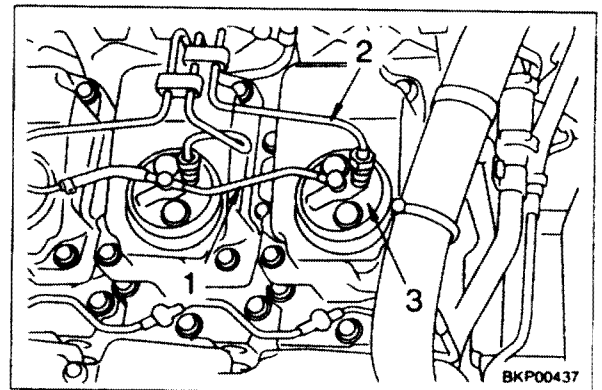
 **kgm** Delivery valve holder:  
 $98.0 \pm 9.8 \text{ Nm}$  ( $10.0 \pm 1.0 \text{ kgm}$ )



- 11) Fit nozzle holder assembly (3), then install spill tube (1) and fuel injection tube (2).

 **kgm** Nozzle holder mounting bolt:  
 $21.6 \pm 3 \text{ Nm}$  ( $2.2 \pm 0.3 \text{ kgm}$ )

 **kgm** Spill tube joint bolt:  
 $12.3 \pm 2.5 \text{ Nm}$  ( $1.25 \pm 0.25 \text{ kgm}$ )



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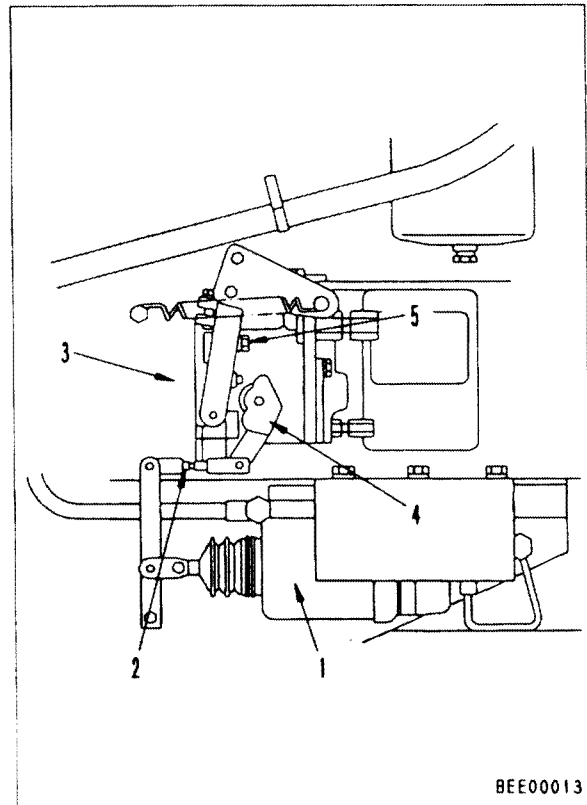


## TESTING AND ADJUSTING FUEL CUT SOLENOID

If the solenoid does not work smoothly, an excessive current will flow and the solenoid coil will burn out or there will be a drop in output caused by a drop in the amount of fuel injected, so carry out inspection of the clearance between the stopper and lever, and adjust the length of the rod as follows.

1. In order to ensure that the stop lever is actuated when the solenoid is actuated, pull the rod at the solenoid end and adjust the length of the rod so that the clearance between the stop lever and the STOP stopper of the fuel injection pump is 0.3 – 0.5 mm.
2. Pass electricity through the solenoid and check the stroke of the solenoid and the clearance between the stop lever and the STOP stopper of the fuel injection pump (0.3 – 0.5 mm). Make any final adjustments that are necessary.
3. Start and stop the engine 2 or 3 times, and check that the solenoid is actuated smoothly and that the engine stops.  
(It must stop within 10 seconds.)
4. Lock the adjustment nut.

★ **Problems caused by improper adjustment of solenoid**



- |                        |               |
|------------------------|---------------|
| 1. Solenoid valve      | 4. Stop lever |
| 2. Rod                 | 5. Stopper    |
| 3. Fuel injection pump |               |

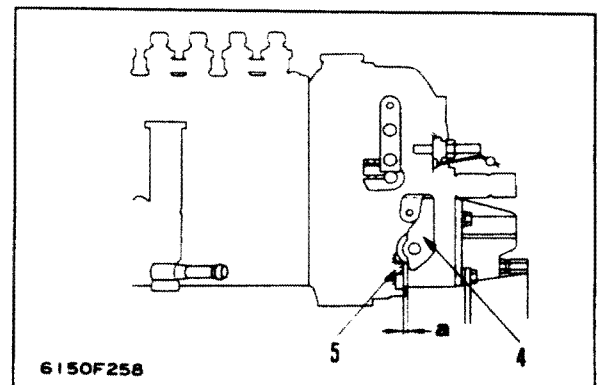
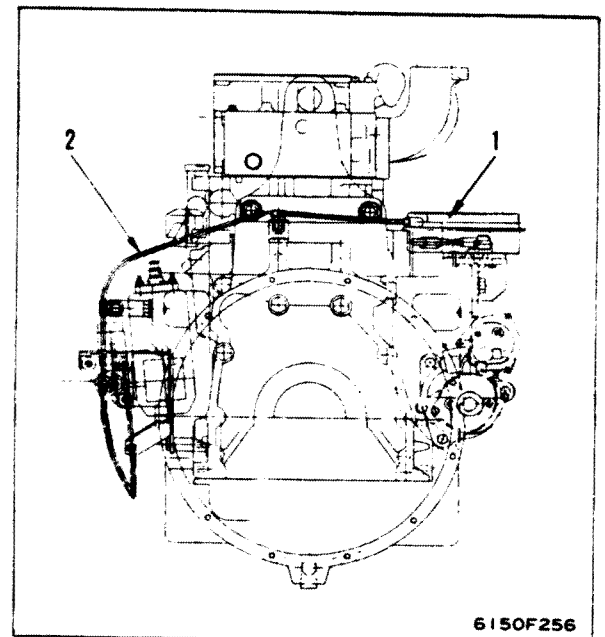
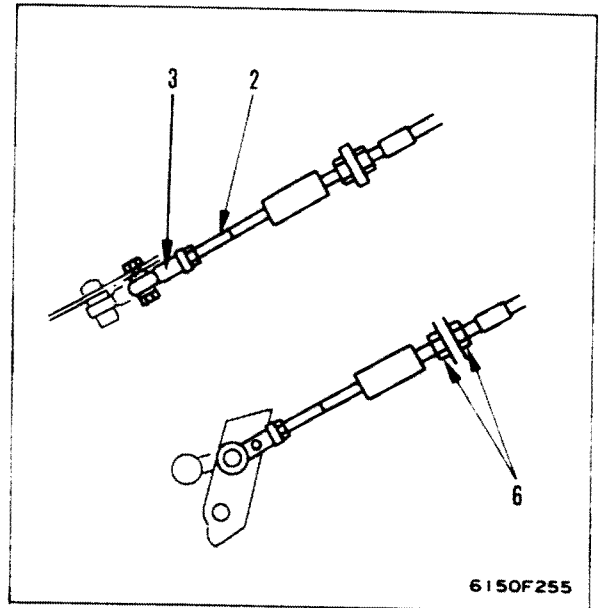
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<ul style="list-style-type: none"> <li>• If clearance between lever and engine STOP stop bolt is 0 when electricity is flowing</li> </ul>	<ul style="list-style-type: none"> <li>• Solenoid coil will burn out (when solenoid is partially pulled)</li> <li>• Injection pump governor will break or there will be scuffing (excessive force will be brought to bear on lever)</li> </ul>
<ul style="list-style-type: none"> <li>• If clearance between stop lever and FULL bolt is excessive when free (defective linkage)</li> </ul>	<ul style="list-style-type: none"> <li>• Engine output will drop because of drop in amount of fuel injected</li> </ul>

## ADJUSTING ENGINE STOP MOTOR LEVER

SA6D125-2 (WA470-3: with mechanical governor)

1. Temporarily install ball joint (3) to cable (2) of engine stop motor (1) (tighten fully, then turn back approx. 1/2 turn), then install a ball joint to the stop lever of the fuel injection pump.
2. Pull injection pump stop lever (4) by hand to the ENGINE STOP (NO INJECTION) position, and temporarily assemble the cable to the bracket. When doing this, put stop lever (4) in contact with ENGINE STOP stopper (5), and temporarily fit the cable to the bracket using lock nut (6).
  - ★ Engine stop motor (1) is delivered with cable (2) pulled (ENGINE STOP position).
  - ★ Stop lever (4) of the fuel injection pump is at the RUN position when the lever is free. (It is pulled to the RUN position by a spring.)
3. Adjust so that clearance **a** between stop lever (4) of the fuel injection pump and STOP stopper (5) is 1 – 2 mm. Carry out the adjustment with nut (6) holding the cable to the bracket, or make fine adjustments by changing the amount that ball joint (3) is screwed in.



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4. Tighten all bolts and nuts.
5. Turn the engine starting switch ON and OFF repeatedly, and check that engine stop motor (1) and the cable move smoothly. Then check the following points again.
  - 1) When the engine is running, check visually that there is slack in the engine stop motor cable, and that the stop lever of the fuel injection pump is fully returned to the RUN position.
  - 2) Check again that the clearance between the stop lever and the STOP stopper is 1 – 2 mm when the engine is stopped.
  - ★ The engine stop motor has limit switches built in at both ends of the cable stroke.
  - ★ Engine stop motor stroke: 35 mm  
Fuel injection pump stop lever stroke: 30 mm
  - ★ When the engine is running, there is slack in the engine stop motor cable, and the RUN position is maintained by the action of a spring (this is frequently built into the fuel injection pump).
  - ★ There is a loose spring inside the engine stop motor, and this absorbs the tolerance of the stop motor when the engine is stopped.  
However, if it is absorbed by the loose spring of the engine stop motor, force is applied to the injection pump, so depending on the model, this may be impossible.  
With such models, if the clearance between the stop lever and the STOP stopper is made 0 when the engine is stopped, there is a risk that problems may occur with the injection pump.

★ Problems caused by defective adjustment of the engine stop motor cable.

<ul style="list-style-type: none"> <li>• When the clearance between the stop lever and STOP stopper is excessive with the engine stop motor cable pulled</li> <li>• When the clearance between the stop lever and the RUN stopper is excessive at the free position</li> </ul>	<ul style="list-style-type: none"> <li>• Engine does not stop</li> <li>• Fuel injection amount drops, causing loss of engine output</li> </ul>
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## FUEL INJECTION PUMP CALIBRATION DATA

Engine	Injection pump part number	Engine serial number	Applicable machine	Page
6D125-2	6150-72-1170		D65E-12, D70LE-12	12-12
	6150-72-1220		D53A, P-17 D58E-1, D58P-1	12-12-1
	6150-72-1370		D65E-12 (-40°C)	12-12
S6D125-2	6151-72-1180		D65EX-12, D65P-12, D65PX-12 D85E-SS-2, D85E-SS-2A	12-12-4
	6151-72-1190		D60P-12	12-12-2
	6151-72-1390		EG220BS-2	12-12-11
	6151-72-1390		DCA-220SSK (For MQ, Prime)	12-12-16
	6151-72-1570		CS210-1	12-12-21
	6151-72-1640 6151-72-1641		D75S-5	12-12-5
	6151-72-1770 6151-72-1771 6151-72-1860		D85A-21, D85E-21, D85P-21 D85C-21, D85A-21S, D85A-21B D85A-21D	12-12-3
	6151-72-1790 6151-72-1791		LW250-5	12-12-6
	6151-72-1810		FD250-2	12-12-13
	6151-72-1820		FD400-2	12-12-14
	6151-72-1910		D87E-2, D87P-2	12-12-20
SA6D125-2	6152-72-1210		PC400, 400LC-6 (CUSTOM) • – 31999 PC450, 450LC-6 (MIGHTY) • – 11999 BR500JG-1	12-12-8
	6152-72-1250		PC400, 400LC-6 (CUSTOM) 32001 and up PC450, 450LC-6 (MIGHTY) 12001 and up	12-12-22
	6152-72-1260		PC400, 400LC-6 (EXCEL) PC450, 450LC-6 (EXCEL)	12-12-19
	6152-72-1310		HD255-5	12-12-9
	6152-72-1380		J6D125E-G1-2 (Generator)	12-13-2
	6152-72-1390 6152-72-1391 6152-72-1392		EG300BS-5	12-12-12
	6152-72-1390 6152-72-1391 6152-72-1392		DCA-300SSK (MQ generator)	12-12-18
	6152-72-1440 6152-72-1441 6152-72-1442		WA470-3	12-12-17

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Engine	Injection pump part number	Engine serial number	Applicable machine	Page
SA6D125-2	6152-72-1810		FD430-2	12-12-15
	6152-72-1920		J6D125E-G1-2 (Generator) (OPT)	12-13-1
SAA6D125-2	6152-72-1280		PC400AC-6 PC400-6 • PC450-6 (USA) BR550JG-1	12-13-3
	6152-72-1971		Generator (50 Hz only)	12-12-10
	6152-72-1971		SAA6D125-P400	12-13

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**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6150-72-1170 (092000-1200)

6150-72-1370 (190100-1220)(-40°C)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
NB(EP9)	DENSO

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D65E-12		6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	4.2
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

Flywheel horsepower (kW (HP)) / rpm	142 (190)/1,950 (Gross)
Maximum torque (Nm (kgm)/ rpm)	817 (83.3)/1,100 (Gross)
High idling speed (rpm)	2,050 - 2,150
Low idling speed (rpm)	800 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

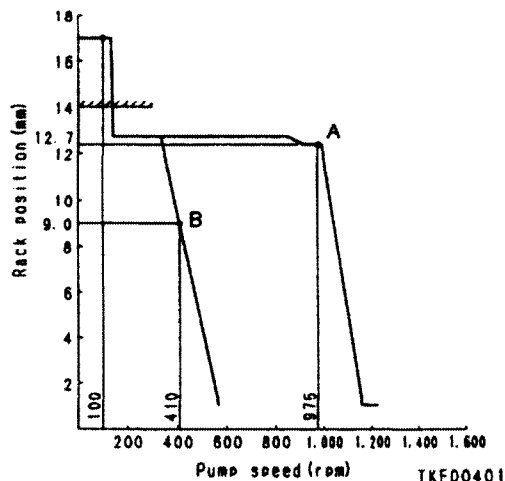
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.			(093500-6080)
Nozzle part No.	(093400-0540)		(093400-3010)	
Nozzle holder part No.	(093100-0190)		(093100-6080)	
Injection pipe (mm) (Outside dia. x inside dia. x length)	6 x 2 x 600		6 x 2 x 747	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)		24.5 (250)	
Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)			

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>• Marks ★ are average volumes.</li> </ul>	A (Basic point)	12.7	975	★ 140 - 146	8		
	B	9.0	410	★ 20 - 24	5		
	C						
	D						
	E						

**Governor performance curve**



615002

(CALIBRATION DATA)

Injection Pump Assembly Number  
6150-72-1220 (092000-1650)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
NB(EP9)	DENSO

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D53A-17, D53P-17 D58E-1, D58P-1		6D125-2	

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	4.2
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

Engine Specification

Flywheel horsepower (kW (HP)) / rpm	104 (140)/1,900 (Gross)
Maximum torque (Nm (kgm)/ rpm)	650 (66.3)/1,300 (Gross)
High idling speed (rpm)	2,050 - 2,150
Low idling speed (rpm)	800 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

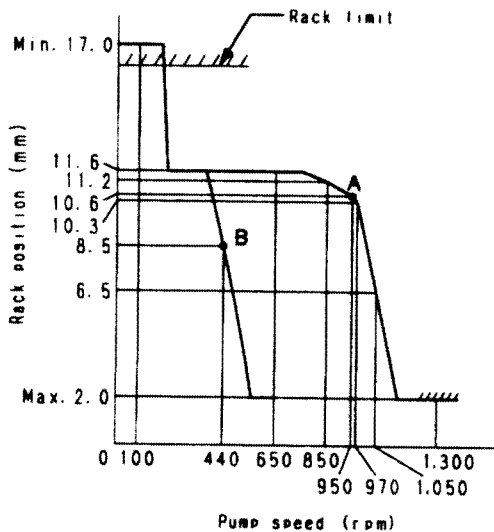
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(093500-8080)	(093500-6080)	
Nozzle part No.	(093400-0540)	(093400-3010)		
Nozzle holder part No.	(093100-0190)	(093100-6080)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	6 x 2 x 600		6 x 2 x 747	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)	24.5 (250)		
Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)	157 (1.6)		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>Service standard indicates data using calibration test parts.</li> <li>Manufacturer standard is data for factory test.</li> <li>Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>Marks ★ are average volumes.</li> </ul>	A (Basic point)	10.6	950	★95 - 101	8		
	B	8.5	440	★10 - 14	5		
	C						
	D						
	E						

Governor performance curve



TWE00B56

615002

(CALIBRATION DATA)

Injection Pump Assembly Number  
6151-72-1190 (092000-1280)

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D60P-12		S6D125-2	

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
NB(EP9)	DENSO

Injection pump specification

Engine Specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	4.2
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

Flywheel horsepower (kW (HP)) / rpm	153 (205)/1,950 (Gross)
Maximum torque (Nm (kgm)/ rpm)	1,000 (102)/1,200 (Gross)
High idling speed (rpm)	2,050 - 2,150
Low idling speed (rpm)	800 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

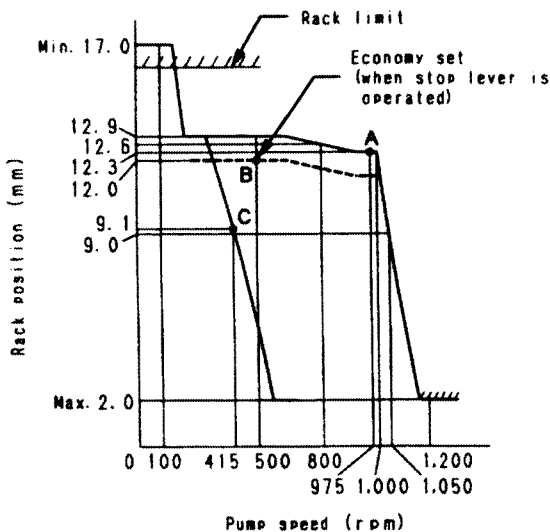
Calibration Standard

( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>Service standard indicates data using calibration test parts.</li> <li>Manufacturer standard is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(093500-8080)	Nozzle & nozzle holder part No.
	Nozzle part No.	(093400-0540)	Nozzle part No.	(093400-3020)
	Nozzle holder part No.	(093100-0190)	Nozzle holder part No.	(093100-6090)
	Injection pipe (mm) (Outside dia. x inside dia. x length)	6 x 2 x 600	Injection pipe (mm) (Outside dia. x inside dia. x length)	6 x 2 x 747
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	24.5 (250)
	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)		
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder	
<ul style="list-style-type: none"> <li>Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>Marks ★ are average volumes.</li> </ul>	A (Basic point)	12.3	975	★ 139 - 145	8			
	B	12.0	500	★ 148 - 154	8			
	C	9.1	415	★ 24 - 28	5			
	D							
	E							

Governor performance curve



TWE00B15

615002



**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1770 (106692-9260)  
 6151-72-1771 (106692-9261)  
 6151-72-1860 (106069-7270) (-50°C)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D85A-21, D85E-21 D85P-21, D85C-21 D85A-21S, D85A-21B D85A-21D		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	177 {222}/2,000 (Gross)
Maximum torque (Nm {kgm}/ rpm)	1,040 {106}/1,400 (Gross)
High idling speed (rpm)	2,150 - 2,250
Low idling speed (rpm)	670 - 720
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

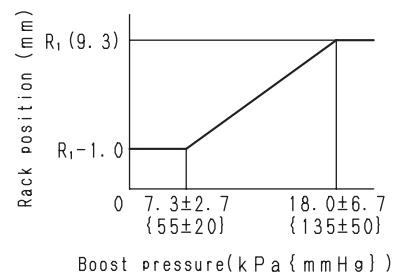
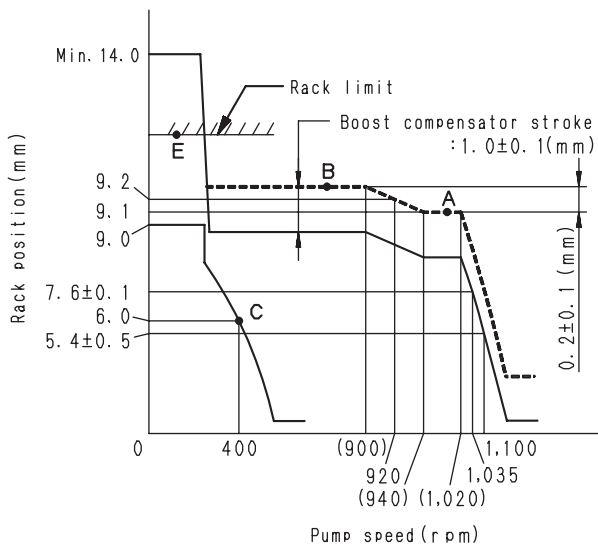
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3200 (105111-4550)
	Nozzle part No.	(105780-0000)	6151-12-3220 (105025-0330)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions B to E</b> are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.1	1,000	★119 - 123	±3	★145	-
	B	9.3	700	★142.5 - 146.5	±4	★167	-
	C	Approx. 6.0	400	-	±15	★16	-
	E	-	100	★185 - 205	-	★200	-
	Z	Approx. 6.0	540	-	-	-	-

**Governor performance curve**

**Boost compensator performance curve**



TJE01351

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**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1180 (092000-1210)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
NB(EP9)	DENSO

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D65EX-12, D65P-12 D65PX-12 D85E-SS-2 D85E-SS-2A		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	4.2
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

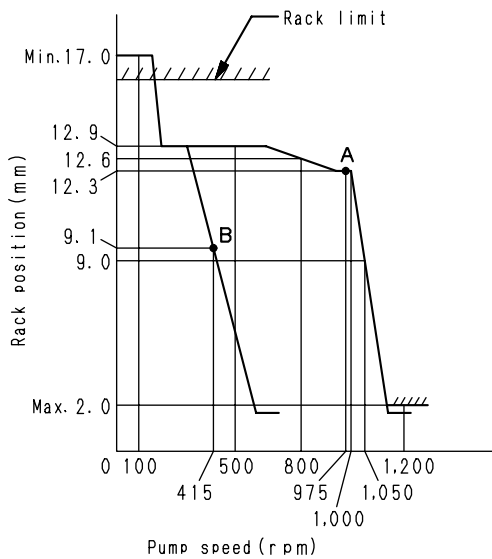
Flywheel horsepower (kW {HP}) / rpm	141 {188}/1,950 (Net)
Maximum torque (Nm {kgm})/ rpm	981 {100}/1,200 (Net)
High idling speed (rpm)	2,050 - 2,150
Low idling speed (rpm)	800 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard				
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.		(093500-6090)			
	Nozzle part No.	(093400-0540)	(093400-3020)				
	Nozzle holder part No.	(093100-0190)	(093100-6090)				
	Injection pipe (mm) (Outside dia. x inside dia. x length)	6 x 2 x 600	6 x 2 x 747				
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent					
	Oil temperature (°C)	40 to 45					
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}				
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}					
Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions</b> B to E are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	12.3	975	139 - 145	8		
	B	9.1	410	24 - 28	5		
	C						
	D						
	E						

**Governor performance curve**



TJE00973

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**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1640 (106692-9320)

6151-72-1641 (106692-9323)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D75S-5		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	166 {222}/2,000 (Gross)
Maximum torque (Nm {kgm}/ rpm)	963 {98.2}/1,500 (Gross)
High idling speed (rpm)	2,150 - 2,250
Low idling speed (rpm)	550 - 650
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

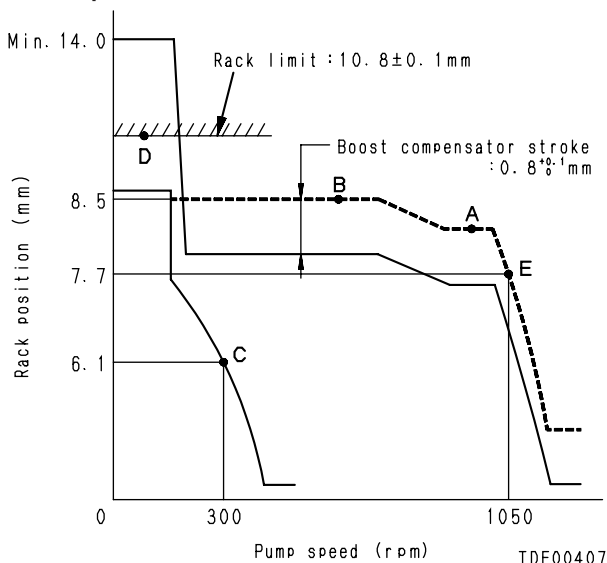
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3400 (105111-4600)
	Nozzle part No.	(105780-0000)	6151-12-3420 (105025-0750)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 720
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

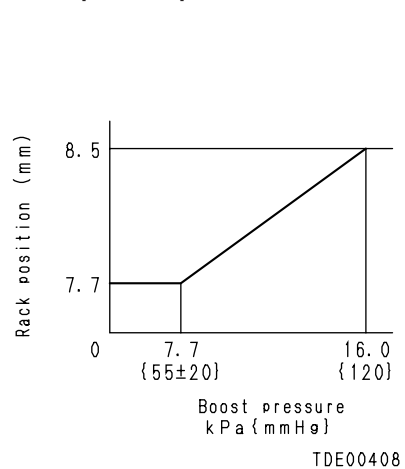
  

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/ st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions B to E</b> are the reference volume when adjusting the injection volume.</li> <li>● <b>Marks ★</b> are average volumes.</li> </ul>	A (Basic point)	8.0	1,000	-	-	★ 128 - 132	±3
	B	8.5	750	-	-	★ 150 - 154	±4
	C	6.1	300	-	-	★ 13.5 - 16.5	±15
	D	10.7 - 10.9	100	-	-	-	-
	E	7.7	1,050	-	-	★ 119 - 125	-

**Governor performance curve**



**Boost compensator performance curve**



TDE00408

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1790 (106692-9350)

6151-72-1791 (106692-9352)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3000)	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
LW250-5		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	184 {250}/2,100 (Gross)
Maximum torque (Nm {kgm})/ rpm	1,100 {112}/1,400 (Gross)
High idling speed (rpm)	2,300 - 2,400
Low idling speed (rpm)	550 - 650
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

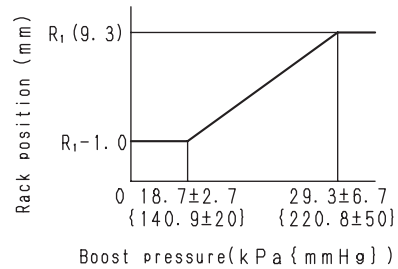
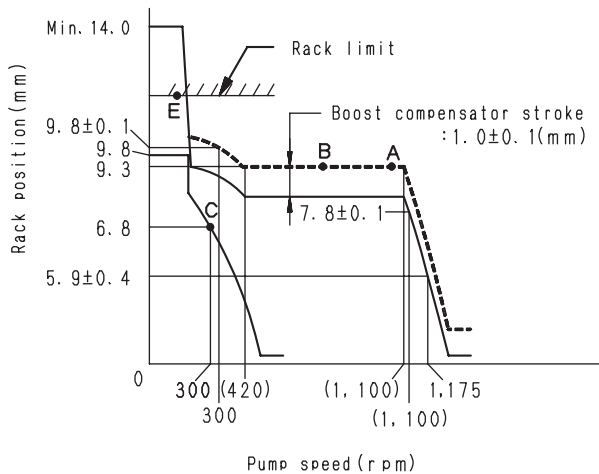
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	● <b>Service standard</b> indicates data using calibration test parts.	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3400 (105111-4600)
● <b>Manufacturer standard</b> is data for factory test.	Nozzle part No.	(105780-0000)	6151-12-3420 (105025-0750)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}	
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/ st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
● <b>Rack positions</b> B to E are the reference volume when adjusting the injection volume. ● <b>Marks ★</b> are average volumes.	A (Basic point)	9.0	1,050	★125 ± 2	±3	★147.5	-
	B	9.0	700	★147 ± 2	-	★161.5	-
	C	approx. 6.3	300	★14 ± 1.5	±15	★15	-
	D	-	-	-	-	-	-
	E	-	100	★145 <sup>+20</sup> / <sub>0</sub>	-	★150	-

**Governor performance curve**

**Boost compensator performance curve**



TJE01352

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6152-72-1210 (106675-4150)  
 6152-72-1240 (106675-4430) (-50°C)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
PC400-6 (CUSTOM)	• - 31009	SA6D125-2	
PC400LC-6 (CUSTOM)	• - 31009		
PC450-6 (MIGHTY)	• - 11009		
PC450LC-6 (MIGHTY)	• - 11009		
BR500JG-1			

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	241 {322}/1,950 (Gross)
Maximum torque (Nm {kgm})/ rpm	1,250 {127}/1,400 (Gross)
High idling speed (rpm)	2,100 - 2,200
Low idling speed (rpm)	750 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

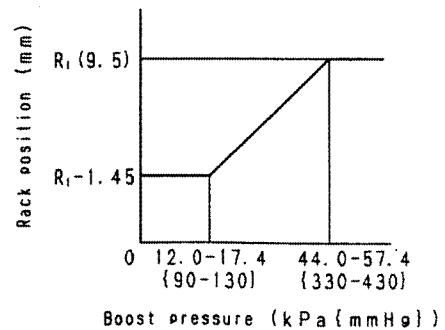
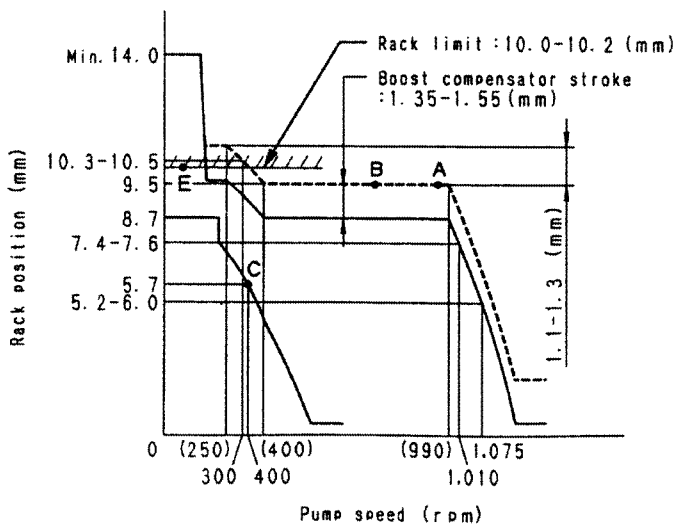
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	• Service standard indicates data using calibration test parts.	• Manufacturer standard is data for factory test.		
Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3100 (105111-4540)		
Nozzle part No.	(105780-0000)	6152-12-3120 (105025-0120)		
Nozzle holder part No.	(105780-2080)	(105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)		6 x 2.2 x 720		
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}		
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/ st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
• Rack positions B to E are the reference volume when adjusting the injection volume.	A (Basic point)	9.5	975	173.5 - 181.5	±3	185	11
	B	9.5	700	172.5 - 182.5	-	184	-
	C	Approx. 5.7	400	9.5 - 12.5	±15	16.5	0.6
	D				-	-	-
	E	10.0 - 10.2	100		-	160	-

**Governor performance curve**

**Boost compensator performance curve**



TWE00820

615002

(CALIBRATION DATA)

Injection Pump Assembly Number  
6152-72-1310 (106675-4390)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
HD255-5		SA6D125-2	

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

Engine Specification

Flywheel horsepower (kW (HP)) / rpm	241 (328)/2,100 (Gross)
Maximum torque (Nm (kgm))/ rpm	1,300 (132)/1,400 (Gross)
High idling speed (rpm)	2,400 - 2,500
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

( ): Injection pump manufacturer's part number

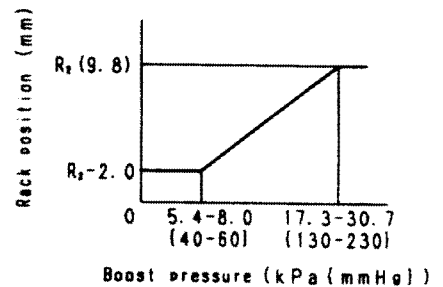
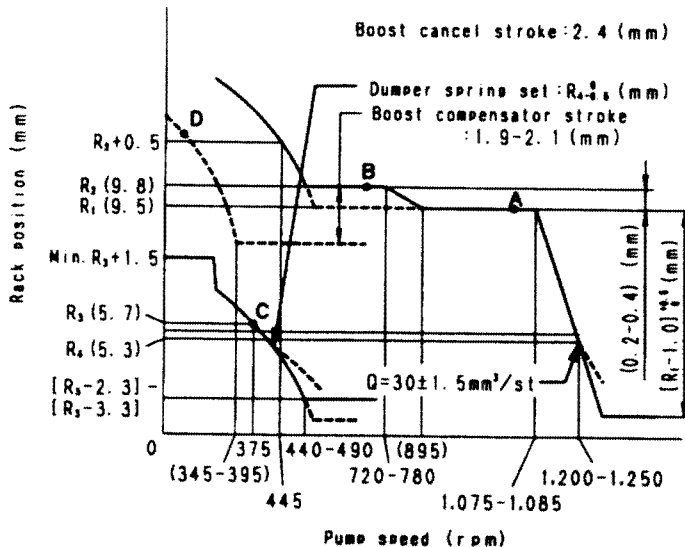
Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3100 (105111-4540)	
Nozzle part No.	(105780-0000)	6152-12-3120 (105025-0120)		
Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 720	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)		27.5 (280)	
Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)		157 (1.6)	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>Service standard indicates data using calibration test parts.</li> <li>Manufacturer standard is data for factory test.</li> <li>Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>Marks * are average volumes.</li> </ul>	A (Basic point)	9.5	1,050	170.5 - 178.5	±3	178 - 186	±3
	B	9.8	700	182.5 - 192.5	-	189 - 199	-
	C	5.7	375	11.5 - 14.5	±15	13.5 - 16.5	±15
	D						
	E						

Governor performance curve

Boost compensator performance curve



TWF00821

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6152-72-1971 (106682-9451)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS7S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
Generator (50 Hz only)		SAA6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	2.75 - 2.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Rated flywheel horsepower (kW {HP} / rpm)	307 (411)/1,500 (Gross)
Maximum flywheel horsepower (kW {HP} / rpm)	337 (452)/1,500 (Gross)
High idling speed (rpm)	Max. 1,575
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

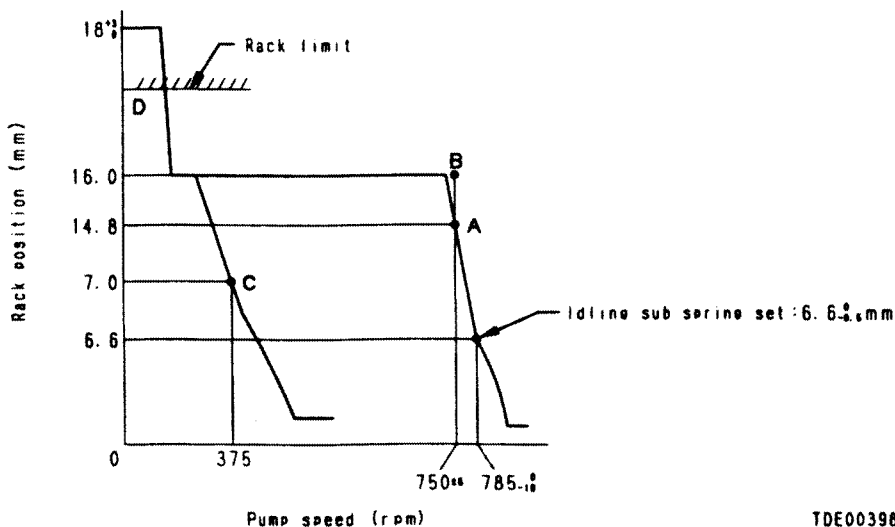
**Calibration Standard**

( ): Injection pump manufacturer's part number

Conditions	Service standard	Manufacturer standard
	Nozzle & nozzle holder part No. Nozzle part No. Nozzle holder part No. Injection pipe (mm) (Outside dia. x inside dia. x length) Test oil Oil temperature (°C) Nozzle opening pressure (MPa(kg/cm <sup>2</sup> )) Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	(105780-0050) (105780-2090) 8 x 4 x 1,000 ASTM D975 No. 2 diesel fuel or equivalent 40 to 45 17.2 (175) 157 (1.6)

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
● Rack positions B to E are the reference volume when adjusting the injection volume. ● Marks ★ are average volumes.	A (Basic point)	14.8	750	383 ± 5	23	310	
	B	16.0	750	441 - 451	-	350	
	C	7.0	375	8.5 - 12.5	3	15	
	D	-	100	380 - 400	-	385	
	E						

**Governor performance curve**



TDE00398

615002

(CALIBRATION DATA)

Injection Pump Assembly Number  
6151-72-1390 (106692-9280)

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
EG220BS-2 DCA220SPK (DENYO generator)		S6D125-2	

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-A(PS3S)	ZEXEL

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.55 - 3.65
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

Engine Specification

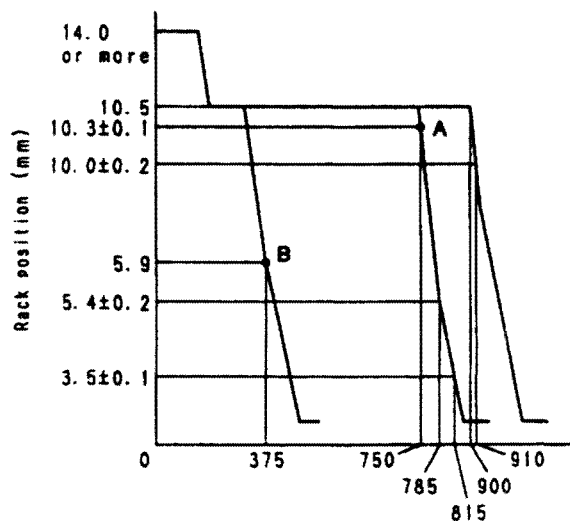
Flywheel horsepower (kW (HP)) / rpm	181 (243)/1,500 (50 Hz, Gross) 209 (280)/1,800 (60 Hz, Gross)
Maximum torque (Nm (kgm)) / rpm	-
High idling speed (rpm)	max. 1,567 (50 Hz) max. 1,880 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard				
	<ul style="list-style-type: none"> <li>Service standard indicates data using calibration test parts.</li> <li>Manufacturer standard is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3300 (105111-4570)			
	Nozzle part No.	(105780-2080)	6151-12-3320 (105025-0690)				
	Nozzle holder part No.	(105780-0000)	6152-12-3110 (105041-7130)				
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720				
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent					
	Oil temperature (°C)	40 to 50					
	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)	24.5 (250)				
	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)	157 (1.6)				
Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>Marks * are average volumes.</li> </ul>	A (Basic point)	10.3	750	*208 - 212	±3	*230	
	B	approx. 5.9	375	*13.5 - 16.5	±15	*15	
	C						
	D						
	E						

Governor performance curve



TWE00591

615002



(CALIBRATION DATA)

Injection Pump Assembly Number

6152-72-1390 (106675-4291)

6152-72-1391 (106675-4292)

6152-72-1392 (106675-4295)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-A(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
EG300BS-5 DCA300SPK (DENYO generator)		SA6D125-2	

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.55 - 3.65
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

Engine Specification

Flywheel horsepower (kW (HP)) / rpm	232 (311)/1,500 (50 Hz, Gross) 257 (344)/1,800 (60 Hz, Gross)
Maximum torque (Nm (kgm)/ rpm)	-
High idling speed (rpm)	max. 1,568 (50 Hz) max. 1,880 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

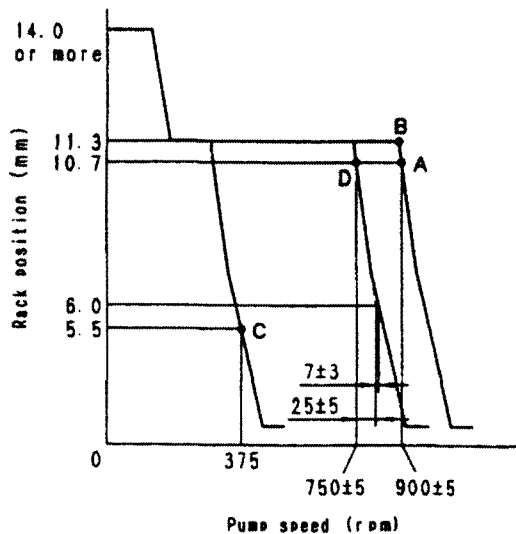
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3200 (105111-4560)	
Nozzle part No.	(105780-2080)	6152-12-3220 (105025-0680)		
Nozzle holder part No.	(105780-0000)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 720	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 50			
Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)		27.5 (280)	
Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)		157 (1.6)	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
• Rack positions B to E are the reference volume when adjusting the injection volume. • Marks ★ are average volumes.	A (Basic point)	10.7	900	★320 - 326	max. 19	★255	
	B	11.3	900	★355 - 363	-	★288	
	C	approx. 5.5	375	★15 - 18	max. 5	★15	
	D	10.7	750	★315	-	★265	
	E						

Governor performance curve



TWE00592

615002

(CALIBRATION DATA)

Injection Pump Assembly Number

6151-72-1810 (106992-9440)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
FD250-2		S6D125-2	

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

Engine Specification

Flywheel horsepower (kW {HP}) / rpm	168 {224}/2,100 (Gross)
Maximum torque (Nm {kgm})/ rpm	951 {97}/1,400 (Gross)
High idling speed (rpm)	2,250 - 2,350
Low idling speed (rpm)	650 - 700
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

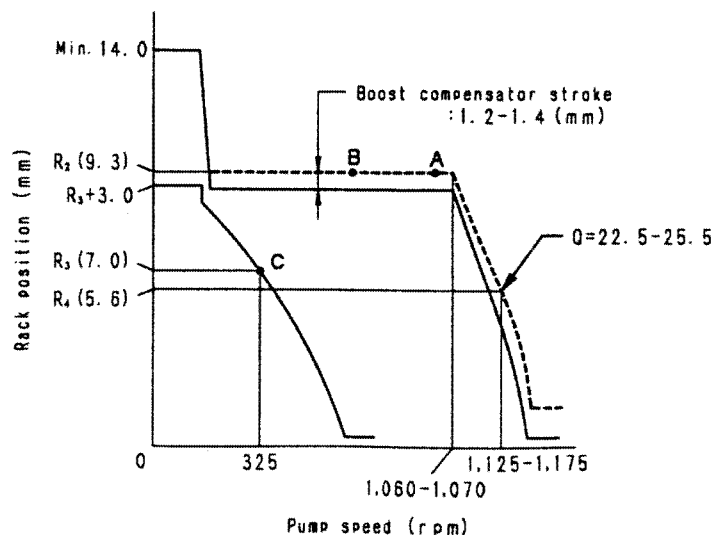
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3200 (105111-4550)	
Nozzle part No.	(105780-0000)	6151-12-3220 (105025-0320)		
Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720		
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}		
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

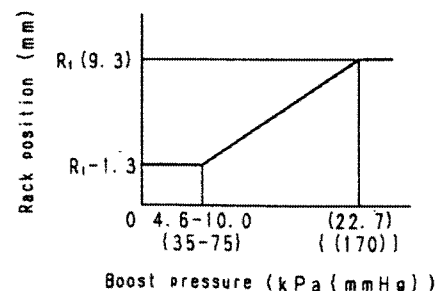
  

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.3	1,050			130 - 134	±3
	B	9.3	700				-
	C	7.0	325			28.5 - 31.5	±15
	D						
	E						

Governor performance curve



Boost compensator performance curve



TWE00822

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1820 (106992-9460)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
FD400-2		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW (HP)) / rpm	204 (273)/2,000 (Gross)
Maximum torque (Nm {kgm})/ rpm	1,170 (119)/1,400 (Gross)
High idling speed (rpm)	2,250 - 2,350
Low idling speed (rpm)	650 - 700
Pump tester capacity for Service standard	Motor 7.5 kW

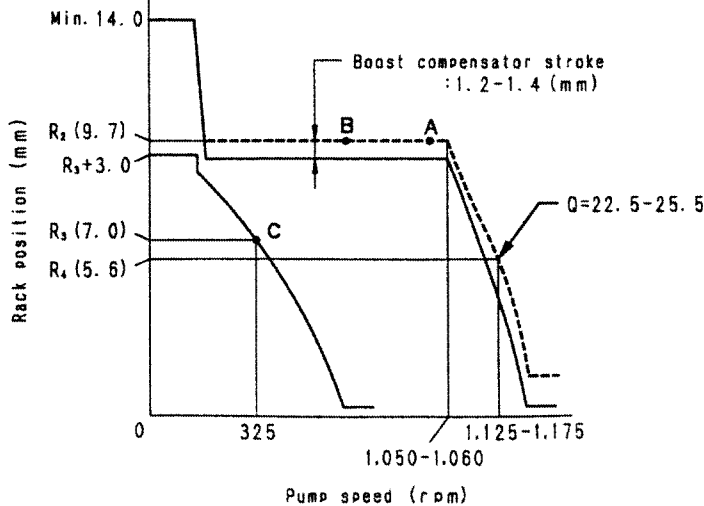
**Calibration Standard**

( ): Injection pump manufacturer's part number

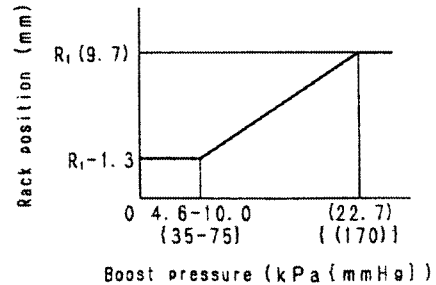
Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>• Service standard indicates data using calibration test parts.</li> <li>• Manufacturer standard is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3200 (105111-4550)
	Nozzle part No.	(105780-0000)	6151-12-3220 (105025-0330)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 {175}	24.5 {250}	
	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.7	1,000			161 - 165	±3
	B	9.7	700				-
	C	7.0	325			28.5 - 31.5	±15
	D						
	E						

**Governor performance curve**



**Boost compensator performance curve**



TWE00823

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6152-72-1810 (106675-4312)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
FD430-2		SA6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	227 {304}/2,100 (Gross)
Maximum torque (Nm {kgm}/ rpm)	1,190 {121}/1,400 (Gross)
High idling speed (rpm)	2,250 - 2,350
Low idling speed (rpm)	800 - 850
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

( ): Injection pump manufacturer's part number

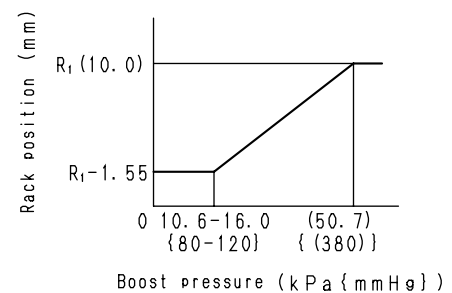
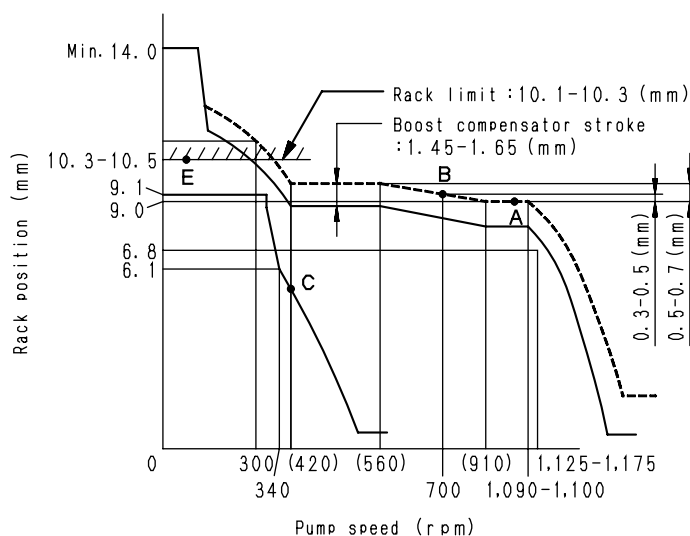
Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3100 (105111-4550)
	Nozzle part No.	(105780-0000)	6152-12-3120 (105041-7120)	
	Nozzle holder part No.	(105780-2080)	(105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 750	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions B to E</b> are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.0	1,050			161 - 165	±3
	B	9.4	700			176 - 182	-
	C	6.1	340			28 - 32	±15
	D	-	-	-	-	-	-
	E	10.1 - 10.3	100			150 - 170	

**Governor performance curve**

**Boost compensator performance curve**



TWE00824

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6151-72-1390 (106692-9280)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
For MQ generator DCA-220 SSK (Prime)		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.59 - 3.65
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	209 {280}/1,800 (60 Hz, Gross)
Maximum torque (Nm {kgm})/ rpm	—
High idling speed (rpm)	Max. 1,890 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

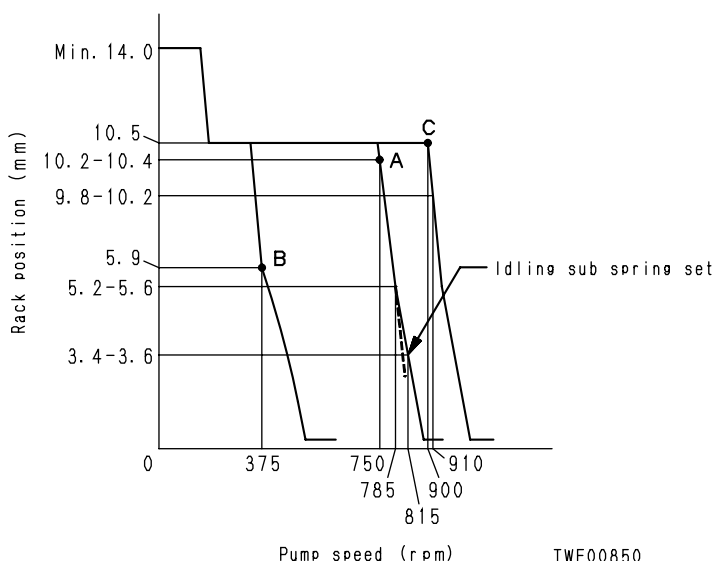
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3300 (105111-4570)	
Nozzle part No.	(105780-0000)	6151-12-3320 (105025-0690)		
Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720		
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}		
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• <b>Rack positions</b> B to E are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	10.3	750	208 - 212	±3	230	—
	B	Approx. 5.9	375	13.5 - 16.5	±15	15	—
	C						
	D						
	E						

**Governor performance curve**



TWE00850

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6152-72-1440 (106675-4172)  
 6152-72-1441 (106675-4173)  
 6152-72-1442

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-6P	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
WA470-3		SA6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	202 {275}/2,200 (Gross)
Maximum torque (Nm {kgm}/ rpm)	1,070 {109}/1,400 (Gross)
High idling speed (rpm)	2,350 - 2,450
Low idling speed (rpm)	700 - 750
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

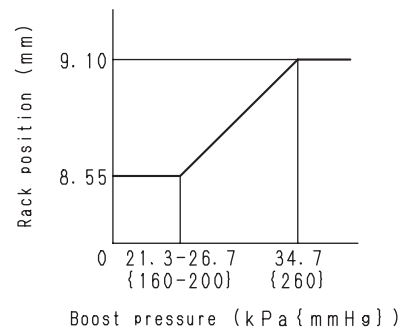
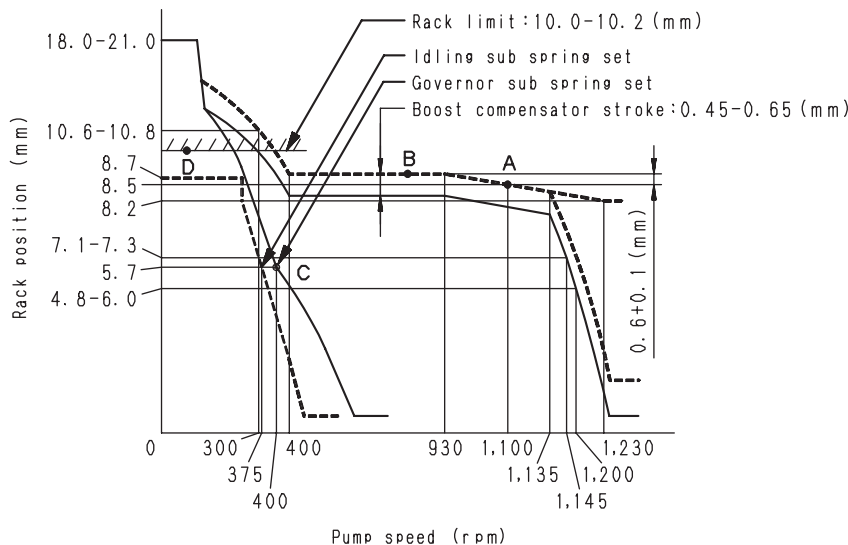
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3120 (105125-0120)
	Nozzle part No.	(105780-0000)	6152-12-3110 (105041-7130)	
	Nozzle holder part No.	(105780-2080)		
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)		
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder	
<ul style="list-style-type: none"> <li>● <b>Rack positions B to E</b> are the reference volume when adjusting the injection volume.</li> <li>● <b>Marks ★</b> are average volumes.</li> </ul>	A (Basic point)	8.5	1,100	★142 - 146	±3	★155	-	
	B	9.1	700	★162.5 - 168.5	-	★168.5	-	
	C	5.7	400	★9.5 - 12.5	±15	★16.5	-	
	D	-	-	-	-	-	-	-
	E	10 - 10.2	100	★155 - 175	-	★160	-	

**Governor performance curve**

**Boost compensator performance curve**



TJE01355

615002

(CALIBRATION DATA)

Injection Pump Assembly Number

6152-72-1390 (106675-4291)

6152-72-1391 (106675-4292)

6152-72-1392 (106675-4295)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
DCA-300SSK (MQ generator)		SA6D125-2	

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

Engine Specification

Flywheel horsepower (kW {HP}) / rpm	269 {360}/1,800 (60 Hz, Gross)
Maximum torque (Nm {kgm})/ rpm	—
High idling speed (rpm)	Max. 1,890 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

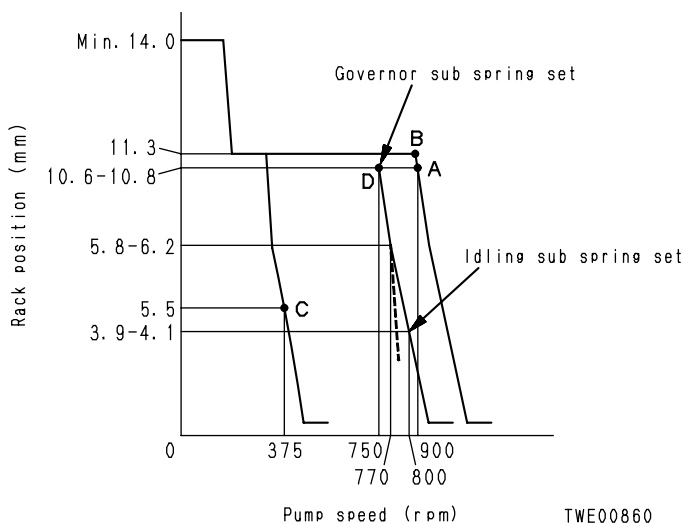
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8130)	6152-12-3200 (105111-4560)	
Nozzle part No.	(105780-0050)	6152-12-3220 (105025-0680)		
Nozzle holder part No.	(105780-2090)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 720	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}		27.5 {280}	
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}		157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>• Marks ★ are average volumes.</li> </ul>	A (Basic point)	10.7	900	★320 - 326	±3	★255	
	B	11.3	900	★355 - 363	-	★280	
	C	Approx. 5.5	375	★15 - 18	±15	★15	
	D	10.7	750	★315	-	★265	
	E						

Governor performance curve



615002

(CALIBRATION DATA)

Injection Pump Assembly Number  
6152-72-1260 (106675-4510)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
PC400-6 (EXCEL)		SA6D125-2	
PC400LC-6 (EXCEL)			
PC450-6 (EXCEL)			
PC450LC-6 (EXCEL)			

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

Engine Specification

Flywheel horsepower (kW (HP)) / rpm	241 (322)/1,950 (Gross)
Maximum torque (Nm (kgm)) / rpm	1,250 (127)/1,400 (Gross)
High idling speed (rpm)	2,100 - 2,200
Low idling speed (rpm)	900 - 950
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

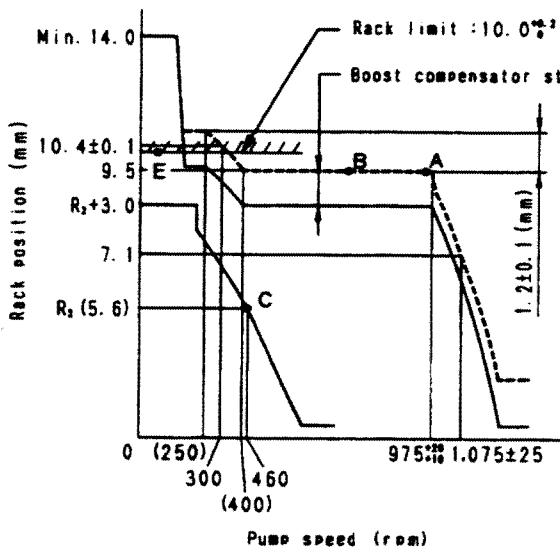
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3100 (105111-4540)	
Nozzle part No.	(105780-0000)	6152-12-3110 (105041-7130)		
Nozzle holder part No.	(105780-2080)	(105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 720	
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)		27.5 (280)	
Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)		157 (1.6)	

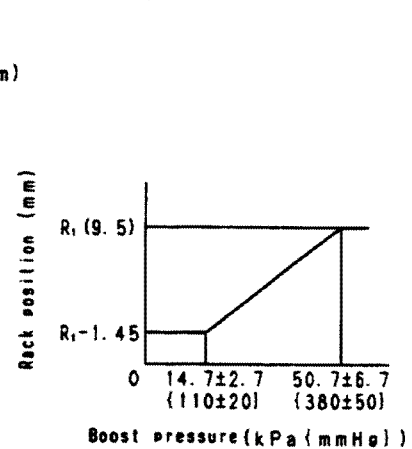
  

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/ st.)		Manufacturer standard (cc/1000 st.)		
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder	
• Rack positions B to E are the reference volume when adjusting the injection volume. • Marks * are average volumes.	A (Basic point)	9.5	975			*181 - 189	±3	
	B	9.5	700			*179 - 189	-	
	C	Approx. 5.6	460			*15 - 18	±15	
	D	-	-	-			-	-
	E	10.0 - 10.2	100			*150 - 170	-	

Governor performance curve



Boost compensator performance curve



TXE00914

615002



(CALIBRATION DATA)

Injection Pump Assembly Number  
6151-72-1910 (106692-9480)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3000)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
D87E-2		S6D125-2	
D87P-2			

Injection pump specification

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.70 - 3.80
Delivery valve (mm <sup>3</sup> /st) retraction volume	90

Engine Specification

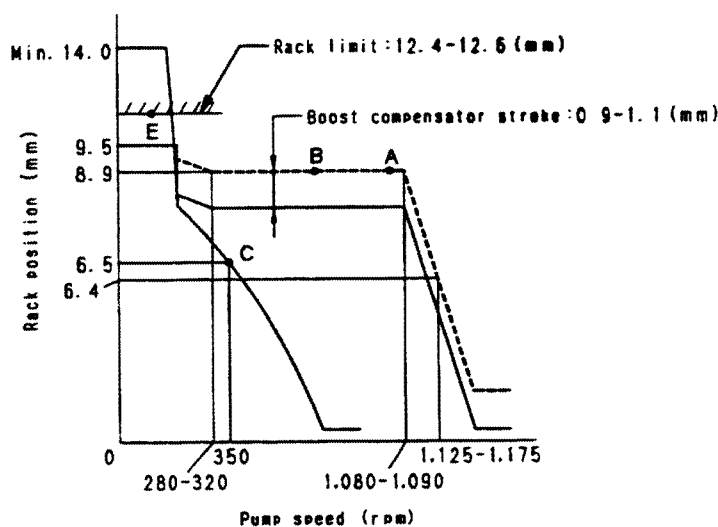
Flywheel horsepower (kW {HP}) / rpm	174 {233}/2,100 (Net)
Maximum torque (Nm {kgm})/ rpm	999 {102}/1,400 (Net)
High idling speed (rpm)	2,250 - 2,350
Low idling speed (rpm)	670 - 720
Pump tester capacity for Service standard	Motor 7.5 kW

Calibration Standard

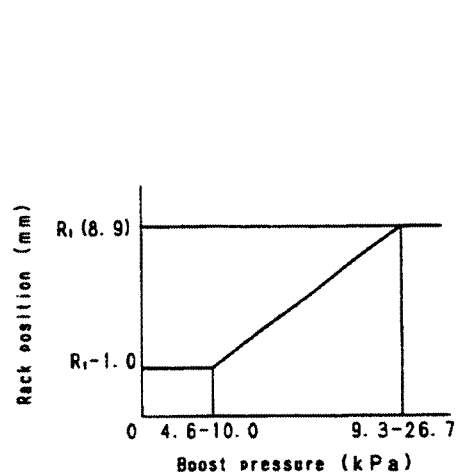
( ): Injection pump manufacturer's part number

Conditions				Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.			(105780-8140)		6151-12-3200 (105111-4550)	
	Nozzle part No.			(105780-0000)		6151-12-3220 (105025-0330)	
	Nozzle holder part No.			(105780-2080)		6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)			8 x 3 x 600		6 x 2.2 x 720	
	Test oil			ASTM D975 No. 2 diesel fuel or equivalent			
	Oil temperature (°C)			40 to 45			
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })			17.2 {175}		24.5 {250}	
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })			157 {1.6}		157 {1.6}		
Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/ st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
	A (Basic point)	8.9	1,050	-			±3
	B	8.9	700	-			±4
	C	6.5	350	-			±15
	F	12.5 ± 0.1	100	-		210 ± 10	-

Governor performance curve



Boost compensator performance curve



SWE01419

SWE01420

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6151-72-1570 (106692-9360)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3000)	BOSCH

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
CS210-1		S6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	60° ± 30'
Plunger pre-stroke (mm)	3.75 ± 0.75
Delivery valve (mm <sup>3</sup> /st) retraction volume	60

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	163 {218}/2,000 (Gross)
Maximum torque (Nm {kgm}/ rpm)	954 {97.3}/1,300 (Gross)
High idling speed (rpm)	2,200 ± 50
Low idling speed (rpm)	650 <sup>+50</sup> <sub>0</sub>
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

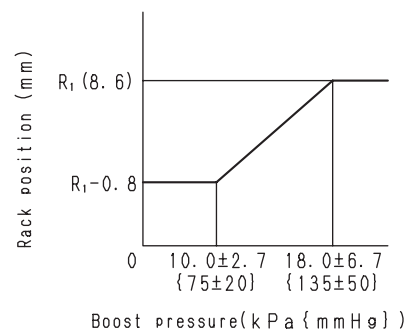
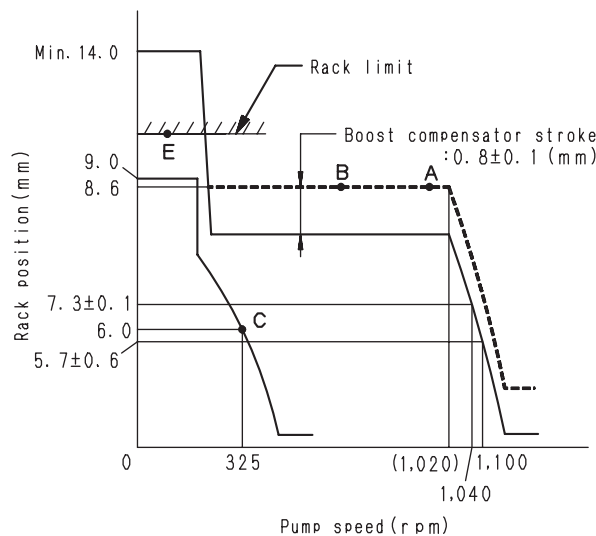
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6151-12-3400 (105111-4600)
	Nozzle part No.	(105780-0000)	6151-12-3420 (105025-0750)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	24.5 {250}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions</b> B to E are the reference volume when adjusting the injection volume.</li> <li>● Marks ★ are average volumes.</li> </ul>	A (Basic point)	8.6	1,000	★ 114 ± 2	±3	★ 133	-
	B	8.6	650	★ 132 ± 3	±4	★ 147.5	-
	C	Approx. 6.0	325	★ 15 ± 1.5	±15	★ 15	-
	E	-	100	★ 145 <sup>+20</sup> <sub>0</sub>	-	★ 150	-

**Governor performance curve**

**Boost compensator performance curve**



TJE01353

615002

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6152-72-1250 (106675-4503)

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
PC400-6 (CUSTOM)	32001 and up	SA6D125-2	
PC400LC-6 (CUSTOM)	32001 and up		
PC450-6 (MIGHTY)	12001 and up		
PC450LC-6 (MIGHTY)	12001 and up		

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 – 5 – 3 – 6 – 2 – 4
Injection interval	59°30' – 60°30'
Plunger pre-stroke (mm)	3.75 – 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	241 {322}/2,050 (Gross)
Maximum torque (Nm {kgm}/ rpm)	1,240 {126}/1,400 (Gross)
High idling speed (rpm)	2,200 – 2,300
Low idling speed (rpm)	675 – 725
Pump tester capacity for Service standard	Motor 7.5 kW

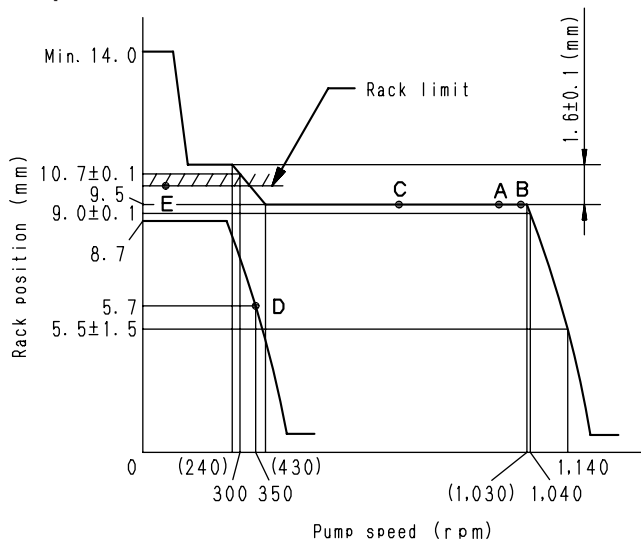
**Calibration Standard**

( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	<ul style="list-style-type: none"> <li>● <b>Service standard</b> indicates data using calibration test parts.</li> <li>● <b>Manufacturer standard</b> is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3100 (105111-4540)
	Nozzle part No.	(105780-0000)	6152-12-3120 (105025-0120)	
	Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)	
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720	
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent		
	Oil temperature (°C)	40 to 45		
	Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}	
	Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}	

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>● <b>Rack positions B to E</b> are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.4	1,015	173 – 177	±3	182.5	–
	B	9.4	1,025	172 – 175	–	182.5	–
	C	9.4	700	171.5 – 177.5	–	181.5	–
	D	Approx. 5.7	350	11.5 – 14.5	±15	15	–
	E	–	100	155 – 175	–	160	–

**Governor performance curve**



TJE00974

615002

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6151-72-1971 (106068-2690)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-6P	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
OEM for generator		SAA6D125-P400	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	2.75 - 2.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

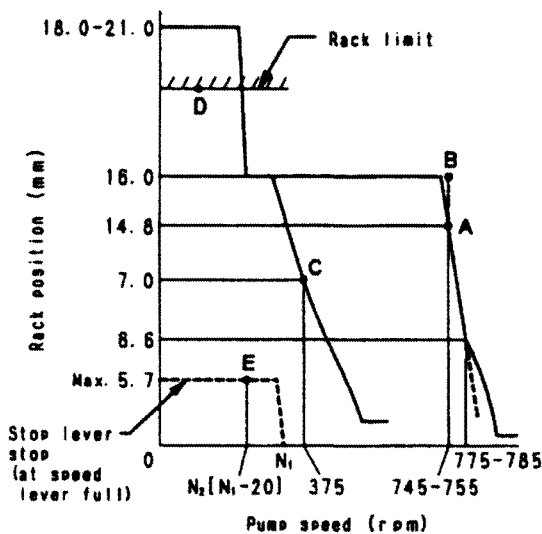
Flywheel horsepower (kW (HP)) / rpm	306.7 (411)/1,500 (Gross)
Maximum torque (Nm {kgm}/ rpm)	
High idling speed (rpm)	Max. 1,575
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard				
	<ul style="list-style-type: none"> <li>• Service standard indicates data using calibration test parts.</li> <li>• Manufacturer standard is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.					
	Nozzle part No.	105780-0050	6152-12-3520 (105025-1090)				
	Nozzle holder part No.	105780-2090	6152-12-3110 (105041-7130)				
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 4 x 1,000	6 x 2.2 x 720				
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent					
	Oil temperature (°C)	40 to 45					
	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)	27.5 (280)				
	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)	157 (1.6)				
Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>• Marks * are average volumes.</li> </ul>	A (Basic point)	14.8	750	378 - 388	±3	310	
	B	16.0	750	441 - 451	-	350	
	C	7.0	375	8.5 - 12.5	±15	15	
	D	-	100	380 - 400	-	385	
	E	Max. 5.7	N2	-	-	-	

**Governor performance curve**



TWE00848

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6152-72-1920 (106675-4760)

(with ZEXEL electronic governor)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P (PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
J6D125E-G1-2 (Generator)		SA6D125-2	

**Injection pump specification**

Rotating direction	Clockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW (HP)) / rpm	193 (258)/1,500 (Gross, 50 Hz) 222 (298)/1,300 (Gross, 60 Hz)
Maximum torque (Nm (kgm))/ rpm	-
High idling speed (rpm)	Max. 1,575 (50 Hz) Max. 1,890 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

( ): Injection pump manufacturer's part number

Conditions	Service standard			Manufacturer's standard			
	<ul style="list-style-type: none"> <li>• Service standard indicates data using calibration test parts.</li> <li>• Manufacturer standard is data for factory test.</li> </ul>	Nozzle & nozzle holder part No.	(105780-8140)		6152-12-3200 (105111-4560)		
	Nozzle part No.	(105780-0000)		6152-12-3220 (105025-0680)			
	Nozzle holder part No.	(105780-2080)		6152-12-3110 (105041-7130)			
	Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600		6 x 2.2 x 725			
	Test oil	ASTM D975 No. 2 diesel fuel or equivalent					
	Oil temperature (°C)	40 - 45					
	Nozzle opening pressure (MPa(kg/cm <sup>2</sup> ))	17.2 (175)		27.5 (280)			
	Transfer pump pressure (kPa(kg/cm <sup>2</sup> ))	157 (1.6)		157 (1.6)			
Injection volume	Rack position (mm)	Rack voltage (V)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Injection volume	Maximum variance between cylinder	Injection volume	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> <li>• Marks * are average volumes.</li> </ul>	Rated point (60 Hz)		900			* 178 - 182	± 3
	Low idling point		375			* 18.5 - 16.5	± 15

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**Governor performance curve**

There is no Governor performance chart because of the mounting fuel injection pump with electronic governor.

**(CALIBRATION DATA)**

**Injection Pump Assembly Number**

6152-72-1380 (106675-4750)

(with mechanical governor)

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
J6D125E-G1-2 (Generator)		SA6D125-2	

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 3.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	193 (258)/1,500 (Gross, 50 Hz) 222 (298)/1,300 (Gross, 60 Hz)
Maximum torque (Nm {kgm})/ rpm	—
High idling speed (rpm)	Max. 1,575 (50 Hz) Max. 1,890 (60 Hz)
Low idling speed (rpm)	700 - 800
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

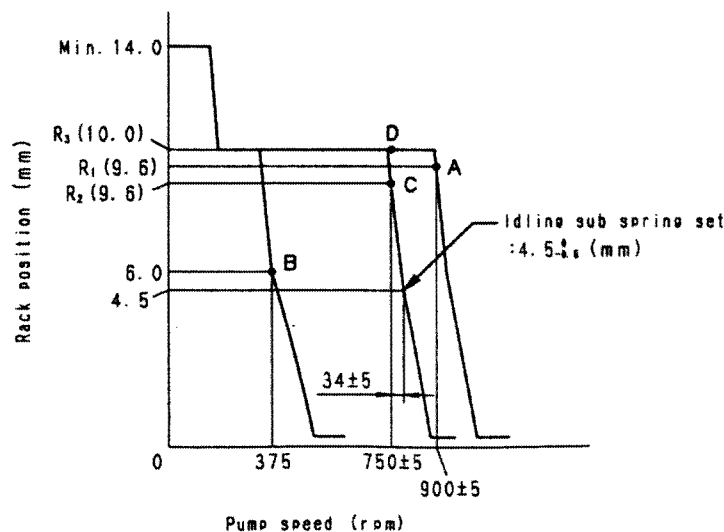
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3200 (105111-4560)	
Nozzle part No.	(105780-0000)	6152-12-3220 (105025-0680)		
Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720		
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}		
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/1000 st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
● Rack positions B to E are the reference volume when adjusting the injection volume.	A (Basic point)	R1 (9.6)	900			178 - 182	±3
	B	Approx. 6.0	900			13.5 - 16.5	±15
	C	R2 (9.6)	375			183 - 187	-
	D	R3 (10.0)	750			206 - 210	-

**Governor performance curve**



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**(CALIBRATION DATA)**

**Injection Pump Assembly Number**  
6152-72-1280 (106671-9991)

( ): Injection pump manufacturer's part No.

Injection Pump Type	Injection pump Manufacturer
PE-P(PS3S)	ZEXEL

Applicable Machine		Applicable Engine	
Model	Serial No.	Model	Serial No.
PC400AC-6 PC400-6 • 450-6 (USA) BR550JG-1		SAA6D125-2	

**Injection pump specification**

Rotating direction	Counterclockwise
Injection order	1 - 5 - 3 - 6 - 2 - 4
Injection interval	59°30' - 60°30'
Plunger pre-stroke (mm)	3.75 - 8.85
Delivery valve (mm <sup>3</sup> /st) retraction volume	100

**Engine Specification**

Flywheel horsepower (kW {HP}) / rpm	240 {322}/2,050 (Gross)
Maximum torque (Nm {kgm})/ rpm	1,240 {126}/1,500 (Gross)
High idling speed (rpm)	2,200 - 2,300
Low idling speed (rpm)	675 - 725
Pump tester capacity for Service standard	Motor 7.5 kW

**Calibration Standard**

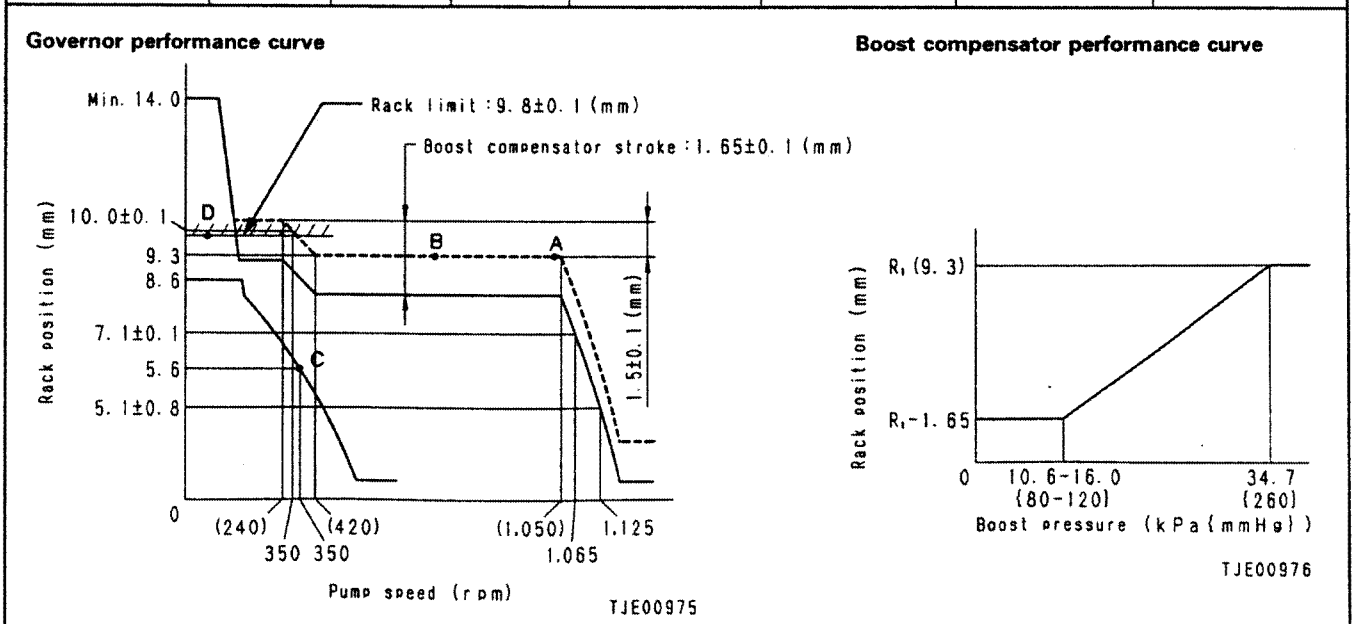
( ): Injection pump manufacturer's part number

Conditions	Service standard		Manufacturer standard	
	Nozzle & nozzle holder part No.	(105780-8140)	6152-12-3800 (105111-5060)	
Nozzle part No.	(105780-0000)	6152-12-3820 (105025-3530)		
Nozzle holder part No.	(105780-2080)	6152-12-3110 (105041-7130)		
Injection pipe (mm) (Outside dia. x inside dia. x length)	8 x 3 x 600	6 x 2.2 x 720		
Test oil	ASTM D975 No. 2 diesel fuel or equivalent			
Oil temperature (°C)	40 to 45			
Nozzle opening pressure (MPa{kg/cm <sup>2</sup> })	17.2 {175}	27.5 {280}		
Transfer pump pressure (kPa{kg/cm <sup>2</sup> })	157 {1.6}	157 {1.6}		

Injection volume	Rack point	Rack position (mm)	Pump speed (rpm)	Service standard (cc/ st.)		Manufacturer standard (cc/1000 st.)	
				Average injection quantity	Maximum variance between cylinder	Average injection quantity	Maximum variance between cylinder
<ul style="list-style-type: none"> <li>• Rack positions B to E are the reference volume when adjusting the injection volume.</li> </ul>	A (Basic point)	9.3	1,025	185.5 - 189.5	±3	184.5	
	B	9.3	700	182.5 - 188.5	-	190.5	
	C	Approx. 5.6	350	12.5 - 15.5	±15	15	
	D	9.7 - 9.9	100	175	-	170	

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**PERFORMANCE TEST**  
**RUN-IN STANDARD**

- ★ The table gives the standard values for machines without fan.
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Item		Order					
				1	2	3	4	5	6
6D125-2	D53A, P-17	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	800	1,000	1,200	1,200	1,500	1,900
		Load	N (kg)	0 (0)	196 (20)	353 (36)	618 (63)	824 (84)	706 (72)
		Flywheel horsepower	kW (HP)	0 (0)	14.7 (19.7)	31.8 (41.4)	53.0 (71.0)	92.7 (123)	142 (190)
	D58E-1 D58P-1	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	850	1,000	1,200	1,500	1,900	
		Load	N (kg)	0 (0)	177 (18)	441 (45)	706 (72)	706 (72)	
		Flywheel horsepower	kW (HP)	0 (0)	13 (17.4)	40 (53.6)	79 (105.8)	101 (135.4)	
	D65E-12 D70LE-12	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	825	1,000	1,200	1,200	1,500	1,950
		Load	N (kg)	0 (0)	196 (20)	343 (35)	588 (60)	982 (90)	971 (99)
		Flywheel horsepower	kW (HP)	0 (0)	14.7 (19.7)	30.9 (41.4)	53.0 (71.0)	99.4 (133)	142 (190)
S6D125-2	D65EX, P, PX-12 D60P-12	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	825	1,000	1,200	1,200	1,400	1,950
		Load	N (kg)	0 (0)	200 (20)	510 (52)	810 (83)	1,270 (130)	1,030 (105)
		Flywheel horsepower	kW (HP)	0 (0)	15 (20)	46 (61)	74 (99)	134 (179)	151 (202)
	D75S-5	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	600	1,000	1,200	1,200	1,400	2,000
		Load	N (kg)	0 (0)	196 (20)	510 (52)	814 (83)	1,400 (143)	1,230 (125)
		Flywheel horsepower	kW (HP)	0 (0)	14.7 (19.7)	45.9 (61.5)	73.3 (98.2)	147 (197)	184 (247)
	D85A-21, 21S D85A-21B D85A-21D D85E-21 D85P-21 D85C-21	Running time	min.	4	8	2	2	9	
		Engine speed	rpm	670	1,000	1,200	1,500	2,000	
		Load	N (kg)	0 (0)	304 (31)	765 (78)	1,220 (124)	1,230 (125)	
		Flywheel horsepower	kW (HP)	0 (0)	23 (31)	69 (94)	137 (186)	184 (250)	
D85E-SS-2 D85E-SS-2A	Running time	min.	4	8	2	2	9	5	
	Engine speed	rpm	825	1,000	1,200	1,200	1,500	1,900	
	Load	N (kg)	0 (0)	200 (20)	510 (52)	810 (83)	1,270 (130)	1,030 (105)	
	Flywheel horsepower	kW (HP)	0 (0)	15 (20)	46 (61)	74 (99)	134 (179)	151 (202)	
D87E-2 D87P-2	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	670 <sup>+50</sup> / <sub>0</sub>	1,000	1,200	1,500	2,100		
	Load	N (kg)	0 (0)	235 (24)	588 (60)	941 (96)	1,177 (120)		
	Flywheel horsepower	kW (HP)	0 (0)	17.7 (24)	53.0 (71)	105.9 (42)	185.3 (248)		

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- ★ The table gives the standard values for machines without fan.
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Item		Order					
				1	2	3	4	5	6
S6D125-2	LW250-5	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	675	1,000	1,200	1,500	2,100	
		Load	N (kg)	0 (0)	235 (24)	588 (60)	941 (96)	1,180 (120)	
		Flywheel horsepower	kW (HP)	0 (0)	17.7 (23.7)	53 (71.0)	106 (142)	188 (248)	
	FD250-2	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	650	1,000	1,200	1,500	2,100	
		Load	N (kg)	0 (0)	196 (20)	490 (50)	785 (80)	1,030 (105)	
		Flywheel horsepower	kW (HP)	0 (0)	15 (20)	44 (59)	88 (118)	163 (218)	
	FD400-2	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	650	1,000	1,200	1,500	2,000	
		Load	N (kg)	0 (0)	196 (20)	490 (50)	785 (80)	1,320 (135)	
		Flywheel horsepower	kW (HP)	0 (0)	15 (20)	44 (59)	88 (118)	190 (266)	
EG220BS-2 DCA220SPK (DENYO generator)	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	750	1,000	1,200	1,500	1,800		
	Load	N (kg)	0 (0)	310 (32)	780 (80)	1,250 (128)	1,570 (160)		
	Flywheel horsepower	kW (HP)	0 (0)	24 (32)	71 (95)	141 (189)	212 (284)		
DCA-220SSK (MQ generator)	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	700 – 800	1,000	1,200	1,500	1,800		
	Load	N (kg)	0 (0)	310 (32)	780 (80)	1,250 (128)	1,570 (160)		
	Flywheel horsepower	kW (HP)	0 (0)	24 (32)	71 (95)	141 (189)	212 (284)		

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- ★ The table gives the standard values for machines without fan.
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Item		Order					
				1	2	3	4	5	6
SA6D125-2	PC400-6 (CUSTOM) PC400LC-6 (CUSTOM) PC450-6 (MIGHTY) PC450LC-6 (MIGHTY) BR500JG-1	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	800	1,000	1,200	1,200	1,400	1,950
		Load	N (kg)	0 {0}	255 {26}	657 {67}	1,050 {107}	1,740 {177}	1,570 {160}
		Flywheel horsepower	kW (HP)	0 {0}	19.1 {25.6}	59.2 {79.3}	94.5 {127}	182 {244}	230 {308}
	HD255-5	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	650	1,000	1,200	1,500	2,100	
		Load	N (kg)	0 {0}	304 {31}	764 {78}	1,215 {124}	1,520 {155}	
		Flywheel horsepower	kW (HP)	0 {0}	22.8 {31}	68.9 {93.6}	137 {186}	239 {326}	
	WA470-3	Running time	min.	4	8	2	2	9	5
		Engine speed	rpm	750	1,000	1,200	1,200	1,400	2,200
		Load	N (kg)	0 {0}	256 {26}	657 {67}	1,050 {107}	1,520 {155}	1,230 {125}
		Flywheel horsepower	kW (HP)	0 {0}	19 {25}	59 {79}	94 {125}	160 {213}	202 {269}
FD430-2	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	800	1,000	1,200	1,500	2,100		
	Load	N (kg)	0 {0}	324 {33}	814 {83}	1,290 {132}	1,400 {143}		
	Flywheel horsepower	kW (HP)	0 {0}	24 {33}	74 {99}	140 {186}	221 {296}		
EG300BS-5 DCA300SPK (DENYO generator)	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	750	1,000	1,200	1,500	1,800		
	Load	N (kg)	0 {0}	390 {40}	980 {100}	1,570 {160}	1,960 {200}		
	Flywheel horsepower	kW (HP)	0 {0}	21 {28}	88 {118}	176 {236}	265 {355}		
DCA-300SSK (MQ genertor)	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	750	1,000	1,200	1,500	1,800		
	Load	N (kg)	0 {0}	390 {40}	980 {100}	1,570 {160}	1,960 {200}		
	Flywheel horsepower	kW (HP)	0 {0}	29{39}	88 {118}	176 {237}	265 {355}		
J6D125E-G1-2 (Generator)	Running time	min.	2	8	2	3	5		
	Engine speed	rpm	750	1,000	1,200	1,500	1,500		
	Load	N (kg)	0 {0}	343 {35}	863 {88}	1,370 {140}	1,720 {175}		
	Flywheel horsepower	kW (HP)	0 {0}	26 {35}	78 {104}	154 {209}	193 {259}		

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- ★ The table gives the standard values for machines without fan.
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Item		Order					
				1	2	3	4	5	6
SAA6D125-2	PC400AC-6 PC400-6 (USA) PC450-6 (USA) BR550JG-1	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	700	1,000	1,200	1,500	2,050	
		Load	N (kg)	0 (0)	314 (32)	785 (80)	1,260 (128)	1,570 (160)	
		Flywheel horsepower	kW (HP)	0 (0)	23.5 (32)	71 (95)	141 (189)	241 (323)	
	Generator (50 Hz only)	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	700 – 800	1,000	1,200	1,500	1,500	
		Load	N (kg)	0 (0)	548 (56)	1,360 (139)	2,180 (222)	2,720 (278)	
		Flywheel horsepower	kW (HP)	0 (0)	41.2 (56)	123 (167)	245 (333)	307 (417)	
	SAA6D125 -P400	Running time	min.	2	8	2	3	5	
		Engine speed	rpm	650 – 850	1,000	1,200	1,500	1,800	
		Load	N (kg)	0 (0)	392 (40)	980 (100)	1,568 (160)	1,960 (200)	
		Flywheel horsepower	kW (HP)	0 (0)	29(39)	98 (118)	177 (237)	265 (355)	

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## PERFORMANCE TEST CRITERIA

- ★ The table gives the standard values using the JIS compensation factor.
- ★ The values in the table are the standard values for machines with the muffler installed, air cleaner installed, alternator under no load, and air compressor open (if installed).
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Test item	Specified value	Engine speed (rpm)	Dynamometer (N {kg})
6D125-2	D53A, P-17	Flywheel horsepower	91 kW(122 HP)/1,900 rpm (Net)	1,895 – 1,905	685 – 724 (69.8 – 73.8)
		Maximum torque	613 Nm(62.5 kgm)/1,300 rpm (Net)	1,200 – 1,400	852 – 901 (86.9 – 91.9)
		High idling speed	2,050 – 2,150 rpm	2,050 – 2,150	-
		Low idling speed	800 – 850 rpm	800 – 850	-
	D58E-1 D58P-1	Flywheel horsepower	97 kW(130 HP)/1,900 rpm (Net)	1,895 – 1,905	690 – 730 (70.4 – 74.4)
		Maximum torque	635 Nm(64.8 kgm)/1,300 rpm (Net)	1,200 – 1,400	859 – 907 (87.6 – 92.5)
		High idling speed	2,050 – 2,150 rpm	2,050 – 2,150	-
		Low idling speed	800 – 850 rpm	800 – 850	-
	D65E-12 D70LE-12	Flywheel horsepower	131 kW(175 HP)/1,950 rpm (Net)	1,945 – 1,955	951 – 1,000 (97.0 – 102)
		Maximum torque	799 Nm(81.5 kgm)/1,100 rpm (Net)	1,000 – 1,200	1,110 – 1,170 (113 – 119)
		High idling speed	2,050 – 2,150 rpm	2,050 – 2,150	-
		Low idling speed	800 – 850 rpm	800 – 850	-
S6D125-2	D65EX-12 D65P, PX-12 D60P-12	Flywheel horsepower	140 kW(188 HP)/1,950 rpm (Net)	1,945 – 1,955	1,030 – 1,090 (105 – 111)
		Maximum torque	981 Nm(100 kgm)/1,200 rpm (Net)	1,100 – 1,300	1,360 – 1,440 (139 – 147)
		High idling speed	2,050 – 2,150 rpm	2,050 – 2,150	-
		Low idling speed	800 – 850 rpm	800 – 850	-
	D75S-5	Flywheel horsepower	152 kW(203 HP)/2,000 rpm (Net)	1,995 – 2,005	1,070 – 1,130 (110 – 112)
		Maximum torque	921 Nm(94 kgm)/1,500 rpm (Net)	1,400 – 1,600	1,300 – 1,380 (133 – 141)
		High idling speed	2,150 – 2,250 rpm	2,150 – 2,250	-
		Low idling speed	550 – 650 rpm	550 – 650	-
	D85A-21, 21S D85A-21B D85A-21D D85E-21 D85P-21 D85C-21	Flywheel horsepower	168 kW(225 HP)/2,000 rpm (Net)	1,995 – 2,005	1,220 – 1,280 (124 – 131)
		Maximum torque	1,020 Nm(104 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,500 – 1,580 (153 – 161)
		High idling speed	2,150 – 2,250 rpm	2,150 – 2,250	-
		Low idling speed	670 – 720 rpm	670 – 720	-
	D85E-SS-2 D85E-SS-2A	Flywheel horsepower	140 kW(188 HP)/1,950 rpm (Net)	1,945 – 1,955	1,030 – 1,090 (105 – 111)
		Maximum torque	981 Nm(100 kgm)/1,200 rpm (Net)	1,100 – 1,300	1,360 – 1,440 (139 – 147)
		High idling speed	2,050 – 2,150 rpm	2,050 – 2,150	-
		Low idling speed	800 – 850 rpm	800 – 850	-

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- ★ For fuel, use ASTM D975 No. 1 or No. 2.
- ★ For lubricant, use SAE15W-40 or SAE30 oil.

Flywheel horsepower (kW (HP))	Torque (Nm (kgm))	Fuel consumption (sec/200cc)	Coolant temperature (°C)	Lubrication oil temperature (°C)	Lubrication oil pressure (kPa (kg/cm <sup>2</sup> ))	Exhaust temperature (°C)
96.2 – 101 (Gross) (129 – 136) (Gross)	-	Min. 28	70 – 90	90 – 110	3.0 – 5.0	Max. 550
-	610 – 645 (62.2 – 65.8) (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
98.3 – 104 (Gross) (132 – 139) (Gross)	-	Min. 26.6	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 550
-	615 – 650 (62.7 – 66.3) (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
139 – 146 (Gross) (186 – 196) (Gross)	-	Min. 18.4	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 650
-	796 – 835 (81.2 – 85.2) (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
150 – 160 (Gross) (204 – 216) (Gross)	-	Min. 16.9	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 630
-	975 – 1,030 (99.4 – 105) (Gross)	-	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 650
-	-	-	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
161 – 170 (Gross) (216 – 228) (Gross)	-	Min. 16.1	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 550
-	934 – 987 (95.2 – 101) (Gross)	-	70 – 90	90 – 110	-	Max. 600
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
183 – 193 (Gross) (245 – 258) (Gross)	-	Min. 13.8	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 650
-	1,070 – 1,130 (109 – 116) (Gross)	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-
150 – 160 (Gross) (204 – 216) (Gross)	-	Max. 16.9	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 650
-	975 – 1,030 (99.4 – 105) (Gross)	-	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 650
-	-	-	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	-
-	-	-	70 – 90	80 – 110	Min. 150 (1.5)	-

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- ★ The table gives the standard values using the JIS compensation factor.
- ★ The values in the table are the standard values for machines with the muffler installed, air cleaner installed, alternator under no load, and air compressor open (if installed).
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Test item	Specified value	Engine speed (rpm)	Dynamometer (N (kg))
S6D125-2	D87E-2 D87P-2	Flywheel horsepower	174 kW(233 HP)/2,100 rpm (Net)	2,095 – 2,105	1,136 – 1,199 {115.8 – 122.3}
		Maximum torque	999 Nm(102 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,384 – 1,465 {141.1 – 149.4}
		High idling speed	2,250 – 2,350 rpm	2,250 – 2,350	-
		Low idling speed	670 – 720 rpm	670 – 720	-
	LW250-5	Flywheel horsepower	177 kW(237 HP)/2,100 rpm (Net)	2,095 – 2,105	1,150 – 1,220 {118 – 125}
		Maximum torque	1,080 Nm(110 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,490 – 1,580 {152 – 161}
		High idling speed	2,300 – 2,400 rpm	2,300 – 2,400	-
		Low idling speed	675 – 695 rpm	675 – 695	-
	FD250-2	Flywheel horsepower	162 kW(217 HP)/2,100 rpm (Net)	2,095 – 2,105	1,030 – 1,100 {105 – 112}
		Maximum torque	941 Nm(96 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,270 – 1,390 {129 – 142}
		High idling speed	2,250 – 2,350 rpm	2,250 – 2,350 rpm	-
		Low idling speed	650 – 700 rpm	650 – 700 rpm	-
	FD400-2	Flywheel horsepower	199 kW(266 HP)/2,000 rpm (Net)	1,995 – 2,005	1,310 – 1,390 {134 – 142}
		Maximum torque	1,160 Nm(118 kgm)/1,400 rpm (Net)	1,395 – 1,405	1,590 – 1,690 {162 – 172}
		High idling speed	2,250 – 2,350 rpm	2,250 – 2,350 rpm	-
		Low idling speed	650 – 700 rpm	650 – 700rpm	-
	EG220BS-2	Flywheel horsepower	178 kW(239 HP)/1,500 rpm (Net, 50 Hz)	1,495 – 1,955 (50Hz)	1,610 – 1,660 (50 Hz) {164 – 169} (50 Hz)
			204 kW(273 HP)/1,800 rpm (Net, 60 Hz)	1,795 – 1,805 (60Hz)	1,550 – 1,590 (60 Hz) {158 – 162} (60 Hz)
		High idling speed	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	-
		Low idling speed	700 – 800 rpm	700 – 800	-
	For MQ generator DCA-220SSK (Prime)	Flywheel horsepower	204 kW(273 HP)/1,800 rpm (Net, 60 Hz)	1,795 – 1805	1,550 – 1,590 {158 – 162}
		High idling speed	Max. 1,890 rpm (60 Hz)	Max. 1,890 (60 Hz)	-
		Low idling speed	700 – 800 rpm	700 – 800	-

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- ★ For fuel, use ASTM D975 No. 1 or No. 2.
- ★ For lubricant, use SAE15W-40 or SAE30 oil.

Flywheel horsepower (kW (HP))	Torque (Nm {kgm})	Fuel consumption (sec/200cc)	Coolant temperature (°C)	Lubrication oil temperature (°C)	Lubrication oil pressure (kPa (kg/cm <sup>2</sup> ))	Exhaust temperature (°C)
179 - 189 (Gross) {240 - 253} (Gross)	-	-	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	Max. 650
-	991 - 1,049 {101.0 - 107.0} (Gross)	-	70 - 90	90 - 110	-	Max. 650
-	-	-	70 - 90	90 - 110	-	-
-	-	-	70 - 90	80 - 110	Min. 147 {1.5}	-
182 - 193 (Gross) {243 - 258} (Gross)	-	Min. 13.8	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	Max. 600
-	1,070 - 1,130 {109 - 116} (Gross)	-	70 - 90	90 - 110	-	Max. 650
-	-	-	70 - 90	90 - 110	-	-
-	-	-	70 - 90	80 - 110	Min. 150 {1.5}	-
163 - 173 (Gross) {221 - 235} (Gross)	-	-	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	Max. 600
-	-	-	70 - 90	90 - 110	-	Max. 650
-	-	-	70 - 90	90 - 110	-	-
-	-	-	70 - 90	80 - 110	Min. 150 {1.5}	-
198 - 210 (Gross) {269 - 285} (Gross)	-	-	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	Max. 600
-	1,140 - 1,210 (Gross) {116 - 123} (Gross)	-	70 - 90	90 - 110	-	Max. 650
-	-	-	70 - 90	90 - 110	-	-
-	-	-	70 - 90	80 - 110	Min. 150 {1.5}	-
181 - 186 (Gross,50Hz) {242 - 249}(Gross,50Hz)	-	Min. 14.8 (50 Hz)	70 - 90 (50 Hz)	90 - 110 (50 Hz)	290 - 490 (50 Hz) {3.0 - 5.0} (50 Hz)	Max. 650 (50 Hz)
209 - 214 (Gross,60Hz) {280 - 287}(Gross,60Hz)	-	Min. 12.5 (60 Hz)	70 - 90 (60 Hz)	90 - 110 (60 Hz)	290 - 490 (60 Hz) {3.0 - 5.0} (60 Hz)	Max. 650 (60 Hz)
-	-	-	70 - 90	90 - 110	-	-
-	-	-	70 - 90	80 - 110	Min. 150 {1.5}	-
209 - 214 (Gross, 60Hz) {280 - 288}(Gross,60Hz)	-	Min. 12.5 (60 Hz)	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	Max. 670
-	-	-	70 - 90	90 - 110	290 - 490 {3.0 - 5.0}	-
-	-	-	70 - 90	80 - 110	Min. 150 {1.5}	-

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- ★ The table gives the standard values using the JIS compensation factor.
- ★ The values in the table are the standard values for machines with the muffler installed, air cleaner installed, alternator under no load, and air compressor open (if installed).
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Test item	Specified value	Engine speed (rpm)	Dynamometer (N {kg})
SA6D125-2	PC400-6 (CUSTOM) PC400LC-6 (CUSTOM) PC450-6 (MIGHTY) PC450LC-6 (MIGHTY) BR500JG-1	Flywheel horsepower	228 kW(306 HP)/1,950 rpm (Net)	1,945 – 1955	1,560 – 1,650 {159 – 168}
		Maximum torque	1,210 Nm(123 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,690 – 1,800 {172 – 183}
		High idling speed	2,100 – 2,200 rpm	2,100 – 2,200	-
		Low idling speed	750 – 850 rpm	750 – 850	-
	HD255-5	Rated flywheel horsepower	235 kW(315 HP)/2,100 rpm (Net)	2,095 – 2,105	1,490 – 1,570 {152 – 161}
		Maximum flywheel horsepower	1,280 Nm(131 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,760 – 1,860 {179 – 190}
		High idling speed	2,400 – 2,500 rpm	2,400 – 2,500	-
		Low idling speed	700 – 800 rpm	700 – 800	-
	WA470-3	Flywheel horsepower	194 kW(260 HP)/2,200 rpm (Net)	2,195 – 2,205	1,190 – 1,260 {122 – 129}
		Maximum torque	1,050 Nm(107 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,490 – 1,570 {152 – 161}
		High idling speed	2,350 – 2,450 rpm	2,350 – 2,450	-
		Low idling speed	722 – 772 rpm	722 – 772	-
	FD430-2	Flywheel horsepower	221 kW(296 HP)/2,100 rpm (Net)	2,095 – 2,105	1,390 – 1480 {142 – 151}
		Maximum torque	1,180 Nm(120 kgm)/1,400 rpm (Net)	1,300 – 1,500	1,610 – 1,710 {164 – 174}
		High idling speed	2,250 – 2,350 rpm	2,250 – 2,350	-
		Low idling speed	800 – 850 rpm	800 – 850 rpm	-

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- ★ For fuel, use ASTM D975 No. 1 or No. 2.
- ★ For lubricant, use SAE15W-40 or SAE30 oil.

Flywheel horsepower (kW (HP))	Torque (Nm (kgm))	Fuel consumption (sec/200cc)	Coolant temperature (°C)	Lubrication oil temperature (°C)	Lubrication oil pressure (kPa (kg/cm <sup>2</sup> ))	Exhaust temperature (°C)
228 – 241 (Gross) (305 – 323) (Gross)	-	Min. 11.4	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 600
-	1,210 – 1,280 {123 – 131} (Gross)	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	90 – 110	-	-
-	-	-	-	80 – 110	Min. 120 {1.2}	-
234 – 248 (Gross) (318 – 338) (Gross)	-	Min. 11.1	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 600
-	1,260 – 1,330 {128 – 136} (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
197 – 208 (Gross) (268 – 283) (Gross)	-	Min. 13.0	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 600
-	1,070 – 1,130 (Gross) (109 – 115) (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
220 – 233 (Gross) (299 – 317) (Gross)	-	-	70 – 90	90 – 110	290 – 490 (3.0 – 5.0)	Max. 600
-	1,160 – 1,230 (Gross) (118 – 125) (Gross)	-	70 – 90	90 – 110	-	Max. 650
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-

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- ★ The table gives the standard values using the JIS compensation factor.
- ★ The values in the table are the standard values for machines with the muffler installed, air cleaner installed, alternator under no load, and air compressor open (if installed).
- ★ The loads for the dynamometer are at an arm's length of 716 mm.

Engine model	Applicable machine	Test item	Specified value	Engine speed (rpm)	Dynamometer (N (kg))	
SA6D125-2	EG330BS-2	Flywheel horsepower	232 kW(311 HP)/1,500 rpm (Net, 50 Hz) 257 kW(345 HP)/1,800 rpm (Net, 60 Hz)	1,495 - 1,505 (50Hz) 1,795 - 1,805(60Hz)	2,090 - 2,220 (50 Hz) (213 - 227) (50 Hz) 1,930 - 2,050 (60 Hz) (197 - 209) (60 Hz)	
		High idling speed	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	-	
		Low idling speed	700 - 800 rpm	700 - 800	-	
		DCA-300SSK (MQ generator)	Flywheel horsepower	257 kW(345 HP)/1,800 rpm (Net, 60 Hz)	1,795 - 1,805 (60 Hz)	1,930 - 2,050 (197 - 209)
	DCA-300SSK (MQ generator)	High idling speed	Max. 1,890 rpm (60 Hz)	Max. 1,880 (60 Hz)	-	
		Low idling speed	700 - 800 rpm	725 - 775	-	
	J6D125E-G1-2 (Generator)	Flywheel horsepower	185 kW(248 HP)/1,500 rpm (Net, 50 Hz) 209 kW(280 HP)/1,800 rpm (Net, 60 Hz)	1,495 - 1,505 (50 Hz) 1,795 - 1,805 (60 Hz)	- -	
		High idling speed	Max. 1,575 rpm (50 Hz) Max. 1,890 rpm (60 Hz)		-	
		Low idling speed	700 - 800 rpm		-	
		SAA6D125-2	PC400AC-6 PC400-6 (USA) PC450-6 (USA) BR550JG-1	Flywheel horsepower	228 kW(306 HP)/2,050 rpm (Net)	2,045 - 2,055
	Maximum torque			1,210 Nm(123.7 kgm)/1,500 rpm (Net)	1,400 - 1,600	1,696 - 1,794 (173 - 183)
	High idling speed			2,200 - 2,300 rpm	2,200 - 2,300	-
Low idling speed	675 - 725 rpm			675 - 725	-	
Generator (50 Hz only)	Flywheel horsepower		298 kW(400 HP)/1,500 rpm (Net) 328 kW(440 HP)/1,500 rpm (Net)	1,495 - 1,505 1,495 - 1,505	2,580 - 2,730 (263 - 279) 3,000 - 3,200 (290 - 330)	
	High idling speed				-	
	Low idling speed		700 - 800 rpm	700 - 800	-	
	SAA6D125-P400		Flywheel horsepower	298 kW(400 HP)/1,500 rpm (Prime) 329 kW(441 HP)/1,500 rpm (Standby)	1,495 - 1,505 (Prime) 1,495 - 1,505 (Standby)	2,577 - 2,734 (Prime) (263 - 279) 2,842 - 3,195 (Standby) (290 - 326)
High idling speed		Max. 1,575 rpm (Prime) Max. 1,600 rpm (Standby)	Max. 1,575 rpm (Prime) Max. 1,600 rpm (Standby)	0 0		
Low idling speed		700 - 800 rpm	700 - 800 rpm	0		

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- ★ For fuel, use ASTM D975 No. 1 or No. 2.
- ★ For lubricant, use SAE15W-40 or SAE30 oil.

Flywheel horsepower (kW (HP))	Torque (Nm (kgm))	Fuel consumption (sec/200cc)	Coolant temperature (°C)	Lubrication oil temperature (°C)	Lubrication oil pressure (kPa (kg/cm <sup>2</sup> ))	Exhaust temperature (°C)
235 – 250 (Gross,50Hz) {315 – 355}(Gross,50Hz)	-	Min. 11.0 (50 Hz)	70 – 90 (50 Hz)	90 – 110 (50 Hz)	290 – 390 (50 Hz) {3.0 – 4.0} (50 Hz)	Max. 700 (50 Hz)
260 – 277(Gross,60Hz) {348 –371}(Gross,60Hz)	-	Min. 9.7 (60 Hz)	70 – 90 (60 Hz)	90 – 110 (60 Hz)	290 – 390 (60 Hz) {3.0 – 4.0} (60 Hz)	Max. 700 (60 Hz)
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
260 – 277 (Gross, 60 Hz) {354 – 376} (Gross, 60 Hz)	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 650
-	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
187 – 199 {251 – 267} (Gross, 50 Hz)	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 650
216 – 229 {289 – 307} (Gross, 60 Hz)	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 650
-	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
235 – 248 (Gross) {319 – 337} (Gross)	-	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 650
-	1,210 – 1,280 {124 – 131}	-	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 680
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
290 – 308 Gross) {388 – 412} (Gross)	-	Min. 9.2	70 – 90	90 – 110	290 – 490 {3.0 – 5.0}	Max. 700
320 – 338 (Gross) {429 – 453} (Gross)	-	Min. 7.9	70 – 90	90 – 110	-	Max. 750
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 150 {1.5}	-
294 – 307 {394 – 412} (Prime)	-	Min. 9.2	70 – 90	90 – 110	290 – 490 {3.0 – 5.0} (Prime)	Max. 700
320 – 338 {429 – 453} (Standby)	-	Min. 7.9	70 – 90	90 – 110	290 – 490 {3.0 – 5.0} (Standby)	Max. 750
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	90 – 110	-	-
-	-	-	70 – 90	80 – 110	Min. 147 {1.5}	-

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# TROUBLESHOOTING

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- ⚠** When carrying out testing and adjusting, or troubleshooting, stop the machine on level ground, fit safety pins, block the wheels, and apply the parking brake.
  - ⚠** When carrying out operations with two or more workers, always use signals, and do not allow any unauthorized person near the machine.
  - ⚠** When checking the water level, if the radiator cap is removed when the engine is hot, boiling water will spurt out and may cause burns, so always wait for the engine to cool down before checking the water level.
  - ⚠** Be extremely careful not to touch any hot parts.
  - ⚠** Be extremely careful not to get caught in the fan or any other rotating parts.
  - ⚠** When removing the plugs or caps from places under hydraulic pressure, water pressure, or air pressure, release the internal pressure first. Fit the measuring tools securely before carrying out any testing, adjusting, or troubleshooting.
- ★ When using the standard values table for judgement in testing, adjusting, or troubleshooting, it is necessary to be careful of the following points.
1. The standard values for the new machines in the standard values table are values given as reference from the standards for new machines and machines shipped from the factory. They should be used as values for estimating wear during operation or as target values when carrying out repairs.
  2. The failure judgement standard values in the standard values table are values using estimated values based on the results of various tests and standard values for machines shipped from the factory. Use these values for reference together with the repair and operation history of the machine when judging failures.
  3. Do not use this standard values table as a standard for judging claims.

## POINTS TO REMEMBER WHEN TROUBLESHOOTING

Troubleshooting means locating the basic cause of the failure, and carrying out swift repairs, and ensuring that the failure does not occur again.

When carrying out troubleshooting, it is of course important to understand the structure and function. But to carry out the troubleshooting effectively, a quick method is to carry out troubleshooting using the problems mentioned by the operator as a guide in locating the cause.

### 1. Do not disassemble the machine simply because there is a failure

If the machine is disassembled immediately just because there is a failure:

- Unrelated or unnecessary places are also disassembled
- It becomes difficult to locate the cause of the failure

This means that there is not only a waste of time and money on replacement parts, oil, and grease, but this action will also lose the confidence of the user and operator.

For this reason also, it is important to carry out troubleshooting based on full investigation before starting and troubleshooting following the correct order.

### 2. Questions to ask the user and operator

- 1) Are there any problems other than those already reported?
- 2) Did anything unusual happen before the failure occurred?
- 3) Did the failure occur suddenly, or had the condition of the machine been poor before the failure occurred?
- 4) What were the conditions when the failure occurred?
- 5) Had any repairs been carried out before the failure occurred?
- 6) Had any similar failure occurred before?

### 3. Checks before troubleshooting

- 1) Check the oil level.
- 2) Check for any external leakage of oil from the piping and hydraulic equipment.
- 3) Check the travel of the control levers.
- 4) Other maintenance items can also be carried out visually, so carry out any check that is considered necessary.

### 4. Confirming failure

Check the degree of the problem to judge for yourself if it is really a failure, or if there is some problem in the handling or operation of the machine.

- ★ When driving the machine and re-enacting the failure, be sure that the investigation or measurement does not make the failure worse.

### 5. Troubleshooting

Narrow down the causes of the failure from the results of the questions and checks in the above Items 2 – 4, then follow the troubleshooting flow chart to locate the failure.

- ★ Basic procedure for troubleshooting
  - 1) Start from the simple places.
  - 2) Start from the most probable places.
  - 3) Investigate related parts also.

### 6. Basic action to remedy cause of failure

Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.

To prevent this, it is necessary to investigate why the failure occurred, and to remove the root cause of the failure.

# METHOD OF USING TROUBLESHOOTING CHART

This troubleshooting chart is divided into three sections: **questions, check items, and troubleshooting**. The questions and check items are used to pinpoint high probability causes that can be located from the failure symptoms or simple inspection without using troubleshooting tools.

Next, troubleshooting tools or direct inspection are used to check the high probability causes to make final confirmation.

**[Questions]**

Sections **(A) + (B)** in the chart on the right corresponds to the items where answers can be obtained from the user. The items in **(B)** are items that can be obtained from the user, depending on the user's level.

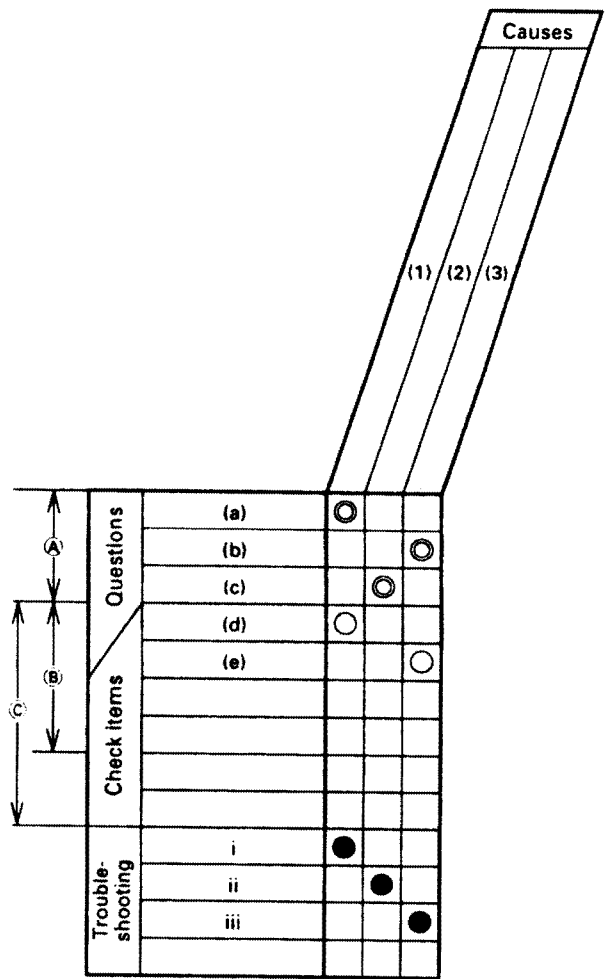
**[Check items]**

The serviceman carries out simple inspection to narrow down the causes. The items under **(C)** in the chart on the right correspond to this.

The serviceman narrows down the causes from information **(A)** that he has obtained from the user and the results of **(C)** that he has obtained from his own inspection.

**[Troubleshooting]**

Troubleshooting is carried out in the order of probability, starting with the causes that have been marked as having the highest probability from information gained from **[Questions]** and **[Check items]**.



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The basic method of using the troubleshooting chart is as follows.

Items listed for **[Questions]** and **[Check items]** that have a relationship with the Cause items are marked with !, and of these, causes that have a high probability are marked with T.

Check each of the **[Questions]** and **[Check items]** in turn, and marked the ! or T in the chart for items where the problem appeared. The vertical column (Causes) that has the highest number of points is the most probable cause, so start troubleshooting for that item to make final confirmation of the cause.

※1. For **[Confirm recent repair history]** in the **[Questions]** Section, ask the user, and mark the Cause column with # to use as reference for locating the cause of the failure. However, do not use this when making calculations to narrow down the causes.

※2. Use the # in the Cause column as reference for **[Degree of use (Operated for long period)]** in the **[Questions]** section as reference. As a rule, do not use it when calculating the points for locating the cause, but it can be included if necessary to determine the order for troubleshooting.

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		Causes						
		Seized turbocharger, interference	Clogged air cleaner element	Worn piston ring, cylinder	Clogged, seized injection nozzle	Improper injection timing	Defective injection pump (excessive injection)	
※1	Confirm recent repair history							
※2	Degree of use							
	Operated for long period		△	△	△			



• **Example of troubleshooting when exhaust gas is black**

Let us assume that [Clogged air cleaner] is taken to be the cause of black exhaust gas. Three symptoms have causal relationship with this problem: [Exhaust gas slowly became black], [Power slowly became weaker], and [Dust indicator is red].

If we look from these three symptoms to find the causes, we find that there is a relationship with five causes. Let us explain here the method of using this causal relationship to pinpoint the most probable cause.

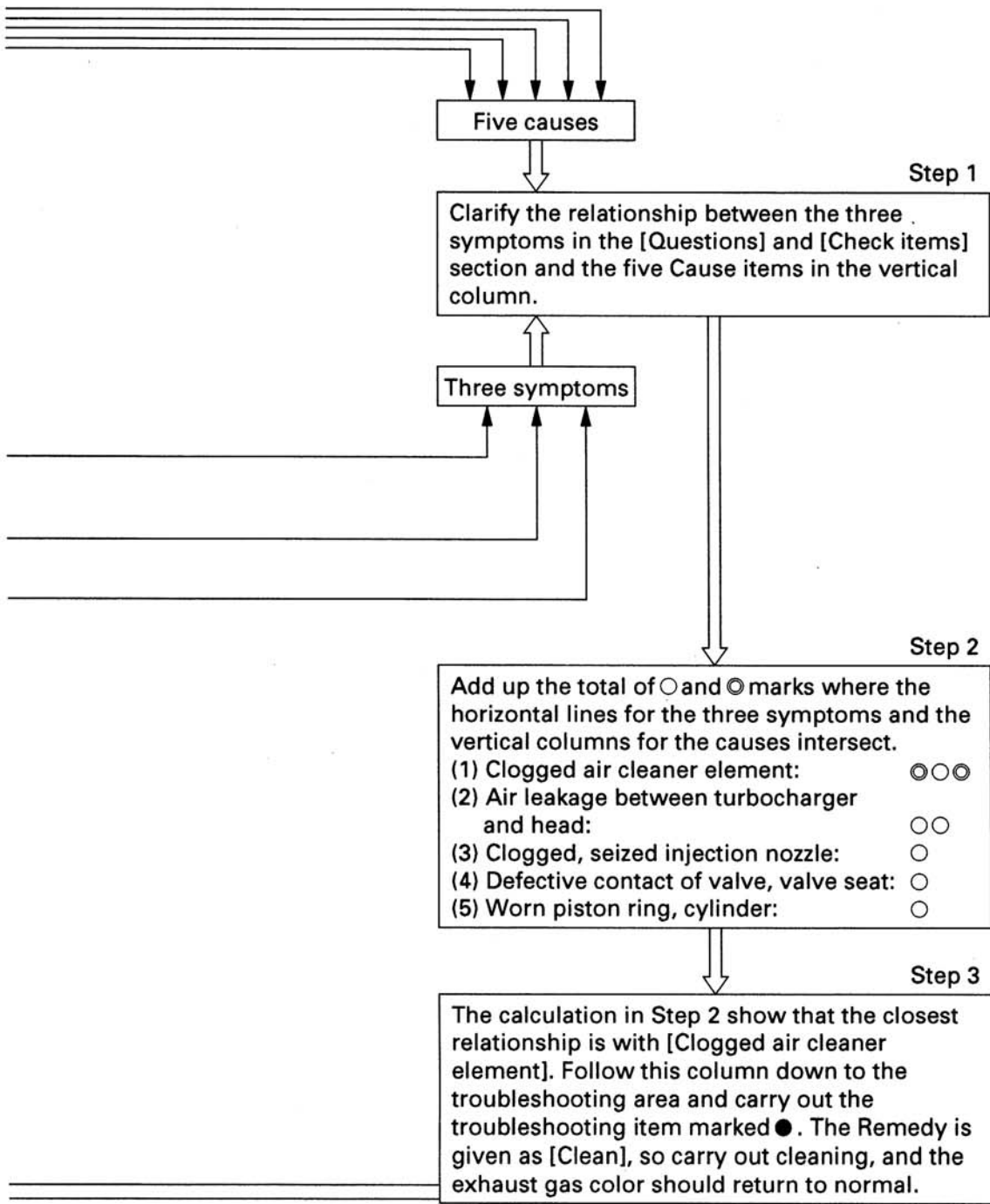
**S-7 Exhaust gas is black (incomplete combustion)**

General causes why exhaust gas is black

- Insufficient intake of air
- Improper condition of fuel injection
- Excessive injection of fuel

		Causes											
		Seized turbocharger, interference	Worn piston ring, cylinder	Clogged, seized injection nozzle	Improper injection timing	Defective injection pump	Crushed valve clearance	Leakage of air between turbocharger and head	Defective contact of valve, valve seat	Defective injection pump track, plunger, nozzle			
Questions	Confirm recent repair history												
	Degree of use	Operated for long period											
	Color of exhaust gas	Suddenly became black											
		Gradually became black											
	Blue under light load												
	Engine oil must be added more frequently												
	Power was lost	Suddenly											
		Gradually											
	Non-specified fuel has been used												
	Noise of interference is heard from around turbocharger												
Check items	Dust indicator is red												
	Blow by gas is excessive												
	Engine pickup is poor and combustion is irregular												
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low												
	Match marks on fuel injection pump are out of alignment												
	Seal on injection pump has come off												
	Clanging sound is heard from around cylinder head												
	Exhaust noise is abnormal												
	Muffler is crushed												
	Leakage of air between turbocharger and head, noise clamp												
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy												
	When air cleaner is inspected directly, it is found to be clogged												
	When compression pressure is measured, it is found to be low												
	Speed of some cylinders does not change when operating on reduced cylinders												
	When check is made using delivery method, injection timing is found to be incorrect												
	Injection pump test shows that injection amount is incorrect												
	When valve clearance is checked directly it is found to be outside standard value												
	When muffler is removed, exhaust gas color returns to normal												
	When control rack is pushed, it is found to be heavy or does not return												
	Remedy	Replace	Clean	Replace	Replace	Adjust	Adjust	Adjust	Repair	Replace	Replace		

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### S-1 Starting performance is poor (Starting always takes time)

General causes why starting performance is poor

- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel  
(At ambient temperature of -10°C or below, use ASTM D975 No. 1, and -10°C or above, use ASTM D975 No. 2 diesel fuel.)
- ★ Battery charging rate.

Ambient temperature	Charging rate				
	100%	90%	80%	75%	70%
20°C	1.28	1.26	1.24	1.23	1.22
0°C	1.29	1.27	1.25	1.24	1.23
-10°C	1.30	1.28	1.26	1.25	1.24

- The specific gravity should exceed the value for the charging rate of 70% in the above table.
- In cold weather the specific gravity must exceed the value for the charging rate of 75% in the above table.

Causes	
Worn piston ring, cylinder liner	
Defective contact of valve, valve seat	
Clogged air cleaner element	
Clogged fuel filter, strainer	
Clogged feed pump strainer	
Defective intake heater	
Defective regulator (ribbon type)	
Defective alternator	
Defective or deteriorated battery	
Defective injection nozzle	
Leakage, clogging, air in fuel system	
Clogged fuel tank air breather hole	

- Legend
- : Possible causes (judging from Questions and check items)
  - ◐ : Most probable causes (judging from Questions and Check items)
  - △ : Possible causes due to length of use (used for a long period)
  - : Items to confirm the cause

	Questions	Check items	Troubleshooting	Causes																
				1	2	3	4	5	6	7	8	9	10							
	Confirm recent repair history																			
	Degree of use	Operated for long period																		
	Ease of starting	Gradually became worse																		
		Starts when warm																		
	Indicator lamp does not light up																			
	Engine oil must be added more frequently																			
	Replacement of filters has not been carried out according to operation manual																			
	Non-specified fuel has been used																			
	Dust indicator is red																			
	Battery charge lamp is ON																			
	Starting motor cranks engine slowly																			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low																			
	Engine does not pick up smoothly, and combustion is irregular																			
	Blow-by gas is excessive																			
	Match marks on fuel injection pump are out of alignment																			
	Mud is stuck to fuel tank cap																			
	When engine is cranked with starting motor																			
	1) Little fuel comes out even when injection pipe sleeve nut is loosened																			
	2) Little fuel comes out even when fuel filter air bleed plug is loosened																			
	Leakage from fuel piping																			
	There is hunting from engine (rotation is irregular)																			
	When compression pressure is measured, it is found to be low																			
	When air cleaner element is inspected directly, it is found to be clogged																			
	When fuel filter, strainer are inspected directly, they are found to be clogged																			
	When feed pump strainer is inspected directly, it is found to be clogged																			
	Heater mount does not become warm																			
	Voltage is 26 - 30V between alternator terminal B and terminal E with engine at low idling																			
	Either specific gravity of electrolyte or voltage of battery is low																			
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working																			
	When check is made using delivery method, injection timing is found to be incorrect																			
	When control rack is pushed, it is found to be heavy or does not return (when blind plug at rear of pump is removed, it can be seen that plunger control sleeve does not move)																			
	When fuel cap is inspected directly, it is found to be clogged																			
	Remedy																			

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## S-2 Engine does not start

### (1) Engine does not turn

General causes why engine does not turn

- Internal parts of engine seized
  - ★ If internal parts of the engine are seized, carry out troubleshooting for "Engine stops during operations".
- Failure in power train
- Defective electrical system

Legend

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes									
Defective wiring of starting circuit									
Defective or deteriorated battery									
Defective starting motor									
Broken ring gear									
Defective safety relay or safety switch									
Defective battery relay									
Defective battery terminal connection									
Defective fuel cut solenoid									
Defective adjustment of engine stop motor									
Defective engine stop motor wire									
Defective starting switch									

Questions											
Confirm recent repair history											
Degree of use	Operated for long period		△	△							
Condition of horn when starting switch is turned ON	Horn does not sound	⊙						○			○
	Horn sound level is low	⊙									
When starting switch is turned to START, pinion moves out, but	Rotating speed is slow	⊙									
	Makes grating noise			⊙	⊙						
	Soon pinion disengages again					⊙					
	Makes rattling noise and does not turn	○	○			○					
When starting switch is turned to START, pinion does not move out	⊙	○								○	
When starting switch is turned to ON, there is no clicking sound		○					⊙				
Battery terminal is loose								⊙			
When starting switch is turned to ON, linkage does not move								⊙	⊙	⊙	
When battery is checked, battery electrolyte is found to be low		⊙									
Troubleshooting	Specific gravity of electrolyte, voltage of battery is low										●
	For the following conditions 1) - 5), turn the starting switch OFF, connect the cord, and carry out troubleshooting at ON										
	1) When terminal B and terminal C of starting switch are connected, engine starts										●
	2) When terminal B and terminal C of starting motor are connected, engine starts			●							
	3) When terminal B and terminal C of safety relay are connected, engine starts				●						
	4) When terminal of safety switch and terminal B of starting motor are connected, engine starts				●						
	5) There is no 24V voltage between battery relay terminal b and terminal E					●					
	When ring gear is inspected directly, tooth surface is found to be chipped			●							
	Does not move even when fuel cut solenoid linkage is disconnected								●		
	Does not move even when engine stop motor linkage is disconnected									●	●
Remedy		Replace	Replace	Replace	Replace	Replace	Replace	Replace	Adjust	Replace	Replace

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**(2) Engine turns but no exhaust gas comes out  
(Fuel is not being injected)**

General causes why engine turns but no exhaust gas comes out

- Supply of fuel impossible
- Supply of fuel is extremely small
- Improper selection of fuel (particularly in winter)

Standards for use of fuel

Type of fuel	Ambient temperature									
	-22	-4	14	32	50	68	86	104	122°F	
	-30	-20	-10	0	10	20	30	40	50°C	
Diesel fuel	ASTM D975 No.2									
	ASTM D975 No.1									

Legend

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes										
Broken injection pump drive shaft, key										
Defective injection pump (rack, plunger seized)										
Seized, broken feed pump (rack, plunger seized)										
Clogged fuel filter, strainer										
Clogged feed pump strainer										
Lack of fuel										
Clogged, leaking fuel piping										
Clogged fuel tank air breather hole										
Defective fuel cut solenoid										
Defective engine stop motor										
Improper fuel used										

Questions	Causes										
	Broken injection pump drive shaft, key	Defective injection pump (rack, plunger seized)	Seized, broken feed pump (rack, plunger seized)	Clogged fuel filter, strainer	Clogged feed pump strainer	Lack of fuel	Clogged, leaking fuel piping	Clogged fuel tank air breather hole	Defective fuel cut solenoid	Defective engine stop motor	Improper fuel used
Confirm recent repair history											
Degree of use											
Operated for long period				△	△			△			
Exhaust gas suddenly stops coming out (when starting again)	⊙	⊙	⊙								
Replacement of filters has not been carried out according to operation manual				⊙	⊙						
Fuel tank is found to be empty						⊙					
There is leakage from fuel piping							⊙				
Mud is stuck to fuel tank cap								⊙			
When starting switch is turned ON, linkage does not move									⊙	⊙	
When fuel filter is drained, fuel does not come out										⊙	
When engine is cranked with starting motor,											
1) Injection pump coupling does not rotate	⊙										
2) No fuel comes out even when fuel filter air bleed plug is loosened	⊙			⊙	⊙						⊙
3) No fuel spurts out even when injection pipe sleeve nut is loosened	⊙	⊙	⊙								
Rust and water are found when fuel is drained				⊙	⊙						

Troubleshooting	Causes										
	Broken injection pump drive shaft, key	Defective injection pump (rack, plunger seized)	Seized, broken feed pump (rack, plunger seized)	Clogged fuel filter, strainer	Clogged feed pump strainer	Lack of fuel	Clogged, leaking fuel piping	Clogged fuel tank air breather hole	Defective fuel cut solenoid	Defective engine stop motor	Improper fuel used
Check injection pump directly	●										
When control rack is pushed, it is found to be heavy, or does not return		●									
Check feed pump directly			●								
When fuel filter, strainer are inspected directly, they are found to be clogged				●							●
When feed pump strainer is inspected directly, it is found to be clogged					●						
When fuel cap is inspected directly, it is found to be clogged									●		
Does not move even when fuel cut solenoid linkage is disconnected									●		
Does not move even when engine stop motor linkage is disconnected										●	
Remedy	Replace	Replace	Replace	Clean	Clean	Add	Repair	Repair	Replace	Replace	Replace

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**(3) Exhaust gas comes out but engine does not start  
(Fuel is being injected)**

General causes why exhaust gas comes out but engine does not start

- Lack of rotating force due to defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel

**Legend**

- : Possible causes (judging from Questions and check items)
- : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes									
Defective, broken valve system (valve, rocker lever, etc.)									
Defective injection pump (rack, plunger, stuck)									
Worn piston ring, cylinder liner									
Clogged fuel filter, strainer									
Clogged feed pump strainer									
Defective air cleaner strainer									
Defective intake element									
Leakage or deteriorated heater (ribbon heater type)									
Clogged, clogging, air in fuel system									
Clogged injection nozzle, defective spray									
Clogged fuel tank air breather hole									
Improper fuel used									

		Confirm recent repair history	Degree of use	Operated for long period	Defective, broken valve system (valve, rocker lever, etc.)	Defective injection pump (rack, plunger, stuck)	Worn piston ring, cylinder liner	Clogged fuel filter, strainer	Clogged feed pump strainer	Defective air cleaner strainer	Defective intake element	Leakage or deteriorated heater (ribbon heater type)	Clogged, clogging, air in fuel system	Clogged injection nozzle, defective spray	Clogged fuel tank air breather hole	Improper fuel used
Questions	Confirm recent repair history															
	Degree of use		Operated for long period			△	△	△							△	
	Suddenly failed to start	○	○													
	When engine is cranked, abnormal noise is heard from around cylinder head	○														
	Engine oil must be added more frequently						○									
	Non-specified fuel has been used		○											○		
	Replacement of filters has not been carried out according to operation manual						○	○	○							
	Rust is found when fuel is drained						○	○								
	Dust indicator is red								○							
	Indicator lamp does not light up									○						
	Starting motor cranks engine slowly										○					
	Mud is stuck to fuel tank cap														○	
	Check items	When fuel lever is placed at FULL position, it does not contact stopper					○									
When engine is cranked with starting motor, 1) Little fuel comes out even when injection pipe sleeve nut is loosened						○										
2) Little fuel comes out even when fuel filter air bleed plug is loosened							○	○								○
There is leakage from fuel piping												○				
When exhaust manifold is touched immediately after starting engine, temperature of some cylinder is low													○			
When fuel filter is drained, no fuel comes out																○

		Remove head cover and check directly	When control rack is pushed, it is found to be heavy, or does not return	When compression pressure is measured, it is found to be low	When fuel filter, strainer are inspected directly, they are found to be clogged	When feed pump strainer is inspected directly, it is found to be clogged	When air cleaner element is inspected directly, it is found to be clogged	Heater mount does not become warm	Either specific gravity of electrolyte or voltage of battery is low	When feed pump is operated, there is no response, or pump is heavy	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working	When fuel cap is inspected directly, it is found to be clogged
Troubleshooting	Remove head cover and check directly	●										
	When control rack is pushed, it is found to be heavy, or does not return		●									
	When compression pressure is measured, it is found to be low			●								
	When fuel filter, strainer are inspected directly, they are found to be clogged				●							●
	When feed pump strainer is inspected directly, it is found to be clogged					●						
	When air cleaner element is inspected directly, it is found to be clogged						●					
	Heater mount does not become warm							●				
	Either specific gravity of electrolyte or voltage of battery is low								●			
	When feed pump is operated, there is no response, or pump is heavy									●		
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working										●	
	When fuel cap is inspected directly, it is found to be clogged											●

Remedy	Replace	Replace	Replace	Clean	Clean	Clean	Repair	Replace	Repair	Clean	Clean

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### S-3 Engine does not pick up smoothly (Follow-up is poor)

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used

**Legend**

- : Possible causes (judging from Questions and check items)
- ◎ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause

Causes	
Clogged air cleaner element	
Clogged fuel filter, strainer	
Clogged feed pump strainer	
Clogged injection strainer	
Seized injection nozzle, defective spary	
Worn piston ring, cylinder plunger	
Seized turbocharger, interference	
Improper valve clearance	
Clogged fuel tank air breather hole	
Clogged, leaking fuel piping	
Defective contact of valve, valve seat	

Questions	Confirm recent repair history																		
	Degree of use	Operated for long period		△	△	△					△								
Replacement of filters has not been carried out according to operation manual			◎	◎	◎														
Non-specified fuel has been used				◎	◎	◎	◎												
Engine oil must be added more frequently										◎									
Engine pick-up suddenly became poor							○			◎			○	○					
Rust and water are found when fuel is drained				◎	◎														
Dust indicator is red			◎																
Noise of interference is heard from around turbocharger										◎									
Color of exhaust gas	Blue under light load									◎									
	Black		◎			◎				◎									○
Check items	Clanging sound is heard from around cylinder head											◎							
	Mud is stuck to fuel tank cap													◎					
	There is leakage from fuel piping																		◎
	High idling speed under no load is normal, but speed suddenly drops when load is applied				◎	◎								○					
	There is hunting from engine (rotation is irregular)			○	◎	○								○					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low						◎	○											
	Blow-by gas is excessive										◎								

Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●																	
	When fuel filter, strainer are inspected directly, they are found to be clogged			●																
	When feed pump strainer is inspected directly, it is found to be clogged				●															
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working					●														
	When control rack is pushed, it is found to be heavy, or does not return						●													
	When compression pressure is measured, it is found to be low									●										●
	When turbocharger is rotated by hand, it is found to be heavy										●									
	When valve clearance is checked directly, it is found to be outside standard value												●							
	When fuel cap is inspected directly, it is found to be clogged													●						
	When feed pump is operated, operation is too light or too heavy														●					
Remedy		Clean	Clean	Clean	Repair	Replace	Replace	Replace	Adjust	Clean	Repair	Replace								

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### S-4 Engine stops during operations

General causes why engine stops during operations

- Seized parts inside engine
- Insufficient supply of fuel
- Overheating
  - ★ If there is overheating and insufficient output, carry out troubleshooting for overheating.
- Failure in power train
  - ★ If the engine stops because of a failure in the power train, carry out troubleshooting for the chassis.

Causes										
Broken, seized piston connecting rod	Broken, seized crankshaft bearing	Broken valve system (valve, rocker lever, etc.)	Broken gear train	Broken pump auxiliary equipment	Lack of fuel	Clogged fuel filter, strainer	Clogged feed pump drive shaft, key	Broken, seized pump strainer	Clogged, leaking feed pump piston	Clogged, leaking fuel piping
Defective injection pump	Failure in chassis power train									

Legend

- : Possible causes (judging from Questions and check items)
- ◎ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause

Questions															
Confirm recent repair history															
Degree of use	Operated for long period							△	△						
Condition when engine stopped	Abnormal noise was heard and engine stopped suddenly	◎	◎	◎	◎	◎	◎		○			○	◎		
	Engine overheated and stopped	◎	○		○										
	Engine stopped slowly						◎	○	○						
	There was hunting and engine stopped						◎	○	○		○				
Replacement of filters has not been carried out according to operation manual								◎	◎						
Non-specified fuel has been used								○	○	○			○		
Fuel gauge lamp lights up								◎							
Fuel tank is found to be empty								◎							
When feed pump is operated, there is no response or it is heavy								○	○		◎				
Mud is stuck to fuel tank cap												◎			
Check items	Engine turns, but stops when transmission control lever is operate													◎	
	Try to turn by hand using barring tool	Does not turn at all	◎	◎											
		Turns in opposite direction			◎										
		Moves amount of backlash				◎	◎								
		Shaft does not turn						◎							
Rust and water are found when fuel is drained								◎	◎						
Metal particles are found when oil is drained		◎	◎					○	○						
Troubleshooting	Remove oil pan and check directly		●	●											
	Remove head cover and check directly			●											
	When gear train is inspected, it does not turn				●										
	Turns when pump auxiliary equipment is removed					●									
	When fuel filter, strainer are inspected directly, they are found to be clogged							●							
	When feed pump strainer is inspected directly, it is found to be clogged								●						
	Check feed pump directly									●					
	When control rack is pushed, it is found to be heavy or does not return													●	
Remedy	Replace	Replace	Replace	Replace	Replace	Replace	Add	Clean	Clean	Replace	Repair	Clean	Replace	-	

Carry out troubleshooting in chassis volume

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### S-5 Engine does not rotate smoothly (hunting)

General causes why engine does not rotate smoothly

- Air in fuel system
- Defective governor mechanism
- Defective engine throttle controller mechanism (engine throttle controller type)
  - ★ If there is no hunting when the engine throttle controller rod is disconnected, carry out troubleshooting for the electrical system.

Causes
Defective operation of governor
Defective adjustment of governor
Defective operation of control rack
Low idling speed is too low
Lack of fuel
Clogged feed pump strainer
Clogged fuel filter, strainer
Clogged, air in circuit between fuel tank and feed pump
Clogged fuel tank air breather hole

Legend

- : Possible causes (judging from Questions and check items)
- ◎ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause

		Confirm recent repair history											
Questions	Degree of use	Operated for long period						△	△				
	Condition of hunting	Occurs at certain speed range	◎	◎	◎	○							
		Occurs at low idling	○			◎		○	○	○	○		
		Occurs even when speed is raised	○	○	○							○	
		Occurs on slopes					◎						
Check items	Replacement of filters has not been carried out according to operation manual							◎	◎				
	Fuel tank is found to be empty						◎						
	Rust is found when fuel is drained							○	○				
	Leakage from fuel piping									◎	◎		
	When feed pump is operated, 1) No response, light, return is quick									◎	◎		
	2) No response, light, return is normal									◎			
	Engine speed sometimes rises too high		◎	◎									
	Engine is sometimes difficult to stop		◎	◎	◎								
	Seal on injection pump has come off			◎	◎								
Troubleshooting	When governor lever is moved it is found to be stiff		●	●									
	When injection pump is tested, governor is found to be improperly adjusted			●									
	When control rack is pushed, it is found to be heavy, or does not return				●								
	When fuel cap is inspected directly, it is found to be clogged					●						●	
	When feed pump strainer is inspected directly, it is found to be clogged							●					
	When fuel filter, strainer are inspected directly, they are found to be clogged								●				
Remedy		Adjust	Adjust	Adjust	Adjust	Add	Clean	Clean	Repair	Repair	Clean		

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### S-6 Engine lacks output (no power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used  
(if non-specified fuel is used, output drops)
- Lack of output due to overheating
- ★ If there is overheating and insufficient output, carry out troubleshooting for overheating.

Legend

- : Possible causes (judging from Questions and check items)
- : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes	
Clogged air cleaner element	
Seized turbocharger, interference	
Worn piston ring, cylinder liner	
Clogged fuel filter, strainer	
Clogged feed pump strainer	
Seized injection nozzle, defective spray	
Improper pump plunger	
Defective valve clearance	
Bent fuel lever linkage, valve seat	
Clogged, leaking fuel piping	
Clogged fuel tank air breather hole	

Questions														
Confirm recent repair history														
Degree of use	Operated for long period		△		△	△	△						△	
Power was lost	Suddenly		○											
	Gradually		○	○	○	○	○					○		
Engine oil must be added more frequently				○										
Replacement of filters has not been carried out according to operation manual			○		○	○								
Non-specified fuel has been used					○	○	○	○						
Dust indicator is red			○											
Color of exhaust gas	Black		○	○										
	Blue under light load			○										
Noise of interference is heard from around turbocharger			○											
Blow-by gas is excessive				○										
Engine pickup is poor and combustion is irregular			○				○					○	○	
High idling speed under no load is normal, but speed suddenly drops when load is applied						○	○						○	
When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low								○	○					
There is hunting from engine (rotation is irregular)						○	○						○	○
Clanging sound is heard from around cylinder head										○				
High idling speed of engine is low												○		
Leakage from fuel piping														○

Troubleshooting														
When air cleaner element is inspected directly, it is found to be clogged		●												
When turbocharger is rotated by hand, it is found to be heavy			●											
When compression pressure is measured, it is found to be low				●							●			
When fuel filter, strainer are inspected directly, they are found to be clogged					●									
When feed pump strainer are inspected directly, it is found to be clogged						●								
Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working							●							
When control rack is pushed, it is found to be heavy, or dose not return								●						
When valve clearance is checked directly, it is found to be outside standard value									●					
When lever is placed at FULL position, it does not contact stopper											●			
When feed pump is operated, operation is too light or too heavy												●		
When fuel cap is inspected directly, it is found to be clogged														●
Remedy		Clean	Replace	Replace	Clean	Clean	Repair	Replace	Adjust	Replace	Adjust	Repair	Clean	

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### S-7 Exhaust gas is black (incomplete combustion)

General causes why exhaust gas is black

- Insufficient intake of air
- Improper condition of fuel injection
- Excessive injection of fuel

		Causes										
		Seized turbocharger, interference	Clogged air cleaner element	Worn piston ring, cylinder liner	Clogged, seized injection liner	Improper injection nozzle	Defective injection timing	Improper injection pump	Crushed, clogged muffer	Leakage of air between turbocharger and cylinder head	Defective contact of valve, valve seat	Defective injection pump (rack, plunger seized)
Legend												
○ : Possible causes (judging from Questions and check items)												
⊙ : Most probable causes (judging from Questions and Check items)												
△ : Possible causes due to length of use (used for a long period)												
● : Items to confirm the cause.												
Questions	Confirm recent repair history											
	Degree of use	Operated for long period		△	△	△						△
	Color of exhaust gas	Suddenly became black	⊙			○						○
		Gradually became black		⊙		○				○		
		Blue under light load			⊙							
	Engine oil must be added more frequently			⊙								
	Power was lost	Suddenly	⊙			○			○			○
		Gradually		○	○					○	○	
	Non-specified fuel has been used				○							○
	Noise of interference is heard from around turbocharger		⊙									
	Dust indicator is red		⊙									
	Blow-by gas is excessive			⊙								
	Engine pickup is poor and combustion is irregular		○		⊙		○	○	○			○
	Check items	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low				○						○
		Match marks on fuel injection pump are out of alignment					⊙					
Seal on injection pump has come off							⊙					
Clanging sound is heard from around cylinder head								⊙				
Exhaust noise is abnormal		○		○					⊙			
Muffler is crushed									⊙			
Leakage of air between turbocharger and cylinder head, loose clamp										⊙		
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy	●										
	When air cleaner is inspected directly, it is found to be clogged		●									
	When compression pressure is measured, it is found to be low			●							●	
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working				●							
	When check is made using delivery method, injection timing is found to be incorrect					●						
	Injection pump test shows that injection amount is incorrect						●					
	When valve clearance is checked directly it is found to be outside standard value							●				
	When muffler is removed, exhaust gas color returns to normal								●			
	When control rack is pushed, it is found to be heavy, or does not return										●	
Remedy	Replace	Clean	Replace	Replace	Adjust	Adjust	Adjust	Replace	Repair	Replace	Replace	

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### S-8 Oil consumption is excessive (or exhaust gas is blue)

★ Do not run the engine at idling for more than 20 minutes continuously. (Both low and high idling)

General causes why oil consumption is excessive

- Abnormal combustion of oil
- External leakage of oil
- Wear of lubrication system

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		Causes												
		Broken piston ring	Worn piston ring	Clogged breather or breather liner	Leakage from oil filter, oil cooler	Leakage from oil piping	Leakage from oil drain plug	Broken oil pan	Worn oil pan, cylinder head, etc.	Worn seal at turbine end	Worn, broken rear seal	Dust sucked in from intake system	Worn valve (stem, guide), broken seal	
Questions	Confirm recent repair history													
	Degree of use	Operated for long period												
	Oil consumption suddenly increased													
	Engine oil must be added more frequently													
	Engine oil becomes contaminated quickly													
	Exhaust gas is blue under light load													
	Amount of blow-by gas	Abnormally excessive												
		None												
	Check items	Area around engine is dirty with oil												
		There is oil in engine cooling water												
When exhaust pipe is removed, inside is found to be dirty with oil														
Inside of turbocharger intake pipe is dirty with oil														
Oil level in clutch or TOROFLOW transmission damper chamber rises														
Clamps for intake system are loose														
Troubleshooting		When compression pressure is measured, it is found to be low												
	When breather element is inspected, it is found to be clogged with dirty oil													
	There is external leakage of oil from engine													
	Pressure-tightness test of oil cooler shows there is leakage													
	Excessive play of turbocharger shaft													
	Check rear seal directly													
	When intake manifold is removed, dust is found inside													
When intake manifold is removed, inside is found to be dirty with oil														
Remedy		Replace	Replace	Clean	Repair	Repair	Repair	Repair	Replace	Replace	Replace	Repair	Repair	

### S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated quickly

- Intake of exhaust gas due to internal wear
- Clogging of lubrication passage
- Improper combustion
- Improper oil used
- Operation under excessive load

		Causes							
		Worn piston ring, cylinder liner	Clogged breather, breather liner	Clogged oil filter	Worn valve, valve guide	Clogged oil cooler	Defective seal at turbocharger drain tube	Defective safety valve	Exhaust gas is black
Questions	Confirm recent repair history								
	Degree of use	Operated for long period	△		△		△		
	Engine oil must be added more frequently		●						
	Non-specified fuel has been used			○					
	Color of exhaust gas	Blue under light load	○						
		Black							○
	Amount of blow-by gas	Abnormally excessive	○		○		○	○	
		None		○					
	Oil filter caution lamp stays on even when oil pressure rises			○				○	
	When oil filter is inspected, metal particles are found		○	○	○				
When exhaust pipe is removed, inside is found to be dirty with oil				○					
Engine oil temperature rises quickly					○				
Troubleshooting	When compression pressure is measured, it is found to be low	●			●				
	When breather element is inspected directly, it is found to be clogged with dirty oil, or hose is broken		●						
	When oil filter is inspected directly, it is found to be clogged			●					
	When oil cooler is inspected directly, it is found to be clogged					●			
	Turbocharger drain tube is clogged						●		
	Excessive play of turbocharger shaft							●	
	When safety valve is directly inspected, spring is found to be catching or broken								●
	Remedy	Replace	Clean	Replace	Replace	Clean	Clean	Replace	Replace

Carry out troubleshooting for "Exhaust is black"

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### S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

- Leakage of fuel
- Improper condition of fuel injection
- Excessive injection of fuel

Causes							
Defective injection pump (excessive injection)							
Defective injection nozzle spray							
Defective injection pump plunger							
Improper fuel injection timing							
External leakage from fuel piping							
Leakage of fuel inside head cover							
Defective oil seal inside feed pump (piston)							
Defective adjustment of fuel lever linkage							

**Legend**

- : Possible causes (judging from Questions and check items)
- : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

		Defective injection pump (excessive injection)	Defective injection nozzle spray	Defective injection pump plunger	Improper fuel injection timing	External leakage from fuel piping	Leakage of fuel inside head cover	Defective oil seal inside feed pump (piston)	Defective adjustment of fuel lever linkage	
Questions	Confirm recent repair history									
	Degree of use									
	Condition of fuel consumption	Operated for long period			△	△				△
		More than for other machines of same model	○			○				
		Gradually increased		○	○					
	Suddenly increased					○	○			
	Exhaust gas color	Black	○	○		○				○
		White						○		
	Seal on injection pump has come off	○								
	There is irregular combustion		○							
When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low			○	○						
Match mark on injection pump is misaligned					○					
There is external leakage of fuel from engine						○				
Engine oil level rises and smells of diesel fuel		○					○	○		
Engine low idling speed is high		○						○		
Troubleshooting	Injection pump test shows that injection amount is excessive	●								
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working		●							
	When control rack is pushed, it is found to be heavy, or does not return			●						
	When check is made using delivery method, injection timing is found to be incorrect				●					
	Remove head cover and check directly						●			
	Remove feed pump and check directly							●		
	When engine speed is measured, low idling speed is found to be high								●	
Remedy	Adjust	Replace	Replace	Adjust	Repair	Repair	Repair	Adjust		

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# S-11 Oil is in cooling water, or water spurts back, or water level goes down

General causes why oil is in cooling water

- Internal leakage in lubrication system
- Internal leakage in cooling system

		Causes					
		Broken oil cooler core, O-ring	Broken cylinder head, head gasket	Insufficient protrusion of cylinder liner	Broken oil cooler for power train	Broken cylinder liner O-ring, holes caused by pitting	Internal cracks in cylinder block
Questions	Confirm recent repair history						
	Degree of use	Operated for long period	△			△	
	Oil level	Suddenly increased	○	○	○		
		Gradually increased				○	○
Check items	Hard water is being used as cooling water	○			○		
	Engine oil level has risen, oil is cloudy white	●			○	○	
	Excessive air bubbles inside radiator, spurts back		●	●			
	Hydraulic oil, torque converter transmission oil is cloudy white			●			
	When hydraulic oil, torque converter, transmission oil is drained, water is found			○			
Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage	●			●		
	Pressure-tightness test of cylinder head shows there is leakage		●				
	Remove cylinder head and check directly		●				
	Remove oil pan and check directly				●	●	
Remedy		Replace	Replace	Replace	Replace	Replace	Replace

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## S-12 Oil pressure lamp lights up (drop in oil pressure)

General causes why oil pressure lamp lights up

- Leakage, clogging, wear of lubricating system
- Defective oil pressure control
- Improper oil used (improper viscosity)
- Deterioration of oil due to overheating

Standards for engine oil selection

Type of oil	Selection of oil SAE number according to ambient temperature								
	-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104 40	122 50°C
Engine oil				SAE 30					
	SAE 10W								
	SAE 10W-30								
	SAE 15W-40								

Causes	
Clogged oil filter	
Worn bearing journal	
Clogged strainer inside oil pan	
Clogged, broken oil pipe inside oil pan	
Broken suction pipe inside oil pan	
Defective oil pump	
Insufficient oil in oil pan	
Defective regulator valve	
Leaking relief valve	
Defective oil level sensor	
Defective oil pressure sensor	
Water, fuel in oil	

Legend

- : Possible causes (judging from Questions and check items)
- : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- ▲ : Items to confirm the cause.

Questions	Confirm recent repair history																			
	Degree of use	Operated for long period		△	△															
Replacement of filter has not been carried out according to operation manual			○																	
Caution lamp lights up			○																	
Non-specified fuel has been used			○	○																
Condition when oil pressure lamp lights up	Lights up at low idling		○																	
	Lights up at low, high idling			○	○	○	○	○	○	○	○									
	Lights up on slopes											○								
	Sometimes lights up												○	○						
Check items	There is clogging, leakage from hydraulic piping (external)																			
	Oil level sensor lamp lights up																			
	When oil level in oil pan is checked, it is found to be low																			
	Metal particles are found when oil is drained			○																
	Metal particles are stuck to oil filter element			○																
Troubleshooting	Oil is cloudy white or smells of diesel oil																			○
	When oil filter is inspected directly, it is found to be clogged		●	●																
	Remove oil pan and check directly				●	●	●													
	Oil pump rotation is heavy, there is play																			
	There is catching of relief valve, regulator valve, spring, or valve guide is broken																			
	When oil level sensor is replaced, oil pressure sensor lamp goes out																			●
When oil pressure is measured, it is found to be within standard value																			●	
Remedy		Clean	Clean	Clean	Clean	Repair	Replace	Add	Adjust	Adjust	Adjust	Repair	Replace	Replace	-					

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### S-13 Oil level rises

★ If there is oil in the cooling water, carry out troubleshooting for "Oil is in cooling water".

General causes why oil level rises

- Water in oil (cloudy white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of oil from other component

Cause	
Broken oil cooler core, O-ring	
Defective nozzle holder sleeve	
Broken cylinder head, head gasket	
Clogged water pump breather hole, defective seal	
Worn, damaged rear seal surface	
Defective seal of pump or auxiliary equipment	
Leakage of fuel from piping inside head cover	
Defective part inside injection pump (flange type)	
Damaged liner O-ring, holes made by pitting	
Cracks inside cylinder block	

Legend

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Questions												
	Degree of use	Operated for long period										
Confirm recent repair history												
There is oil in radiator cooling water			●	○	○						○	○
Exhaust gas is white			⊙						○	○		
When engine is first started, drops of water come from muffler			⊙									
Leave radiator cap open. When engine is run at idling, an abnormal number of bubbles appear, or water spurts back				○							○	
Water pump breather hole is clogged with mud					○							
When water pump breather hole is clean, water comes out					○							
Oil level goes down in clutch, TORQFLOW transmission, or damper chamber						○						
Oil level goes down in hydraulic tank							○					
Engine oil smells of diesel fuel								○	○	○		
Fuel is added more frequently								○	○	○		

Troubleshooting												
	Pressure-tightness test of oil cooler shows there is leakage	●										
	Pressure-tightness test of cylinder head shows there is leakage	●										
	When compression pressure is measured, it is found to be low		●									
	Remove water pump and check directly			●								
	Check rear seal directly				●							
	When pump auxiliary equipment is removed, seal is found to be broken					●						
	Remove head cover and check directly						●					
	Remove injection pump and check directly							●				
	There is improper contact of thermostat seat valve								●			

Remedy												
Replace												
Replace												
Replace												
Replace												
Repair												
Replace												
Repair												
Replace												
Repair												
Replace												
Replace												

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# S-14 Water temperature becomes too high (overheating)

General causes why water temperature becomes too high

- Lack of cooling water (deformation, damage of fan)
- Drop in heat dissipation efficiency
- Defective cooling circulation system
- Rise in oil temperature of power train
- ★ Carry out troubleshooting for chassis.

Legend

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes									
Broken water pump									
Clogged, crushed radiator fin									
Clogged radiator core									
Defective thermostat (does not open)									
Insufficient water temperature gauge									
Fan belt slipping, worn fan pulley									
Clogged, broken oil cooler									
Defective pressure valve									
Broken cylinder head, head gasket									
Damaged cylinder liner O-ring, holes made by pitting									
Rise in torque converter oil temperature									

Questions											
Confirm recent repair history											
Degree of use	Operated for long period		△	△						△	△
Condition of overheating	Suddenly overheated	⊙					○	○			
	Always tends to overheat		⊙	⊙	○			○			
Water temperature gauge	Rises quickly				⊙		○				
	Does not go down from red range					○					
Radiator water level sensor lights up							○				
Fan belt whines under sudden load								○			
Cloudy white oil is floating on cooling water									○		
Cooling water flows out from overflow hose										○	
Excessive air bubbles inside radiator, water spurts back											○
Engine oil level has risen, oil is cloudy white									○		○
There is play when fan pulley is rotated		○									
Radiator shroud, inside of underguard are clogged with dirt or mud			○					○			
When light bulb is held behind radiator, no light passes through			○								
Water is leaking because of cracks in hose or loose clamps							○				
Belt tension is found to be slack								○			
Power train oil temperature enters red range before engine water temperature											○

Troubleshooting												Carry out troubleshooting for chassis
Temperature difference between top and bottom radiator tank is excessive		●										
Temperature difference between top and bottom radiator tank is slight			●									
When water filler port is inspected, the core is found to be clogged				●								
When a function test is carried out on the thermostat, it does not open even at the cracking temperature					●							
When water temperature is measured, it is found to be normal						●						
When oil cooler is inspected directly, it is found to be clogged								●				
When measurement is made with radiator cap tester, set pressure is found to be low									●			
When compression pressure is measured, it is found to be low										●		
Remove oil pan and check directly											●	
Remedy		Replace	Repair	Repair	Replace	Replace	Add	Repair	Replace	Replace	Replace	

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### S-15 Abnormal noise is made

★ Judge if the noise is an internal noise or an external noise.

General causes why abnormal noise is made

- Abnormality due to defective parts
- Abnormal combustion noise
- Air sucked in from intake system

**Legend**

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes									
Worn piston ring, cylinder liner									
Seized turbocharger, interference									
Missing, seized bushing									
Clogged, seized bushing									
Defective injection nozzle									
Defective injection pump (rack, plunger seized)									
Deformed fan, interference of fan belt									
Improper adjustment of fan belt									
Broken valve system (valve clearance)									
Improper gear train backlash									
Leakage of air between turbocharger and cylinder head									
Defect inside muffler (dividing board out of position)									

Questions	Confirm recent repair history														
	Degree of use	Operated for long period	△												
Condition of abnormal noise	Gradually occurred	○							○						
	Suddenly occurred			○	○						○				
Non-specified fuel has been used					○	○									
Engine oil must be added more frequently		⊙													
Color of exhaust gas	Blue under light load	⊙													
	Black			⊙						○				○	
Metal particles are found in oil filter		⊙		⊙											
Blow-by gas is excessive		⊙													
Noise of interference is heard from around turbocharger		⊙													
Engine pickup is poor and combustion is irregular					⊙										
When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					⊙	○									
Seal on injection pump has come off										⊙					
Abnormal noise is loud when accelerating engine									○	○	○	○		○	
Clanging sound is heard from around cylinder head												○	○		
Leakage of air between turbocharger and cylinder head, loose clamp														○	
Vibrating noise is heard from around muffler															○

Troubleshooting	When compression pressure is measured, it is found to be low		●													
	When turbocharger is rotated by hand, it is found to be heavy		●													
	Remove gear cover and check directly			●											●	
	Stop fuel injection to one cylinder at a time. If there is no change in engine speed, that cylinder is not working				●											
	When control rack is pushed, it is found to be heavy or does not return					●										
	Injection pump test shows that injection amount is incorrect						●									
	Fan is deformed, or belt is loose							●								
	When valve clearance is checked directly, it is found to be outside standard value								●							
	Remove cylinder head cover and check directly									●						
	When muffler is removed, abnormal noise disappears															●
Remedy		Replace	Replace	Replace	Replace	Replace	Adjust	Repair	Adjust	Replace	Repair	Repair	Repair	Replace		

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### S-16 Vibration is excessive

★ If there is abnormal noise together with the vibration, carry out troubleshooting for "Abnormal noise is made".

General causes why vibration is excessive

- Defective parts (abnormal wear, breakage)
- Improper alignment
- Abnormal combustion

Legend

- : Possible causes (judging from Questions and check items)
- ⊙: Most probable causes (judging from Questions and Check items)
- △: Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes	
Worn connecting rod, main bearing	
Worn cam bushing	
Worn support pilot	
Loose engine mounting	
Broken part inside output shaft, broken cushion	
Misalignment between engine and damper	
Improper gear train engine and power train	
Valve system (valve, rocker lever, etc) stuck	
Defective injection pump (excessive injection)	

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	Questions	Check items										Troubleshooting										Remedy			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10				
	Confirm recent repair history																								
	Degree of use	Operated for long period		△	△	△	△																		
	Condition of vibration	Suddenly increased						○																	
		Gradually increased		○	○	○	○																		
	Non-specified fuel has been used	○	○																						
	Metal particles are found in oil filter	⊙	⊙																						
	Metal particles are found when oil is drained	⊙	⊙																						
	Oil pressure is low at low idling	○	○																						
	Vibration occurs at mid-range speed							○	○																
	Vibration follows engine speed							○	○	○	○														
	Exhaust gas is black																				⊙	○			
	Seal on injection pump has come off																								⊙
	Remove oil pan and check directly																								●
	Remove side cover and check directly																								●
	Check directly for worn support pilot, play																								●
	Check directly for loose engine mounting bolts, broken cushion																								●
	Check inside of output shaft (damper) directly																								●
	When radial runout, face runout are measured, they are found to be outside standard value																								●
	Remove front cover and check directly																								●
	Remove head cover and check directly																								●
	Injection pump test shows that injection amount is incorrect																								●

## TESTING AND ADJUSTING TOOL LIST

Check or adjustment item	Symbol	Part Number	Part Name	Remarks	
Engine speed	A	799-203-8001	Multi-tachometer	Digital display L: 60 – 2,000 rpm H: 60 – 19,999 rpm	
Specific gravity of battery electrolyte	B	795-500-1001	Battery, coolant tester	1.100 – 1.300	
Coolant freezing temperature				-5 to -50°C	
Water, oil, intake and exhaust temperatures	C	799-101-1502	Thermometer	-99.9 – 1,299°C	
Lubricant pressure	D	1	799-401-2320	Pressure gauge	1 MPa (10 kg/cm <sup>2</sup> )
		2	799-101-5150	Hose	Hydro tester kit 799-101-5002
			790-261-1150	Hose	
Air supply pressure (boost pressure)	E	799-201-2201	Boost gauge kit	-760 – 1500 mmHg	
Blow-by pressure	F	1	799-201-1504	Blow-by checker	0 – 1,000 mmAg
		2	799-201-1590	Gauge	
Compression pressure	G	1	795-502-1590	Gauge assembly	Kit Part No.795-502-1205 0 – 6.8 MPa (0 – 70 kg/cm <sup>2</sup> )
		2	795-502-1360	Adapter	
Valve clearance	H	Commercially available	Feeler gauge	0.33, 0.71 mm	
Exhaust color	I	1	792-201-9000	Handy smoke tester	Discoloration 0 – 70% (With standard color) (Discoloration x 1/10 ÷ Bosch index)
		2	Commercially available	Smoke meter	
Water, fuel in oil	J	799-201-6000	Engine oil checker	Water content 0.1%, 0.2% standard sample	
Fuel injection pressure	K	Commercially available	Nozzle tester	0 – 39.2 MPa (0 – 400 kg/cm <sup>2</sup> )	
Nozzle spray condition					
Quality of coolant	L	799-202-7002	Water tester	PH, nitrous acid ion density	
Pressure valve function	M	799-202-9001	Radiator cap tester	0 – 0.2 MPa (0 – 2 kg/cm <sup>2</sup> )	
Leakage from cooling system					
Clogging of radiator	N	799-202-2001	Anemometer (wind speed)	1 – 40 m/s	
Engine cranking	O	795-610-1000	Cranking kit	Engine with DC24V starting motor	
Adjusting injection timing	P	795-471-1200	Gauge assembly		
Electric circuit	Q	Commercially available	Tester		

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# TESTING AND ADJUSTING DATA

Engine model				6D125-2			
Applicable machine model				D53A, P-17		D58E-1, D58P-1	
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value
Performance	Engine speed	High idling speed	rpm	2,050 – 2,150	2,050 – 2,150	2,050 – 2,150	2,050 – 2,150
		Low idling speed	rpm	850 – 900	850 – 900	850 – 900	850 – 900
	Necessary starting speed	0°C (Without starting aid)	rpm	Min. 100	–	Min. 100	–
		–20°C (With starting aid)	rpm	Min. 85	–	Min. 85	–
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	–
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	–	–	–	–
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	–	–	–	–
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 550	700	Max. 650	700
	Exhaust gas color	Quick acceleration (Low idle → high idle)	Bosch index	Max. 3.5	5.5	Max. 3.5	5.5
		At rated flywheel horsepower	Bosch index	Max. 2.0	3.0	Max. 2.0	3.0
		High idling speed	Bosch index	Max. 1.0	2.0	Max. 1.0	2.0
Valve clearance (When engine is hot or cold)	Intake valve	mm	0.33	–	0.33	–	
	Exhaust valve	mm	0.71	–	0.71	–	
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 3.3 {34}	2.4 {24}	Min. 3.3 {34}	2.4 {24}
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 80	160	Max. 50	100
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}	0.29 – 0.54 {3.0 – 5.5}	0.21 {2.1}
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.08 {0.8}
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}
	Oil temperature	All speed (Oil in oil pan)	°C	90 – 110	120	90 – 110	120
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0	Max. 0.5	1.0	
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	25.0 – 26.0 {255 – 265}	20.1 {205}	25.0 – 26.0 {255 – 265}	20.1 {205}
	Fuel injection timing	B.T.D.C.	degree	14.25 – 15.75	14.25 – 15.75	14.25 – 15.75	14.25 – 15.75
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	63.8 – 83.4 {0.65 – 0.85}	63.8 – 83.4 {0.65 – 0.85}	63.8 – 83.4 {0.65 ± 0.85}	63.8 – 83.4 {0.65 ± 0.85}
	Fan speed	At rated engine speed	rpm	1,677 – 1,777	1,677 – 1,777	1,677 – 1,777	1,677 – 1,777
	Fan belt tension	Deflects when pushed with a force of 59 N (6 kg)	mm	7.5	5 – 10	13	10 – 15

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6D125-2							
D65E-12, D70LE-12							
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
2,050 – 2,150	2,050 – 2,150						
800 – 850	800 – 850						
Min. 100	–						
Min. 85	–						
Max. 2.94 (300)	7.47 (762)						
–	–						
–	–						
Max. 630	700						
Max. 3.5	5.5						
Max. 2.0	3.0						
Max. 1.0	2.0						
0.33	–						
0.71	–						
Min. 3.5 (36)	2.5 (26)						
Max. 50	100						
0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}						
0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}						
Min. 0.15 {1.5}	0.08 {0.8}						
Min. 0.10 {1.0}	0.07 {0.7}						
90 – 110	120						
Max. 0.5	1.0						
25.0 – 26.0 {255 – 265}	20.1 {205}						
15.25 – 16.75	15.25 – 16.75						
73.6 – 103.0 {0.75 – 1.05}	73.6 – 103.0 {0.75 – 1.05}						
1,715 – 1,835	1,715 – 1,835						
10	8 – 12						

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Engine model				S6D125-2			
Applicable machine model				D60P-12		D65EX, P, PX-12	
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value
Performance	Engine speed	High idling speed	rpm	2,050 – 2,150	2,050 – 2,150	2,050 – 2,150	2,050 – 2,150
		Low idling speed	rpm	800 – 850	800 – 850	800 – 850	800 – 850
	Necessary starting speed	0°C (Without starting aid)	rpm	Min. 100	-	Min. 100	-
		-20°C (With starting aid)	rpm	Min. 85	-	Min. 85	-
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 2.94 (300)	7.47 (762)	Max. 2.94 (300)	7.47 (762)
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	Min. 80.0 (600)	64.0 (480)	Min. 80.0 (600)	64.0 (480)
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	Min. 66.5 (500)	53.3 (400)	Min. 66.5 (500)	53.3 (400)
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 650	700	Max. 650	700
	Exhaust gas color	Quick acceleration (Low idle → high idle)	Bosch index	Max. 5.0	7.0	Max. 5.0	7.0
		At rated flywheel horsepower	Bosch index	Max. 2.0	3.0	Max. 2.0	3.0
		High idling speed	Bosch index	Max. 1.0	2.0	Max. 1.0	2.0
Valve clearance (When engine is hot or cold)	Intake valve	mm	0.33	-	0.33	-	
	Exhaust valve	mm	0.71	-	0.71	-	
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 3.3 (34)	2.4 (24)	Min. 3.3 (34)	2.4 (24)
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 50	100	Max. 50	100
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 (3.0 – 5.0)	0.21 (2.1)	0.29 – 0.49 (3.0 – 5.0)	0.21 (2.1)
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 (2.5 – 4.5)	0.18 (1.8)	0.25 – 0.44 (2.5 – 4.5)	0.18 (1.8)
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.15 (1.5)	0.08 (0.8)	Min. 0.15 (1.5)	0.08 (0.8)
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.10 (1.0)	0.07 (0.7)	Min. 0.10 (1.0)	0.07 (0.7)
	Oil temperature	All speed (Oil in oil pan)	°C	90 – 110	120	90 – 110	120
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0	Max. 0.5	1.0	
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	25.0 – 26.0 (255 – 265)	20.1 (205)	25.0 – 26.0 (255 – 265)	20.1 (205)
	Fuel injection timing	B.T.D.C.	degree	12.25 – 13.75	12.25 – 13.75	12.25 – 13.75	12.25 – 13.75
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	73.6 – 103.0 (0.75 – 1.05)	73.6 – 103.0 (0.75 – 1.05)	73.6 – 103.0 (0.75 – 1.05)	73.6 – 103.0 (0.75 – 1.05)
	Fan speed	At rated engine speed	rpm	1,725 – 1,825	1,725 – 1,825	1,725 – 1,825	1,725 – 1,825
	Fan belt tension	Deflects when pushed with a force of 59 N (6 kg)	mm	10	8 – 12	10	8 – 12

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S6D125-2

D75S-5		D85A-21, 21S, 21B, 21D, D85E, P, C-21		D85E-SS-2, -2A		D87E-2 D87P-2	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
2,150 - 2,250	2,150 - 2,250	2,150 - 2,250	2,150 - 2,250	2,050 - 2,150	2,050 - 2,150	2,250 - 2,350	2,250 - 2,350
550 - 650	550 - 650	670 - 720	670 - 720	800 - 850	800 - 85	670 - 720	670 - 720
Min. 100	-	Min. 100	-	Min. 100	-	Min. 100	-
Min. 85	-	Min. 85	-	Min. 85	-	Min. 85	-
Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}
Min. 66.7 {500}	-	Min. 80.0 {600}	-	Min. 80.0 {600}	64.0 {480}	Min. 80.0 {600}	-
Min. 53.3 {400}	-	Min. 66.7 {500}	-	Min. 66.5 {500}	53.3 {400}	Min. 66.7 {500}	-
Max. 600	700	Max. 650	700	Max. 650	700	Max. 650	700
Max. 4.5	5.5	Max. 5.5	7.0	Max. 5.5	7.0	Max. 5.5	7.0
Max. 1.5	2.5	Max. 2.0	3.0	Max. 2.0	3.0	Max. 2.0	3.0
Max. 1.0	2.0	Max. 2.0	3.0	Max. 2.0	3.0	Max. 2.0	3.0
0.33	-	0.33	-	0.33	-	0.33	-
0.71	-	0.71	-	0.71	-	0.71	-
Min. 2.9 {30}	2.0 {20}	Min. 2.9 {30}	2.0 {20}	Min. 3.3 {34}	2.4 {24}	Min. 2.9 {30}	2.0 {20}
Max. 80	160	Max. 100	200	Max. 50	100	Max. 100	200
0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}
0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}
Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.07 {0.7}	Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.08 {0.8}
Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}
90 - 110	120	90 - 110	120	90 - 110	120	90 - 110	120
Max. 0.5	1.0	Max. 0.5	1.0	Max. 0.5	1.0	Max. 0.5	1.0
25.0 - 26.0 {255 - 265}	20.1 {205}	25.0 - 26.0 {255 - 265}	20.1 {205}	25.0 - 26.0 {255 - 265}	20.1 {205}	25.0 - 26.0 {255 - 265}	20.1 {205}
15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	12.25 - 13.75	12.25 - 13.75	15.25 - 16.75	15.25 - 16.75
-	-	83.4 - 112.8 {0.85 - 1.15}	83.4 - 112.8 {0.85 - 1.15}	73.6 - 103 {0.75 - 1.05}	73.6 - 103 {0.75 - 1.05}	88.3 {0.9}	88.3 {0.9}
1,360 - 1,440	1,360 - 1,440	1,085 - 1,145	1,085 - 1,145	1,725 - 1,825	1,725 - 1,825	1,550 - 1,650	1,550 - 1,650
10	8 - 12	automatic tension	-	10	8 - 12	13	12 - 15

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Engine model				S6D125-2			
Applicable machine model				LW250-5			
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value
Performance	Engine speed	High idling speed	rpm	2,300 – 2,400	2,300 – 2,400		
		Low idling speed	rpm	675 – 695	675 – 695		
	Necessary starting speed	0°C (Without starting aid)	rpm	Min. 100	–		
–20°C (With starting aid)		rpm	Min. 85	–			
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 4.02 (410)	7.47 (762)		
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	Min. 80.0 (600)	–		
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	Min. 73.3 (550)	–		
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 600	700		
	Exhaust gas color	Quick acceleration (Low idle → high idle)	Bosch index	Max. 4.0	5.5		
		At rated flywheel horsepower	Bosch index	Max. 1.5	2.5		
High idling speed		Bosch index	–	–			
Valve clearance (When engine is hot or cold)	Intake valve	mm	0.33	–			
	Exhaust valve	mm	0.71	–			
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C  (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 2.9 (30)	2.0 (20)		
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 100	200		
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}		
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}		
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.12 (1.2)	0.08 (0.8)		
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.08 (0.8)	0.07 (0.7)		
Oil temperature	All speed (Oil in oil pan)	°C	90 – 110	120			
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0			
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	25.0 – 26.0 {255 – 265}	20.1 {205}		
	Fuel injection timing	B.T.D.C.	degree	15.25 – 16.75	15.25 – 16.75		
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	54.0 – 83.4 {0.55 – 0.85}	54.0 – 83.4 {0.55 – 0.85}		
	Fan speed	At rated engine speed	rpm	1,701 – 1,785	1,701 – 1,785		
	Fan belt tension	Deflects when pushed with a force of 59 N (6 kg)	mm	10	8 – 12		

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S6D125-2

FD250-2		FD400-2		EG220BS-2	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
2,250 - 2,350	2,250 - 2,350	2,250 - 2,350	2,250 - 2,350	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)
650 - 700	650 - 700	650 - 700	650 - 700	700 - 800	700 - 800
Min. 100	-	Min. 100	-	Min. 100	-
Min. 85	-	Min. 85	-	Min. 85	-
Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}	Max. 3.92 {400}	7.47 {762}
Min. 79.8 {600}	63.8 {480}	Min. 79.8 {600}	63.8 {480}	-	-
Min. 66.5 {500}	53.2 {400}	Min. 79.8 {600}	53.2 {400}	-	-
Max. 650	700	Max. 650	700	Max. 700	700
Max. 6.0	8.0	Max. 6.0	8.0	-	-
Max. 1.5	2.5	Max. 1.5	2.5	Max. 1.5	2.5
Max. 1.0	2.0	Max. 1.0	2.0	Max. 1.0	2.0
0.33	-	0.33	-	0.33	-
0.71	-	0.71	-	0.71	-
Min. 3.3 {34}	2.4 {24}	Min. 3.3 {34}	2.4 {24}	Min. 2.9 {30}	2.5 {26}
Max. 0.98 {100}	1.96 {200}	Max. 0.98 {100}	1.96 {200}	Max. 1.27 {130}	2.55 {260}
0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}
0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}
Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.08 {0.8}
Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}
90 - 110	120	90 - 110	120	90 - 110	120
Max. 0.5	1.0	Max. 0.5	1.0	Max. 0.5	1.0
24 - 26 {245 - 265}	20.1 {205}	24 - 26 {245 - 265}	20.1 {205}	27.9 - 28.7 {285 - 293}	22.3 {228}
15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	11.25 - 12.75	11.25 - 12.75
-	-	-	-	39.2 - 58.8 {0.4 - 0.6}	39.2 - 58.8 {0.4 - 0.6}
1,460	1,460	1,390	1,390	1,450 - 1,550 (50Hz) 1,750 - 1,850 (60Hz)	1,450 - 1,550 (50Hz) 1,750 - 1,850 (60Hz)
10	8 - 12	10	8 - 12	8	6 - 10

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Engine model				S6D125-2				
Applicable machine model				DCA-220SSK (MQ generator)				
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value	
Performance	Engine speed	High idling speed	rpm	Max. 1,890 (60 Hz)	Max. 1,890 (60 Hz)			
		Low idling speed	rpm	700 – 800	700 – 800			
	Necessary starting speed	0°C (Without starting aid) -20°C (With starting aid)	rpm	Min. 100 Min. 85	- -			
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 2.94 {300}	7.47 {762}			
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	Min. 79.8 {600}	63.8 {480}			
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	Min. 66.5 {500}	53.2 {400}			
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 670	700			
	Exhaust gas color	Quick acceleration (Low idle → high idle)	Bosch index		-	-		
		At rated flywheel horsepower	Bosch index		Max. 1.5	2.5		
Valve clearance (Whel engine is hot or cold)	Intake valve		mm	0.33	-			
	Exhaust valve		mm	0.71	-			
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 2.9 {30}	2.0 {20}			
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 1.27 {130}	2.55 {260}			
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}			
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.15 {1.5}	0.08 {0.8}			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.10 {1.0}	0.07 {0.7}			
Oil temperature	All speed (Oil in oil pan)	°C	90 – 110	120				
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0				
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	27.9 – 28.7 {285 – 293}	22.3 {228}			
	Fuel injection timing	B.T.D.C.	degree	11.25 – 12.75	11.25 – 12.75			
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	-	-			
	Fan speed	At rated engine speed	rpm	1,220 – 1,300 (60 Hz)	1,220 – 1,300 (60 Hz)			
	Fan belt tension	Deflects when pushed with a force of 59 N (6 kg)	mm	10	8 – 12			

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SA6D125-2

PC400-6 (CUSTOM), PC400LC-6 (CUSTOM) PC450-6 (MIGHTY), PC450LC-6 (MIGHTY) BR500JG-1		HD255-5		WA470-3		Standard value	Permissible value
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
2,050 - 2,150	-	2,400 - 2,500	2,400 - 2,500	2,400 - 2,500			
750 - 850	-	725 - 775	725 - 775	700 - 750			
Min. 100	-	Min. 100	-	Min. 100	-		
Min. 85	-	Min. 85	-	Min. 85	-		
Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}	Max. 2.94 {300}	7.47 {762}		
Min. 106 {800}	-	Min. 106 {800}	-	Min. 113 {650}	79.8 {600}		
Min. 80 {600}	-	Min. 80 {600}	-	Min. 79.8 {650}	73.1 {550}		
Max. 700	700	Max. 650	700	Max. 650	700		
Max. 5.5	7.5	Max. 5.0	7.0	Max. 6.0	8.0		
Max. 1.5	2.5	Max. 1.5	2.5	Max. 2.0	3.0		
Max. 1.0	2.0	Max. 1.0	2.0	Max. 1.0	2.0		
0.33	-	0.33	-	0.33	-		
0.71	-	0.71	-	0.71	-		
Min. 2.9 {30}	2.0 {20}	Min. 2.9 {30}	2.0 {20}	Min. 2.9 {30}	2.0 {20}		
Max. 100	200	Max. 80	160	Max. 0.78	1.6		
0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}		
0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}		
Min. 0.12 {1.2}	0.07 {0.7}	Min. 0.15 {1.5}	0.07 {0.7}	Min. 0.15 {1.5}	0.08 {0.8}		
Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}		
90 - 120	120	90 - 110	120	90 - 110	120		
Max. 0.5	1.0	Max. 0.5	1.0	Max. 0.5	1.0		
28.0 - 28.5 {285 - 290}	22.6 {230}	28.0 - 28.5 {285 - 290}	22.6 {230}	28.0 - 28.4 {285 - 290}	22.5 {230}		
15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	15.25 - 16.75	15.25 - 16.75		
39.2 - 58.8 {0.4 - 0.6}	39.2 - 58.8 {0.4 - 0.6}	-	-	58.84 - 78.45 {0.60 - 0.80}	58.84 - 78.45 {0.60 - 0.80}		
1,715 - 1,835	1,715 - 1,835	1,360 - 1,440	1,360 - 1,440	1,710 - 1,810	1,710 - 1,810		
8	6 - 10	10	8 - 12	10	7 - 13		

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Engine model				SA6D125-2				
Applicable machine model				FD430-2				
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value	
Performance	Engine speed	High idling speed	rpm	2,300 – 2,400	2,300 – 2,400			
		Low idling speed	rpm	800 – 850	800 – 850			
	Necessary starting speed	0°C (Without starting aid)	rpm	Min. 100	–			
		–20°C (With starting aid)	rpm	Min. 85	–			
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 2.94 (300)	7.47 (762)			
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	Min. 106 (800)	–			
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	Min. 79.8 (600)	–			
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 650	700			
	Exhaust gas color	Quick acceleration (Low idle → high idle)	Bosch index		Max. 6.0	8.0		
		At rated flywheel horsepower	Bosch index		Max. 1.5	2.5		
		High idling speed	Bosch index		Max. 1.0	2.0		
Valve clearance (When engine is hot or cold)	Intake valve	mm	0.33	–				
	Exhaust valve	mm	0.71	–				
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 2.9 (30)	2.0 (20)			
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 0.98 (100)	1.96 (200)			
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}			
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.15 (1.5)	0.08 (0.8)			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.10 (1.0)	0.07 (0.7)			
Oil temperature	All speed (Oil in oil pan)	°C	80 – 110	120				
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0				
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	27.9 – 28.7 {285 – 293}	22.5 {230}			
	Fuel injection timing	B.T.D.C.	degree	15.25 – 16.75	15.25 – 16.75			
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	–	–			
	Fan speed	At rated engine speed	rpm	1,460	1,460			
	Fan belt tension	Deflects when pushed with a force of 59 N (6 kg)	mm	10	8 – 12			

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SA6D125-2

EG300BS-5 (DENYO DCA300SPK)		DCA-300SSK (MQ generator)		J6D125E-G1-2		Standard value	Permissible value
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,570 (50 Hz) Max. 1,880 (60 Hz)	Max. 1,880 (60 Hz)	Max. 1,881 (60 Hz)	Max. 1,575 (50 Hz) Max. 1,890 (60 Hz)	Max. 1,575 (50 Hz) Max. 1,890 (60 Hz)		
700 - 800	700 - 800	700 - 800	700 - 800	700 - 800	700 - 800		
Min. 100	-	Min. 100	-	Min. 100	-		
Min. 85	-	Min. 85	-	Min. 85	-		
Min. 3.92 {400}	7.47 {762}	Min. 3.92 {400}	7.47 {762}	Min. 3.92 {400}	7.47 {762}		
-	-	-	-	-	-		
-	-	-	-	-	-		
Max. 700	700	Max. 650	700	Max. 650	700		
-	-	-	-	-	-		
Max. 1.5	2.5	Max. 1.5	2.5	Max. 1.0	2.5		
Max. 1.0	2.0	Max. 1.0	2.0	Max. 0.8	1.5		
0.33	-	0.33	-	0.33	-		
0.71	-	0.71	-	0.71	-		
Min. 2.9 {30}	2.0 {20}	Min. 2.9 {30}	2.0 {20}	Min. 3.3 {34}	2.4 {24}		
Max. 1.47	2.94	Max. 1.47	2.94	Max. 1.47 {150}	2.94 {300}		
0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}	0.29 - 0.49 {3.0 - 5.0}	0.21 {2.1}		
0.25 - 0.44 {2.5 - 4.5}	0.17 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}	0.25 - 0.44 {2.5 - 4.5}	0.18 {1.8}		
Min. 0.15 {1.5}	0.07 {0.7}	Min. 0.15 {1.5}	0.08 {0.8}	Min. 0.15 {1.5}	0.08 {0.8}		
Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}	Min. 0.10 {1.0}	0.07 {0.7}		
90 - 110	120	90 - 110	120	90 - 110	120		
Max. 0.5	1.0	Max. 0.5	1.0	Max. 0.5	1.0		
27.9 - 28.7 {285 - 293}	22.3 {228}	27.9 - 28.7 {285 - 293}	22.3 {228}	27.9 - 28.7 {285 - 293}	22.3 {228}		
13.25 - 14.75	13.25 - 14.75	13.25 - 14.75	13.25 - 14.75	14.0 - 16.0	14.0 - 16.0		
39.2 - 58.8 {0.4 - 0.6}	39.2 - 58.8 {0.4 - 0.6}	39.2 - 58.8 {0.4 - 0.6}	39.2 - 58.8 {0.4 - 0.6}	-	-		
1,450 - 1,550 (50Hz) 1,750 - 1,850 (60Hz)	1,450 - 1,550 (50Hz) 1,750 - 1,850 (60Hz)	1,750 - 1,850 (60Hz)	1,750 - 1,850 (60Hz)	1,455 - 1,545 (50Hz) 1,745 - 1,855 (60Hz)	1,455 - 1,545 (50Hz) 1,745 - 1,855 (60Hz)		
8	6 - 10	10	8 - 12	10	8 - 12		

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Engine model				SAA6D125-2				
Applicable machine model				PC400AC-6 PC400 • PC450-6 (USA) BR550JG-1				
	Item	Condition, etc.	Unit	Standard value	Permissible value	Standard value	Permissible value	
Performance	Engine speed	High idling speed	rpm	2,200 – 2,300	–			
		Low idling speed	rpm	675 – 725	–			
	Necessary starting speed	0°C (Without starting aid)	rpm	Min. 100	–			
		–20°C (With starting aid)	rpm	Min. 85	–			
Intake and exhaust system	Intake resistance	At all speed	kPa {mmH <sub>2</sub> O}	Max. 2.94 (300)	7.47 (762)			
	Boost pressure	At rated flywheel horsepower	kPa {mmHg}	Min. 106 (800)	–			
	Exhaust pressure (Turbine inlet press.)	At rated flywheel horsepower	kPa {mmHg}	Min. 80 (600)	–			
	Exhaust temperature (Turbine inlet temp.)	All speed (At 20°C)	°C	Max. 650	700			
	Exhaust gas color	Quick acceleration (Low idle → high idle)		Bosch index	Max. 5.5	7.5		
		At rated flywheel horsepower		Bosch index	Max. 1.5	2.5		
		High idling speed		Bosch index	Max. 1.0	2.0		
Valve clearance (When engine is hot or cold)	Intake valve		mm	0.33	–			
	Exhaust valve		mm	0.71	–			
Engine body	Compression pressure (SAE30 or SAE15W-40)	Oil temperature: 40 – 60°C (Engine speed: 150 – 200 rpm)	MPa {kg/cm <sup>2</sup> }	Min. 2.9 (30)	2.0 (20)			
	Blow-by pressure (SAE30 or SAE15W-40)	At rated flywheel horsepower (Water temp.: Min. 70°C)	mmH <sub>2</sub> O	Max. 0.98 (100)	1.96 (200)			
Lubrication system	Oil pressure (Oil temperature: min. 80°C)	At rated flywheel horsepower SAE30 or SAE15-40 oil	MPa {kg/cm <sup>2</sup> }	0.29 – 0.49 {3.0 – 5.0}	0.21 {2.1}			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	0.25 – 0.44 {2.5 – 4.5}	0.18 {1.8}			
		At low idling SAE30 or SAE15W-40 oil	MPa {kg/cm <sup>2</sup> }	Min. 0.15 (1.5)	0.08 {0.8}			
		SAE10W oil	MPa {kg/cm <sup>2</sup> }	Min. 0.10 (1.0)	0.07 (0.7)			
Oil temperature	All speed (Oil in oil pan)	°C	90 – 110	120				
Oil consumption ratio	At continuous rated (Ratio to fuel consumption)	%	Max. 0.5	1.0				
Fuel system	Fuel injection pressure	Nozzle tester	MPa {kg/cm <sup>2</sup> }	28.0 – 28.5 {285 – 293}	22.5 {230}			
	Fuel injection timing	B.T.D.C.	degree	8.5 – 9.5	8.5 – 9.5			
Cooling system	Radiator pressure valve	Opening pressure (Differential pressure)	kPa {kg/cm <sup>2</sup> }	0.04 – 0.06 {0.4 – 0.6}	0.04 – 0.06 {0.4 – 0.6}			
	Fan speed	At rated engine speed	rpm	1,805 – 1,915	1,805 – 1,915			
	Fan belt tension	Deflects when pushed with a force of 59 N {6 kg}	mm	8	6 – 10			

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SAA6D125-2

SAA6D125-P400 (50 Hz)		Generator (50 Hz only)					
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 1,575 (prime) Max. 1,600 (standby)	Max. 1,575 (prime) Max. 1,600 (standby)	Max. 1,575 (at rated) Max. 1,600 (at max.)	-				
700 - 800	700 - 800	700 - 800	-				
Min. 100	-	Min. 100	-				
Min. 85	-	Min. 85	-				
Min. 3.92 (400)	7.47 (762)	Min. 3.94 (400)	7.47 (762)				
Max. 112.5 (1,500)	99 (1,320)	Min. 200 (1,500)	Min. 176 (1,320)				
Max. 750 (1,000)	64.5 (860)	Min. 133 (1,000)	Min. 114 (860)				
Max. 750	750	Max. 750	750				
-	-	-	-				
Max. 1.5	2.5	Max. 1.5	2.5				
Max. 1.0	2.0	Max. 1.0	2.0				
0.33	-	0.33	-				
0.71	-	0.71	-				
Min. 2.9 (30)	2.0 (20)	Min. 2.9 (30)	2.0 (20)				
Max. 1.47 (150)	2.94 (300)	Max. 1.47 (150)	2.94 (300)				
0.29 - 0.49 (3.0 - 5.0)	0.21 (2.1)	0.29 - 0.49 (3.0 - 5.0)	0.21 (2.1)				
0.25 - 0.44 (2.5 - 4.5)	0.18 (1.8)	0.25 - 0.44 (2.5 - 4.5)	0.18 (1.8)				
Min. 0.15 (1.5)	0.07 (0.7)	Min. 0.15 (1.5)	0.07 (0.7)				
Min. 0.10 (1.0)	0.07 (0.7)	Min. 0.10 (1.0)	0.07 (0.7)				
90 - 110	120	90 - 110	120				
Max. 0.5	1.0	Max. 0.2	1.0				
27.0 - 28.7 (275 - 293)	22.5 (230)	28.0 - 28.5 (285 - 293)	22.6 (230)				
14.0 - 16.0	14.0 - 16.0	14.0 - 16.0	14.0 - 16.0				
58.8 - 78.5 (0.6 - 0.8)	58.8 - 78.5 (0.6 - 0.8)	58.8 - 78.5 (0.6 - 0.8)	58.8 - 78.5 (0.6 - 0.8)				
1,455 - 1,545	1,455 - 1,545	1,455 - 1,515	1,455 - 1,515				
10	8 - 12	10	8 - 12				

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# 13 DISASSEMBLY AND ASSEMBLY

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## DISASSEMBLY ..... 13-1

● SPECIAL TOOL LIST .....	13-2	21. Head covers .....	13- 9
1. Starting motor assembly .....	13-3	22. Nozzle holders .....	13- 9
2. Engine oil cooler assembly .....	13-3	23. Rocker arms .....	13-10
3. Setting to engine overhaul stand .....	13-3	24. Crossheads .....	13-10
4. Fan .....	13-4	25. Push rods .....	13-10
5. Engine mounts .....	13-4	26. Rocker arm housings .....	13-10
6. Air cleaner, bracket assembly .....	13-4	27. Cylinder head assemblies .....	13-11
7. Turbocharger, exhaust manifold assembly .....	13-5	28. Oil pan .....	13-11
8. Corrosion resistor and piping, wiring .....	13-5	29. Flywheel .....	13-12
9. Engine oil filter .....	13-5	30. Rear seal .....	13-12
10. Lubrication valve .....	13-6	31. Flywheel housing .....	13-13
11. Fuel filter .....	13-6	32. Front cover .....	13-13
12. Fuel injection pipes .....	13-6	33. Fuel injection pump drive gear .....	13-13
13. Aftercooler assembly .....	13-6	34. Cam follower covers .....	13-13
14. Fuel injection pump assembly .....	13-7	35. Cam followers .....	13-14
15. Alternator assembly .....	13-7	36. Camshaft .....	13-14
16. Thermostat housing, water pump .....	13-8	37. Oil pump .....	13-15
17. Fan pulley, drive assembly .....	13-8	38. Idler gear .....	13-15
18. Front support .....	13-8	39. Oil suction pipe .....	13-15
19. Crankshaft pulley, vibration damper .....	13-9	40. Piston, connecting rod assembly .....	13-16
20. Air vent tube, spill pipe .....	13-9	41. Crankshaft .....	13-17
		42. Piston cooling nozzle .....	13-18
		43. Cylinder liner .....	13-19

## ASSEMBLY ..... 13-21

## SPECIAL TOOL LIST

★ Tools with part number 790T-000-0000 cannot be supplied (they are items to be locally manufactured).

★ New/remodel: N : Tools with new part numbers, newly developed for this model  
R : Tools with upgraded part numbers, remodeled from items already available for other models

Blank : Tools already available for other models, used without any modification

★ Tools marked in the Sketch column are tools introduced in special sketches (See SKETCHES OF SPECIAL TOOLS).

Component	Symbol	Part No.	Part Name	Q'ty	New/ remodel	Sketch	Nature of work, remarks
A	1	790-501-2001	Repair stand	1			Reduction of labor when overhauling engine
	2	790-901-1240	Bracket	1			
B	1	• 795-102-2110	Handle	1			Kit part number: 795-102-2102 Removal, installation of valve spring
		• 795-102-2140	Bracket	1			
		• 795-102-2130	Bracket	1			
		• 01016-50830	Bolt	1			
		• 01580-10806	Nut	1			
		• 1144-31270	Stud	1			
		• 01580-11008	Nut	1			
C	1	795-931-1100	Seal puller	1			Removal of rear oil seal
		795-931-1220	Sleeve jig	1			Press fitting of rear oil seal
	2	01050-31645	Bolt	1			
		01050-31625	Bolt	1			
	3	1	795-931-1210	Sleeve jig	1		
		2	01050-31625	Bolt	1		
D	1	795-100-1191	Piston ring tool	1			Assembly of piston ring
	2	795-102-3900	Piston holder	1			Insertion of piston into cylinder liner
E		• 795-102-1100	Plate	1			Kit part number: 795-220-1000 Removal of cylinder liner
		• 795-102-1230	Plate	1			
		• 795-102-1130	Knuckle	1			
		• 795-102-1140	Stud	1			
		• 795-102-1150	Nut	1			
		• 01580-11613	Nut	1			
		• 01010-51670	Bolt	1			
F		795-225-1520	Liner driver	1			Press fitting of cylinder liner
G		790-331-1110	Wrench	1			• Tightening of cylinder head • Tightening of crankshaft cap 58.8 – 41.8 Nm (6 – 42 kgfm)
H		795-502-1121	Gauge	1			Measuring of protrusion of piston
I		• 790-101-5221	Grip	1			Kit part number: 790-101-5201 Press fitting of front oil seal
		• 790-101-5341	Plate	1			
		• 01010-51225	Bolt	1			

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**Preparation work**

- Clean off all mud and dirt.
- Drain engine coolant and engine oil.

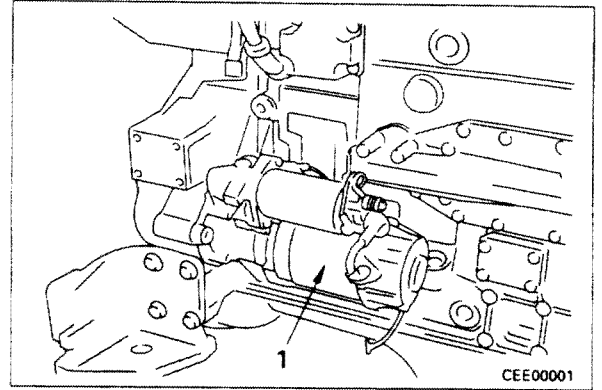


Engine oil: **Approx. 37 ℓ**

- Prepare a stable engine stand to prevent the engine from falling over, and secure the engine on the stand.



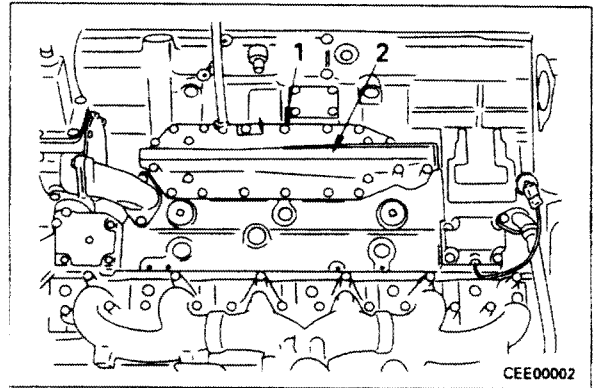
Engine assembly: **Approx. 1,175 kg**  
(The weight differs according to the machine model.)

**1. Starting motor assembly**

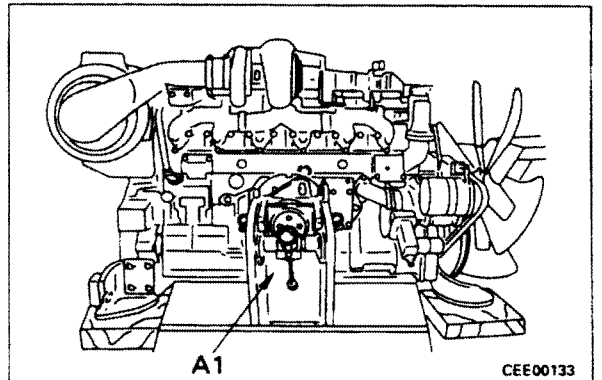
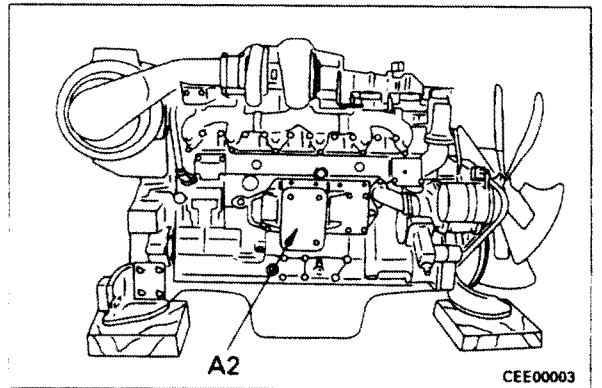
Remove starting motor assembly (1).

**2. Engine oil cooler**

Remove 17 mounting bolts (1), then remove engine oil cooler (2).

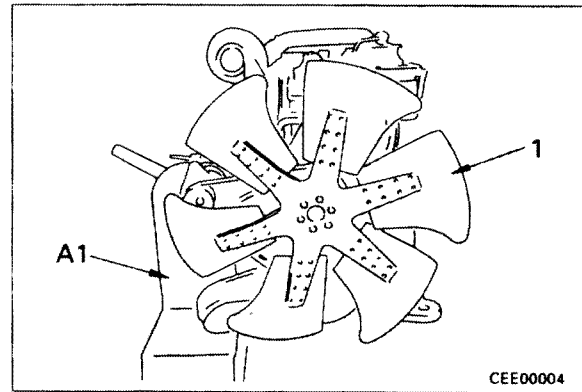
**3. Resetting to tool A1 (overhaul stand)**

- 1) Using oil cooler mounting bolt holes, install tool **A2**.
- 2) Raise engine assembly, then align connection bolt holes of tool **A1** with tool **A2**, and tighten bolts to secure tool **A1**.
- 3) Remove lifting tool.

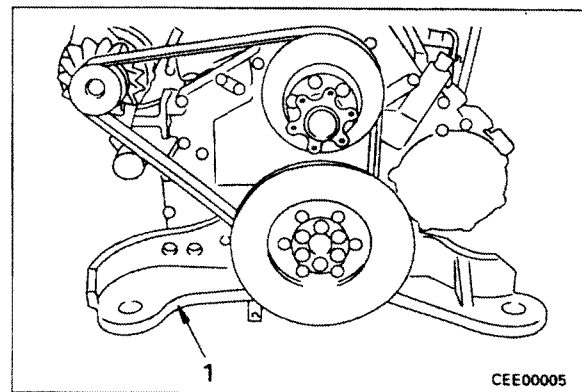


**4. Fan**

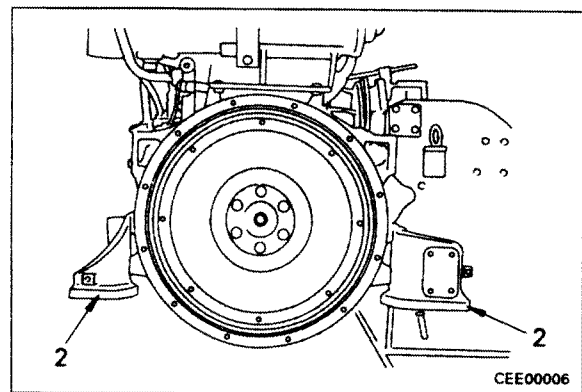
Remove fan (1).

**5. Engine mounts**

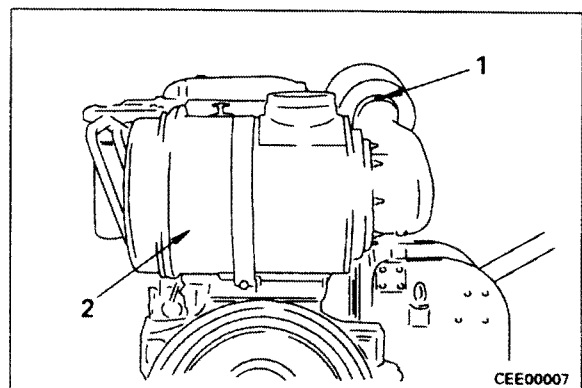
1) Remove engine front mount (1).



2) Remove 2 engine rear mounts (2).

**6. Air cleaner, bracket assembly**

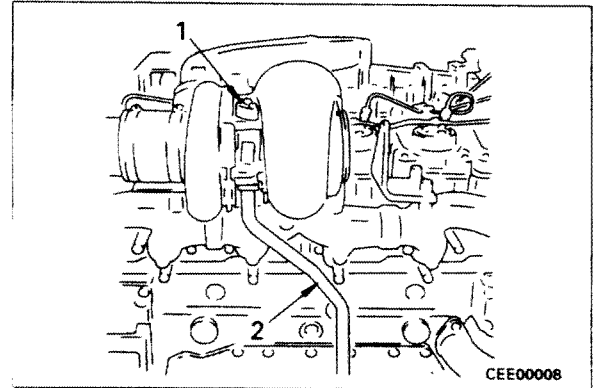
Disconnect hose (1) connecting to turbocharger, then remove mounting bolts, and lift off air cleaner and bracket assembly (2).



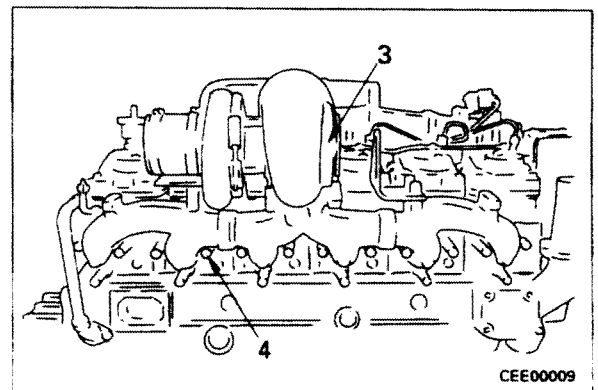
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**7. Turbocharger, exhaust manifold assembly**

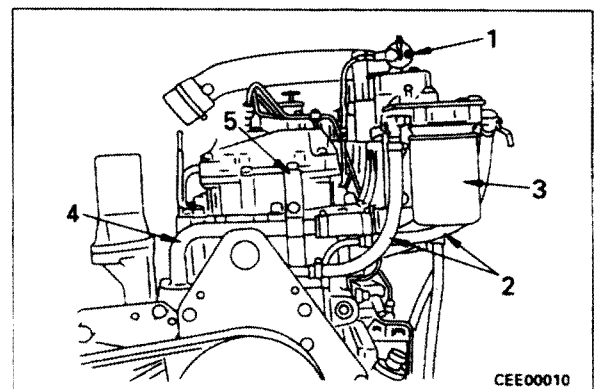
- 1) Remove turbocharger lubrication inlet tube (1) and outlet tube (2).



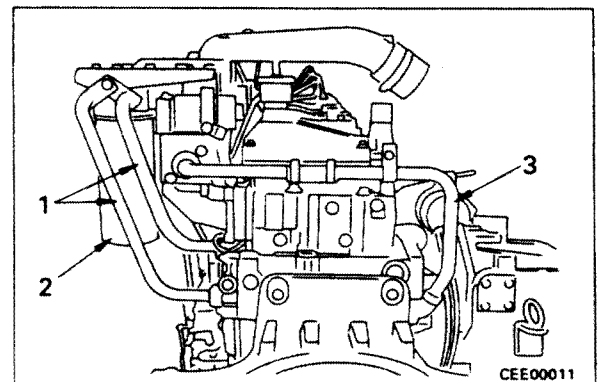
- 2) Disconnect intake connector hose connecting to aftercooler.
- 3) Raise turbocharger and exhaust manifold assembly (3), then remove 18 mounting bolts (4), and lift off.

**8. Corrosion resistor and piping, wiring**

- 1) Disconnect wiring of heater relay (1).
- 2) Disconnect hoses (2) and remove corrosion resistor (3) together with mounting bracket.
- 3) Remove aftercooler outlet pipe (4).
- ★ Disconnect the clamp from bracket (5).

**9. Engine oil filter**

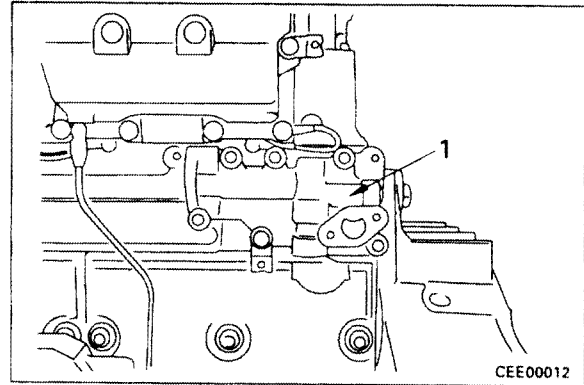
- 1) Remove pipes (1).
- 2) Remove engine oil filter (2) together with mounting bracket.
- 3) Remove aftercooler inlet pipe (3).
- ★ Disconnect the intermediate clamp.



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**10. Lubrication valve**

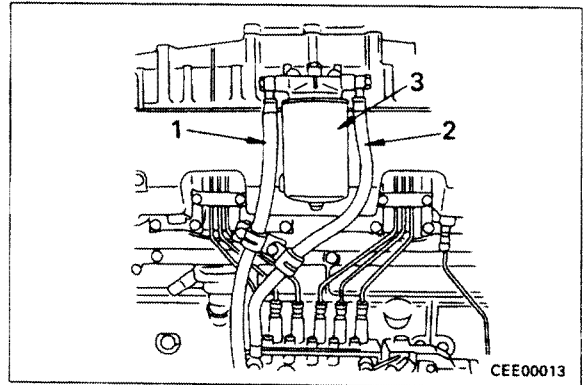
Remove lubrication valve (1).



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**11. Fuel filter assembly**

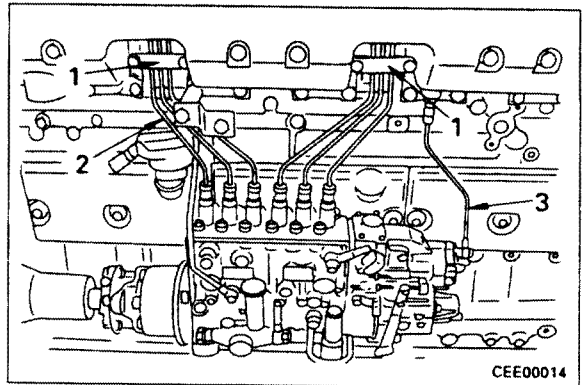
Disconnect hoses (1) and (2) from fuel injection pump, then remove fuel filter (3) together with mounting bracket.



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**12. Fuel injection pipes**

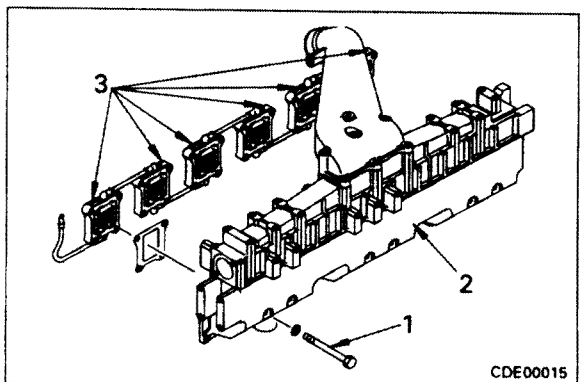
- 1) Remove 2 clamps (1), then remove 6 fuel injection pipes (2).
- 2) Remove boost compensation tube (3).



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**13. Aftercooler assembly**

- 1) Remove 24 mounting bolts (1), then remove aftercooler assembly (2).
- 2) Remove heaters (3).

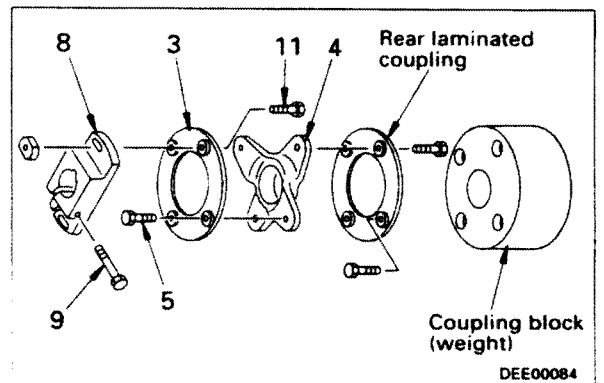
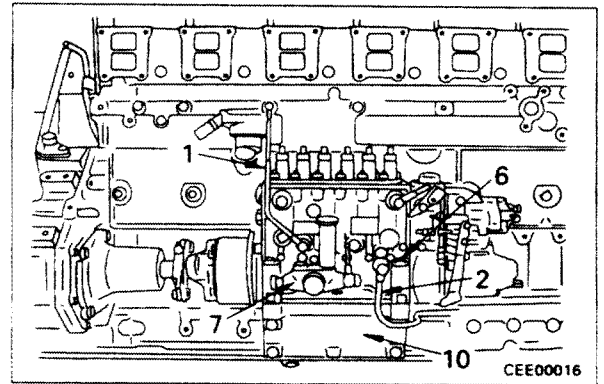


CDE00015

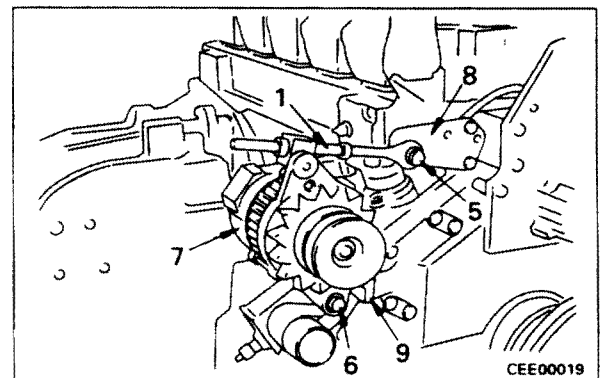
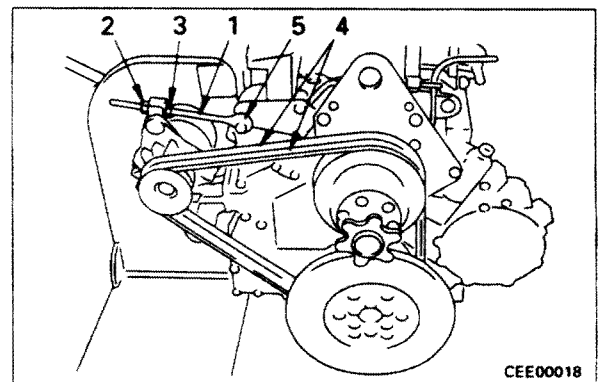
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**14. Fuel injection pump**

- 1) Remove lubrication tubes (1) and (2).
- 2) Remove 2 bolts (5) holding front laminated coupling (3) and cross coupling (4).
- 3) Remove 4 mounting bolts (6) of fuel injection pump.
- 4) Move fuel injection pump assembly (7) towards rear and remove.  
When doing this, leave flange coupling (8) and front laminated coupling (3) on drive shaft.
- 5) Remove bolt (9) connecting coupling and drive shaft, then remove flange coupling (8) and front laminated coupling (3).
- 6) Remove bracket (10).

**15. Alternator assembly**

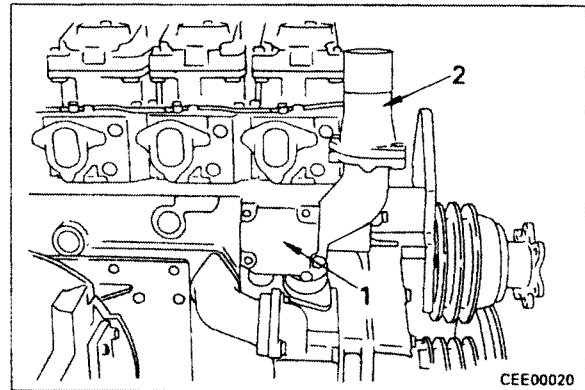
- 1) Loosen nuts (2) and (3) of alternator belt tension adjustment rod (1), then remove V-belt (4).
- 2) Remove alternator mounting bolts (5) and (6), then remove alternator assembly (7) together with belt tension adjustment rod (1).
- 3) Remove alternator mounting brackets (8) and (9).



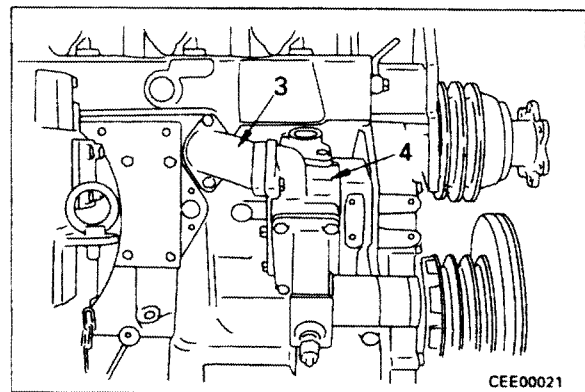


**16. Thermostat housing, water pump**

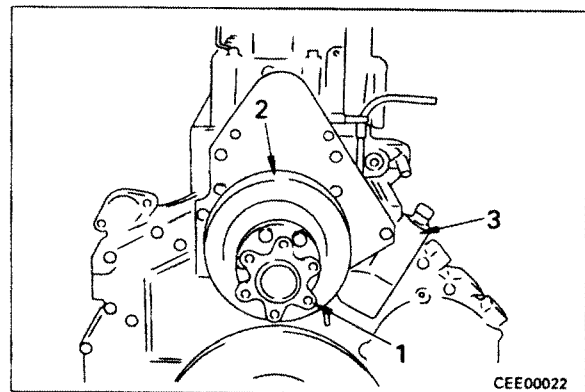
- 1) Remove mounting bolts, then remove thermostat housing (1) together with tube (2).



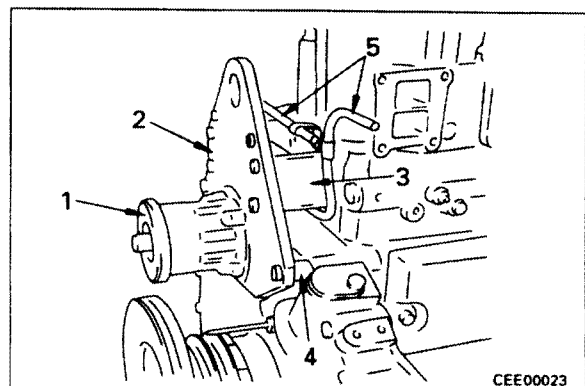
- 2) Remove tube (3) between water pump and cylinder block.
- 3) Remove water pump (4).

**17. Fan pulley, drive assembly**

- 1) Remove mounting bolts, then remove spacer (1) and pulley (2).
- 2) Remove drive assembly (3).

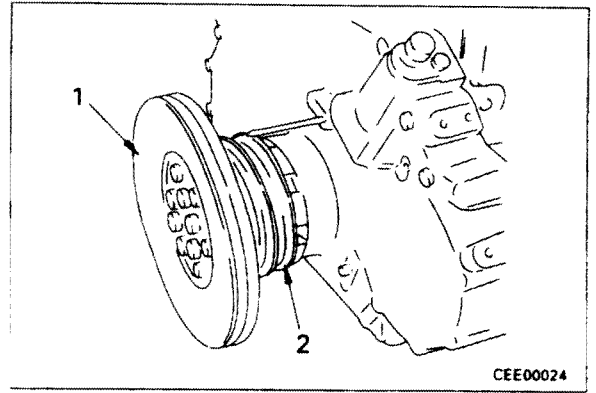
**18. Front support**

- 1) Remove front drive (1) together with front support (2).
  - ★ When doing this, 2 spacers (3) and (4) between front support (2) and the cylinder block will come out at the same time, so be careful not to lose them.
- 2) Remove tubes (5).
- 3) Remove fan drive (1) from support (2).



**19. Crankshaft pulley, vibration damper**

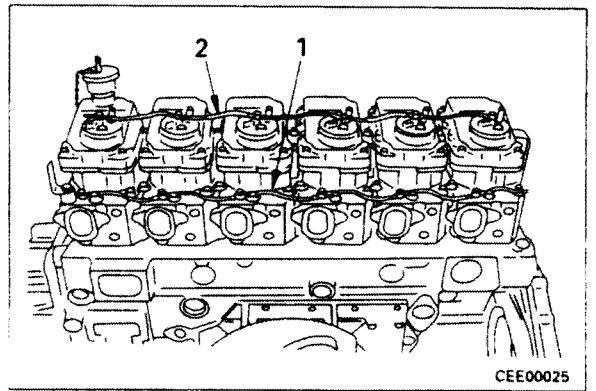
Remove vibration damper (1) together with crankshaft pulley (2).



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**20. Air vent tube, spill pipe**

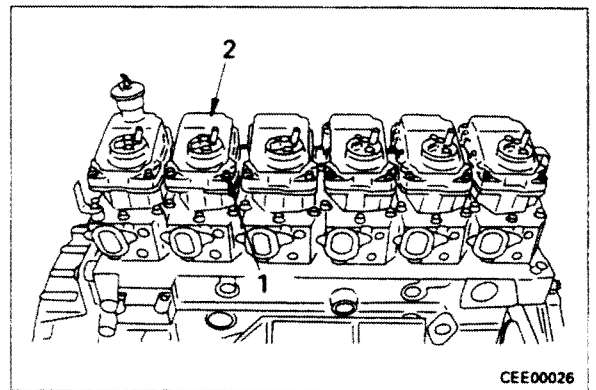
Remove air vent tube (1) and spill pipe (2).



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**21. Head covers**

Remove 24 mounting bolts (1), then remove 6 head covers (2).

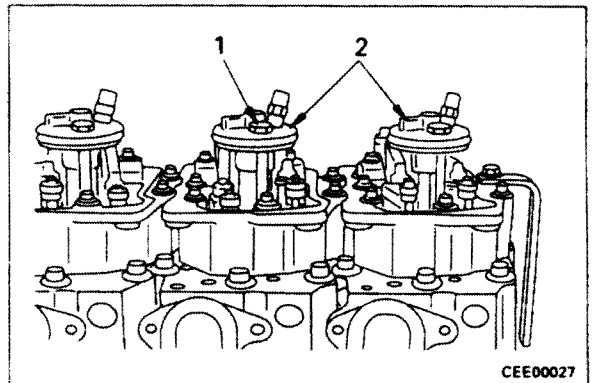


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**22. Nozzle holders**

Remove 12 mounting bolts (1), then remove nozzle holders (2).

★ Mark each nozzle holder with a number before removing. Keep the nozzle holders in a safe place and be careful not to damage them.



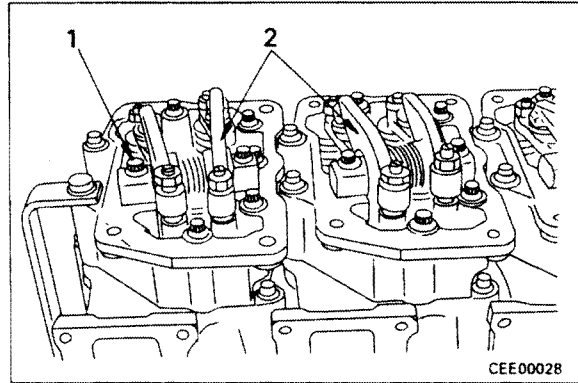
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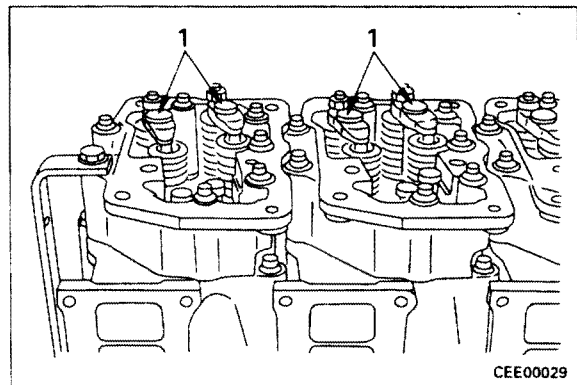
**23. Rocker arms**

Remove 12 mounting bolts (1), then remove 6 rocker arms (2).

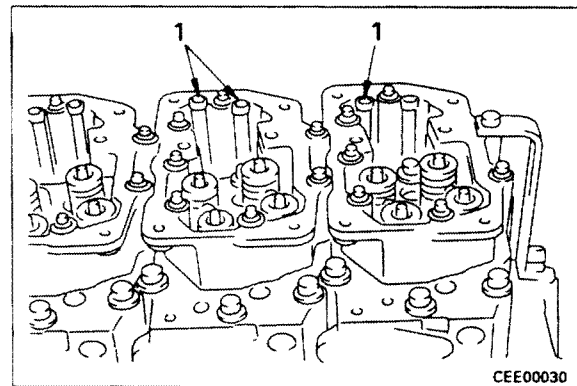
- ★ Loosen the lock nut of the adjustment screw, then loosen each adjustment screw 2 - 3 turns to avoid excessive pressure being brought to bear on the push rods when installing the rocker arm.

**24. Crossheads**

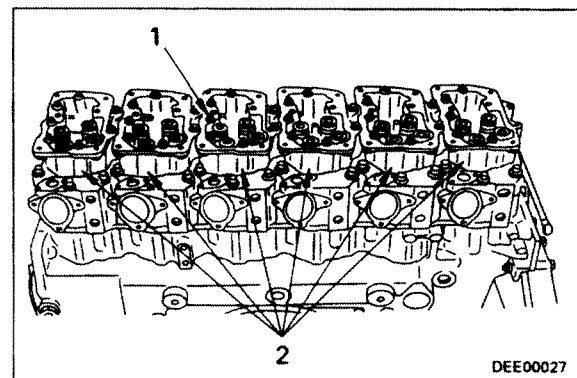
Remove 12 crossheads (1).

**25. Push rods**

Remove 12 push rods (1).

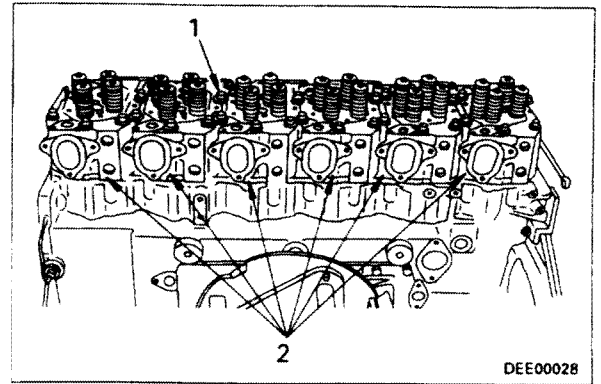
**26. Rocker arm housings**

Remove 42 mounting bolts (1), then remove rocker arm housings (2).



**27. Cylinder head assemblies**

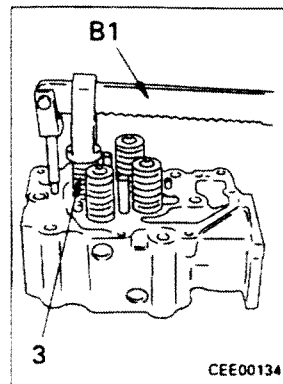
- 1) Remove 42 mounting bolts (1), then remove cylinder heads (2).
- 2) Remove each cylinder head gasket.



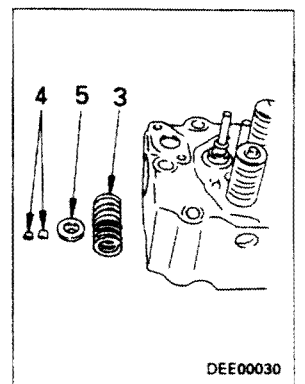
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- Disassemble cylinder head assembly as follows.

- i) Using tool **B1**, compress valve spring (3) and remove valve cotters (4).
- ii) Remove upper seat (5) and valve spring (3).

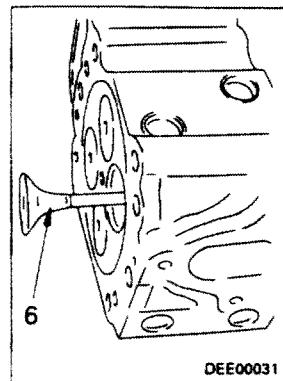


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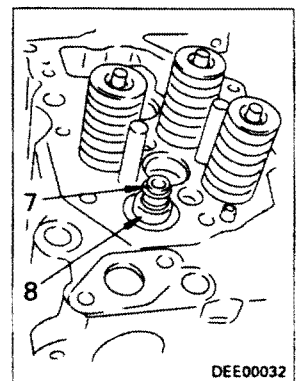


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- iii) Remove seal (7), then remove lower seat (8).
- iv) Raise cylinder head and remove valves (6).
  - ★ The seat is installed only on the exhaust side.
  - ★ Mark the valve with a number to show the combination with the head.



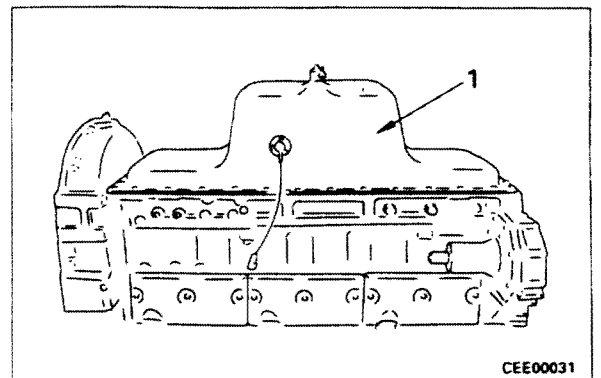
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**28. Oil pan**

Remove oil pan (1).

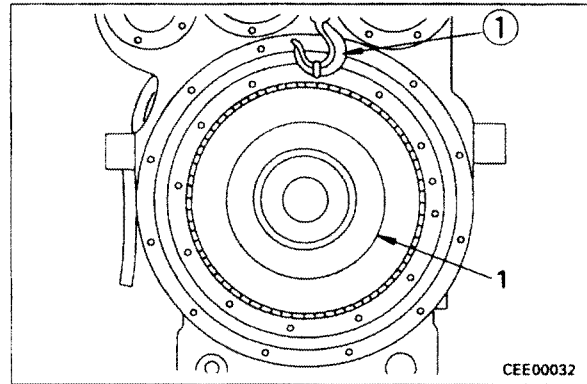


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**29. Flywheel**

Using eyebolt ① (Thread: 12 mm, Pitch=1.75 mm), sling flywheel (1), then remove mounting bolts, and lift off.

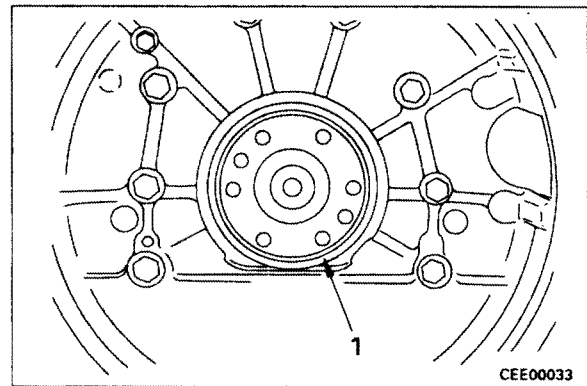
⚠ The pilot is short and the flywheel may come off suddenly, so be careful not to get your fingers caught.



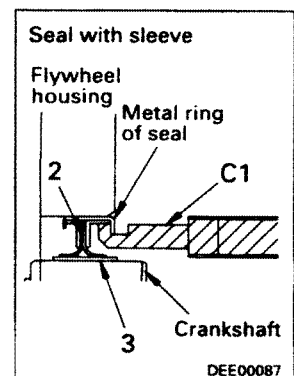
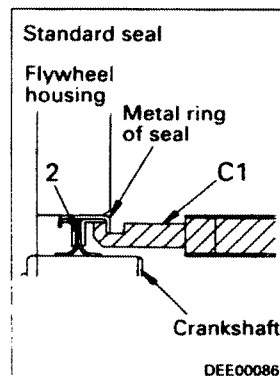
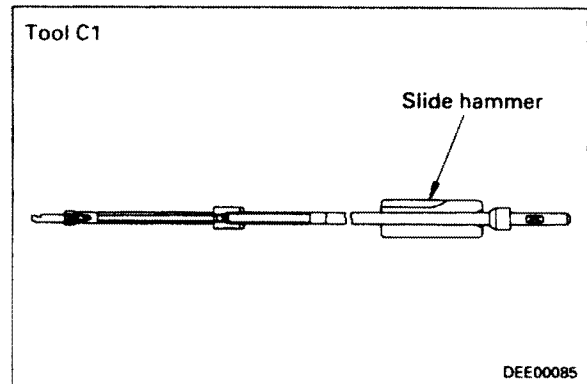
**30. Rear seal**

Remove rear seal (1) as follows.

- Removal of standard seal
  - Hook tip of tool C1 to metal ring of seal (2), then use impact force of slide hammer to remove seal.
  - ★ Before removing the seal, knock it in slightly to release the contact between the seal and the housing. This will make it easier to remove the seal.



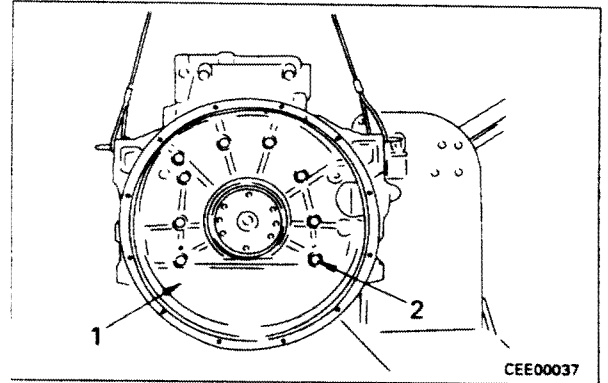
- Removal of seal with sleeve
  - 1) Hook tip of tool C1 to metal ring of seal (2), then use impact force of slide hammer to remove seal.
    - ★ Before removing the seal, knock it in slightly to release the contact between the seal and the housing. This will make it easier to remove the seal.
  - 2) Use a hammer and chisel to cut sleeve (3) to remove it.
    - ★ Be extremely careful not to damage the crankshaft when cutting the seal.
    - ★ If any metal particles are formed, be sure to remove them all completely.



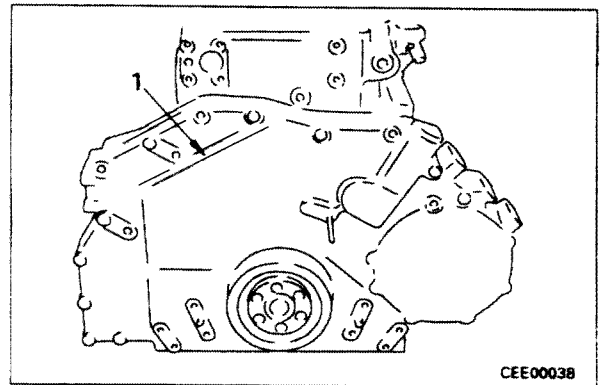
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**31. Flywheel housing**

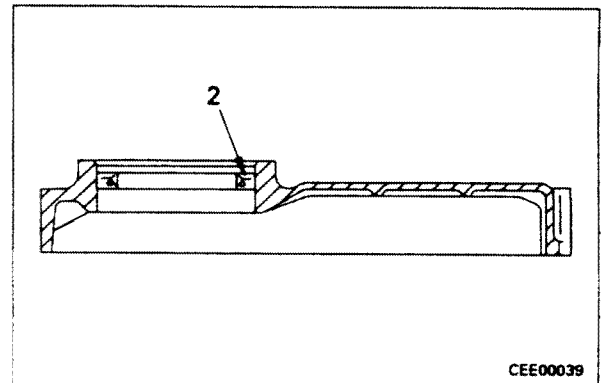
Sling flywheel housing (1), then remove mounting bolts (2) and lift off.

**32. Front cover**

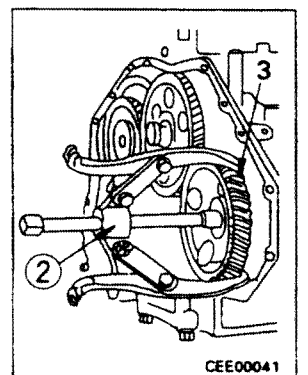
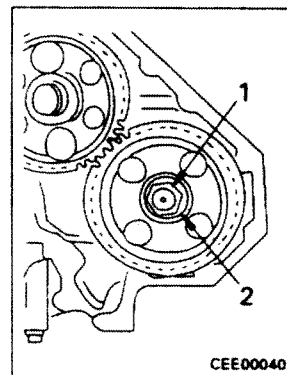
1) Remove front cover (1).



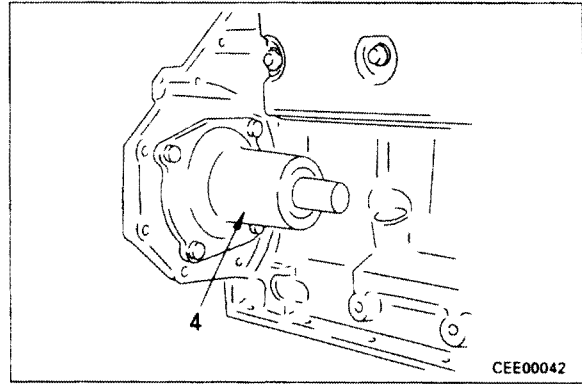
2) After removing front cover, remove oil seal (2).

**33. Fuel injection pump drive gear**

- 1) Remove nut (1), then remove washer (2).
  - ★ Insert a screwdriver between the gears to prevent the gear from turning when loosening the nut.
- 2) Using puller (2), pull out fuel injection pump drive gear (3).

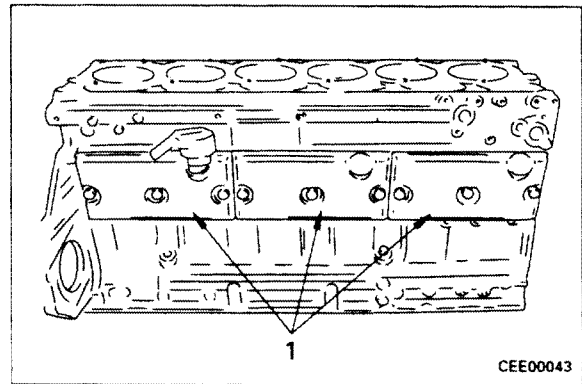


3) Remove drive case (4).



**34. Cam follower covers**

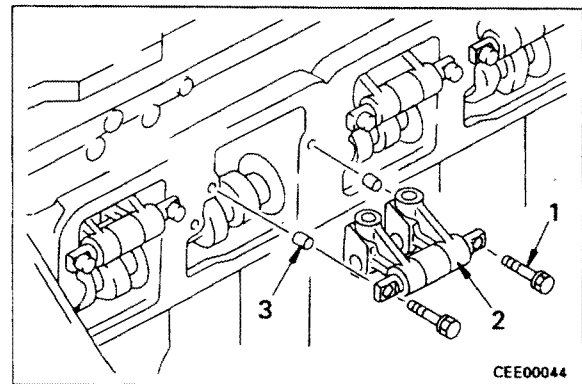
Remove cam follower covers (1).



**35. Cam followers**

Remove 12 mounting bolts (1), then remove cam followers (2).

★ Remove dowel rings (3).

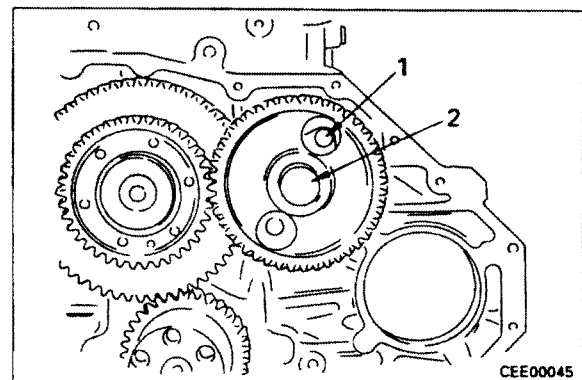


**36. Camshaft**

1) Remove 2 mounting bolts (1).

2) Remove camshaft (2).

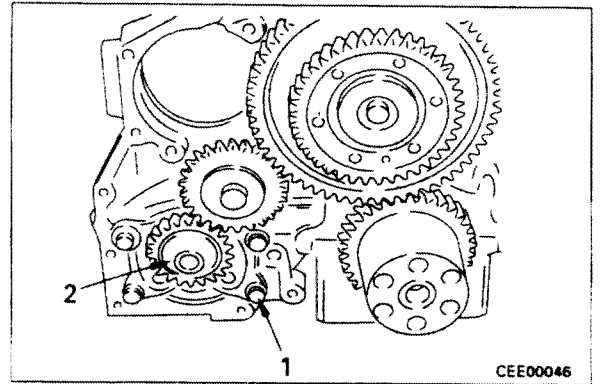
★ When removing the camshaft, rotate it and pull it out carefully to prevent damage to the cam bushing.



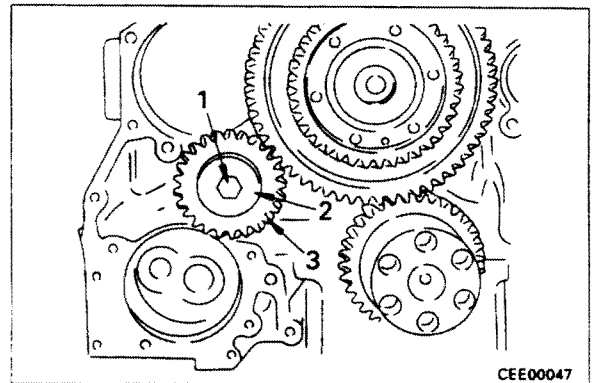
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**37. Oil pump**

Remove 4 mounting bolts (1), then remove oil pump (2).

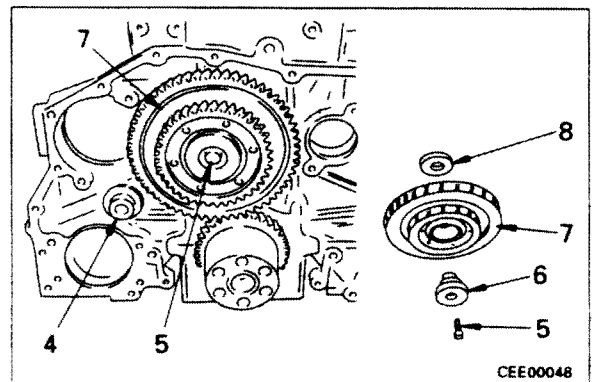
**38. Idler gear**

1) Remove mounting bolt (1), then remove plate (2) and oil pump idler gear (3).

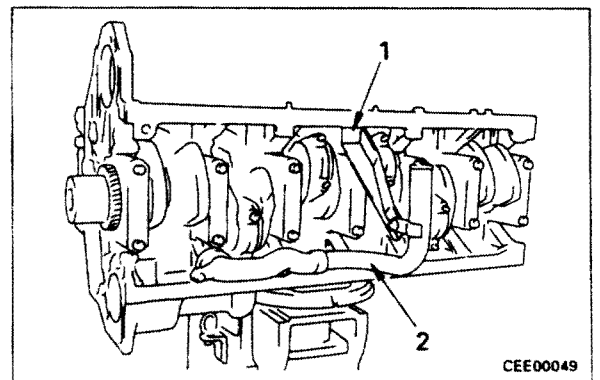


2) Remove shaft (4).

3) Remove mounting bolt (5), then remove shaft (6), main idler gear (7), and plate (8).

**39. Oil suction pipe**

Disconnect bracket (1), and remove oil suction pipe (2).





**40. Piston and connecting rod assembly**

- 1) Check stamp numbers on connecting rod caps.

(Make sure the cap number coincides with the cylinder number and also that the number is stamped on the cam side)

★ If there is no stamp number, stamp the number before the cap is removed.

- 2) Rotate the crankshaft so that piston to be removed is placed in bottom dead center.
- 3) Remove the carbon from the liner wall using a fine sand paper.

★ If necessary, measure the end play of the connecting rod using dial gauge ③ before removing the piston and connecting rod assembly.

- 4) Remove bolt (1) from the connecting rod cap.
- 5) Remove connecting rod cap (2) and the connecting rod lower bearing as a unit by tapping the connecting rod bolt with a plastic hammer.

★ Take care not to damage the screw.

- 6) Push the piston and connecting rod assembly from the oil pan side with a wooden stick. Hold piston (3) in your hand and remove it from the cylinder head side.

★ Take care not to damage the piston cooling nozzle.

(S6D125-2, SA6D125-2)

★ During removal, take care not to damage the inner surface of the liner with the connecting rod.

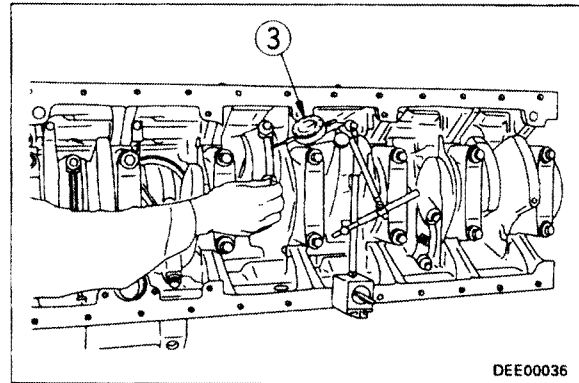
- 7) Remove the remaining piston and connecting rod assemblies in the same manner.

★ When storing the pistons and connecting rods, take care not to damage sliding portions of the piston and the bearings.

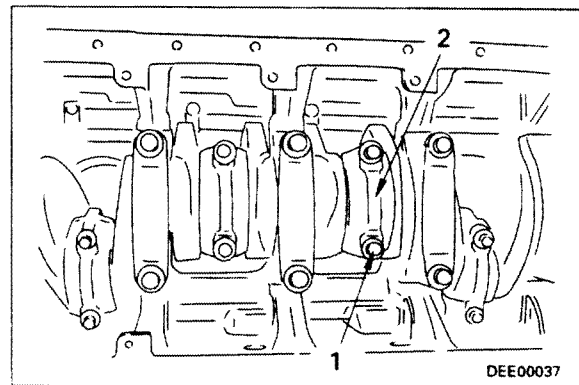
★ Keep the connecting rods and caps together, then store them with their corresponding bearings in order to avoid confusion during reassembly.

- Disassemble the piston and connecting rod assembly as follows.

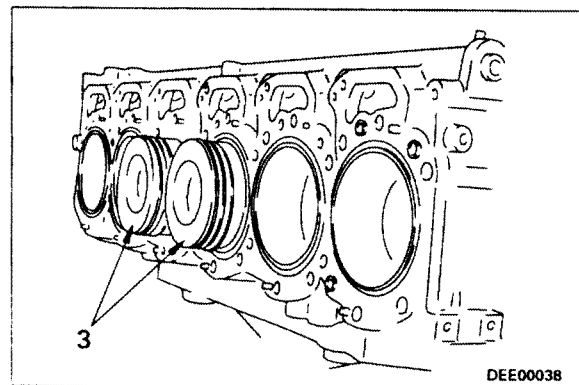
- i) Remove snap ring (4).
- ii) Pull out piston pin (6) while holding connecting rod (5) in your hand, and separate connecting rod from piston (7).
- iii) Remove the snap ring on the opposite side.



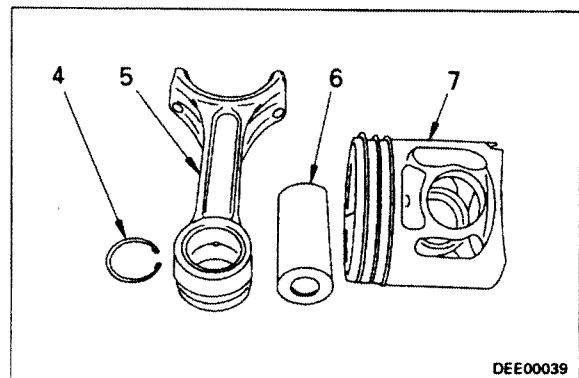
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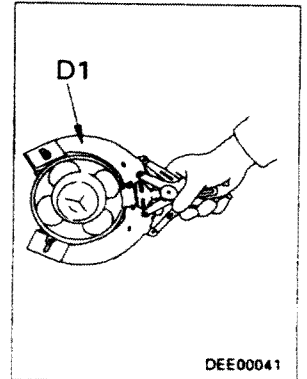
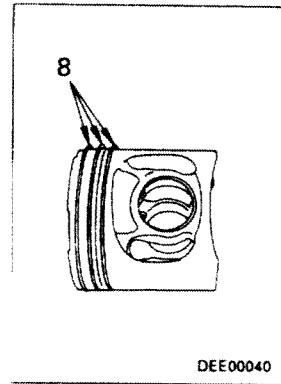
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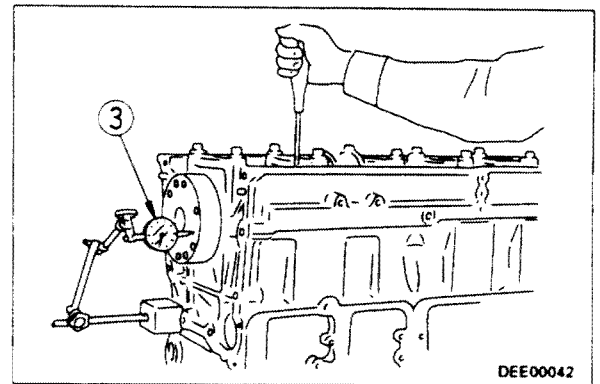
iv) Remove piston ring (8) using piston ring tool D1.

- ★ Store the piston, connecting rod, connecting rod bearings, piston rings, and piston pin for every cylinder.

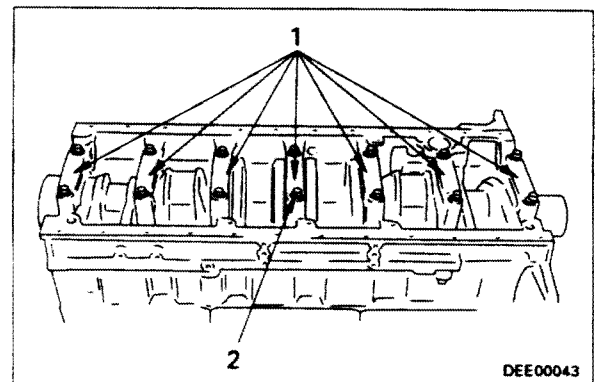


#### 41. Crankshaft

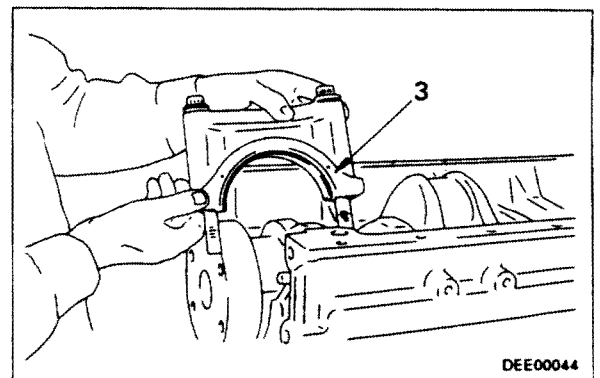
- ★ If necessary, measure the crankshaft end play using dial gauge (3) before removing the crankshaft.



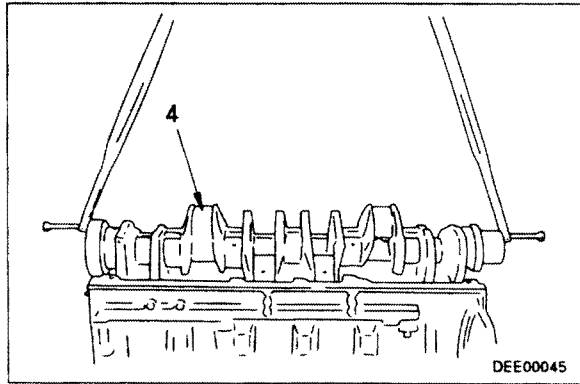
- 1) Remove mounting bolts (2) for main cap (1).
- 2) Insert a bolt into the hole on the main cap, and remove the main cap by shaking it.



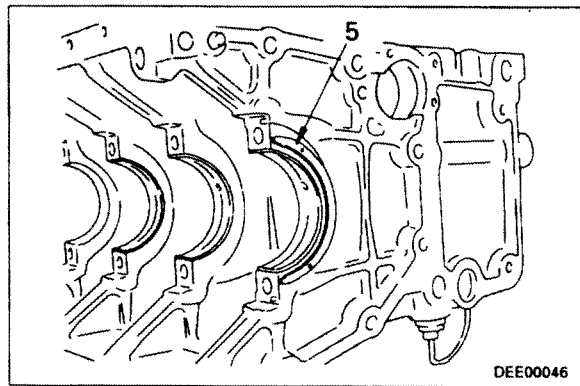
- 3) Since lower thrust bearing (3) is installed to main cap No. 7, mark the installation position after removing the cap.



- 4) Using nylon slings, lift off crankshaft (4).  
 ★ When lifting the crankshaft, take care not to let it hit against the cylinder block.  
 ★ Store the crankshaft in an appropriate place so that its sliding portions do not get damaged.

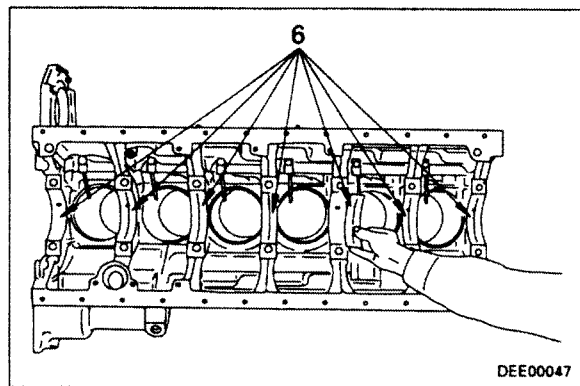


- 5) Remove upper thrust bearing (5).

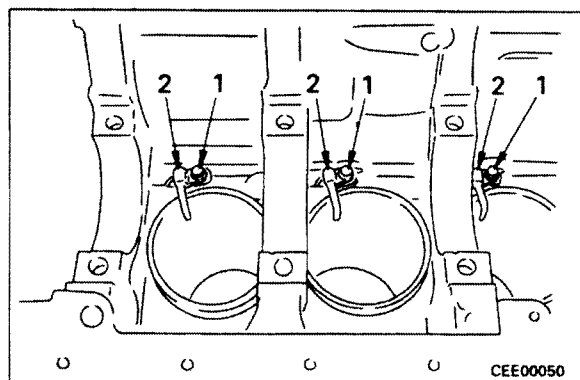


- 6) Remove upper bearing (6).

- ★ Put identification tags on the main caps, main bearings, and thrust bearings or mark their installation positions with a felt-tip pen, segregate them for each cap, and store them properly to protect them from damage.



42. Piston cooling nozzle (S6D125-2, SA6D125-2)  
 Remove mounting bolts (1) and each piston cooling nozzle (2).

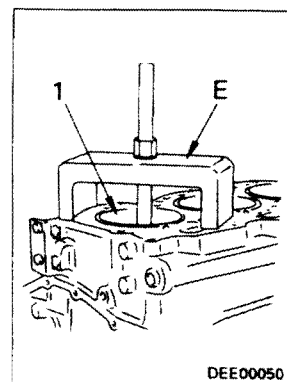
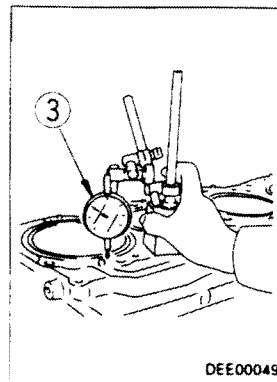


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**43. Cylinder liner**

- ★ If necessary, measure the cylinder liner protrusion using dial gauge ③ before removing the cylinder liners.

Pull out cylinder liners (1) using liner puller E.

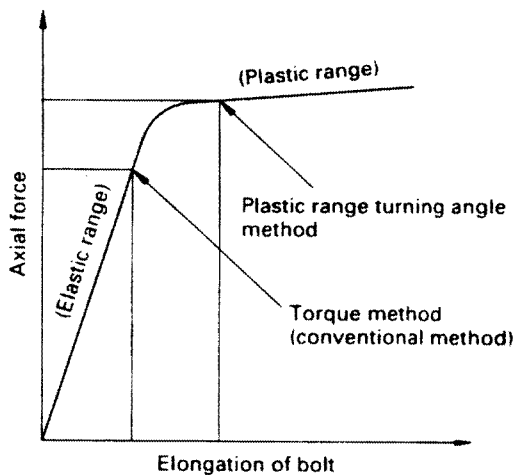


## ASSEMBLY

1. Cylinder liner .....	13-23	24. Rocker arms .....	13-47
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## TIGHTENING BOLTS BY THE PLASTIC RANGE TURNING ANGLE METHOD

- Important bolts in the 125-2 Series engines are tightened by the plastic range turning angle method. In this method, special bolts are used. By being tightened to the load (plastic range) at which they begin to be permanently deformed, accurate and high tightening force can be obtained. The most common method for tightening bolts is the torque control method. In this method, however, it is difficult to accurately control the tightening force because of the coefficient of friction.
- The plastic range turning angle method is based on the initial tightening torque and the turning angle.



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- ★ Elongation exceeding the elastic range results in permanent deformation.
- Bolts to be tightened by the plastic range turning angle method in the 125-2 Series engines.
  - 1) Cylinder head mounting bolts
  - 2) Main cap mounting bolts
  - 3) Connecting rod cap mounting bolts
- ★ In the plastic range turning angle method, the permanent strain remains in bolts after they are tightened. Therefore, the number of times that each bolt can be reused is limited. Observe the following precautions.
  - 1) Before tightening, measure the free length of bolt and check that bolt length exceeds tolerance limit or not. Do not reuse any bolt which has exceeded the tolerance limit. Before tightening, measure the free length of bolt and check that bolt length exceeds tolerance limit or not.
  - 2) If a bolt has been tightened in excess of the specified turning angle, loosen the bolt and measure the free length of bolt again.

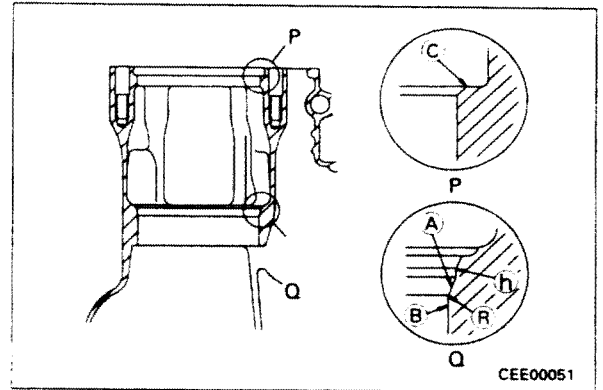
- 3) The tightening angle should be targeted at the standard value plus or minus tolerance.
- ★ Clean every part thoroughly and check the part for dents, flaws, and blowholes. When assembling the parts, make sure that none of the oil and water passages are blocked.

### Preparation work

- Install adapter to the cylinder block, then raise it and place it on engine overhaul stand.
- Repair the cylinder block as follows before inserting the cylinder liners.
  - 1) Remove rust and scale from surfaces (A) and (B) with sandpaper until the machined surface is exposed.
  - 2) Polish portion (R) with No. 240 sandpaper to make surface (R) smooth.
  - 3) Polish portions (R) and (h) with No. 240 sandpaper to make them smooth. If portion (R) is square or burred, polish it with sandpaper or a scraper. Finish this portion to an especially smooth surface to protect the O-ring from damage.
  - 4) If the pitting in surface (B) is so rough that it cannot be repaired, replace the cylinder block.

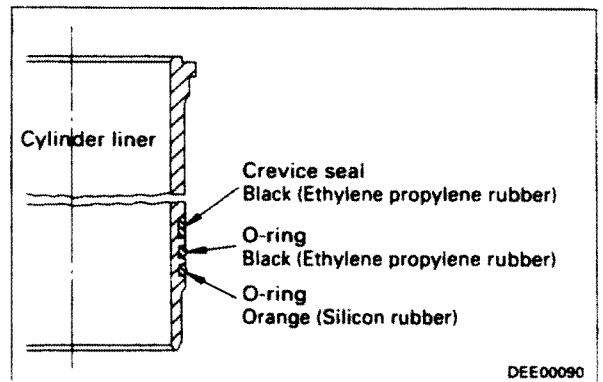
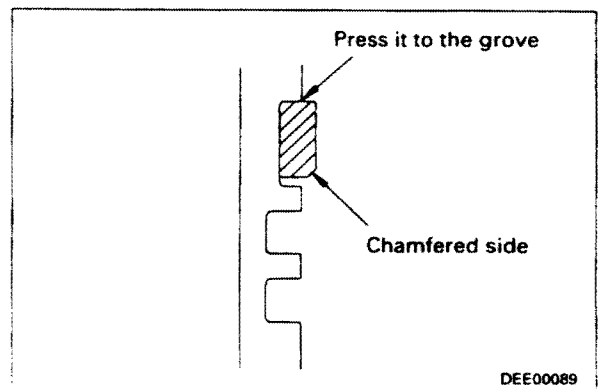
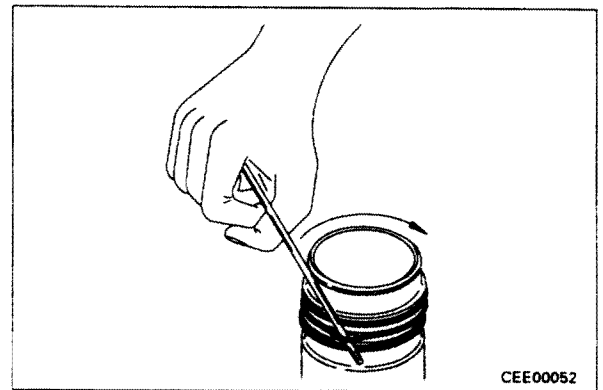
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- 5) If surface **A** and portion **B** are roughened with pitting, finish them smooth.
- 6) Inspect the counterbore section and remove any burrs. Chips and dirt on surface **C** will cause poor contact of the liner, which will lead to water leakage or improper liner projection.
  - ★ Repair the counterbore section if there is any drooping, corrosion, or pitting.



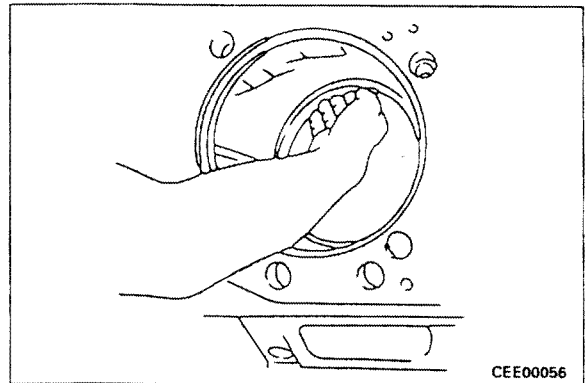
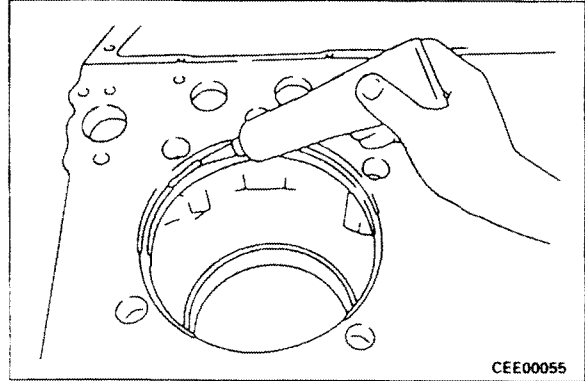
**1. Cylinder liner**

- ★ Replace the liner O-ring and clevis seal with new parts just before assembling the liner.
- Method of installing liner O-rings and clevis seal
  - 1) Confirm that the cylinder liner O-ring grooves and the circumference of the liner are free from rust and pitting.
    - ★ If these surfaces are roughened with pitting, replace the liner to remove the cause of water leakage.
  - 2) Coat liner O-rings and clevis seals with SAE No. 30 engine oil.
    - ★ The clevis seal and black O-ring will become swollen and degraded because of oil. To prevent this, do not leave these parts immersed in oil.
    - ★ Apply a little oil with a brush just before assembling the parts.
  - 3) After fitting the O-ring on the cylinder liner, check that it is not twisted. If it is twisted, use a smooth bar (approx. 10 mm O.D.) to remove the twist from the O-ring.
  - 4) To prevent the clevis seal from twisting, continue to press the whole circumference until it is installed properly in the groove.
  - 5) Install the liner O-ring and clevis seal as shown in the diagram.
    - ★ Install the clevis seal with the chamfered side down.




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- Method of inserting cylinder liners
  - 1) Coat the counterbore with gasket sealant (LG-6).
    - ★ Diameter of line of sealant:  
 $\varnothing 1.5 - 2.0 \text{ mm}$
  - 2) Coat the liner O-ring and cylinder block O-ring groove with clean engine oil (SAE30).
    - ★ Coat by hand uniformly around the whole circumference.
  - 3) Set the "A or B" mark on the top surface of the liner facing the front, then insert the liner into the cylinder block, taking care not to damage the O-ring.
  - 4) Insert the liner by pushing with both hands and using all your weight.
    - ★ If the liner does not go in smoothly when you push with your weight, there is danger that the O-ring may be damaged, so check for any burrs or flashes on the cylinder block.

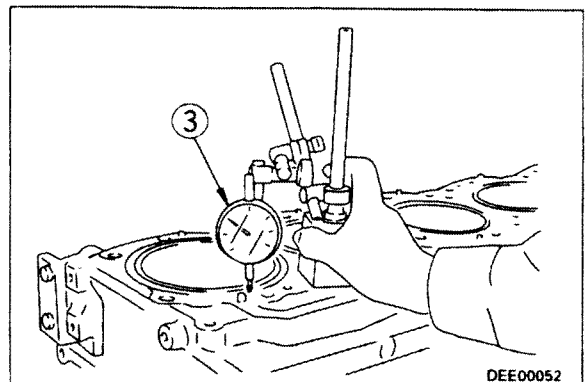
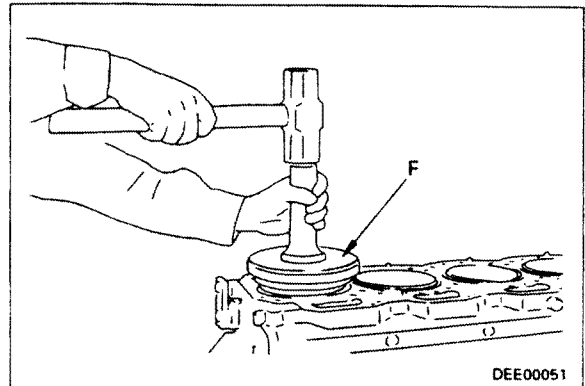


- 5) Using liner driver F, press fit cylinder liner (1) to the cylinder block.
  - ★ Use the following procedure to squeeze out the gasket sealant coated on the counterbore.
    - i) Use an old head gasket and tighten the cylinder head temporarily.

 **Mounting bolt : 127 – 147 Nm  
(13 – 15 kgm)**

- ii) Remove the cylinder head, then wipe off all the gasket sealant that was squeezed out between the cylinder liner and cylinder block.

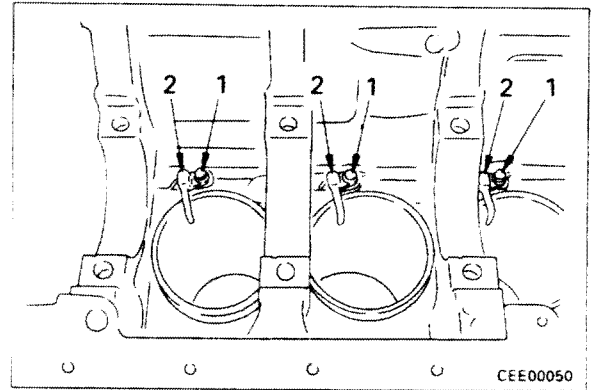
- If the gasket sealant gets on the grommet in the head gasket, it will deform the grommet and this will cause water leakage, so be careful to wipe off all the gasket sealant.
- 6) After press fitting the cylinder liner, use dial gauge ③ and measure the protrusion of the cylinder liner.
  - ★ When measuring the protrusion of the liner, press the liner with a plate to remove any rise of the liner caused by the O-ring.
  - ★ Cylinder liner protrusion :  
 $0.07 - 0.15 \text{ mm}$
  - ★ If the measurement is not within the specified value, take the action given in MAINTENANCE STANDARD.



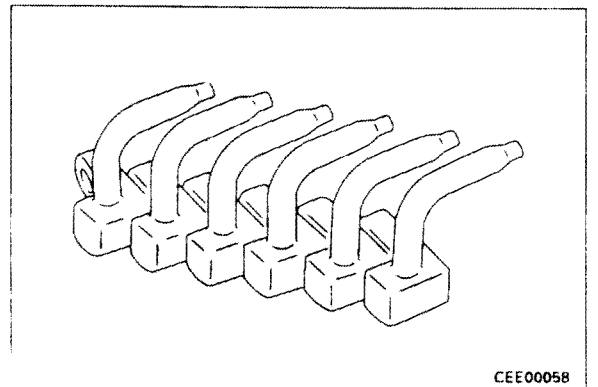
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2. **Piston cooling nozzle (S6D125-2, SA6D125-2)**  
Fit each piston cooling nozzle (2), then tighten mounting bolts (1).

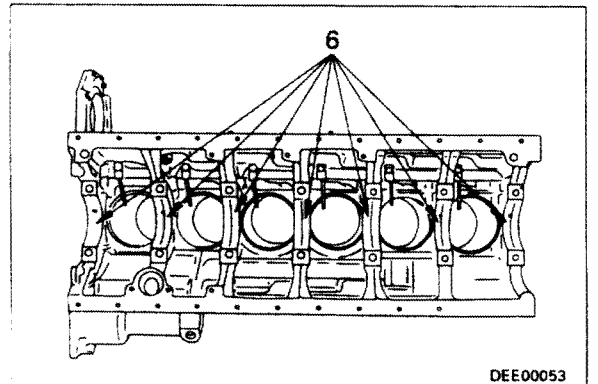


- ★ Before assembling the nozzles, put them side by side and check that there is no bending or other defect.

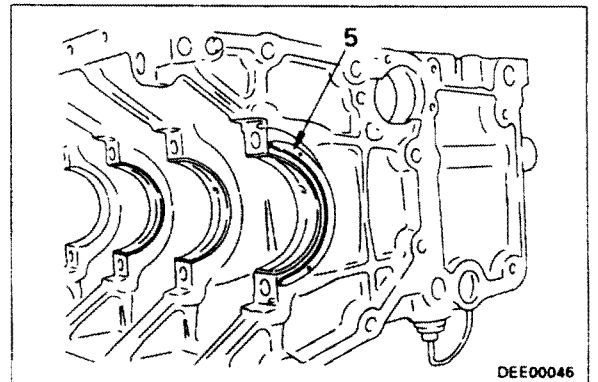


### 3. Crankshaft

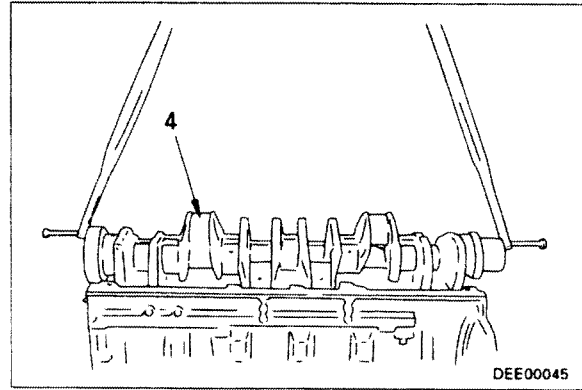
- ★ The cylinder block and main bearing are selective fitting parts, but spare parts are available for supply to maintain the clearance.
- 1) Align the protrusion of upper main bearing (6) with the groove in the cylinder block, and assemble to the cylinder block.
- ★ Check that there is no dirt or dust stuck to the rear face of the bearing before installing. Coat the inside surface of the bearing with SAE 30 engine oil. Do not coat the rear surface with oil.



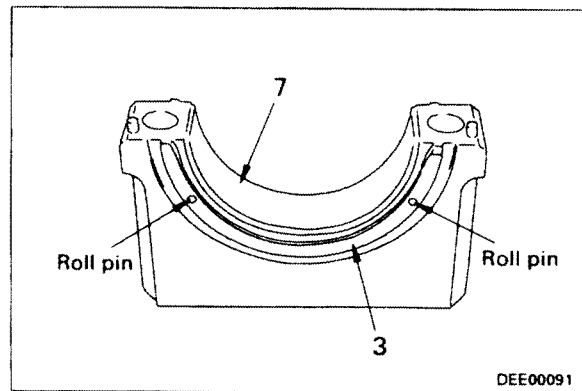
- 2) Drive in the roll pin so that the protrusion from the end face of the block is 1.5 – 1.9 mm, and install upper thrust bearing (5).
- ★ Assemble the thrust bearing so that the side with the groove is on the crankshaft side.



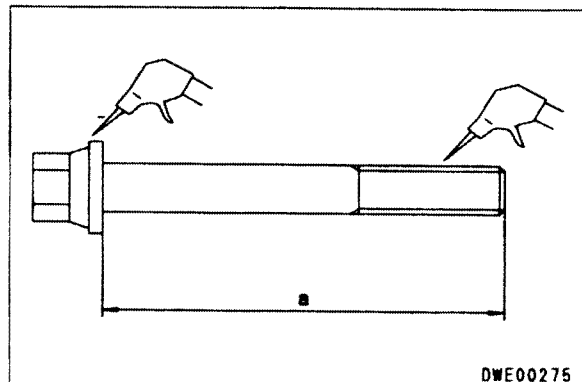
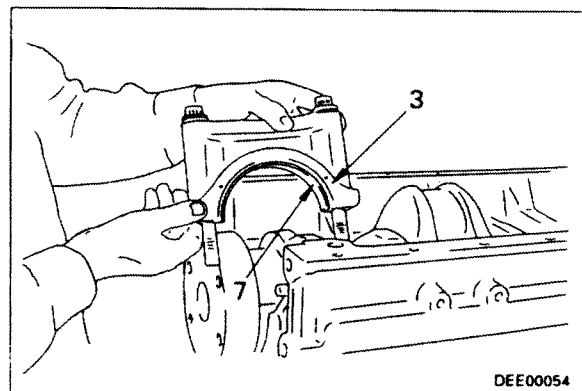
- 3) Before assembling the crankshaft, check the following points.
  - i) Check for abnormality in the front or rear side thread.  
(The bolt can be screwed in smoothly by hand)
  - ii) Check for any scratches or dents in the pin or main journal portion.
  - iii) Check for any dirt stuck inside the oil hole.
- 4) Using a nylon sling, raise crankshaft (4) and set it in the mounting position. When doing this, be careful not to let it hit the cylinder block and be damaged.
  - ★ When replacing the crankshaft gear, heat the new gear in an electric furnace at 200°C for at least 30 minutes, and shrink fit it.




- 5) Install lower main bearing (7) with the projected part of the bearing aligned with the groove on the main cap.
  - ★ Before installing the bearing, make sure that no foreign matter is stuck on the back of the bearing.
- 6) Drive the roll pin into the No. 7 cap until its protrusion reaches 1.5 to 1.9 mm from the end of the cap, and install thrust bearings (3) to both sides.
  - ★ Install the thrust bearings with the grooved side facing the crankshaft.
- 7) Coat the crankshaft journal with SAE30 engine oil, confirm that stamp No. on main cap (1) coincides with the number on the cylinder block, and install the main cap.
  - ★ Install the main cap with the cast number facing the engine front.



- 8) Before tightening main cap mounting bolt (2), make sure as follows.
  - i) Measure the free length **a** of all bolts and check that bolt length exceeds tolerance limit or not. Do not reuse any bolt which has exceeded the tolerance limit.  
Before tightening, measure the free length of bolt and check that bolt length exceeds tolerance limit or not.
  - ii) Tolerance limit of bolt free length:  
Max. 159.8 mm
    - ★ If the bolt length **a** exceeds tolerance limit, do not reuse.




- ★ Coat the main cap mounting bolt thread portion and main cap seat surface washer with engine oil (SAE30).
- 9) Tighten mounting bolts (2) of main cap (1) in turn to fit main cap fully.
- 10) Tighten main cap mounting bolts (2) as follows.
  - ★ When tightening the bolts, start from the center and work to the outside. Tighten the bolts to the specified tightening torque in the following steps.
  - When using tool G to tighten main cap mounting bolts

 Main cap mounting bolt

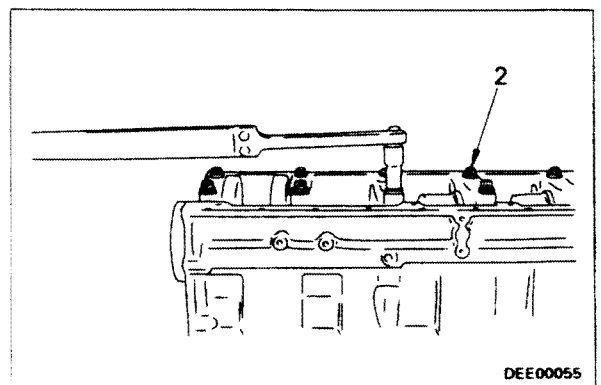
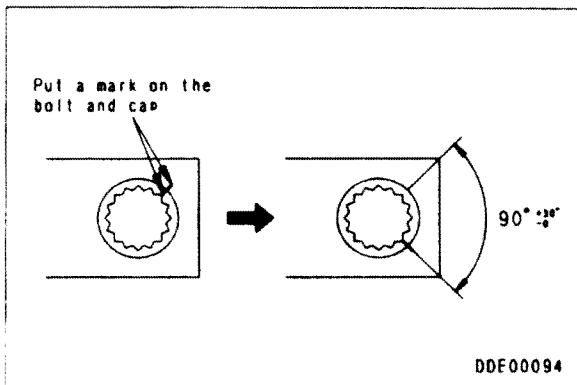
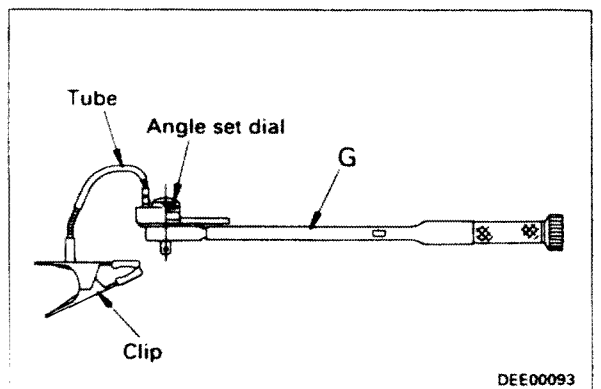
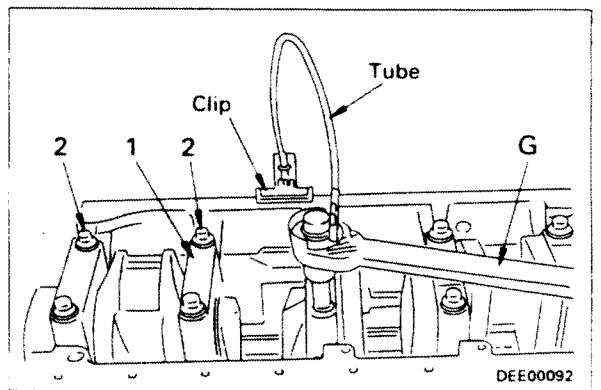
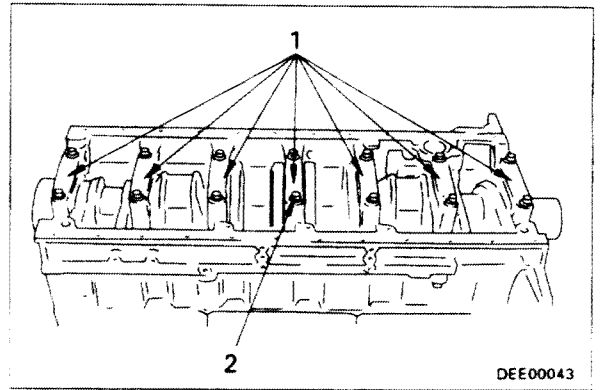
1st step : Tighten to  $98.1 \pm 9.8$  Nm  
( $10.0 \pm 1$  kgm)  
 2nd step: Tighten again to  $196.1 \pm 4.9$  Nm  
( $20.0 \pm 0.5$  kgm)  
 3rd step :  $90^{\circ} \begin{smallmatrix} +30^{\circ} \\ -0^{\circ} \end{smallmatrix}$

- i) Tighten mounting bolts to second stage with torque wrench or tool G.
- ii) With tool G set to mounting bolt, install tube and clip to tool G, then set clip to engine block.
- iii) Set angle scale of tool G to  $90^{\circ}$ , then tighten until scale reads  $0^{\circ}$ .
- When not using tool G

 Main cap mounting bolt

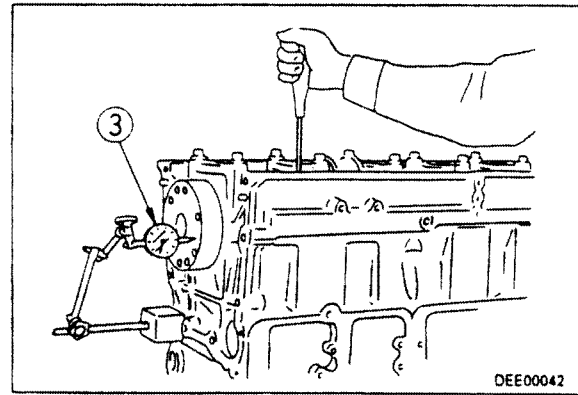
1st step : Tighten to  $98.1 \pm 9.8$  Nm  
( $10.0 \pm 1$  kgm)  
 2nd step: Tighten again to  $196.1 \pm 4.9$  Nm  
( $20.0 \pm 0.5$  kgm)  
 3rd step : Mark bot and cap with felt-tip pen, then tighten bolt  $90^{\circ} \begin{smallmatrix} +30^{\circ} \\ -0^{\circ} \end{smallmatrix}$

- With the above procedure, use a torque wrench to tighten the mounting bolts.



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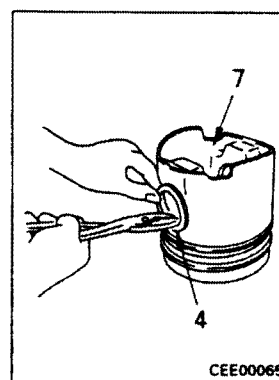
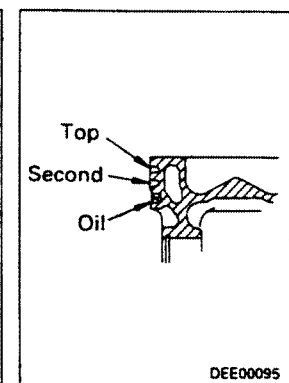
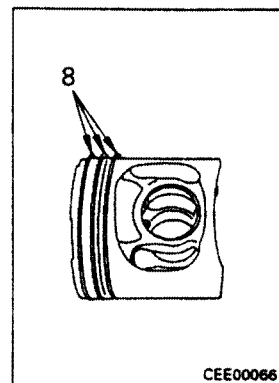
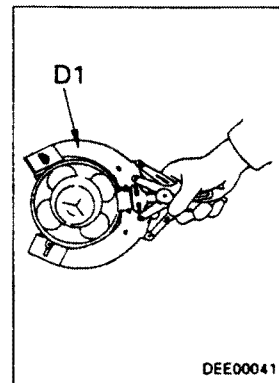
- 11) After tightening bolts, rotate crankshaft and check that it rotates smoothly.
- 12) Measure end play of crankshaft with dial gauge (3). If it is outside standard value, take action according to maintenance standard.
  - ★ End play: 0.14 – 0.315 mm



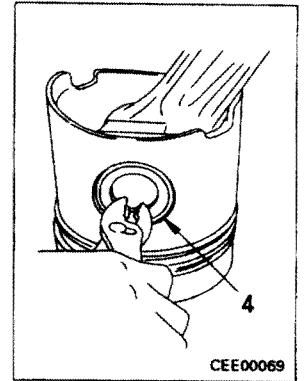
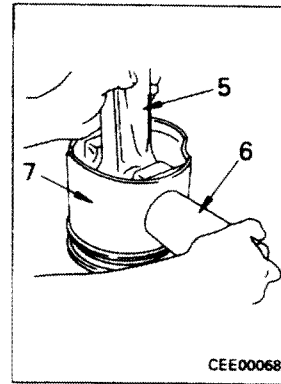
#### 4. Piston and connecting rod assembly

- ★ The piston and cylinder liner are selective fitting parts, and parts which ensure the narrow clearance are provided as spare parts. Assemble piston and connecting rod assembly as follows.

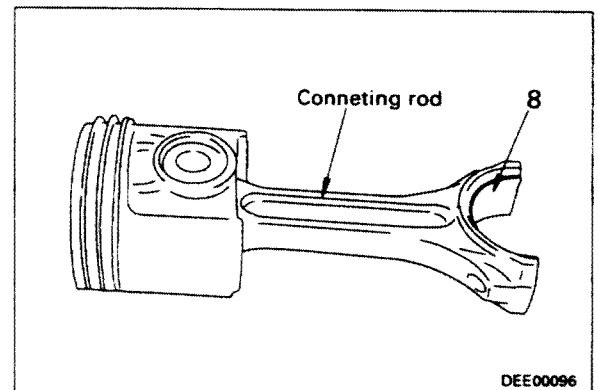
- 1) Remove expander from oil ring, fit in oil ring groove of piston, then assemble oil ring.
- 2) Using tool **D1**, assemble piston rings (8) in the order of oil ring, 2nd ring, and top ring.
  - ★ When doing this, check that the expander is fitted completely in the ring groove.
  - ★ Set the protruding part of the expander coil at 180° to the end gap of the oil ring.
  - ★ Assemble each piston ring as shown in the diagram.
  - ★ Install each ring to the piston with the stamped mark facing up.
- 3) Install snap ring (4) on one side.
- 4) Heat up piston (7) in a heating furnace at 100°C for more than 5 minutes.
  - ★ If no heating furnace is available, heat in hot water at 100°C for more than 5 minutes.
  - ★ If the piston is heated up in hot water, clean it completely after setting it.



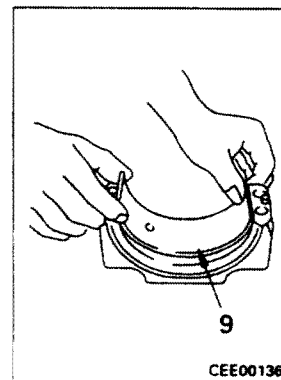
- 5) Coat piston bore with engine oil (SAE30), match number stamped on connecting rod with cylinder number on piston head, set numbers facing in same direction, then insert piston pin (6), and assemble piston (7) to connecting rod (5).
- 6) Install snap ring (4) on opposite side.
- ★ Turn the snap rings to check that the left and right snap rings are completely fitted in the ring groove.



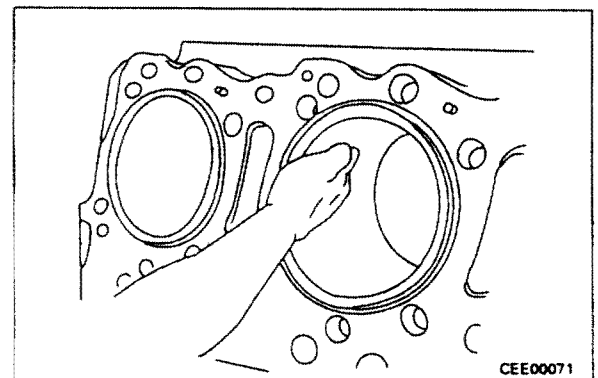
- 7) Align protruding part of connecting rod upper bearing (8) with notch in connecting rod, and install.
- ★ Check that there is no dirt or dust stuck behind the surface of the bearing, then install. When doing this, the rear surface must not be coated with oil.
  - ★ Check that the bearing hole and connecting rod oil hole are aligned.



- 8) Align protruding part of connecting rod lower bearing (9) with notch in connecting rod cap, and install.
- ★ Check that there is no dirt or dust stuck behind the surface of the bearing, then install. When doing this, the rear surface must not be coated with oil.

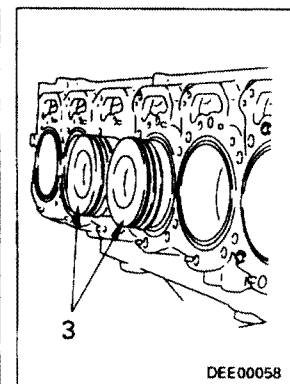
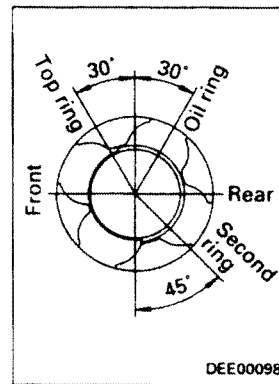
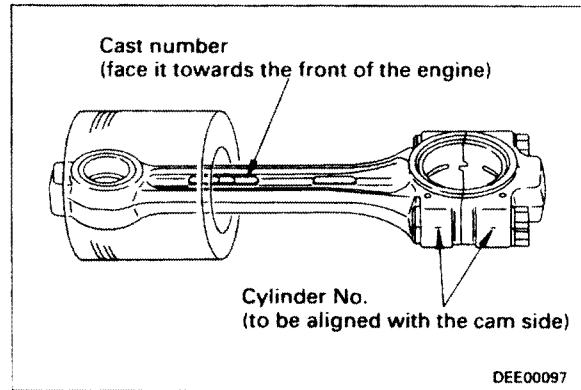


- 9) Set the crankshaft for the cylinder to be assembled to the bottom dead center, and coat the inside surface of the connecting rod bearing and inside surface of cylinder liner with engine oil (SAE30).



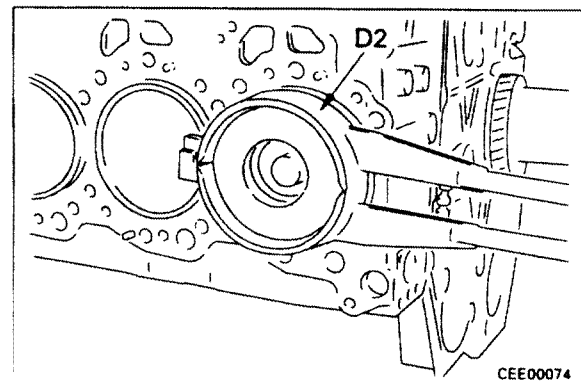
10) Set so that cast letters on connecting rod face front of engine (stamped number is at camshaft end), set relationship between positions of piston ring end gaps as shown in diagram, then insert piston and connecting rod assembly (3).

- ★ When inserting the piston and connecting rod assembly, be careful not to damage the piston cooling nozzle.



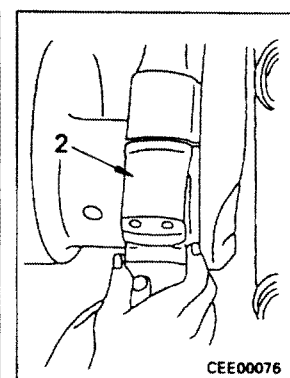
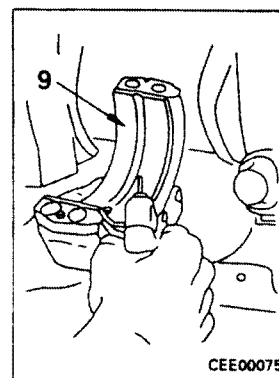
11) Using tool D2, compress piston ring and push in piston head with wooden bar.

- ★ When inserting the piston, be careful not to damage the piston cooling nozzle. Check also that the nozzle is positioned at the center of the notched portion of the piston.
- ★ When assembling the piston and connecting rod assembly, assemble at the places where the crankshaft is at the bottom dead center.



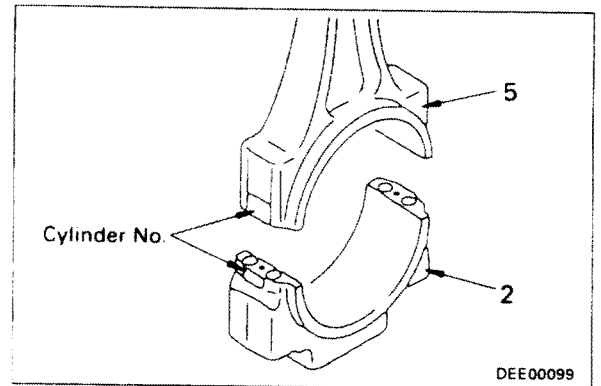
12) Coat connecting rod lower bearing (9) with engine oil (SAE30), check cap number, align with dowel pin, and install connecting rod cap (2).

- ★ When coating with engine oil, spread the oil over the whole surface with a finger.



615002

- ★ When assembling a new connecting rod, mark the cylinder number with an electric pen (do not use a stamping tool).



- 13) Before tightening connecting rod bolt, make sure as follows.

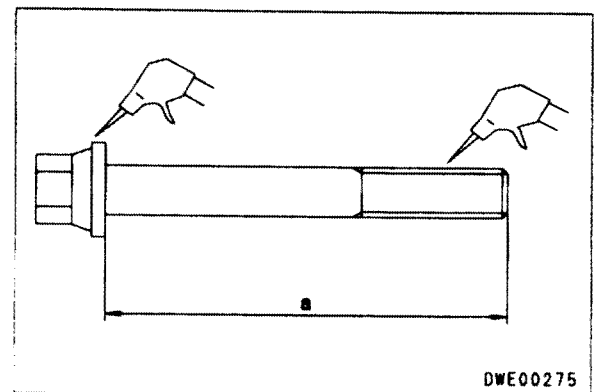
- i) Measure the free length  $a$  of all bolts and check that bolt length exceeds tolerance limit or not. Do not reuse any bolt which has exceeded the tolerance limit.

Before tightening, measure the free length of bolt and check that bolt length exceeds tolerance limit or not.

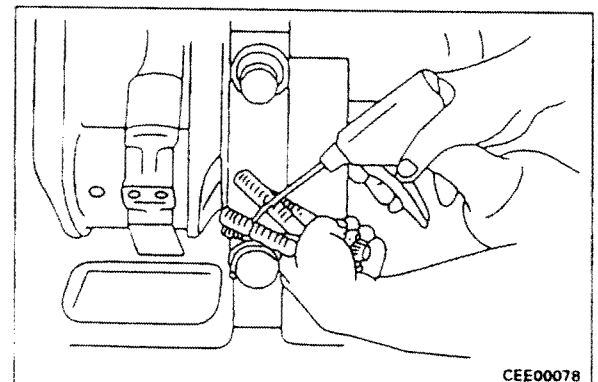
- ii) Tolerance limit of bolt free length:

Max. 84.1 mm

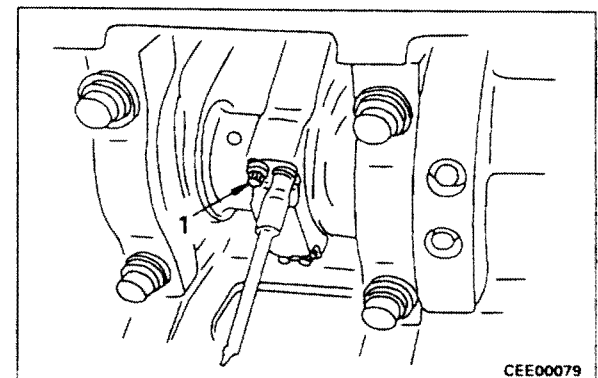
- ★ If the bolt length  $a$  exceeds tolerance limit, do not reuse.



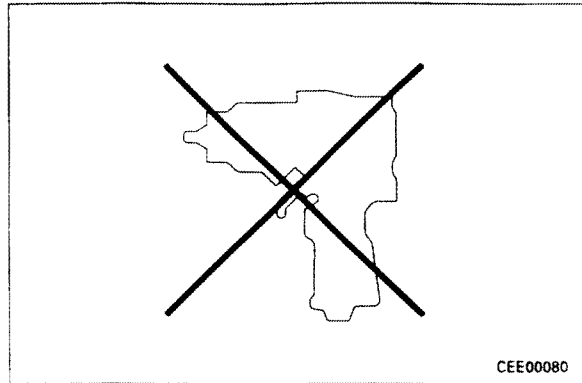
- 14) Coat washer and thread of connecting rod bolt with engine oil (SAE30).



- 15) Tighten connecting rod bolts (1) in turn until connecting rod cap is tightly fitted.



- ★ If an impact wrench or other tool is used to tighten the bolts at high speed, the thread may be damaged, so tighten with a hand tool.



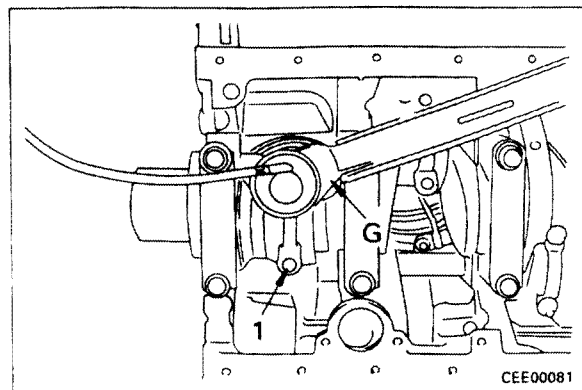
CEE00080

16) Tighten connecting rod bolts.

 Connecting rod cap bolt

1st step : Tighten to  $98.1 \pm 4.9$  Nm  
 (10.0 ± 0.5 kgm)  
 2nd step: Mark bot and cap with felt-tip pen,  
 then tighten bolt  $90^{\circ} \pm 30^{\circ}$

- ★ When tightening the connecting rod, see 3-9) and tighten to the specified value.

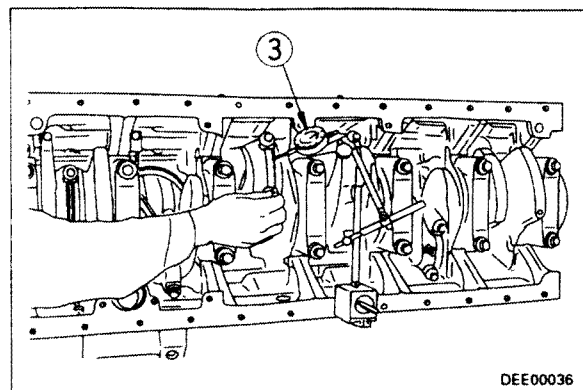


CEE00081

17) After installing the piston and connecting rod assembly, rotate the crankshaft and check that there is no catching or abnormality in the rotation.

18) Using dial gauge ③, measure side clearance of connecting rod.

- ★ Standard value for side clearance:  
 $0.2 - 0.375$  mm



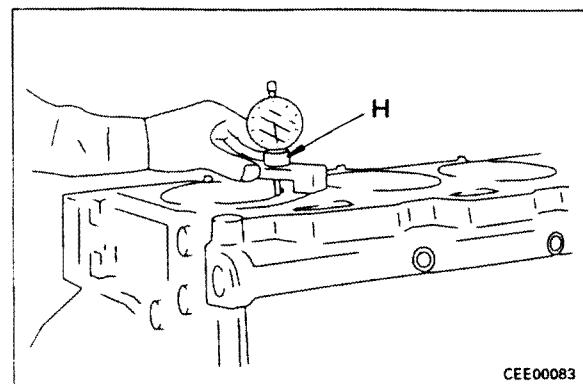
DEE00036

19) Using gauge H, measure protrusion from top surface of cylinder block to top of piston.

- ★ Piston protrusion:  
 (Push top surface of piston, and check that oil clearance is 0 and that there is no rocking)

Unit: mm

(S)6D125-2 (Aluminium piston)	S(A)6D125-2 (FCD piston)
0.806 - 1.151	0.984 - 1.335



CEE00083

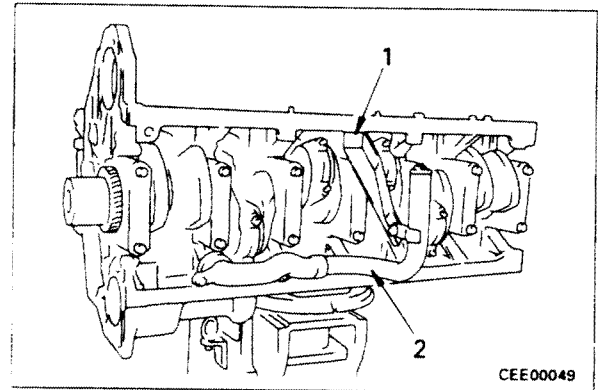
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**5. Oil suction pipe**


Fit O-ring, install oil suction pipe (2), then fit bracket (1) and secure in position.

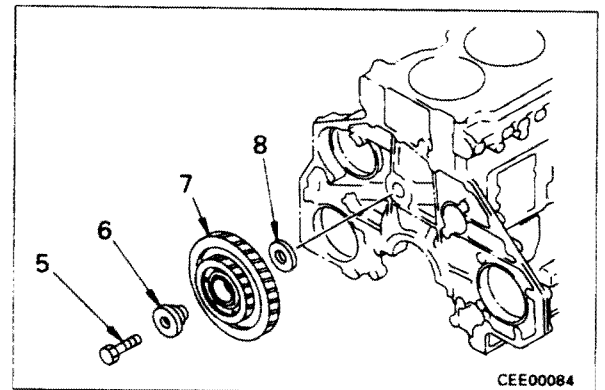
- ★ After determining the mutual positions of the oil suction pipe and bracket, tighten the bolts.

**6. Idler gear**

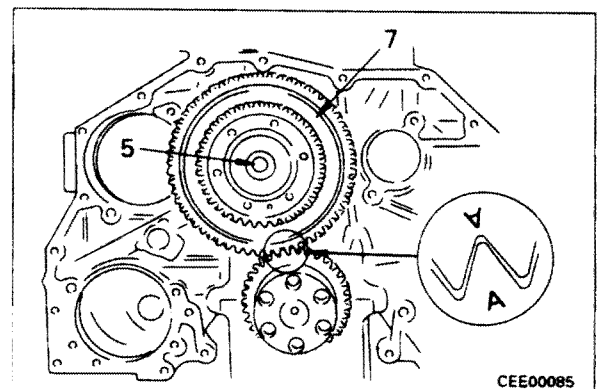
1) Assemble plate (8) to engine block, then install gear (7) and shaft (6), and tighten mounting bolt (5).

- ★ Assemble plate (8) with the chamfered end facing the front of the engine.


 Mounting bolt:  $68.6 \pm 4.9 \text{ Nm}$   
( $7.0 \pm 0.5 \text{ kgm}$ )



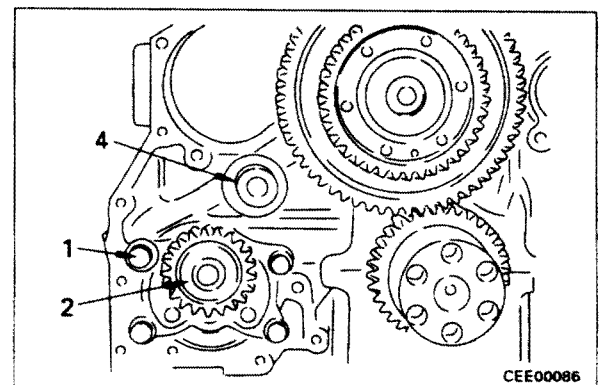
- ★ Precautions when assembling idler gear  
Align the "A" on the crankshaft gear with the "A" mark on main idler gear (7), then tighten mounting bolt (5).

**7. Oil pump**


Fit O-ring, install oil pump (2), then tighten 4 mounting bolts (1).

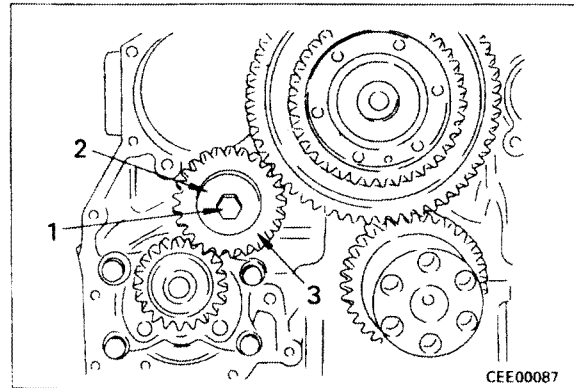
 Mounting bolt :  $68.4 \pm 4.9 \text{ Nm}$   
( $7.0 \pm 0.5 \text{ kgm}$ )

2) Knock in pin and install shaft (4).




- 3) Assemble oil pump idler gear (3), then install plate (2) and tighten mounting bolt (1).

 Mounting bolt :  $161.8 \pm 14.7 \text{ Nm}$   
( $16.5 \pm 1.5 \text{ kgm}$ )

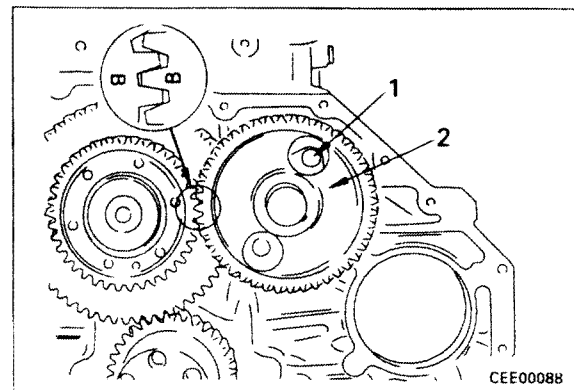


### 8. Camshaft

Coat camshaft journal surface with engine oil (SAE30). Align "B" mark of camshaft gear with "B" mark of main idler gear, install camshaft (2), then tighten mounting bolts (1).


 Mounting bolt of plate :  $66.2 \pm 7.4 \text{ Nm}$   
( $6.75 \pm 0.75 \text{ kgm}$ )

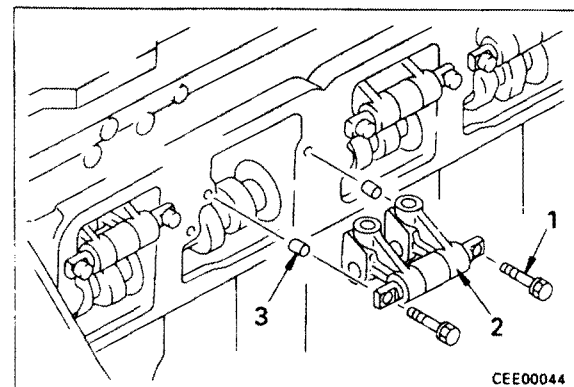
- ★ When installing the camshaft, rotate the camshaft to prevent damage to the cam bushing.
- ★ If the cam gear has been replaced, heat the cam gear in an electric furnace at  $200 - 240^\circ\text{C}$  for more than 30 minutes, then shrink fit the gear.



### 9. Cam followers


- 1) Knock dowel ring (3) into cylinder block.
- 2) Tighten 6 cam follower assemblies (2) with bolts (1).

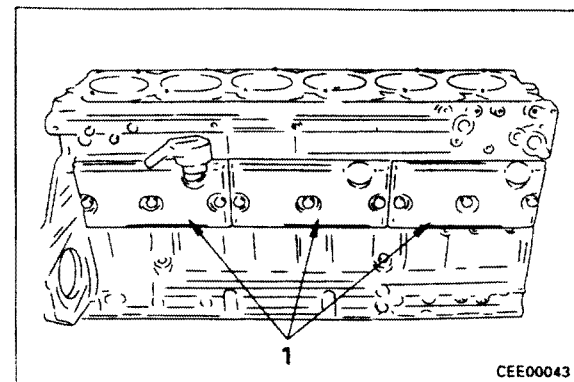
 Mounting bolt :  $51.5 \pm 7.4 \text{ Nm}$   
( $5.25 \pm 0.75 \text{ kgm}$ )



### 10. Cam follower covers

Fit O-rings and install cam follower covers (1).

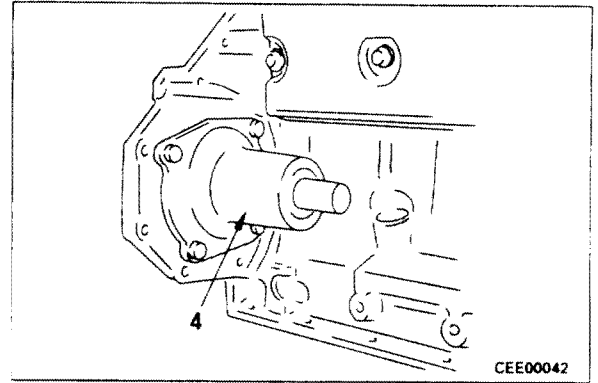
 Mounting bolt :  $11.3 \pm 1.5 \text{ Nm}$   
( $1.15 \pm 0.15 \text{ kgm}$ )



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**11. Drive gear of fuel injection pump**


1) Install drive case (4).

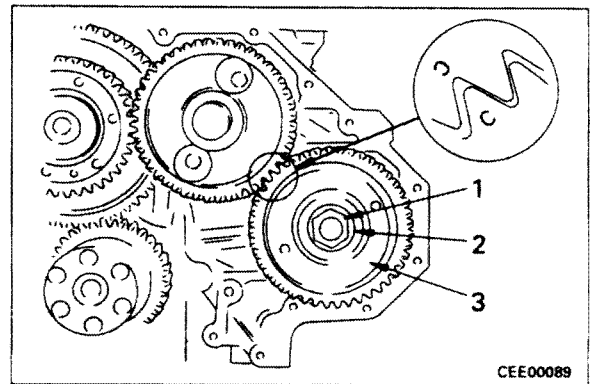


2) Knock in drive shaft gear, align "C" mark of main idler gear with "C" mark of drive gear, then install fuel injection pump drive gear (3).

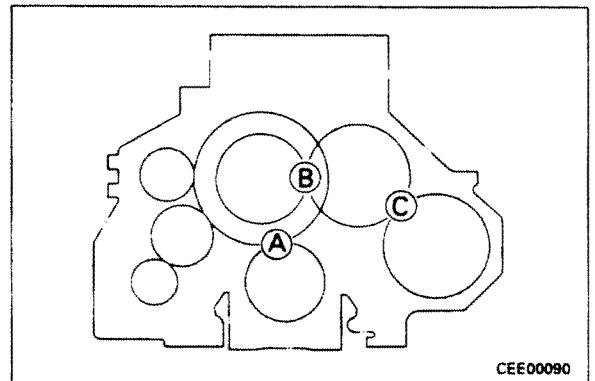
3) Fit washer (2), then tighten nut (1).

★ Fit a screwdriver between the gears to stop the gear from turning when tightening.

 Nut :  $240.3 \pm 14.7 \text{ Nm}$   
 $(24.5 \pm 1.5 \text{ kgm})$



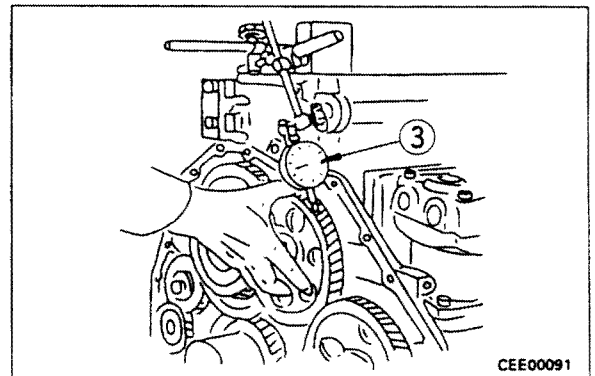
★ Check that the match marks of each drive gear and idler gear are aligned.



★ Measure backlash and end play of each gear using a dial gauge (3).

1) Standard backlash for each gear

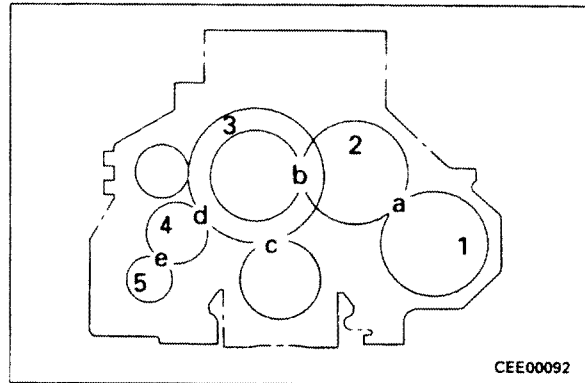
Position	Range (mm)
a	0.127 - 0.393
b	0.127 - 0.393
c	0.139 - 0.427
d	0.128 - 0.405
e	0.082 - 0.389



615002

- 2) Standard end play for each gear

Position	Range (mm)
1	0.09 – 0.48
2	0.10 – 0.25
3	0.05 – 0.17
4	0.05 – 0.21
5	0.03 – 0.09



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**12. Fuel injection pump assembly**

- 1) Fit engine oil dipstick guide (12), then install bracket (10).

Dipstick guide mounting nut :  
**51.5 ± 7.4 Nm (5.25 ± 0.75 kgm)**

- 2) Knock key into fuel injection pump drive shaft, align key groove of pump coupling, then align fuel injection pump (6) with bracket pin and set in position.

- 3) Remove 2 coupling bolts (5) from fuel injection pump, then install flange coupling (8) and front laminated coupling (3) to engine drive shaft.

When doing this, do not tighten coupling connection bolt (9).

- 4) Align coupling key groove with drive shaft key, push in fuel injection pump assembly (6), align with pin portion of bracket, and set in position.

- 5) Tighten 4 mounting bolts (5) of fuel injection pump.

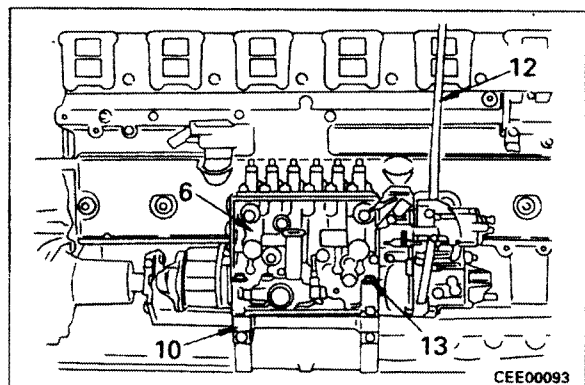
Mounting bolt:  
**31.4 ± 2.9 Nm(3.2 ± 0.3 kgm)(6D125-2)**  
**66.2 ± 7.4 Nm(6.75 ± 0.75 kgm)(S6D125-2)**  
**66.2 ± 7.4 Nm(6.75 ± 0.75 kgm)(SA6D125-2)**

- 6) Tighten 2 bolts (5) connecting coupling and drive shaft.

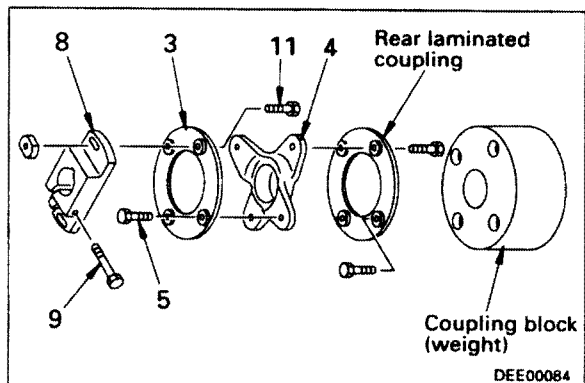
Coupling connecting bolt:  
**61.3 ± 2.5 Nm (6.25 ± 0.25 kgm)**

- 7) Tighten bolt (11) lightly.

- 8) Tighten bolt (9) connecting pump coupling and drive shaft lightly.



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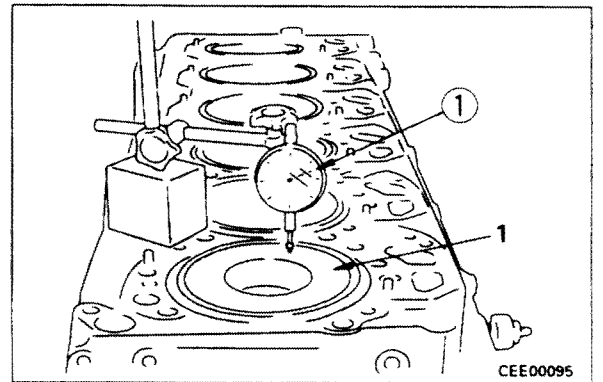
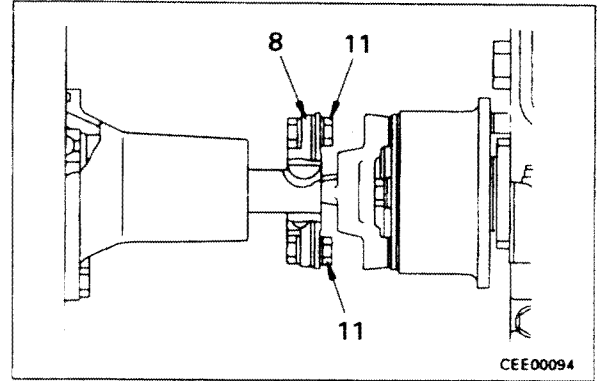
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**13. Adjusting fuel injection timing**


- 1) Loosen bolts and nuts (11), and check that coupling (8) is free.
- 2) Install dial gauge (1) on top of cylinder block, then set gauge probe on top of piston.
- 3) With piston (1) at top dead center, set gauge to 0, then rotate crankshaft 45° in reverse direction.
- 4) Rotate crankshaft slowly in normal direction, and stop at position where dial gauge matches specified distance (piston displacement) shown in table below.
  - ★ For details of the fuel injection timing, see TESTING AND ADJUSTING, Standard values for testing, adjusting, and troubleshooting.
  - ★ Always rotate the crankshaft in the normal direction to align the position.


Piston displacement for each injection timing

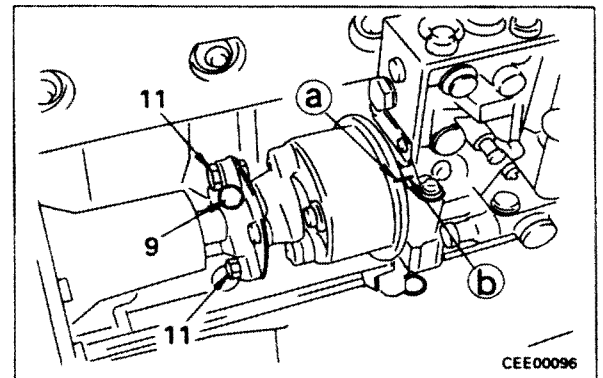
Injection timing	Piston displacement
BTDC12°	2.15 ± 0.20
BTDC13°	2.52 ± 0.20
BTDC14°	2.91 ± 0.20
BTDC15°	3.34 ± 0.20
BTDC16°	3.80 ± 0.20



- 5) Align stamped mark (a) on injection pump housing with stamped mark (b) on coupling (dummy timer).
- 6) Tighten injection mounting bolts (11) and bolt (9) in order.


 Bolt (11) : **88.3 ± 4.9 Nm (9.0 ± 0.5 kgm)**

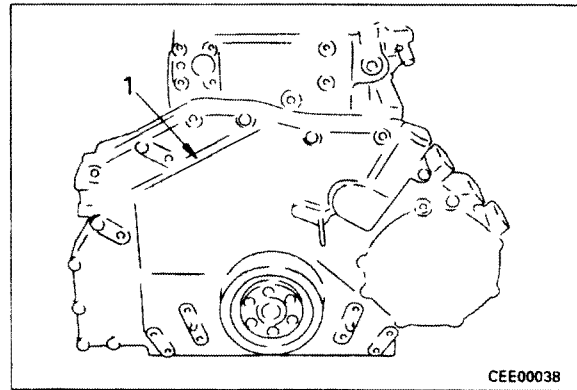
 Bolt (9) : **78.5 ± 4.9 Nm (8.0 ± 0.5 kgm)**




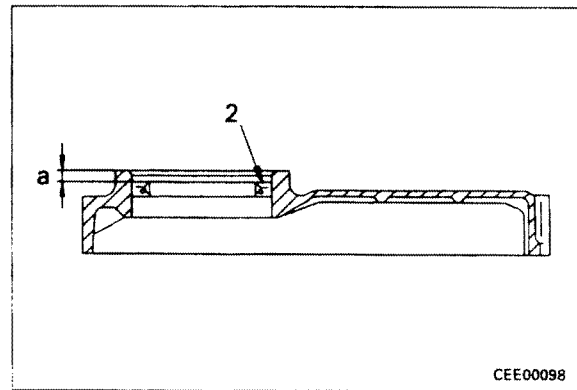
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**14. Front cover**


- 1) Using tool I, press fit oil seal (2) to cover.
    - ★ Oil seal press-fitting tolerance a:  $11\frac{1}{8}$  mm
-  Fill oil seal lip (50 – 80% of space at lip) with **grease (G2-LI)**.

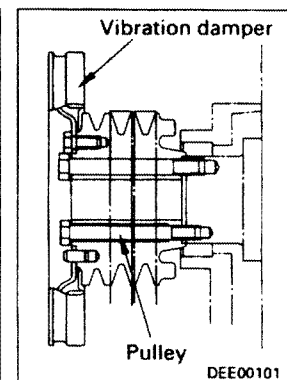
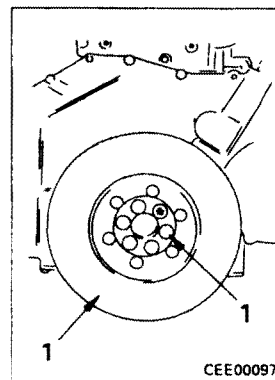


- 2) Coat gasket sealant, then install front cover (1).
    - ★ When installing the cover, be careful not to damage the oil seal.
-  Mating surface: **Gasket sealant (LG-7)**.
- 3) Using a dial gauge, measure the stepped difference between the cylinder block and front cover.
    - ★ Stepped difference: 0 – 0.275 mm





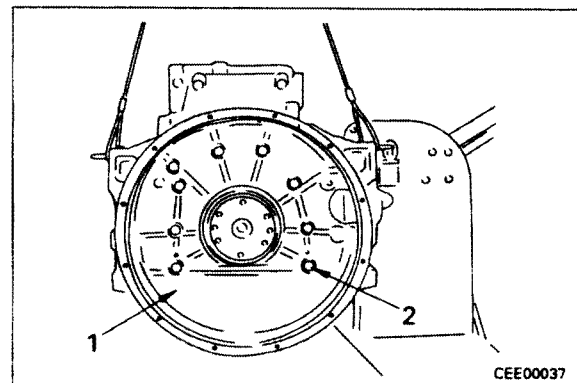
**15. Crankshaft pulley, vibration damper**

- Install crankshaft pulley and vibration damper (2), then tighten with 6 mounting bolts (1).
-  **kgm** Mounting bolt :  $277.0 \pm 31.9$  Nm ( $28.25 \pm 3.25$  kgm)
- Mounting bolt (★ mark) :  $176.5 \pm 19.6$  Nm ( $18 \pm 2$  kgm)




**16. Flywheel housing**

- Raise flywheel housing (1), coat mounting surface with gasket sealant, then install on cylinder block and tighten bolts (2).
-  Contact surface : **Gasket sealant (LG-7)**
-  Coat the bolt thread and seat face with **engine oil (SAE30)** before tightening.



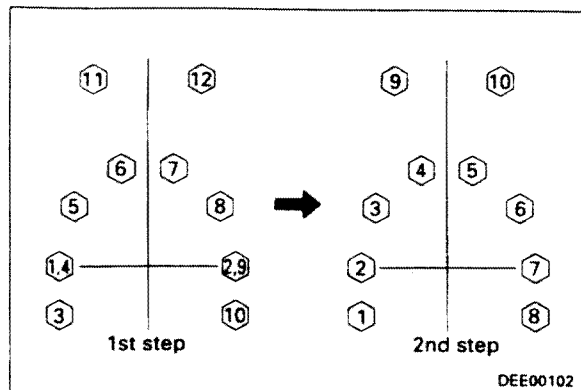
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- ★ Tighten the mounting bolts of the flywheel housing in the order shown in the diagram and to the following torques.

 Flywheel housing mounting bolt

Unit : Nm (kgm)

Order	Target	Range
1st step	186.3 (19)	147.1 – 235.3 (15 – 24)
2nd step	274.6 (28)	245.2 – 308.9 (25 – 31.5)



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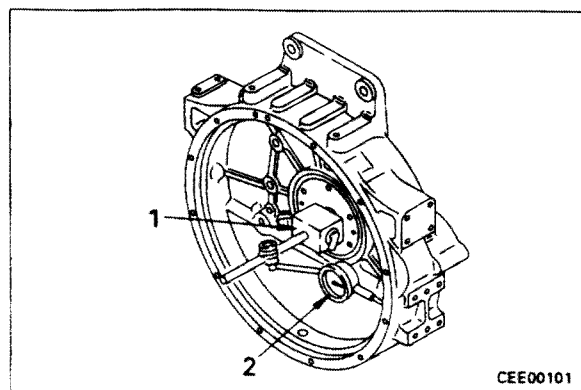
- 1) After installing the flywheel housing, measure the face runout and radial runout with dial gauge ③.
  - ★ Radial runout : Max. 0.20 mm
  - ★ Face runout : Max. 0.20 mm

● **Measuring face runout of flywheel housing**

- Measure as follows.

- 1) Put magnet stand (1) in contact with end face of crankshaft.
- 2) Set indicator so that probe of dial indicator (2) is in contact at right angles with end face of flywheel housing.
- 3) Rotate crankshaft one turn, and read difference between maximum value and minimum value of indicator.

- ★ When measuring, measure at least 8 places evenly spaced around the circumference of the end face of the flywheel housing.
- ★ When measuring, move the crankshaft either to the front or rear to prevent any error from being caused by the end play.
- ★ Check that the indicator returns to the original position when the crankshaft is rotated one full turn.
- ★ The indicator will fluctuate either to the left or right, so be careful not to misread the direction of fluctuation when the indicator is at the top or bottom, or left or right of the end face being measured.



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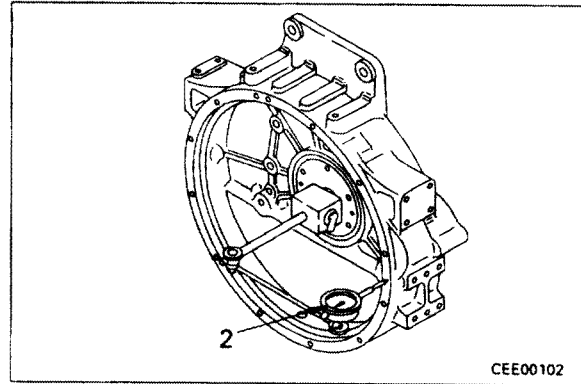
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- **Measuring radial runout of flywheel housing**

- Measure as follows.

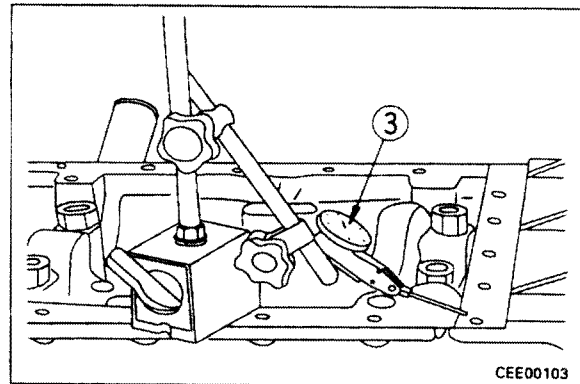
Set in same condition as when measuring face runout, with probe of dial indicator (2) in contact at right angles with pilot portion of flywheel housing, then measure.

- ★ When measuring the radial runout, there is no error caused by the end play of the crankshaft, but the other precautions are the same as the precautions followed when measuring the face runout.



4) Using dial gauge (3), measure stepped difference between cylinder block and flywheel housing.

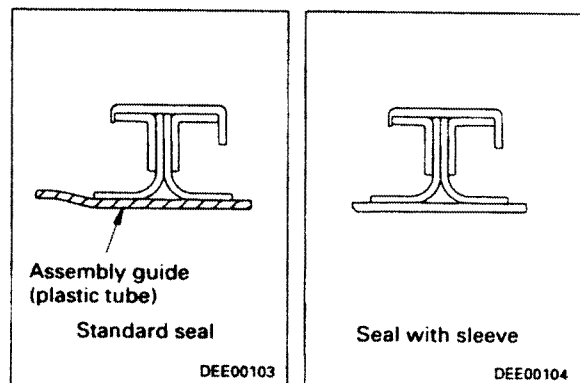
- ★ Stepped difference: 0 - 0.35 mm



### 17. Rear seal

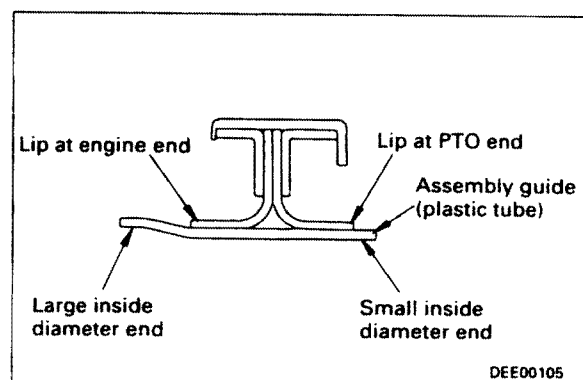
Check condition of wear of shaft, then select standard seal or seal with sleeve for Teflon seal (lay-down lip seal) and assemble seal.

- ★ The condition of wear of the shaft can be judged from the degree of luster (touch with the flat of your finger to check that the depth of wear is less than 10  $\mu\text{m}$ ). If there are no scratches, assemble a standard seal. In all other cases, assemble a seal with sleeve.



#### Procedure for assembling standard seal

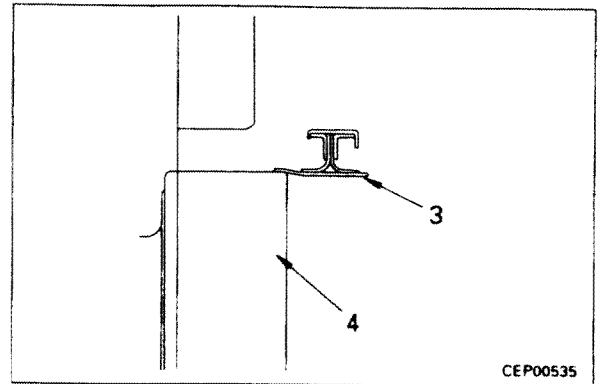
- ★ Before assembling the seal, check that there is no damage, burrs, flashes, or rust on the housing, sliding surface of the lip and the corner of the end face of the crankshaft.
- ★ When assembling the seal, do not coat the shaft or seal lip with oil or grease. If there is any oil or grease on the shaft, wipe it off completely.
- ★ Do not remove the plastic tube inside the standard seal provided as a spare part until immediately before assembling the seal.





- 1) Put large inside diameter end of plastic inner tube (3) in contact with end of crankshaft (4).

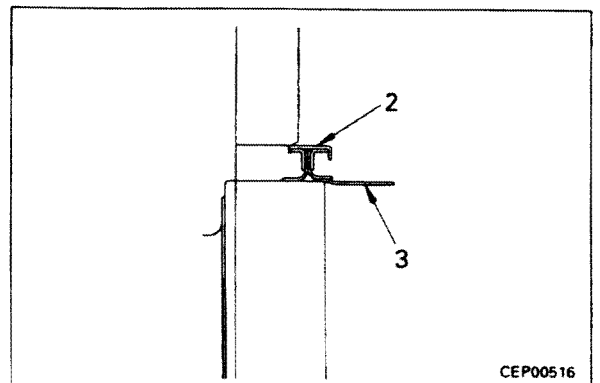
★ Be particularly careful not to mistake the direction when assembling.



- 2) Hold metal ring of seal (2) with both hands, push evenly, and use sudden pushing force to push in.

- 3) After pushing in seal, remove plastic inner tube (3).

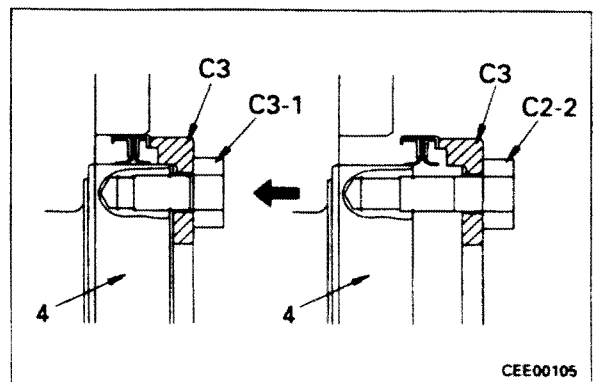
★ Be particularly careful not to damage the seal lip when removing the inner tube.



- 4) Tighten bolts (C2-2, C3-1) uniformly until end face of tool C3 contacts end face of crankshaft (4) to press fit seal (2).

★ When press fitting the seal, be extremely careful not to damage the lip at the PTO end when setting the tool.

★ After press fitting the seal, remove the red sealant layer from the outside circumference.

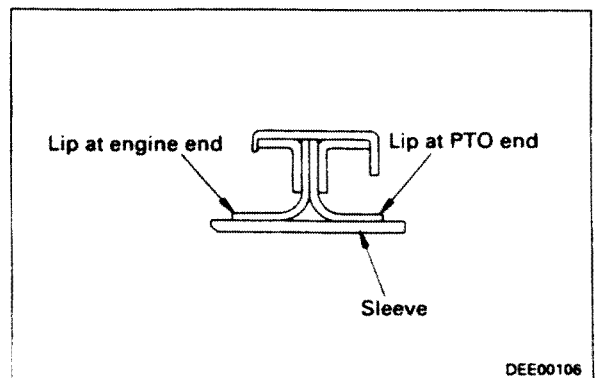


● **Procedure for assembling seal with sleeve**

★ Before assembling the seal, check that there is no damage, burrs, flashes, or rust on the housing, sliding surface of the lip and the corner of the end face of the crankshaft.

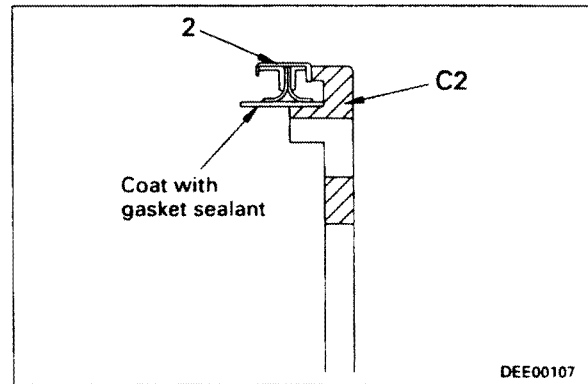
★ When assembling the seal, do not coat the shaft, and the space between the sleeve and seal lip with oil or grease. If there is any oil or grease on the shaft, wipe it off completely.

★ Handle the seal and sleeve as an assembly. Never separate them.

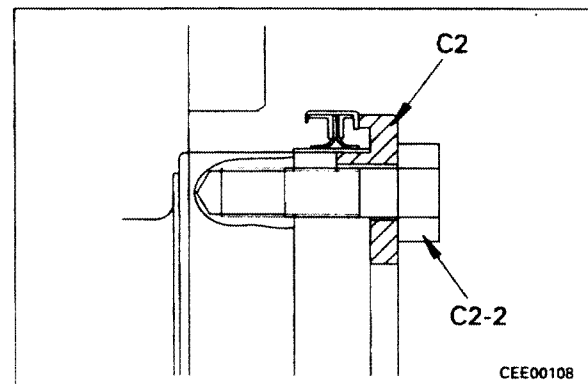


- 1) Set sleeve/seal (2) to tool **C2**.

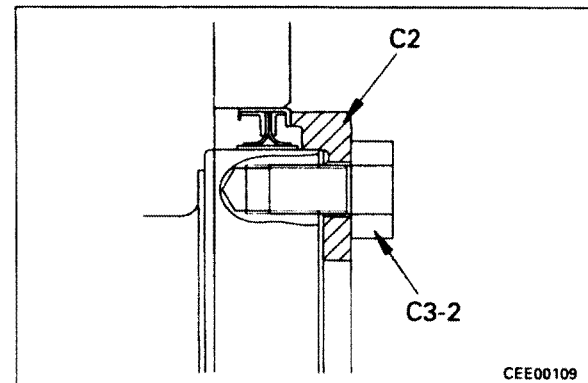
 Surface of sleeve inner tube:  
**Gasket sealant (LG-7)**



- 2) Put sleeve of seal in contact with end face of crankshaft, tighten bolt (**C2-2**) of tool **C2** uniformly until end face of tool **C2** contacts ends face of crankshaft (2) to press fit sleeve/seal (2).




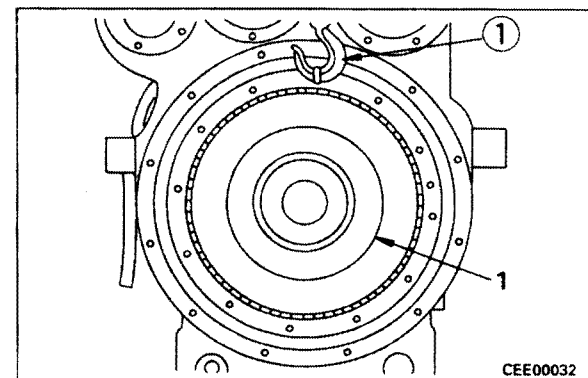
- 3) Remove tool **C2** and replace with tool **C3**.
- 4) Tighten bolt (**C3-2**) of tool **C3** uniformly until end face of tool **C3** contacts ends face of crankshaft (4) to press fit sleeve/seal (2).  
★ After press fitting the seal, remove the red sealant layer from the outside circumference.




## 18. Flywheel

- 1) Using eyebolt ① (Thread=12 mm, Pitch=1.75 mm), raise flywheel (1), install to crankshaft, then tighten bolts.

 Coat the bolt thread and seat face with **engine oil (SAE30)** before tightening.



- ★ Tighten the mounting bolts of the flywheel in the order shown in the diagram and to the following torques.

 Flywheel housing mounting bolt

Unit : Nm (kgm)

Order	Target	Range
1st step	147.1 (15)	247.5 - 166.7 (13 - 17)
2nd step	289.3 (29.5)	269.7 - 308.9 (27.5 - 31.5)

- Using dial gauge ①, measure the face runout and radial runout of the flywheel.
  - ★ Face runout : 0.20 mm
  - ★ Radial runout : 0.15 mm

## 2) Measuring face runout of flywheel

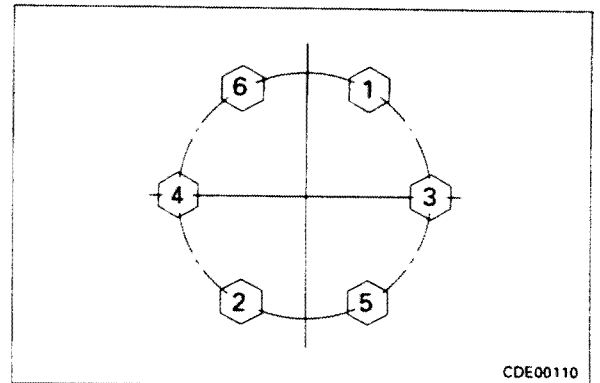
- Measure as follows.
  - Stand magnet stand (1) at flywheel housing.
  - Set indicator so that probe of dial indicator (2) is in contact at right angles with end face near outside circumference of flywheel.
  - Rotate flywheel crankshaft one turn, and read difference between maximum value and minimum value of indicator.
    - ★ When measuring, measure at least 8 places evenly spaced around the circumference of the end face of the flywheel housing.
    - ★ When measuring, move the crankshaft either to the front or rear to prevent any error from being caused by the end play.
    - ★ Check that the indicator returns to the original position when the crankshaft is rotated one full turn.

## 3) Measuring radial runout of flywheel housing

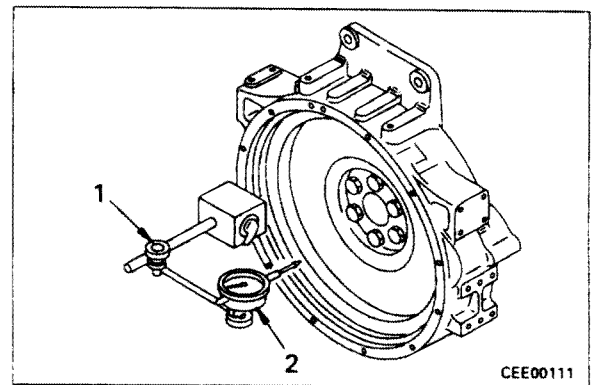
- Measure as follows.
 

Set in same condition as when measuring face runout, with probe of dial indicator (2) in contact at right angles with pilot portion of flywheel housing or face of outside circumference, then measure.

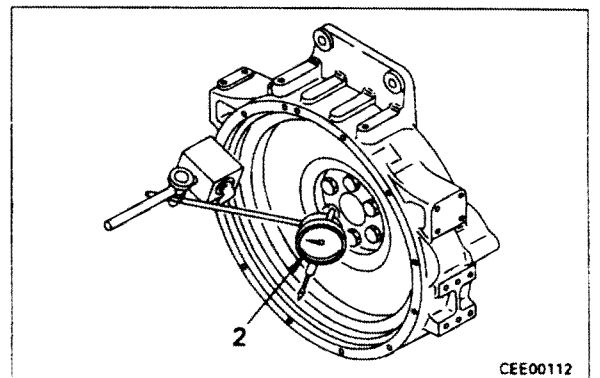
  - ★ When measuring the radial runout, there is no error caused by the end play of the crankshaft, but the other precautions are the same as the precautions followed when measuring the face runout.



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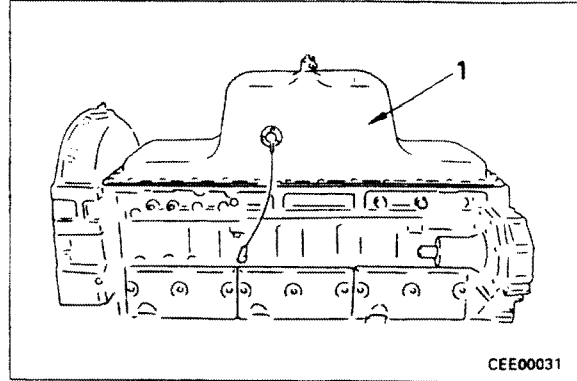


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**19. Oil pan**

Fit gasket and install oil pan (1).

- ★ Assemble the oil pan gaskets with the punched direction at the same face.

**20. Cylinder head assemblies**

1) Assemble cylinder head assembly as follows.

i) Fit lower seat (8) and install seal (7).

- ★ The seal is installed only to the exhaust side.

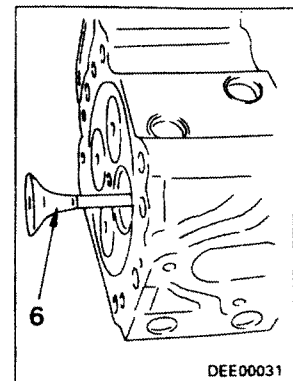
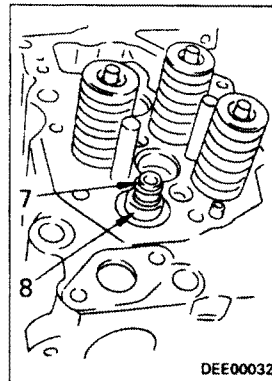
ii) Coat valve stem and inside surface of valve guide with engine oil (SAE30), then assemble valve (6).

- ★ On the S6D125-2 and SA6D125-2, there is a valve rotator installed instead of the lower seat.

- ★ The free length of the intake valve spring on the S6D125-2 and SA6D125-2 is different from the spring on the 6D125-2.

- ★ The exhaust valve spring is different for engines equipped with a slide valve type exhaust brake. (New parts are painted white.)

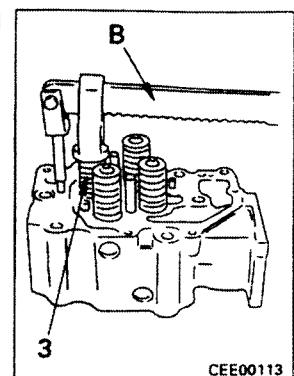
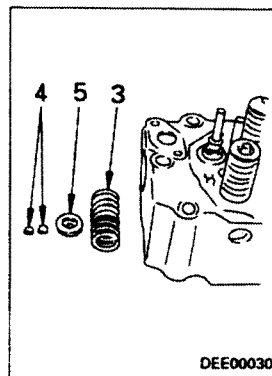
- ★ Only the length of the stem is different for the exhaust valve on engines equipped with an exhaust brake (slide type, butterfly type). (There is a B mark stamped on the valve.)



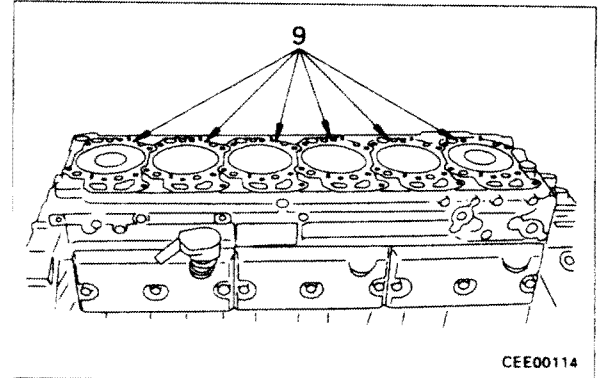
iii) Raise cylinder head and assemble valve spring (3) and upper seat (5).

iv) Using spring pusher B, compress valve spring and install valve cotters (4).

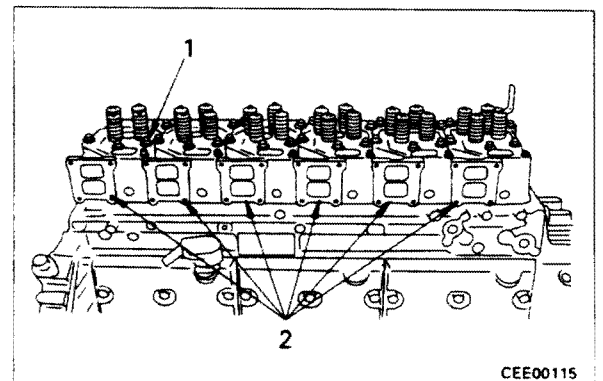
- ★ Tap the valve stem with a plastic hammer to check that the cotters are fitted securely in the valve stem groove.




- 2) Before tightening cylinder head bolt, make sure as follows.
- Measure the free length  $a$  of all bolts and check that bolt length exceeds tolerance limit or not. Do not reuse any bolt which has exceeded the tolerance limit.  
Before tightening, measure the free length of bolt and check that bolt length exceeds tolerance limit or not.
  - Tolerance limit of bolt free length:  
Max. 171.4 mm  
★ If the bolt length  $a$  exceeds tolerance limit, do not reuse.

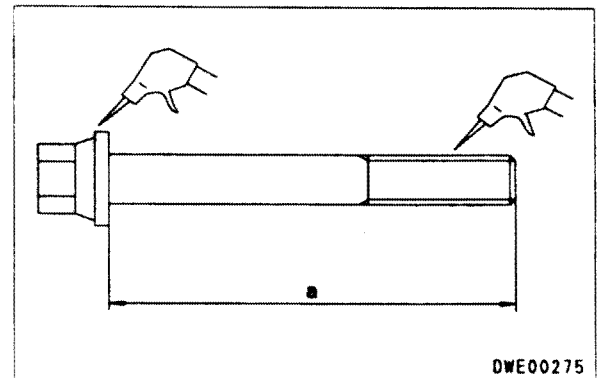


- 3) Check that there is no dirt or dust inside cylinder or on cylinder head mounting surface, then set cylinder head gasket (9) in position.  
★ When installing the gasket, check that the grommets have been installed and have not come out of position.




- 4) Install each cylinder head assembly (2), then tighten mounting bolts (1).

 Coat bolt thread and seat of bolt head with **anti-friction compound (LM-P)**, then tighten.



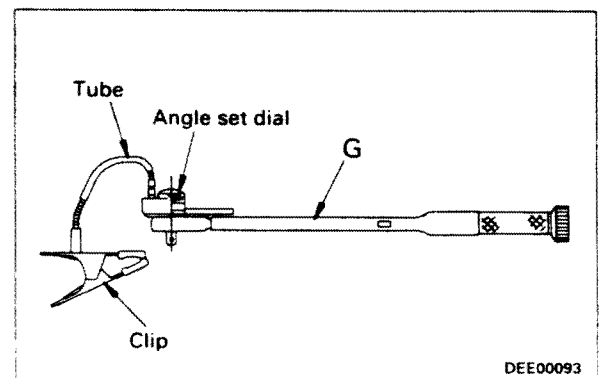
- ★ Tighten the mounting bolts by hand for the first 2 or 3 turns, then tighten as follows.

- When using tool G to tighten cylinder head mounting bolts

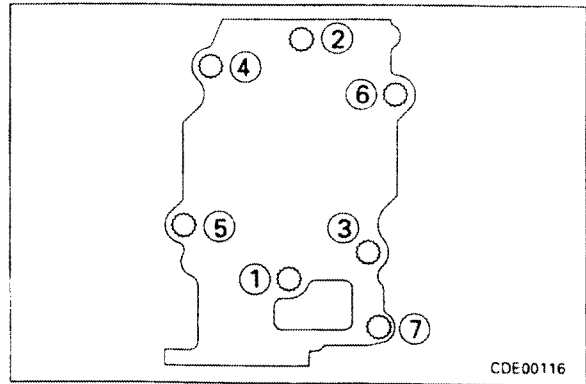
 **kgm** Cylinder head mounting bolt

1st step : Tighten to  $98.1 \pm 9.8 \text{ Nm}$   
( $10.0 \pm 1 \text{ kgm}$ )  
2nd step : Tighten again to  
 $137.3 \pm 4.9 \text{ Nm}$  ( $14.0 \pm 0.5 \text{ kgm}$ )  
3rd step :  $90^\circ \pm 15^\circ$

- Tighten mounting bolts to second stage with torque wrench or tool G.
- With tool G set to mounting bolt, install tube and clip to tool G, then set clip to engine block.
- Set angle of tool G to  $90^\circ$ , then tighten until scale reads  $0^\circ$ .



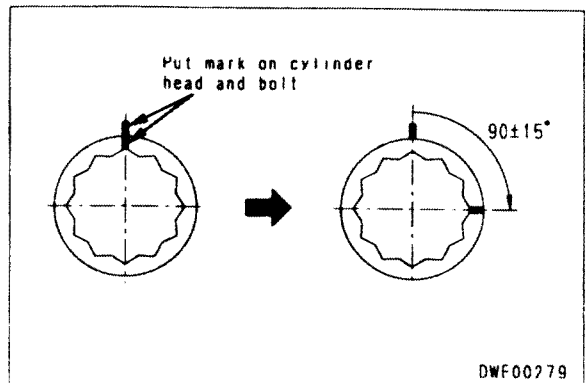
- iv) Tighten head bolts in order shown in diagram on right.
  - ★ Tighten bolt ⑦ to  $66.2 \pm 7.4$  Nm ( $6.5 \pm 0.75$  kgm).



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- When not using tool G
  - Cylinder head mounting bolt

1st step : Tighten to  $98.1 \pm 9.8$  Nm  
( $10.0 \pm 1$  kgm)  
 2nd step: Tighten again to  
 $137.3 \pm 4.9$  Nm ( $14.0 \pm 0.5$  kgm)  
 3rd step : Mark bolt and cap with felt-tip pen, then tighten bolt  $90^\circ \pm 15^\circ$



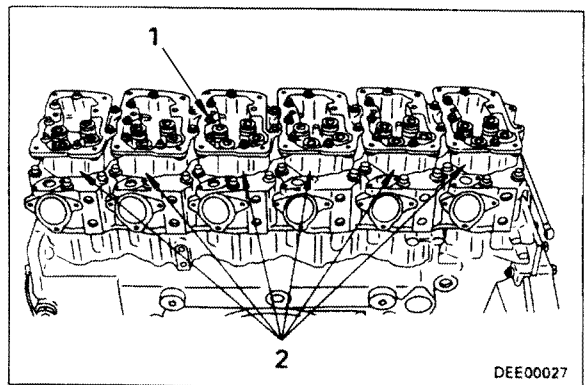
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- With the above procedure, use a torque wrench to tighten the mounting bolts.

**21. Rocker arm housings**

Fit gaskets, install rocker arm housings (2), then tighten 42 bolts (1).

Mounting bolt :  $66.2 \pm 7.4$  Nm  
( $6.75 \pm 0.75$  kgm)

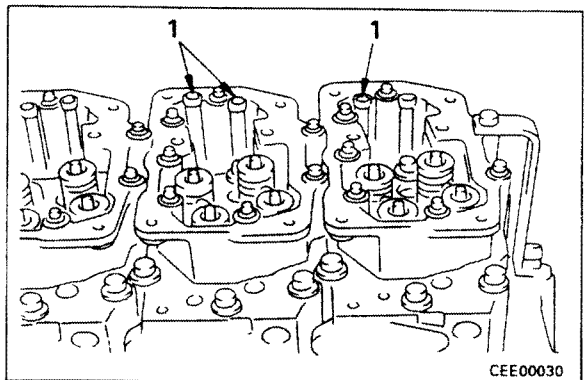


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**22. Push rods**

Install 12 push rods (1).

- ★ Check that the push rods are inserted securely into the holes in the cam follower levers.



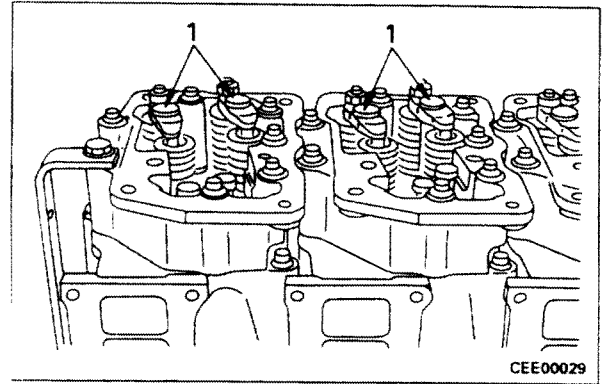
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**23. Crossheads**

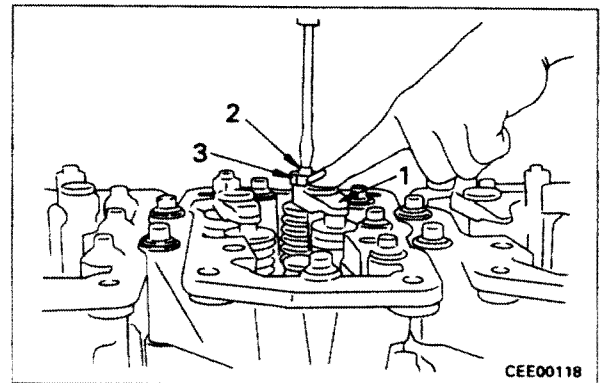
Install 12 crossheads (1).

- ★ Set the adjustment nut end at the exhaust end when installing the crossheads.




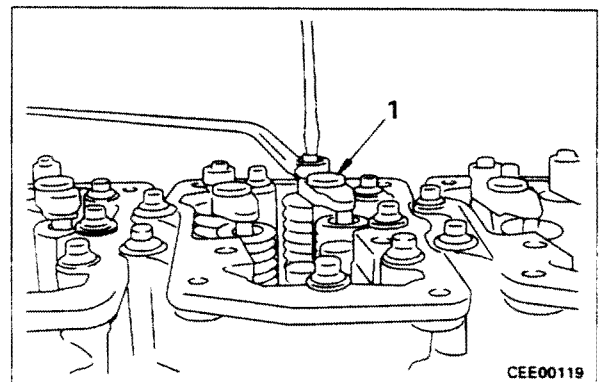
- ★ Adjust the crosshead as follows.

- i) Loosen locknut and turn adjustment screw back.
- ii) Hold down top surface of crosshead (1) lightly with a finger, and screw in adjustment screw (2).




- iii) After adjustment screw contacts valve stem, tighten a further 20°.
- iv) Tighten locknut (3) to hold in position.

 Locknut :  $66.2 \pm 7.4 \text{ Nm}$   
( $6.75 \pm 0.75 \text{ kgm}$ )

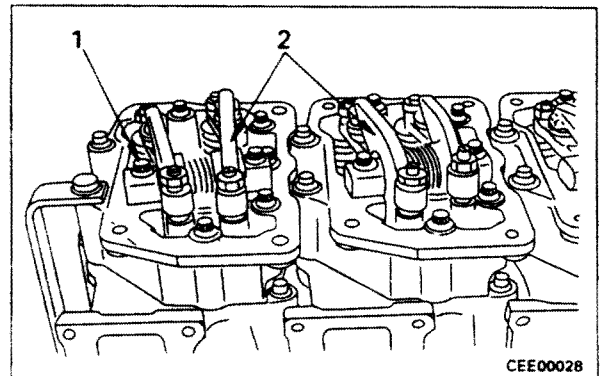
**24. Rocker arms**

Fit gaskets, then install 6 rocker arms (2) and tighten with 12 bolts (1).

- ★ Check that the ball of the adjustment screw is properly fitted into the socket of the push rod.
- ★ Clean the oil hole in the bolts before installing.

 Mounting bolt :  $66.2 \pm 7.4 \text{ Nm}$   
( $6.75 \pm 0.75 \text{ kgm}$ )

- ★ Set the large hole ( $\varnothing 13$ ) at the bottom and assemble the rocker arm shaft so that the blind ball plug is at the front.

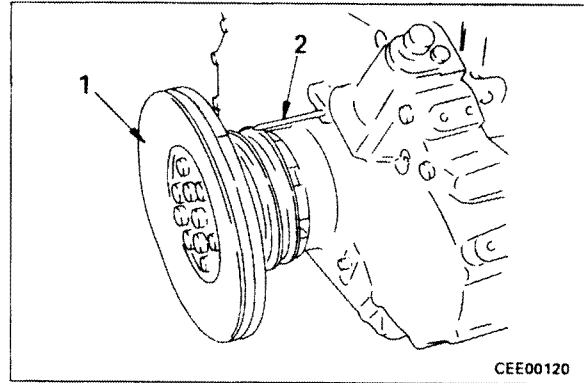


**25. Adjusting valve clearance**

Adjust valve clearance as follows.


- ★ Adjust the valve clearance so that the clearance between the crosshead and rocker arm is the following value.
- ★ Valve clearance (both when hot and when cold)

mm	
Intake valve	Exhaust valve
0.33	0.71

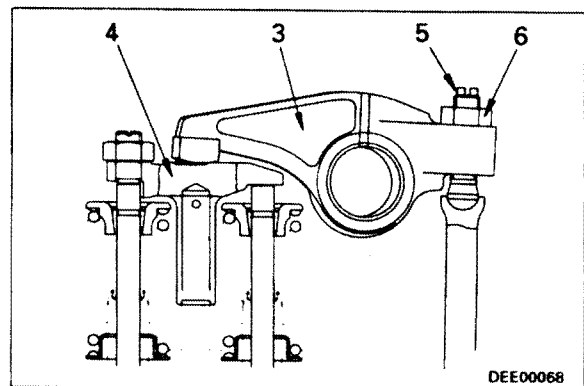
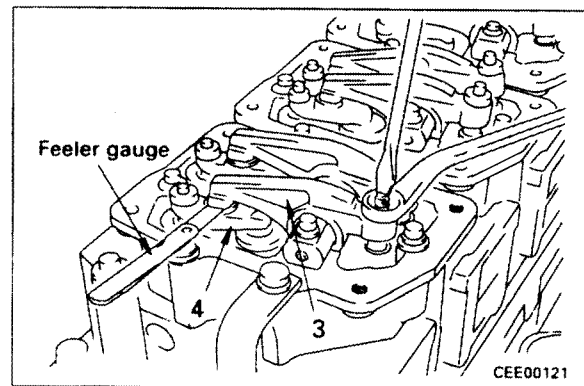


- ★ Crank the engine and adjust the valve clearance of each cylinder in the firing order.  
Firing order : 1 - 5 - 3 - 6 - 2 - 4

- 1) Rotate the crankshaft in the normal direction to align pointer (2) with the 1.6 TOP mark on vibration damper (1). When rotating, check the movement of the valves.
- 2) To adjust, insert feeler gauge between rocker arm (3) and crosshead (4) and turn adjustment screw (5) until clearance is a sliding fit.
- 3) Tighten lock nut (6) to hold adjustment screw (5) in position.


 **kgm** Locknut :  $66.2 \pm 7.4 \text{ Nm}$   
 $(6.75 \pm 0.75 \text{ kgm})$

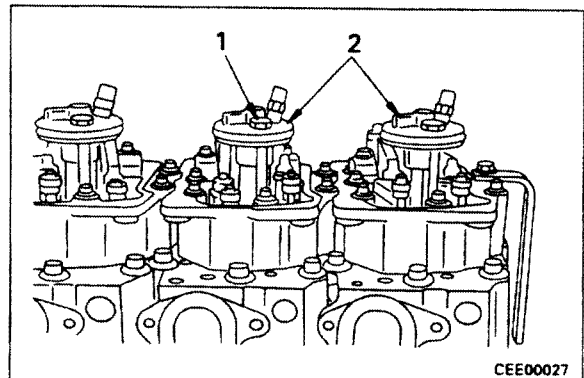
- ★ After tightening the lock nut, check the clearance again.



**26. Nozzle holders**

- ★ Check that there is no dirt or damage inside the nozzle holder sleeve.
- Fit O-rings, assemble 6 nozzle holders (2) to cylinder head, then tighten 12 bolts (1).
- ★ Tighten the nozzle holder mounting bolts uniformly to prevent them from being unevenly tightened.

 **kgm** Mounting bolt :  $21.6 \pm 2.9 \text{ Nm}$   
 $(2.2 \pm 0.3 \text{ kgm})$




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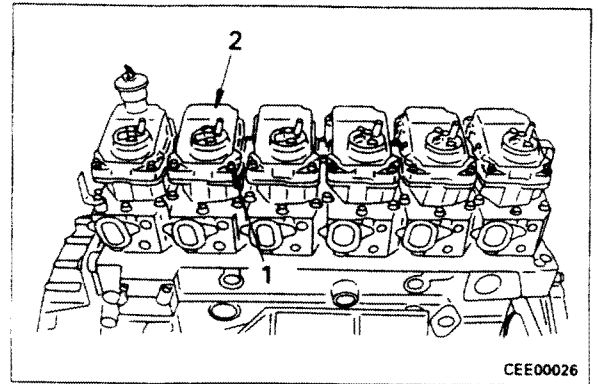


**27. Head covers**

Fit O-rings, then install 6 cylinder head covers (2) and tighten with 24 mounting bolts (1).

- ★ Apply adhesive compound and fit the O-rings of the head covers without twisting.


 Head cover mounting bolt :  
 **$9.8 \pm 1 \text{ Nm}$  ( $1.0 \pm 0.1 \text{ kgm}$ )**



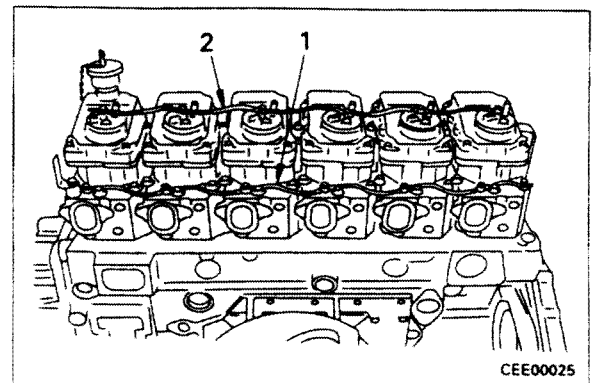
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**28. Spill pipe, air vent tube**

- 1) Fit gaskets to both faces, then install spill pipe (2).

 Joint bolt :  **$12.3 \pm 2.5 \text{ Nm}$**   
 **$(1.25 \pm 0.25 \text{ kgm})$**

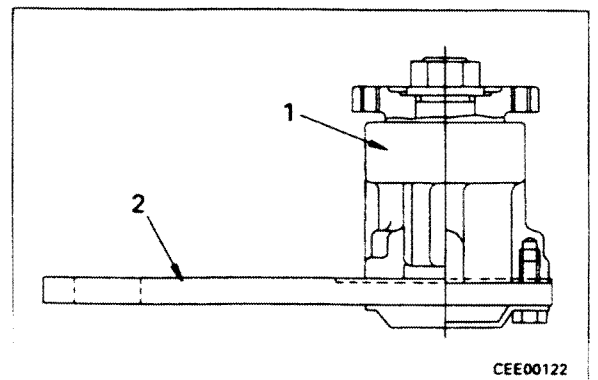
- 2) Fit gaskets to both sides, then install air vent tube (1).



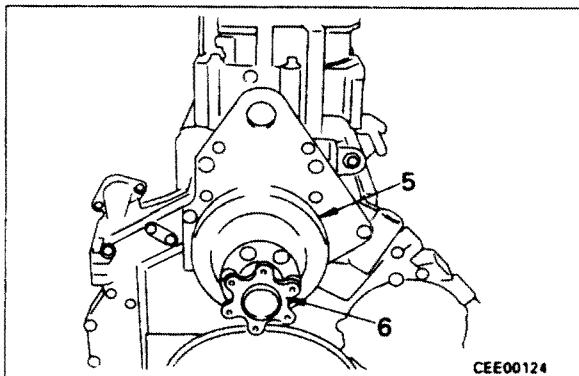
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**29. Pulley, front support**

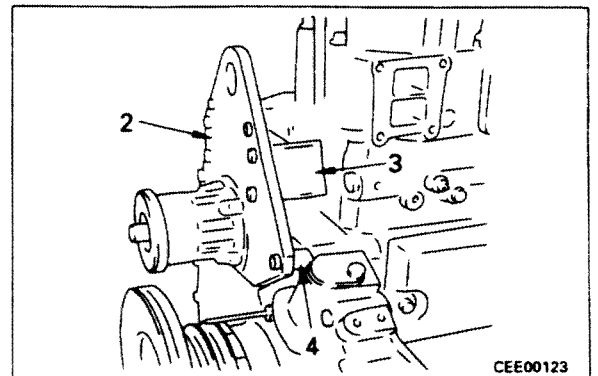
- 1) Install front drive (1) to support (2).
- 2) Install 2 spacers (3) and (4) together with support (2).
- 3) Install pulley (5) and spacer (6).



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

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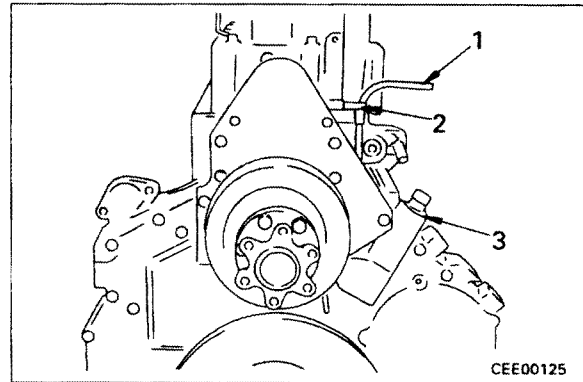


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
**30. Drive sensor, tubes, bracket**

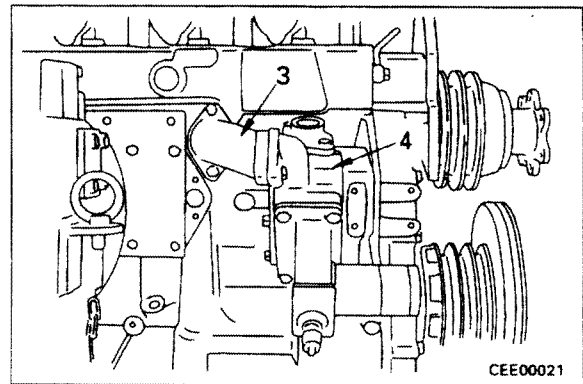
- 1) Install tubes (1) and (2).
- 2) Install drive sensor (3).
  - ★ Tighten the drive sensor until it contacts the ring gear, then loosen  $1.0 \pm 1/6$  turns and lock in position.

 Sensor thread: **Gasket sealant (LG-6)**  
 Locknut :  **$58.8 \pm 9.8$  Nm ( $6 \pm 1$  kgm)**

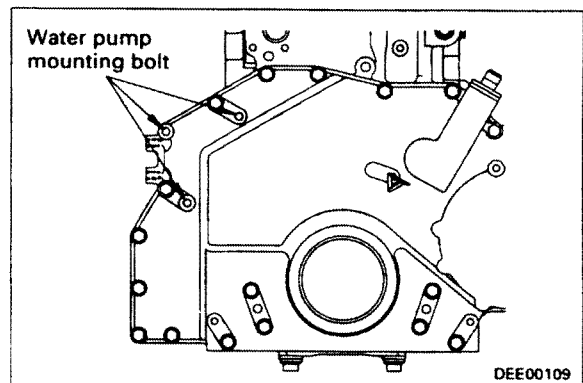


**31. Water pump, thermostat housing**

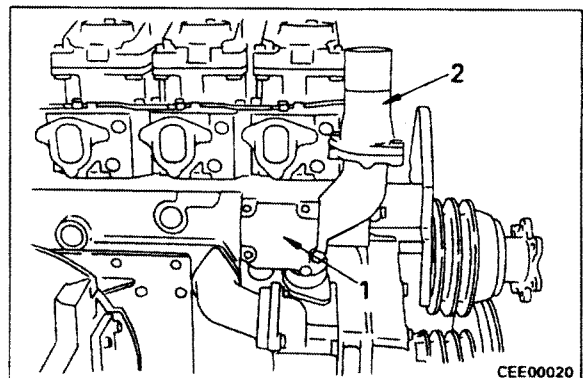
- 1) Fit O-ring and install water pump (4), then tighten bolts.
  -  Mounting bolt :  **$66.2 \pm 7.4$  Nm ( $6.7 \pm 0.75$  kgm)**
- 2) Fit gasket to tube (3) between water pump and cylinder block, then install tube.



- ★ Positions for installing water pump mounting bolts



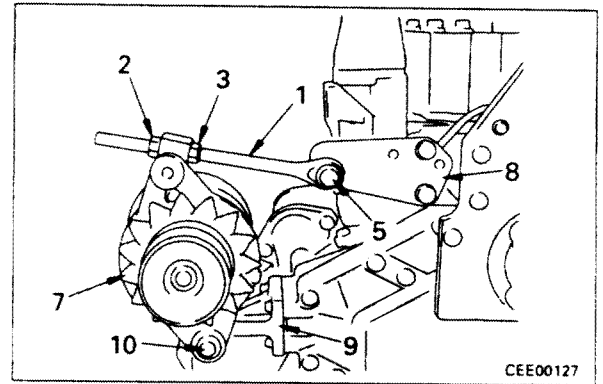
- 4) Install thermostat housing (1) and tube (2).



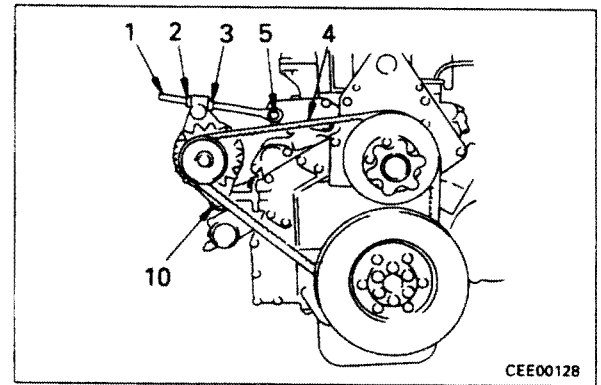
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**32. Alternator assembly**

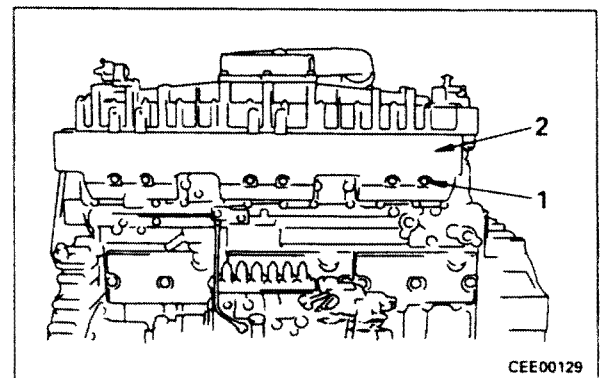
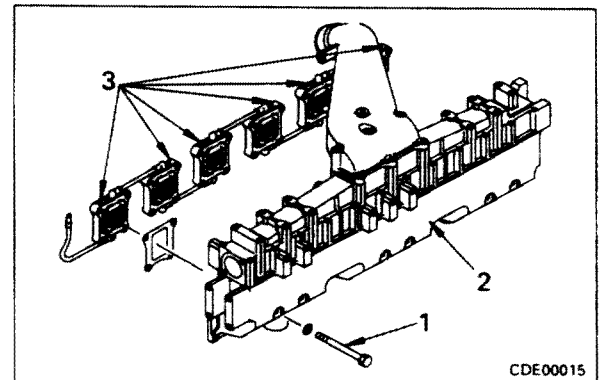
- 1) Install mounting brackets (9) and (8).
- 2) Install alternator assembly (7) to bracket (9), then install rod (1) with bolt (5).

**33. Adjusting V-belts**

- 1) Fit 2 V-belts (4) to pulley groove, loosen nut (2) of tension adjustment rod (1), then tighten nut (3) to adjust V-belt tension.
  - ★ Adjust so that the deflection is 13 mm when the belt is pressed at the mid point with a force of 59 N (6 kg).
- 2) After adjusting tension, tighten bolts (10), (5), (2), and (1).


**34. Aftercooler assembly**

- 1) Raise aftercooler assembly (2), assemble mounting bolts (1) to gasket, heater (3), and gasket, then align with cylinder head and install temporarily.
  - ★ Check that the gaskets are assembled securely.
  - ★ Connect the heater wiring securely.
- 2) Tighten 24 mounting bolts (1) of aftercooler (2).



**35. Fuel injection pump piping**

- 1) Install lubrication tubes (1) and (2) and boost compensator tube (3).


 **kgm** Lubrication tube joint bolt

Unit: Nm (kgm)


Tube No.	Mounting position	Tightening torque
1	Cylinder block mounting side <b>a</b>	11.3 ± 1.5 (1.15 ± 0.15)
	Injection pump mounting side <b>b</b>	17.2 ± 2.5 (1.75 ± 0.25)
2	Cylinder block mounting side <b>c</b>	29.4 ± 4.9 (3 ± 0.5)
	Injection pump mounting side <b>d</b>	27.0 ± 2.5 (2.75 ± 0.25)

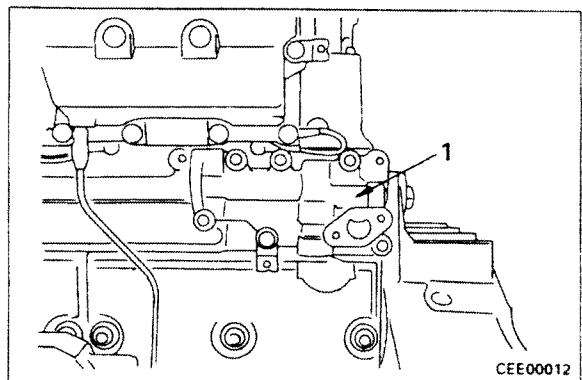
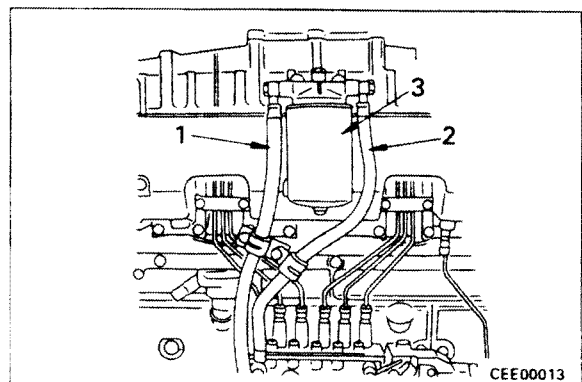
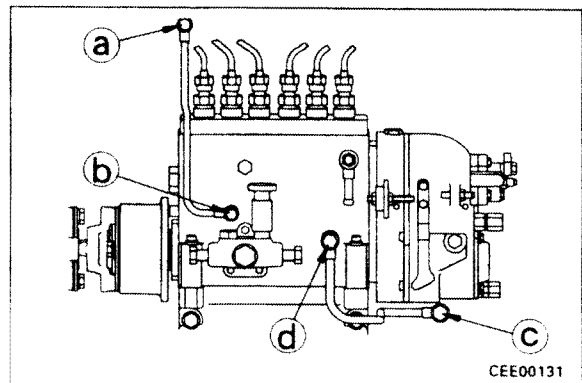
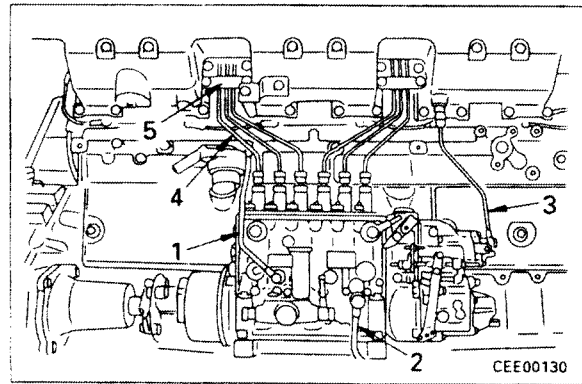
- ★ Before installing the lubrication tube joint bolts, check that there is no damage to the 2 gaskets, then assemble securely.

- 2) Install 6 fuel injection pipes (4), and secure with 2 clamps (5).

 **kgm** Fuel injection pipe: **23.5 ± 1 Nm**  
(2.4 ± 0.1 kgm)

- 3) Fit fuel filter assembly (3), then install hoses (2) and (1).

 **kgm** Fuel hose : **22.1 ± 2.5 Nm**  
(2.25 ± 0.25 kgm)



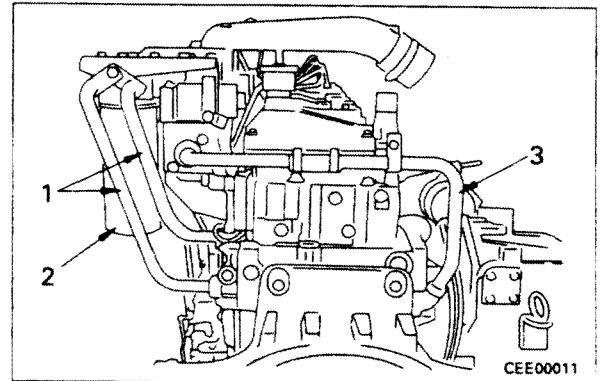
**36. Lubrication valve**

Fit O-ring to lubrication valve (1), then install.

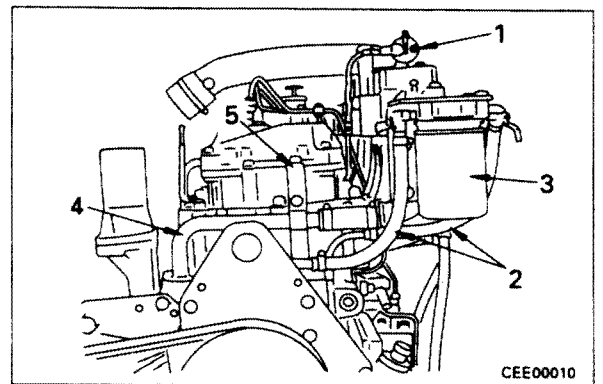
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**37. Engine oil filter**


- 1) Install engine oil filter (2) to aftercooler.
- 2) Fit O-rings and install pipes (1).
- 3) Fit O-ring and gasket to aftercooler inlet pipe (3), then install.

**38. Corrosion resistor**


- 1) Fit O-ring and gasket to aftercooler outlet pipe (4), then install.  
★ Clamp the aftercooler pipe securely to bracket (5).
- 2) Install corrosion resistor (3), then connect hoses (2).
- 3) Connect wiring of heater relay (1).

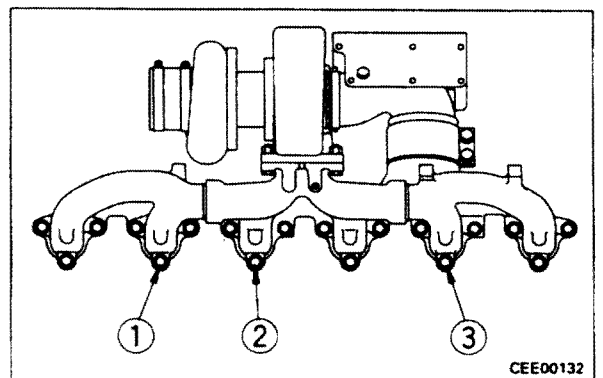
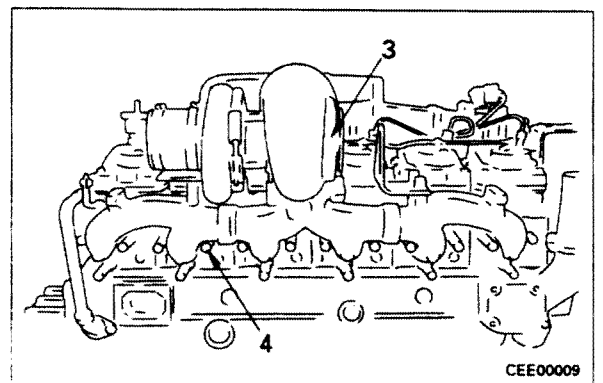
**39. Turbocharger, exhaust manifold assembly**

- 1) Raise turbocharger and exhaust manifold assembly (3), fit gasket, then tighten 18 mounting bolts (4).  
★ Assemble the gasket with the mark on the outside.
- 2) Tighten mounting bolts as follows.
  - i) Tighten mounting bolts 2 - 3 turns by hand.
  - ii) After tightening bolts (1) - (3), tighten other bolts.

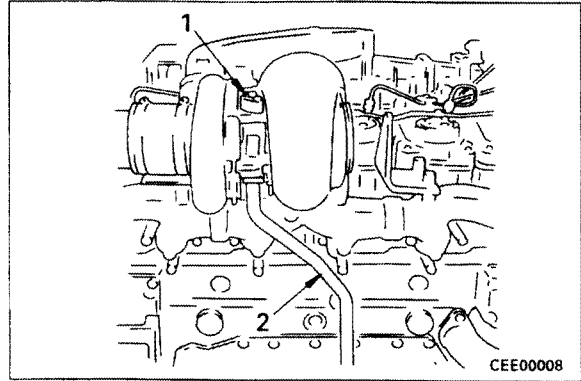
 Mounting bolt :  $66.2 \pm 7.4 \text{ Nm}$   
( $6.75 \pm 0.75 \text{ kgm}$ )

- 3) Connect connection hose for intake connector to turbocharger.

 Intake connector clamp :  
 $8.8 \pm 0.5 \text{ Nm}$  ( $0.9 \pm 0.05 \text{ kgm}$ )




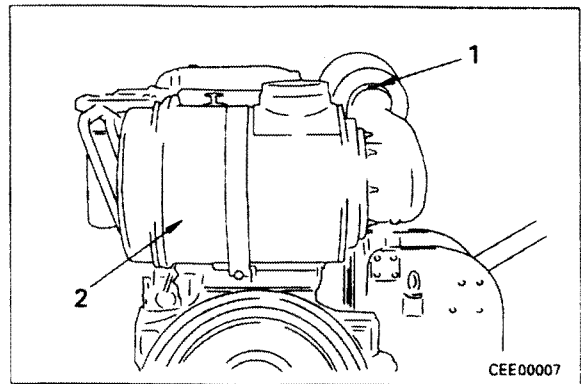
- 4) Fit gaskets to turbocharger lubrication tube inlet port (1) and outlet port (2), then install.



**40. Air cleaner**

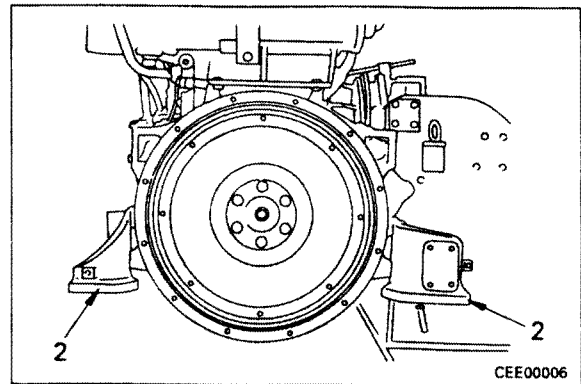
Install air cleaner (1), then connect hose (2) from turbocharger.

 **Hose clamp :  $8.8 \pm 0.5 \text{ Nm}$   
( $0.9 \pm 0.05 \text{ kgm}$ )**

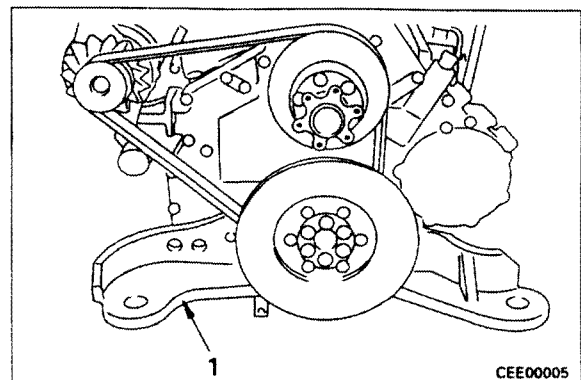


**41. Engine mounts**

- 1) Install rear mounts (2).



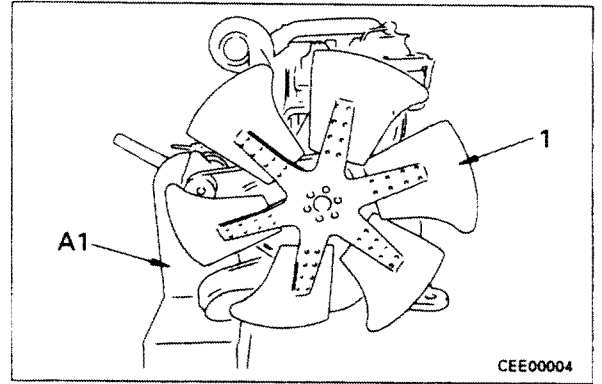
- 2) Install front mount (1).



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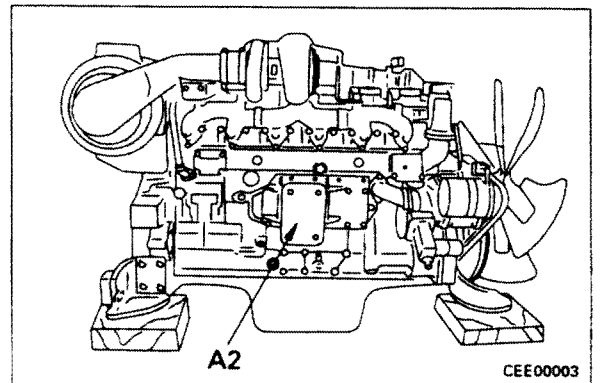
**42. Fan**

Install fan (1).




**43. Resetting engine in engine stand**

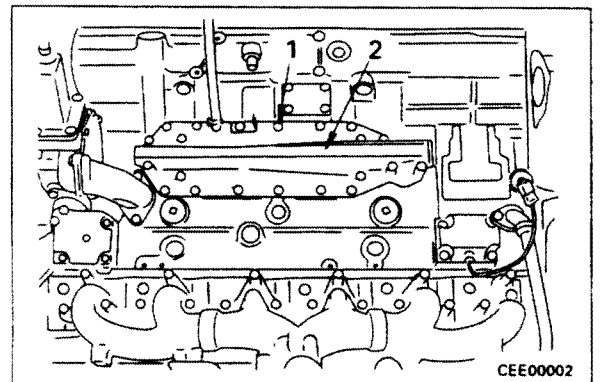
- 1) Sling engine assembly, remove bolts connecting tool A1 and tool A2 to disconnect engine assembly.
- 2) Set engine assembly on engine stand or block.
- 3) Remove tool A2.



**44. Engine oil cooler assembly**

Fit gasket, install engine oil cooler, then tighten 17 bolts (1).

 Mounting bolt :  $66.2 \pm 7.4 \text{ Nm}$   
 $(6.75 \pm 0.75 \text{ kgm})$



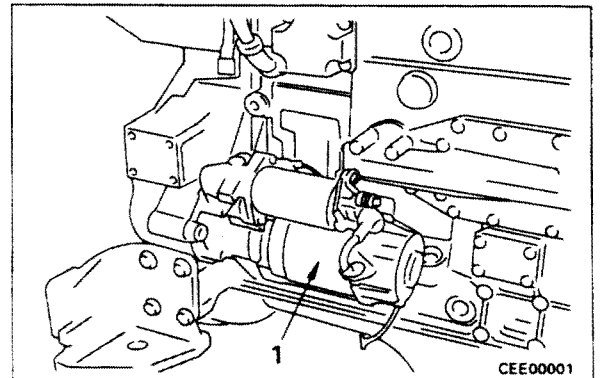
**45. Starting motor assembly**

Fit gasket and install starting motor (1).

● **Refilling with oil**

- 1) Check that engine drain plug is tightened.
- 2) Add engine oil through oil filler to specified level.

 Engine oil pan : **Approx. 37 l**



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# 14 MAINTENANCE STANDARD

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## INTAKE AND EXHAUST SYSTEM

Turbocharger ..... 14- 2

## ENGINE BODY

Cylinder head ..... 14- 4

Valve and valve guide ..... 14- 6

Rocker arm shaft ..... 14- 8

Crosshead ..... 14- 9

Cylinder block ..... 14-10

Cylinder liner ..... 14-12

Crankshaft ..... 14-13

Camshaft ..... 14-14

Cam follower and push rod ..... 14-15

Timing gear ..... 14-16

Piston, piston ring and piston pin ..... 14-18

Connecting rod ..... 14-22

Vibration damper ..... 14-23

Flywheel and flywheel housing ..... 14-24

## COOLING SYSTEM

Water pump and thermostat ..... 14-25

Oil cooler ..... 14-26

## LUBRICATION SYSTEM

Oil pump ..... 14-27

Main relief valve ..... 14-28

Regulator valve and safety valve ..... 14-29

## ACCESSORY

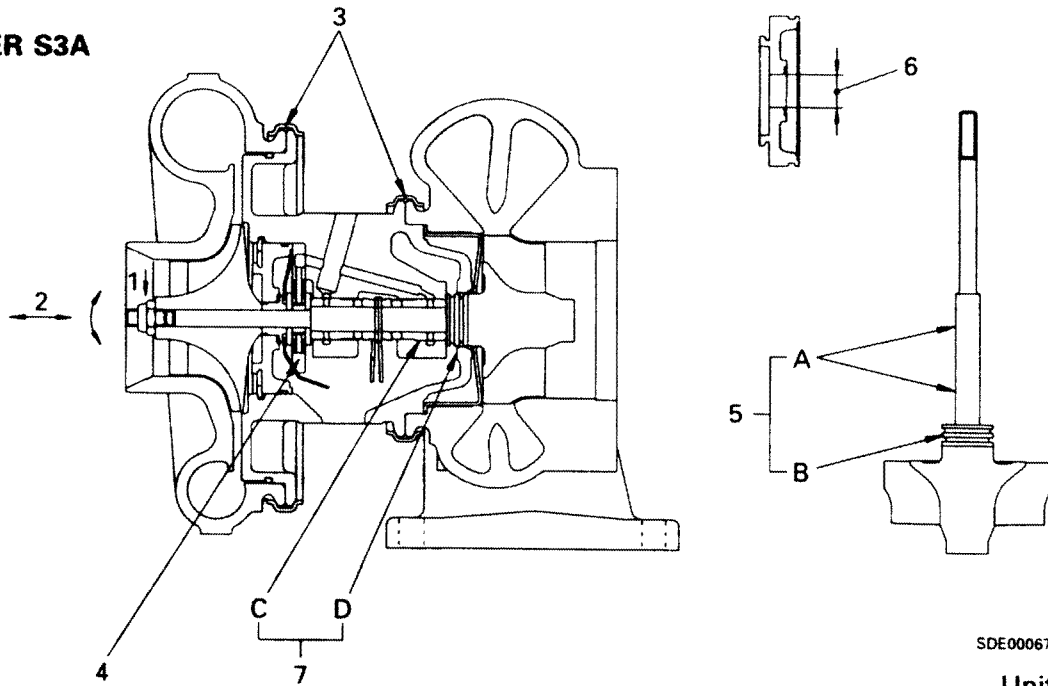
Air compressor ..... 14-30

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**TURBOCHARGER (S6D125-2, SA6D125-2)**

SCHWITZER S3A



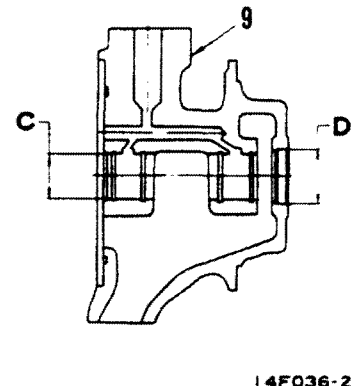
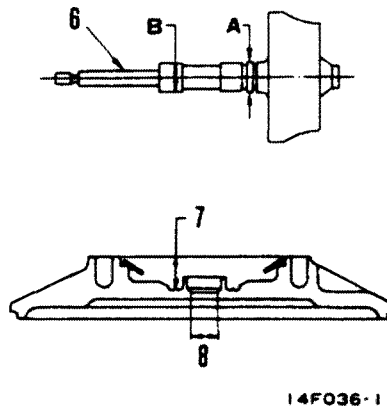
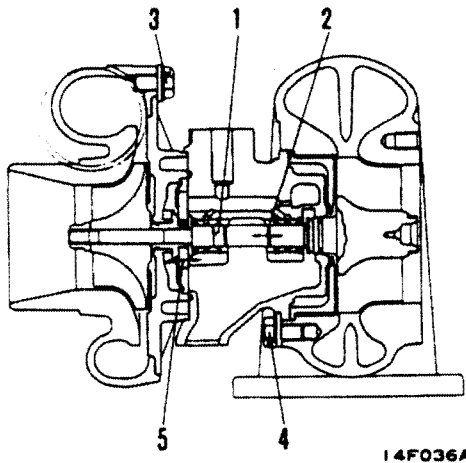
SDE00067

Unit : mm

No.	Item	Criteria		Remedy		
		Standard	Repair limit			
1	Radial play of rotor	0.450 - 0.650	0.84	Repair or replace		
2	End play of rotor	0.07 - 0.12	0.142			
3	Tightening torque of clamp nut	Target (Nm (kgm))	Range (Nm (kgm))	Retighten		
		9.8 (1.0)	9.8 (1.0)			
4	Thickness of thrust bearing	Standard size	Repair limit			
		5.36	5.34			
5	Outside diameter and bend of wheel shaft	Outside diameter	Measuring point	Standard	Repair limit	Replace
			A	11.57	11.55	
		B	24.45	24.38		
	Bend	Repair limit : 0.0076 (Total Indicated Runout)				
6	Inside diameter of insert	15.90	15.90			
7	Inside diameter of center housing	Measuring point	Standard	Repair limit		
		C	19.08	19.10		
		D	25.43	25.43		

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GARRET TO4 E



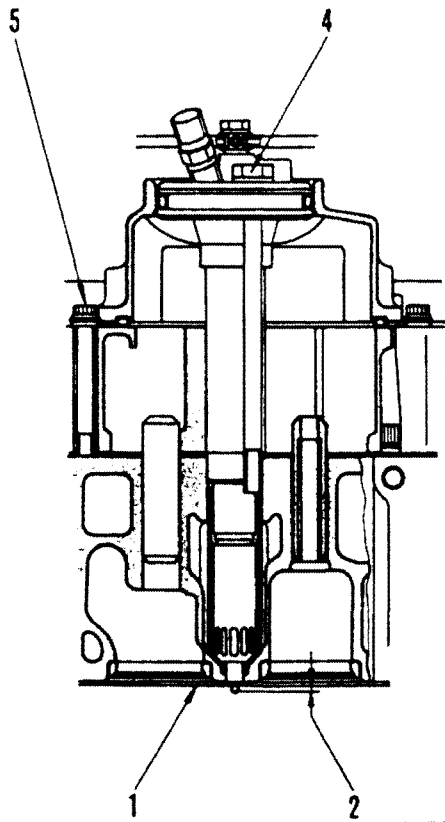
14F036-2  
Unit : mm

No.	Item	Criteria			Remedy
		Standard size	Repair limit		
1	Play of rotor in radial	0.076 - 0.150	0.15		Repair or replace
2	Play of rotor in axial	0.025 - 0.076	0.076		
3	Tightening torque of blower housing bolt	Target (Nm (kgm))	Range (Nm (kgm))		Retighten
		12.8 (1.3)	11.3 - 14.7 (1.15 - 1.5)		
4	Tightening torque of turbine housing bolt	19.6 (2.0)	17.7 - 21.6 (1.8 - 2.2)		
-	Tightening torque of back plate mounting bolt	9.3 (0.95)	8.4 - 10.2 (0.86 - 1.04)		
5	Thickness of thrust bearing	Standard size	Repair limit		
		4.37	4.35		
6	Outside diameter, curvature of wheel shaft	Outside diameter	Standard size	Repair limit	Replace
		A	17.31	17.25	
		B	10.16	10.15	
		Curvature Repair limit : 0.010 (total runout of indicator)			
7	Depth of back plate	Standard size	Repair limit		
		11.66	11.68		
8	Inside diameter of back plate	12.70	12.73		
9	Inside diameter of center housing	Measuring point	Standard	Repair limit	
		C	15.80	15.81	
		D	18.03	18.06	

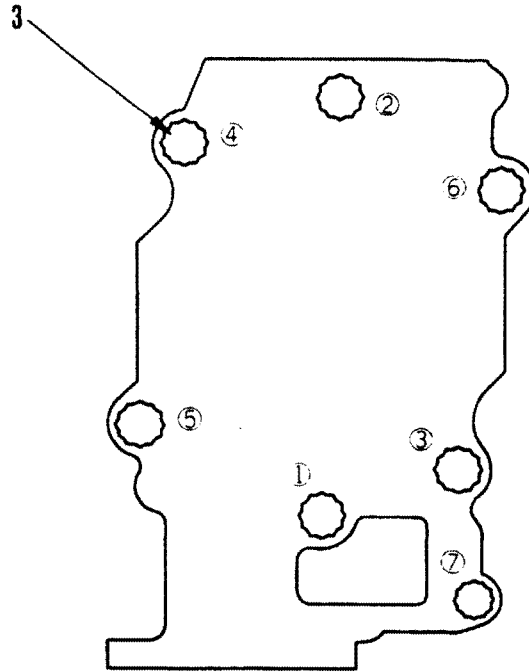
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CYLINDER HEAD

Tightening order of cylinder head mounting bolt



6150F402



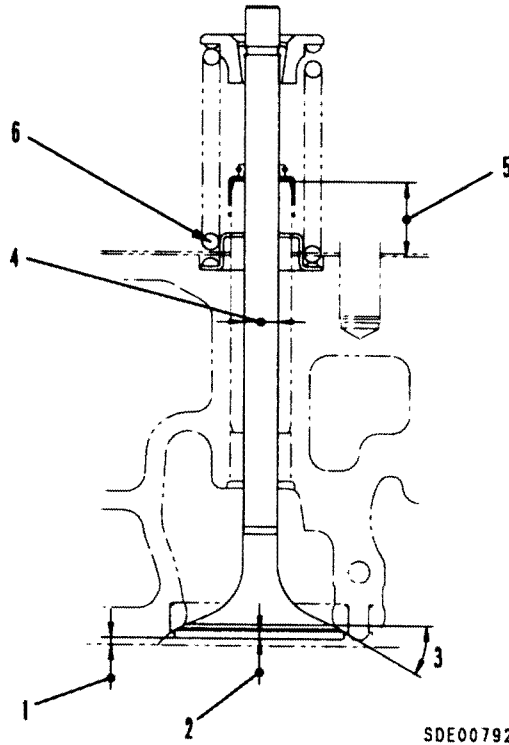
6150F403

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Unit : mm

No.	Item	Criteria				Remedy
		Standard		Repair limit		
1	Distortion of cylinder head mounting surface	Standard		Repair limit		Repair by grinding or replace
		0 - 0.06		0.09		
2	Protrusion of nozzle	Applicable model		Standard		Replace sleeve
		6D125-2	S.T.D.	3.35 - 4.25		
		S6D125-2	S.T.D.	3.35 - 4.25		
		SA6D125-2	S.T.D.	3.35 - 4.25		
3	Tightening torque of cylinder head mounting bolts (Coat the thread areas with molybdenum disulfide or engine oil)	Bolt No.	Order	Target Nm (kgm)	Range Nm (kgm)	Tighten bolts in accordance with bolts No.
		① - ⑥	1st step	98 (10)	88 - 107 (9 - 11)	
			2nd step	137 (14)	127 - 147 (13 - 15)	
			3rd step	Retighten with 90°	90° - 120°	
		⑦	-	68 (7)	58 - 73 (6 - 7.5)	
4	Tightening torque of nozzle holder mounting bolt	21 ± 2.9 Nm (2.2 ± 0.3 kgm)				Retighten
5	Tightening torque of rocker arm housing	66 ± 7.3 Nm (6.75 ± 0.75 kgm)				

VALVE AND VALVE GUIDE



SDE00792

615002

Unit: mm

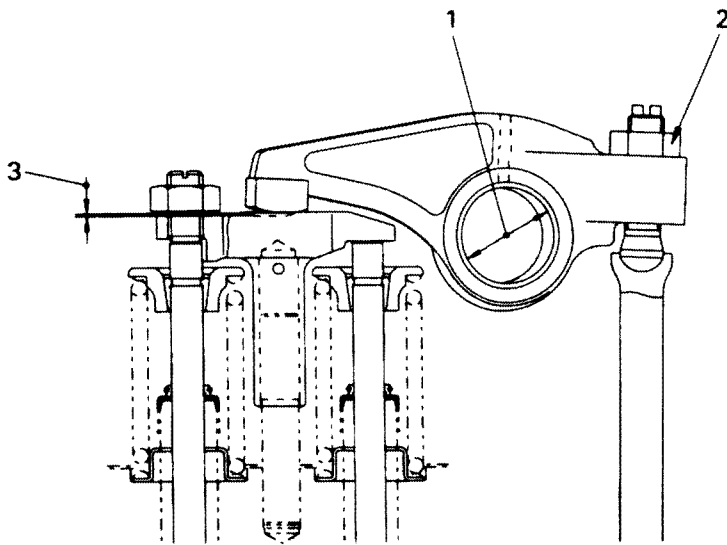
No.	Item	Criteria				Remedy
		Valve	Standard	Tolerance	Repair limit	
1	Amount of valve sinking	Intake	1.88	±0.10	2.51	Replace valve or valve seat
		Exhaust	1.20	±0.10	1.90	
		Valve				
2	Thickness of valve lip	Intake	2.10		1.7	Replace
		Exhaust	1.50		1.2	
		Valve				
3	Valve seat angle	Intake	30°		±0°15'	Repair or replace
		Exhaust	45°		±0°15'	
		Valve				

615002

Unit : mm

No.	Item	Criteria				Remedy	
4	Outside diameter of valve stem	Valve	Standard	Tolerance		Replace	
		Intake	9	-0.045 -0.065			
		Exhaust	9	-0.050 -0.070			
	Inside diameter of valve guide	Before inserting	9	+0.015 -0.003		Replace	
		After inserting	9	+0.009 -0.011			
	Clearance between valve guide and valve stem	Valve	Standard	Clearance limit		Replace	
		Intake	0.034 - 0.074	0.22			
		Exhaust	0.039 - 0.079	0.24			
	Bend of valve stem	Repair limit : 0.01 (Total indicated runout for 100 mm)				Replace	
	5	Protrusion of valve guide	Standard		Tolerance		Repair
20			±0.2				
6	Free length of valve spring	Engine	Valve	Color code	Free length	Repair limit	
		6D125-2 S6D125-2 SA6D125-2	Intake	White		75.2	-
			Exhaust	White		75.2	-
	Installed load of valve spring	Engine	Valve	Color code	Installed length	Installed load	Repair limit
		6D125-2 S6D125-2 SA6D125-2	Intake	White	56.0	519 ± 25 N (53.0 ± 2.6 kg)	467 N (47.7 kg)
			Exhaust	White	56.0	519 ± 25 N (53.0 ± 2.6 kg)	467 N (47.7 kg)
Squareness of valve spring	Repair limit : 2° (for both end)						

ROCKER ARM SHAFT



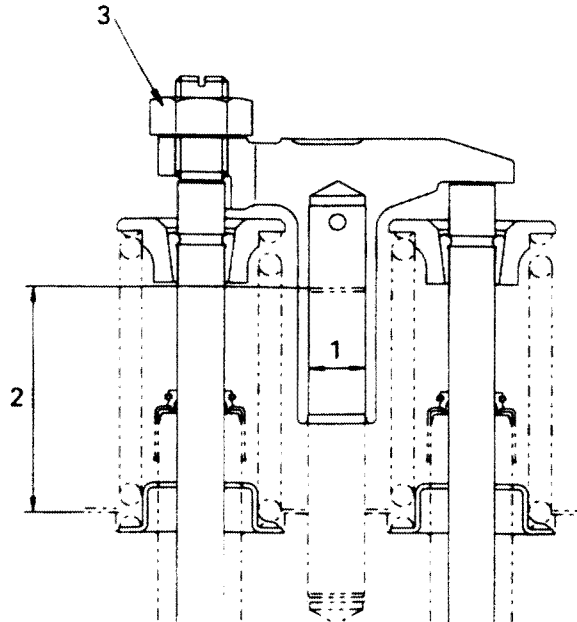
SEE00069

615002

Unit : mm

No.	Item	Criteria		Remedy	
		Standard	Tolerance		
1	Outside diameter of rocker arm shaft	28.6	-0.053 -0.066	Replace rocker arm shaft	
	Inside diameter of rocker arm shaft hole	28.6	+0.033 -0.027		Replace rocker arm
	Clearance between rocker arm and rocker arm shaft	Standard	Clearance limit	Replace rocker arm or rocker arm shaft	
		0.026 - 0.099	0.130		
	Bend of rocker arm shaft	Repair limit : 0.20 (Total indicated runout)		Replace rocker arm shaft	
2	Tightening torque of rocker arm adjustment nut	53 - 65 Nm (5.4 - 6.6 kgm)		Retighten	
3	Valve clearance (at hot or cold)	Valve	Standard	Tolerance	Adjust
		Intake	0.33	±0.02	
		Exhaust	0.71	±0.02	

CROSSHEAD



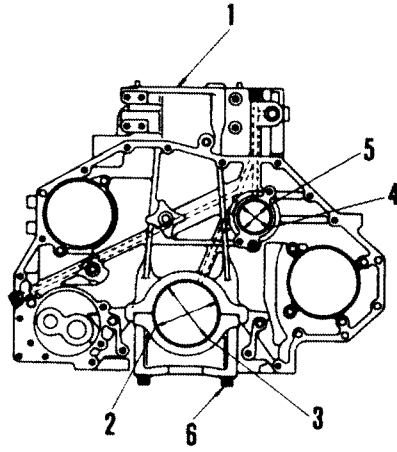
SEE00070

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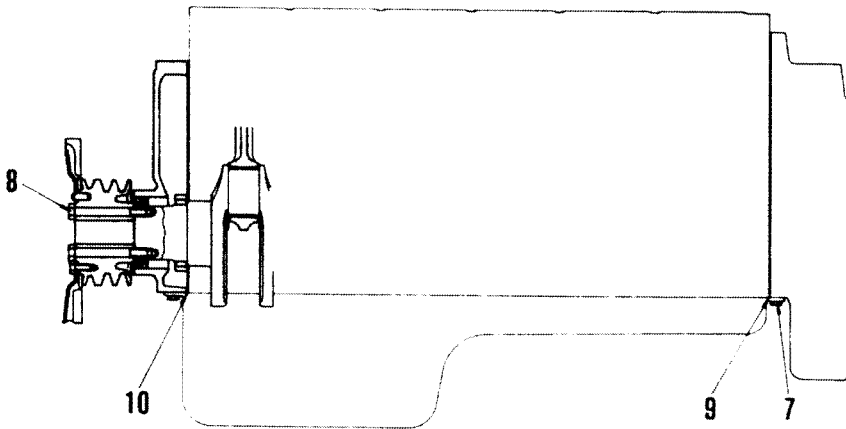
Unit : mm

No.	Item	Criteria			Remedy
		Standard	Tolerance	Repair limit	
1	Inside diameter of crosshead	11	+0.075 +0.025	11.18	Replace
	Outside diameter of crosshead guide	11	+0.011 0	10.95	
2	Protrusion of crosshead guide	45.5	±0.25	-	Repair
3	Tightening torque of crosshead lock nut	66 ± 7.3 Nm (6.75 ± 0.75 kgm)			Retighten

CYLINDER BLOCK



6150F407



6150F408

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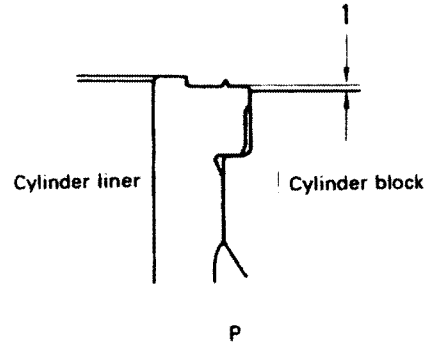
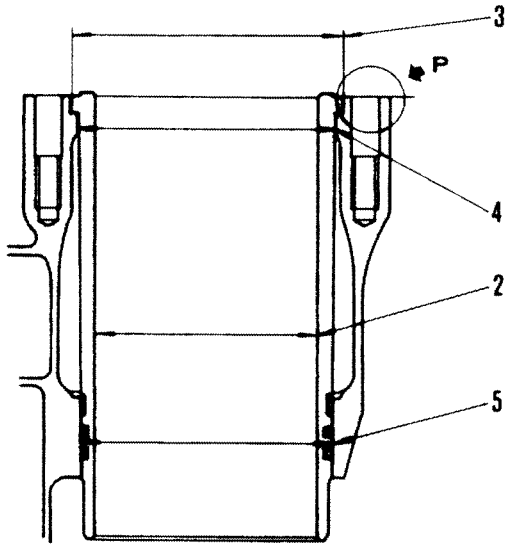


Unit : mm

No.	Item	Criteria			Remedy
1	Distortion of cylinder head mounting surface	Standard	Repair limit		Repair by grinding or replace
		0 - 0.080	0.120		
2	Inside diameter of main bearing hole	Standard	Tolerance		Replace main bearing cap
		116	+0.015 -0.010		
	Thickness of main bearing	3	-0.005 -0.020		Replace bearing
Roundness of main bearing hole	Repair limit : 0.005				
3	Inside diameter of main bearing	Standard	Tolerance	Repair limit	Replace bearing
		110	+0.040 +0.010	110.15	
4	Inside diameter of cam bushing mounting hole	63	+0.030 0		Repair or replace
5	Inside diameter of cam bushing	60	+0.070 0	60.30	Replace
6	Tightening torque of main bearing cap (Coat thread area with engine oil)	Order	Target Nm (kgm)	Range Nm (kgm)	Tighten
		1st step	98 (10)	88 - 107 (9 - 11)	
		2nd step	196 (20)	186 - 205 (19 - 21)	
		3rd step	Retighten with 90°	90° - 120°	
7	Tightening torque of oil pan mounting bolt	53.9 ± 19 Nm (5.5 ± 2.0 kgm)			Tighten
8	Tightening torque of crankshaft pulley mounting bolt	M16 (5 bolts)	274 Nm (28 kgm)	245 - 308 Nm (25 - 31.5 kgm)	
		M14 (1 bolt)	176 Nm (18 kgm)	156 - 196 Nm (16 - 20 kgm)	
9	Difference between lower face of cylinder block and flywheel housing	Repair limit : 0.35			Repair
10	Difference between lower face of cylinder block and front cover	Repair limit : 0.28			

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CYLINDER LINER



6152F010

6150F409

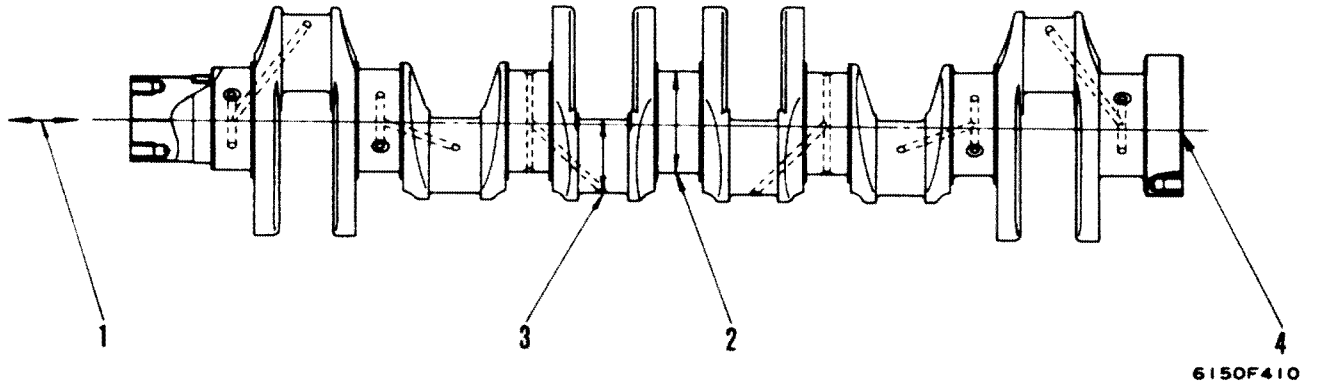
Unit : mm

No.	Item	Criteria				Remedy
1	Protrusion of cylinder liner	Repair limit : 0.07 – 0.15				Replace liner or block
2	Inside diameter of cylinder liner *1	Rank	Standard	Tolerance	Repair limit	Replace cylinder liner (only B rank is supplied)
		A	125	+0.020 0	125.20	
	B	125	+0.040 +0.021	125.20		
	Roundness of cylinder liner *1	Repair limit : 0.08				
	Cylindricity of cylinder liner *1	Repair limit : 0.08				
3	Outside diameter of cylinder liner (Counter bore) *1	Standard		Tolerance		
		153		±0.025		
	Interference between cylinder liner and block (Counter bore)	Standard : 0 – 0.113				Replace liner or block
4	Outside diameter of cylinder liner (Counter bore bottom)	Standard		Tolerance		Replace liner
		145		+0.090 +0.040		
	Interference between cylinder liner and block (Counter bore bottom)	Standard		Interference limit		Replace liner or block
		0.01 – 0.12		0.01		
5	Outside diameter of cylinder liner(O-ring)	Standard		Tolerance		Replace liner
		141		+0.386 +0.361		
	Clearance between cylinder liner and block (O-ring)	Standard : 0.014 – 0.079				Replace liner or block

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\*1 shows the dimension as an individual part

CRANKSHAFT



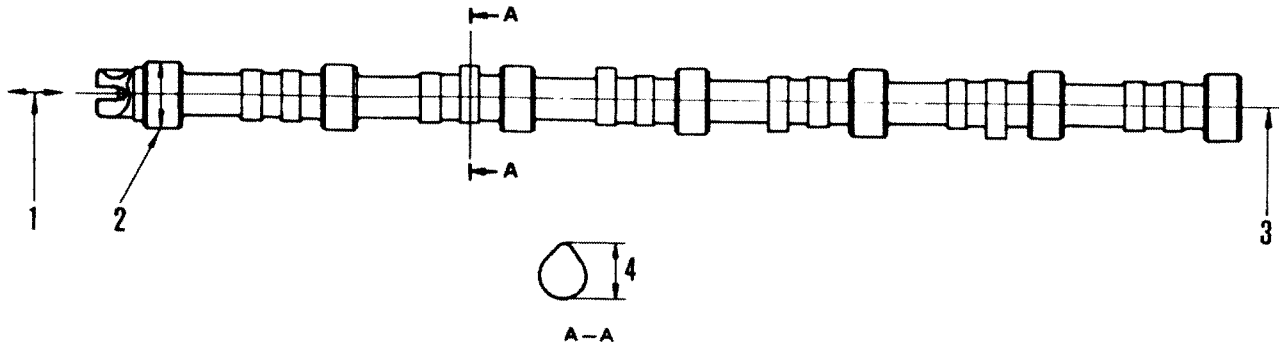
6150F410

Unit : mm

No.	Item	Criteria				Remedy
1	End play	Standard		Repair limit		Repair by using over size thrust bearing or replace
		0.0140 - 0.315		0.50		
2	Outside diameter of main journal		Standard	Tolerance -0.050 -0.070	Repair limit	Repair by using under size main bearing or replace
		STD	110		109.88	
		0.25 U.S.	109.75		109.63	
		0.50 U.S.	109.50		109.38	
		0.75 U.S.	109.25		109.13	
	1.00 U.S.	109.00	108.88			
	Roundness of main journal	Standard		Repair limit		
		0 - 0.010		0.020		
	Clearance of main journal	Standard		Clearance limit		Replace main bearing
		0.062 - 0.106		0.27		
3	Outside diameter of crankpin journal		Standard	Tolerance -0.050 -0.070	Repair limit	Repair by using undersize bearing
		STD	80		79.88	
		0.25 U.S.	79.75		79.63	
		0.50 U.S.	79.50		79.38	
		0.75 U.S.	79.25		79.13	
	1.00 U.S.	79.00	78.88			
	Roundness of crankpin journal	Standard		Repair limit		
		0 - 0.010		0.020		
	Clearance of crankpin journal	Standard		Clearance limit		Replace connecting rod
		0.046 - 0.090		0.24		
4	Bend of crankshaft	Standard		Repair limit		Repair by using under size bearing or replace
		0 - 0.090		0.20		

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CAMSHAFT



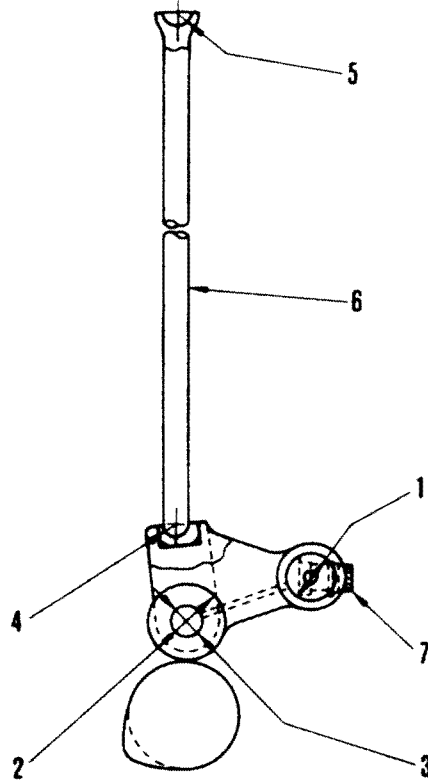
6150F411

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Unit : mm

No.	Item	Criteria		Remedy
1	End play	Standard	Repair limit	Replace thrust plate
		0.15 - 0.35	0.50	
2	Outside diameter of camshaft journal	Standard	Tolerance	Replace
		60	-0.080 -0.110	
4	Clearance of camshaft journal	Standard	Clearance limit	Replace cam bushing
		0.080 - 0.180	0.28	
4	Bend of camshaft	Repair limit : 0.03 (Total indicator reading)		Replace
5	Cam height	Standard	Tolerance	
		52	+0.395 +0.195	Repair limit 51.73

CAM FOLLOWER AND PUSH ROD



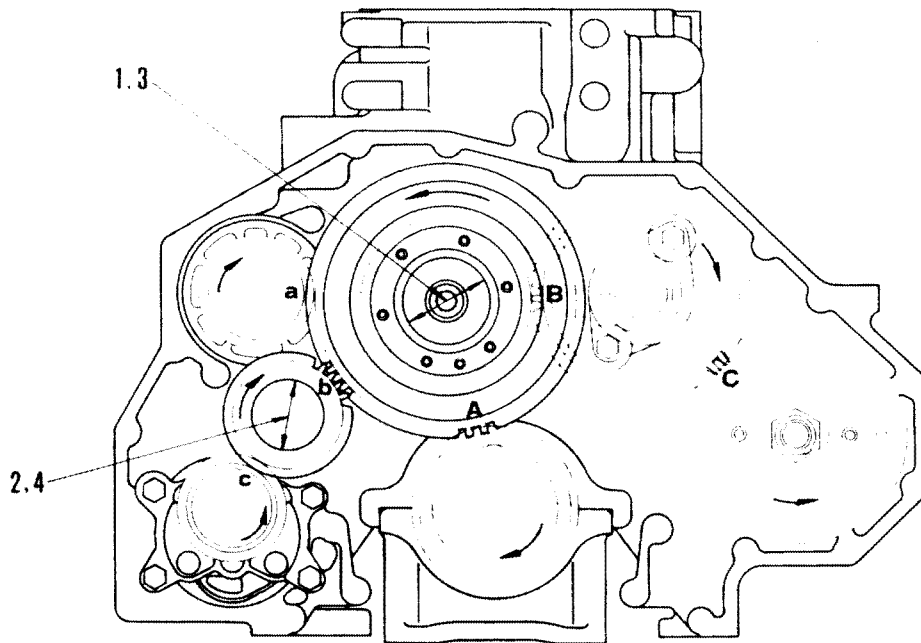
6150F428

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Unit : mm

No.	Item	Criteria			Remedy
		Standard	Tolerance	Repair limit	
1	Outside diameter of cam follower shaft	19.8	-0.040 -0.050	19.73	Replace
	Inside diameter of cam follower shaft hole	19.8	+0.020 0		
2	Outside diameter of cam roller	32	-0.250 -0.280	31.71	
3	Inside diameter of cam roller	13	-0.262 -0.287	12.78	
	Outside diameter of cam roller pin	13	-0.364 -0.376	12.62	
4	Radius of push rod ball end	Standard	Tolerance		
		12.7	0 -0.20		
5	Radius of push rod socket end	12.7	0 -0.20		
6	Bend of push rod	Repair limit : 0.50 (Total indicator reading)			
7	Tightening torque of cam follower housing mounting bolt	51 ± 7.3 Nm (5.25 ± 0.75 kgm)			Retighten

TIMING GEAR



6150F413A

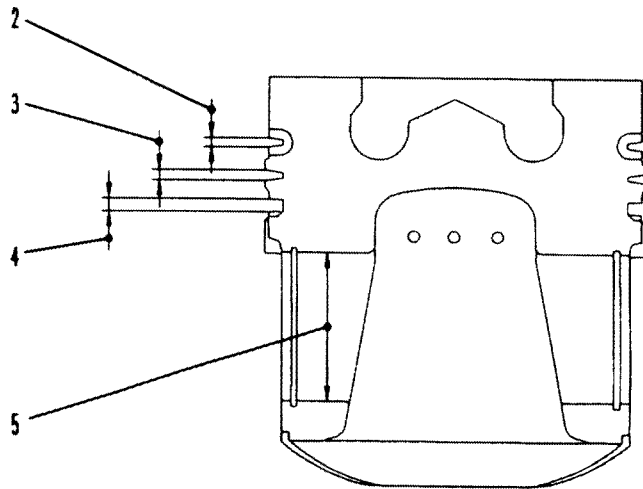
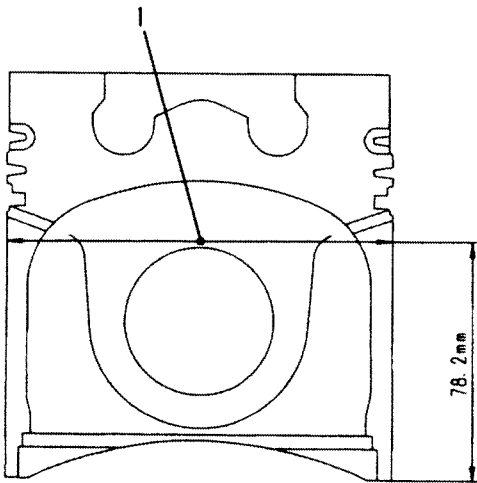
Unit : mm

No.	Item	Measuring point	Criteria			Remedy	
			Gears	Standard	Repair limit		
-	Backlash of each gears	A	Crankshaft gear and main idler gear (Large)	0.140 - 0.425	0.6	Replace	
		B	Main idler gear (Small) and camshaft gear	0.125 - 0.395			
		C	Camshaft gear and fuel injection pump drive gear	0.125 - 0.395			
		a	Main idler gear (Large) and water pump drive gear	0.155 - 0.440			
		b	Main idler gear (Large) and oil pump idler gear	0.130 - 0.405			
		c	Oil pump idler gear and oil pump drive gear	0.080 - 0.390			
		1	Clearance between main idler gear bushing and shaft	Standard size			Tolerance
	47.5	Shaft	Hole				
2	Clearance between oil pump idler gear and shaft	35	-0.025 -0.040	+0.115 +0.100	0.025 - 0.060	0.20	
3	End play of main idler gear	Standard		Repair limit		0.4	Replace thrust bearing
		0.05 - 0.17					
4	End play of oil pump idler gear	0.05 - 0.21		0.4			

615002

# PISTON, PISTON RING AND PISTON PIN

6D125-2 (Aluminum alloy)



SEE00793

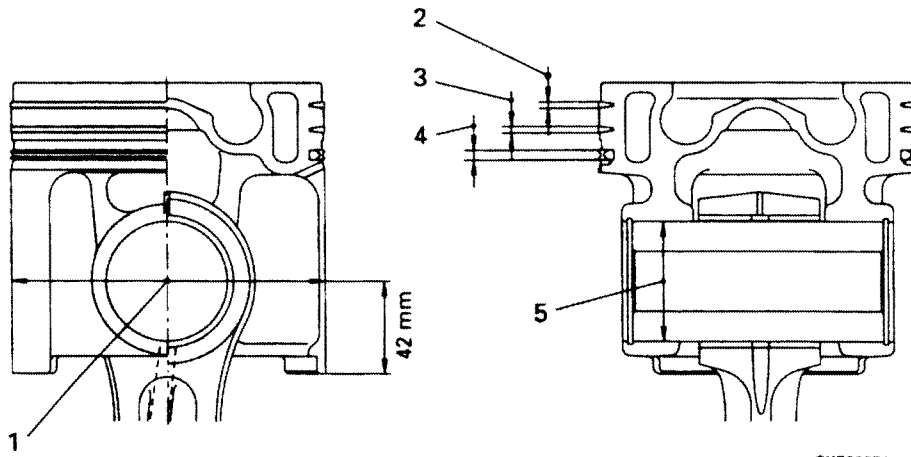
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No.	Item	Criteria				Remedy
		Rank	Standard	Tolerance	Repair limit	
1	Outside diameter of piston	A or S	125	-0.270 -0.285	124.59	Replace piston (supplied only as rank A or S)
		B or L	125	-0.255 -0.270	124.59	
		Thickness of piston ring		No.	Measuring point	
2 3 4	Width of piston ring groove	2	Top ring	Judge using groove wear gauge		Replace piston
		3	Second ring			
		4	Oil ring	4.0	+0.025 +0.010	
		Clearance between piston ring and ring groove		No.	Measuring point	
2 3 4	Piston ring gap	2	Top ring	0.37 - 0.47	2.0	Replace piston ring or cylinder liner
		3	Second ring	0.50 - 0.60	1.5	
		4	Oil ring	0.28 - 0.40	1.0	
5	Outside diameter of piston pin	Standard		Tolerance		Replace piston pin
		48		0 -0.006		
	Inside diameter of piston pin hole	48		+0.012 +0.004		Replace piston
-	Weight of piston	Standard		Clearance limit		Replace piston or piston pin
		0.004 - 0.018		0.030		
-	Weight of piston	6D125-2 : 2,059± 24g		S6D125-2 : 2,170± 24g		Replace piston

615002



S6D125-2, SA6D125-2 (Ductile cast iron (FCD) )

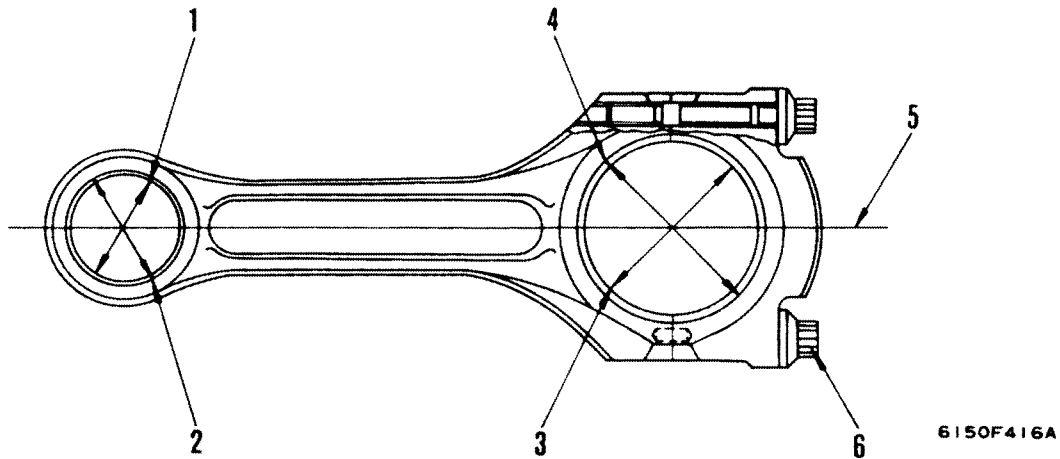


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No.	Item	Criteria				Remedy
		Rank	Standard	Tolerance	Repair limit	
1	Outside diameter of piston	A or S	125	-0.090 -0.105	124.80	Replace piston (supplied only as rank A or S)
		B or L	125	-0.075 -0.090	124.80	
2	Thickness of piston ring	No.	Measuring point	Standard	Tolerance	Replace piston ring
		2	Top ring	2.42	-0.005 -0.025	
		3	Second ring	2.4	-0.010 -0.030	
		4	Oil ring	4.0	-0.010 -0.030	
3	Width of piston ring groove	2	Top ring	Judge using groove wear gauge		Replace piston
		3	Second ring			
		4	Oil ring	4.0	+0.040 +0.020	
4	Clearance between piston ring and ring groove	No.	Measuring point	Standard	Clearance limit	Replace piston or piston ring
		2	Top ring	Judge using groove wear gauge		
		3	Second ring			
		4	Oil ring	0.030 - 0.070	0.15	
5	Piston ring gap	2	Top ring	0.37 - 0.47	2.0	Replace piston ring or cylinder liner
		3	Second ring	0.50 - 0.60	1.5	
		4	Oil ring	0.28 - 0.40	1.0	
5	Outside diameter of piston pin	Standard		Tolerance		Replace piston pin
		48		0 -0.006		
	Inside diameter of piston pin hole	48		+0.045 +0.035		Replace piston
5	Clearance between piston pin and piston	Standard		Clearance limit		Replace piston or piston pin
		0.035 - 0.051		0.063		
-	Weight of piston	3,000 g Permissible range: ± 60 g				Replace piston

615002

CONNECTING ROD

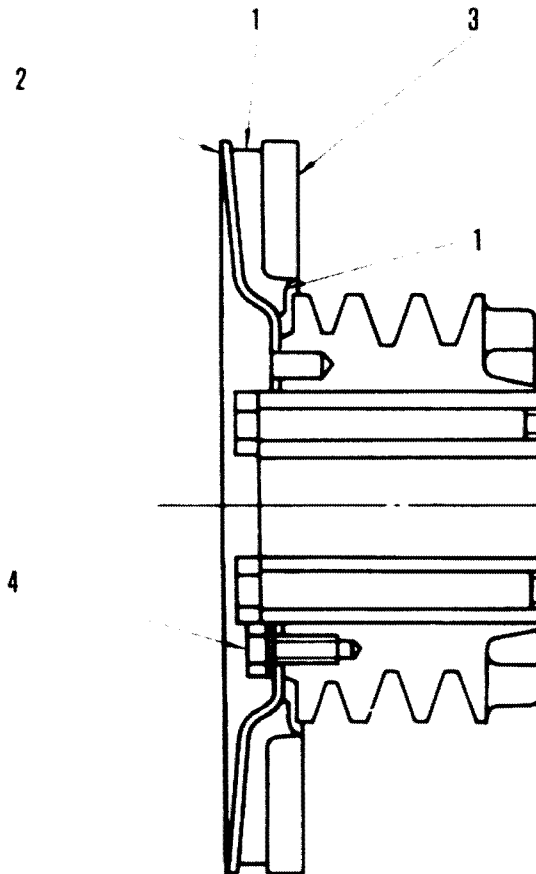


Unit: mm

No.	Item	Criteria			Remedy		
		Standard	Tolerance	Repair limit			
1	Inside diameter of bushing at connecting rod small end	48	+0.041 +0.025	48.08	Replace bushing		
		Clearance between bushing at connecting rod small end and piston pin		0.10		Replace bushing or piston pin	
2	Inside diameter of bushing hole at connecting rod small end	53	+0.030 0		Replace connecting rod		
		Standard		Clearance limit			
3	Inside diameter of bearing at connecting rod big end	80	+0.020 -0.010	80.12	Replace bearing		
		Standard		Tolerance			
4	Inside diameter of bearing hole at connecting rod big end	85	+0.022 -0.004	—	Replace connecting rod		
		Measure after tightening connecting rod cap with specified torque					
	Thickness of connecting rod bearing	2.5	+0.005 -0.005		Replace bearing		
5	Bend and twist of connecting rod			Standard	Repair limit	Replace connecting rod	
				Bend	0 - 0.20		0.25
				Twist	0 - 0.30	0.35	
6	Tightening torque of connecting rod cap mounting bolt (Coat the bolt threads and nut seats with engine oil)	Order	Target Nm (kgm)	Range Nm (kgm)	Retighten		
		1st step	98 (10)	93 - 102 (9.5 - 10.5)			
		2nd step	Retighten with 90°	90° - 120°			

615002

VIBRATION DAMPER



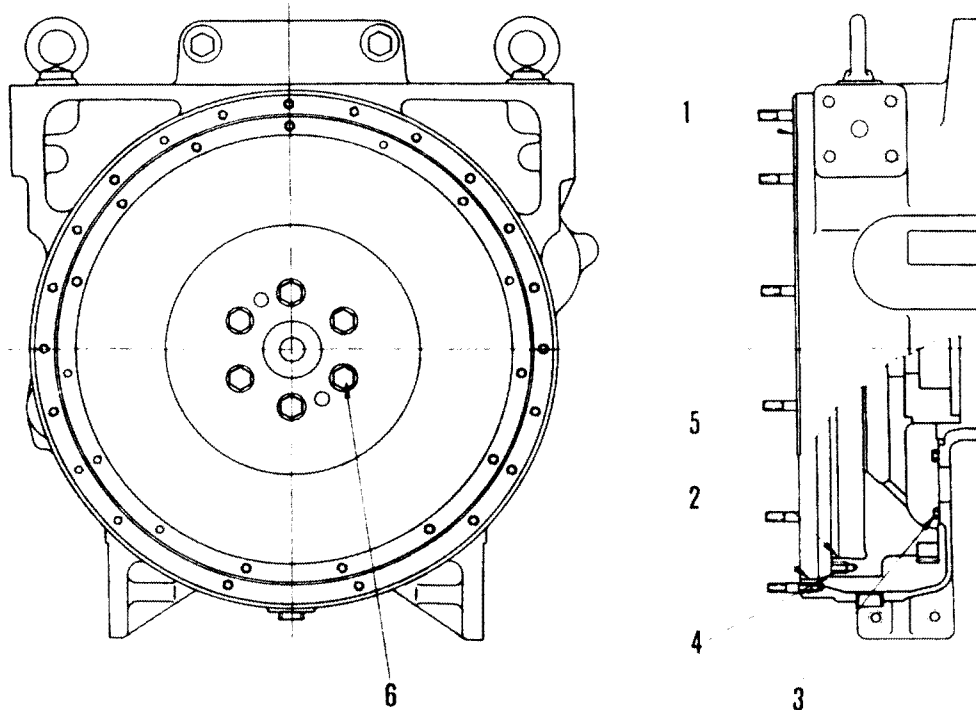
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Unit: mm

No.	Item	Criteria			Remedy
1	Visual check	Not appear any cracks on the rubber part.			Replace
2	Face runout of vibration damper (For D60P-17)	Repair limit: 0.80			Replace
3	Radial runout of vibration damper (For D60P-17)	Repair limit: 0.80			Replace
4	Tightening torque of vibration damper mounting bolt	Bolt	Target Nm (kgm)	Range Nm (kgm)	Retighten
		M12	111 (11.3)	98 - 122 (10 - 12.5)	

FLYWHEEL AND FLYWHEEL HOUSING



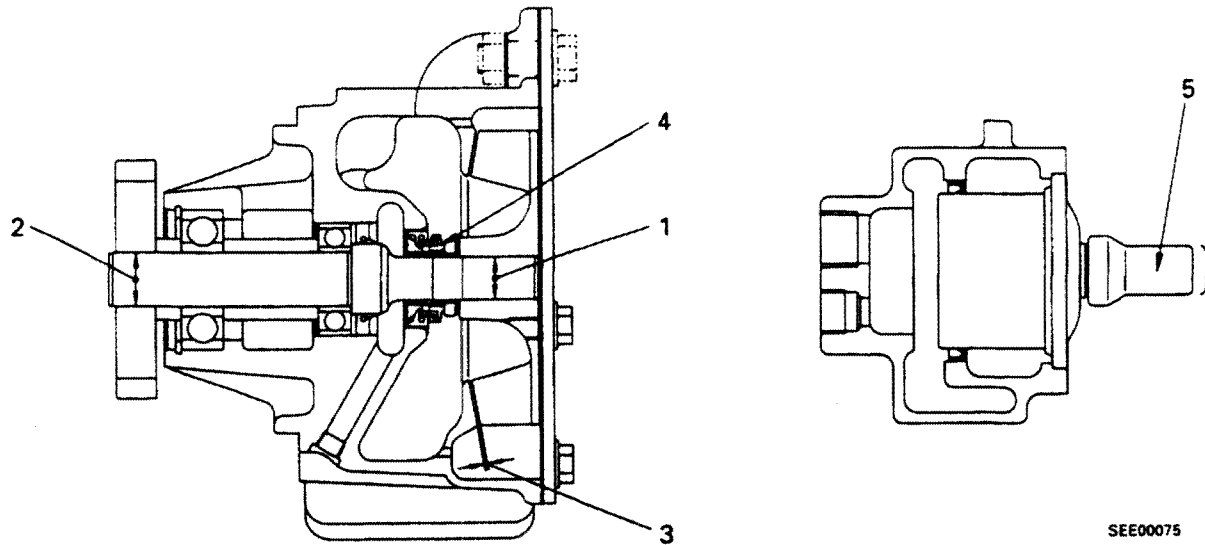
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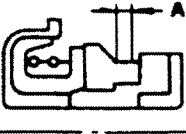
Unit: mm

No.	Item	Criteria.				Remedy	
1	Face runout of flywheel housing	Repair limit: 0.35				Repair by reassembling	
2	Radial runout of flywheel housing	Repair limit: 0.30					
3	Tightening torque of flywheel housing mounting bolt	Bolt	Order	Target Nm (kgm)	Range Nm (kgm)	Retighten	
		M16	1st step	142 (14.5)	83 - 196 (8.5 - 20)		
			2nd step	279 (28.5)	245 - 308 (25 - 31.5)		
M10	-	68 (7)	58 - 73 (6 - 7.5)				
4	Face runout of flywheel	Repair limit: 0.20				Repair by reassembling	
5	Radial runout of flywheel	Repair limit: 0.15					
6	Tightening torque of flywheel mounting bolt (Coat the bolt threads with engine oil)	Tightening order		Order	Target Nm (kgm)	Range Nm (kgm)	Retighten
				1st step	147 (15)	127 - 166 (13 - 17)	
				2nd step	289 (29.5)	269 - 308 (27.5 - 31.5)	

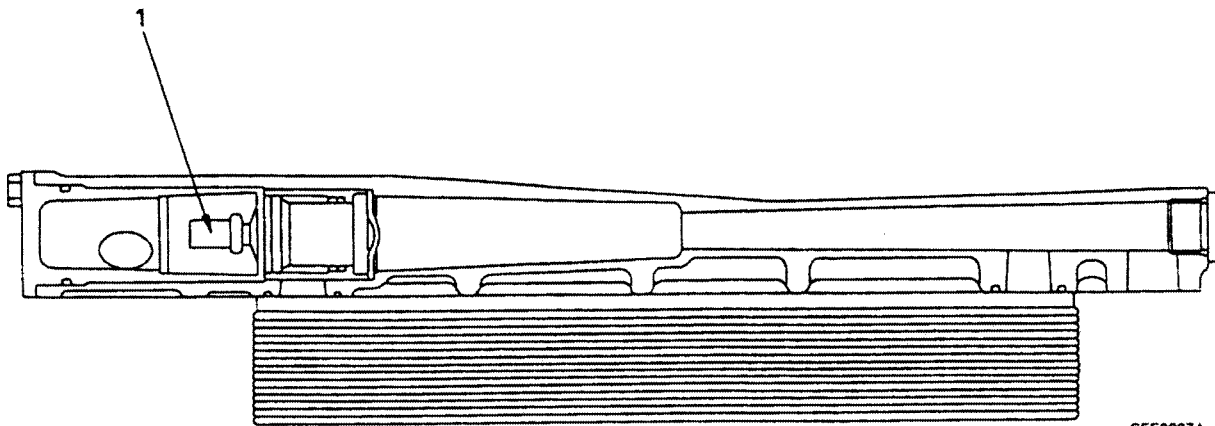
WATER PUMP AND THERMOSTAT



615002

Unit: mm							
No.	Item	Criteria				Remedy	
		Standard size	Tolerance		Standard interference		Interference limit
	Shaft		Hole				
1	Interference between impeller and shaft	15.9	+0.018 +0.005	-0.020 -0.050	0.025 - 0.068	-	Replace impeller
2	Interference between drive gear and shaft	20.0	+0.015 +0.002	-0.023 +0.053	0.025 - 0.068	-	Replace gear
3	Clearance between impeller and body	Standard: 0.30 - 1.10 (Include end play)					
4	Abrasion of seal ring in water seal				Repair limit A: 1.5		Replace
5	Lift of thermostat valve	Min. 10 (Check after immersion in a hot water bath of 90°C for 4 or 5 minutes.)					Replace
	Opening and closing of valve in thermostat	Valve must be close fully when immersed in a hot water bath (71°C) for 4 or 5 minutes after being immersed in a hot water bath (90°C) to fully open the valve.					

OIL COOLER

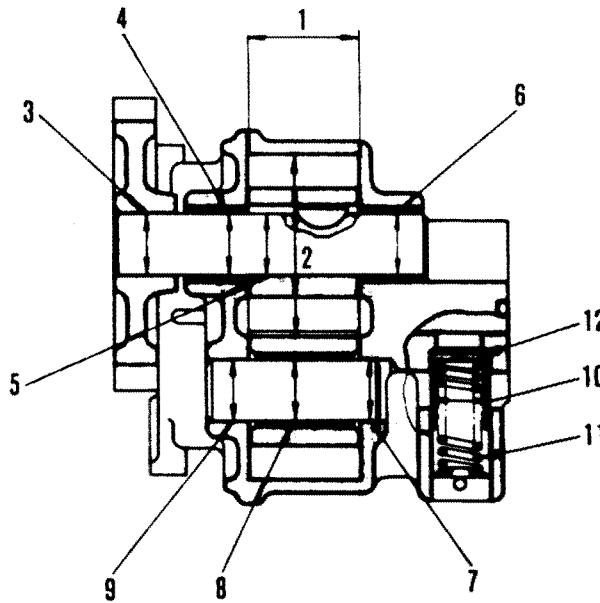


SEE00074

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Unit: mm			
No.	Item	Criteria	Remedy
1	Lift of thermostat valve	Min. 8 (Check after immersion in a hot oil bath of 100°C for 4 or 5 minutes.)	Replace
	Opening and closing of valve in thermostat	Valve must be close fully when immersed in a hot oil bath (85°C) for 4 or 5 minutes after being immersed in a hot oil bath (100°C) to fully open the valve.	

OIL PUMP



6150F418

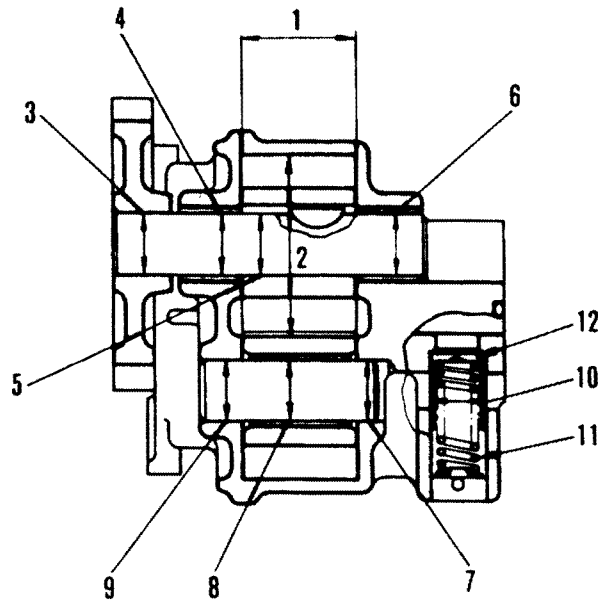
Unit: mm

No.	Item	Criteria					Remedy
		Engine	Standard size	Tolerance		Standard clearance	
Gear thickness	Body depth						
1	Axial clearance of pump gear	6D125-2	23	0 -0.021	+0.065 +0.040	0.03 - 0.09	Replace gear
		S6D125-2 SA6D125-2	47	0 -0.025	+0.065 +0.040	0.03 - 0.09	
2	Radial clearance of pump gear	Standard size	Tolerance		Standard clearance	Clearance limit	
		51.4	Gear O.D.	Gear I.D.			
			-0.15 -0.21	+0.06 0	0.03 - 0.10	0.13	
3	Interference between pump drive gear and drive shaft	Standard size	Tolerance		Standard clearance or interference	Clearance or interference limit	Replace
		18	Shaft	Hole			
			+0.106 +0.088	+0.065 +0.047	0.023 - 0.059	-	
4	Clearance between drive shaft and cover bushing	18	+0.106 +0.088	+0.173 +0.146	0.040 - 0.085		Replace bushing
5	Interference between pump gear and drive shaft	18	+0.106 +0.088	+0.063 +0.028	0.025 - 0.078	-	Replace
6	Clearance between drive shaft and body bushing	18	-0.006 -0.024	+0.061 +0.034	0.040 - 0.085		Replace bushing
7	Clearance between driven shaft and body	18	+0.090 +0.070	+0.129 +0.102	0.012 - 0.059	-	Replace
8	Clearance between driven shaft and gear bushing	18	+0.090 +0.070	+0.147 +0.122	0.032 - 0.077		Replace bushing
9	Interference between driven shaft and cover	18	+0.090 +0.070	+0.040 +0.020	0.030 - 0.068	-	Replace

615002



MAIN RELIEF VALVE

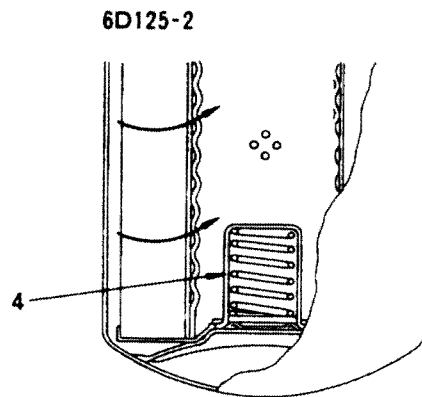
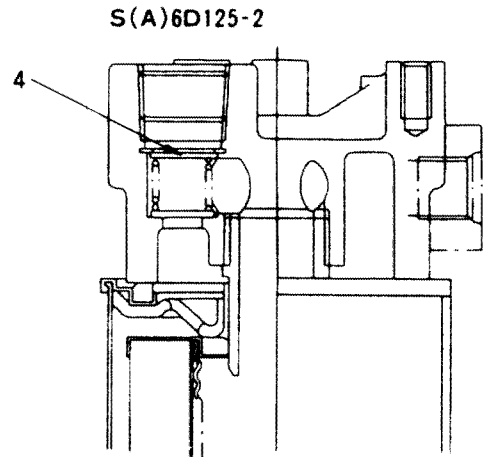
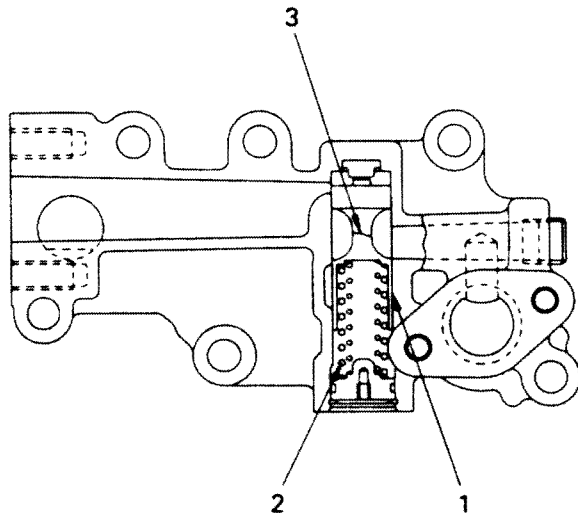


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615002

							Unit: mm	
No.	Item	Criteria				Remedy		
10	Clearance between valve and body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace	
		16	Shaft	Hole				
			-0.040 -0.060	+0.043 0	0.040 - 0.103			
11	Relief valve spring	Standard size			Repair limit			
		Free length	Installed length	Installed load	Free length	Installed load		
		49.1	34.8	105 N (10.8 kg)		96 N (9.8 kg)		
12	Relief valve set pressure	0.7 <sup>+0.1</sup> <sub>0</sub> MPa (7 <sup>+1</sup> <sub>0</sub> kg/cm <sup>2</sup> )						

# REGULATOR VALVE AND SAFETY VALVE

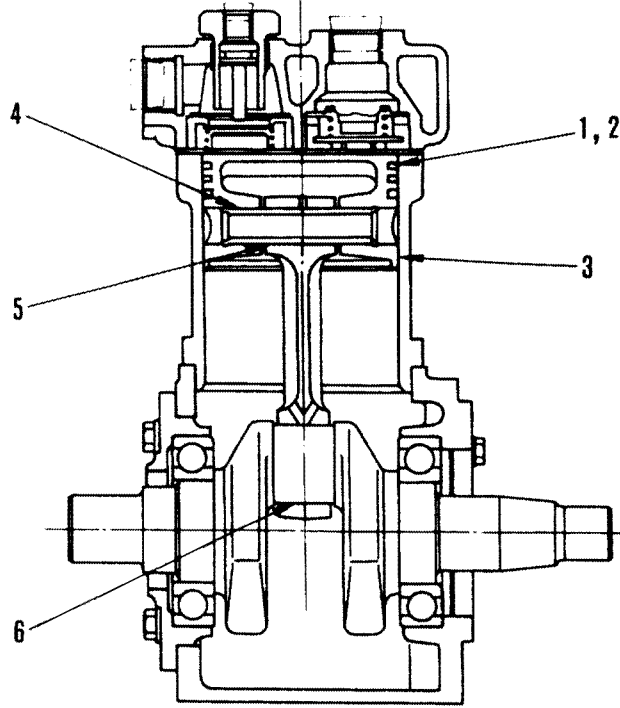
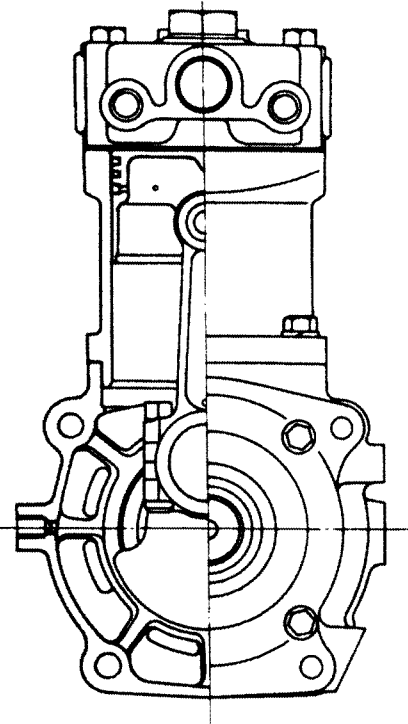


SEE00073

615002

							Unit: mm	
No.	Item		Criteria				Remedy	
1	Clearance between regulator valve and body		Standard size	Tolerance		Standard clearance	Clearance limit	
				Valve	Body			
		22	+0.15 +0.12	+0.28 +0.22	0.07 – 0.16		Replace valve or body	
2	Regulator valve spring		Standard size			Repair limit		Replace
	Remote mounting type	Outer spring	Free length	Installed length	Installed load	Free length	Installed load	
			65.0	42.3	84.6 N (8.63 kg)			
		Inner spring	56.3		41.6 N (4.25 kg)			
3	Regulator valve set pressure		0.36 ± 0.015 MPa (3.75 ± 0.15 kg/cm <sup>2</sup> )				Repair or replace spring	
4	Safety valve set pressure		0.2 ± 0.02 MPa (2.0 ± 0.2 kg/cm <sup>2</sup> )				Replace	

AIR COMPRESSOR



615002

				Unit: mm		
No.	Item		Criteria			Remedy
			Standard clearance		Repair limit	
1	Piston ring gap	1st, 2nd ring	0.1 – 0.3		2.0	Repair or replace
		Oil ring	0.2 – 0.6		1.5	
2	Clearance between piston ring and ring groove	1st, 2nd ring	Standard size	Standard clearance	Repair limit	
		Oil ring	3	0.015 – 0.050	0.15	
3	Clearance between piston and cylinder		85	0.090 – 0.150	0.25	
4	Clearance between piston pin and piston		16	0.006 – 0.026	0.1	
5	Clearance between piston pin and connecting rod small end		16	0.006 – 0.026	0.1	
6	Clearance between crank pin metal and crankpin		35	0.034 – 0.075	0.15	

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# 15 REPAIR AND REPLACEMENT OF PARTS

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Replacing valve seat inserts .....	15- 2
Replacing nozzle holder sleeve .....	15- 6
Replacing valve guide .....	15- 8
Replacing cross head guide .....	15- 8
Grinding the valve .....	15- 9
Grinding of fitting face of cylinder head.....	15- 9
Replacing cam bushing .....	15-10
Replacing cam gear .....	15-12
Replacing flywheel ring gear .....	15-12
Pressure test .....	15-13
Replacing engine rear seal.....	15-14
Replacing connecting rod small end bushing .....	15-18-1
Replacing main bearing cap .....	15-18-2
Grinding crankshaft.....	15-19
Replacing wear sleeve (When equipped with sleeve) .....	15-28

615002

# REPLACING VALVE SEAT INSERTS

## Special tools

	Part No.	Part Name	Q'ty	
A	795-100-4800	Puller (Valve seat)	1	
B	795-101-5001	Push tool (for intake valve and exhaust valve)	1	
1	795-100-3003	Seat cutter (kit)	1	
	795-100-3100	Body assembly	1	
	795-100-3200	Micrometer	1	
	795-100-3300	Gauge	1	
	795-100-3400	Tool head	1	
	795-100-3601	Head support	1	
C	2	795-100-3710	Cutter	1
	3	795-100-3720	Cutter (for 30°)	1
4	795-100-3730	Cutter (for 45°)	1	
5	795-100-4110	Pilot (9.00 mm)	1	
	795-100-4120	Pilot (9.01 mm)	1	
	795-100-4130	Pilot (9.02 mm)	1	
	795-100-4140	Pilot (9.03 mm)	1	

### 1. Pulling out the valve seat insert

**⚠** Before using the grinder, run it for a minute to test it.

- After replacing the grindstone, run the grinder for three minutes to test it.

**⚠** Confirm that the grindstone is not damaged, then install it to the shaft of the grinder without applying excessive force.

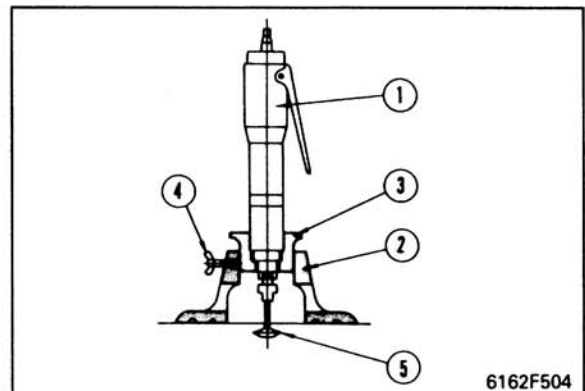
Confirm that there is no play between the grindstone and shaft.

**⚠** When using the grinder, wear safety goggles.

• **When using a valve seat puller to remove the valve seat**

- 1) Install grindstone ⑤ to grinder ①.
- 2) Align the groove of sleeve ③ with holder ②, then insert.

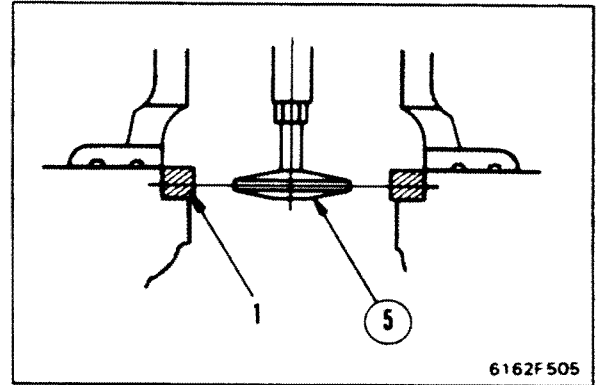
★ Adjust the position of the grinder with set screw ④.



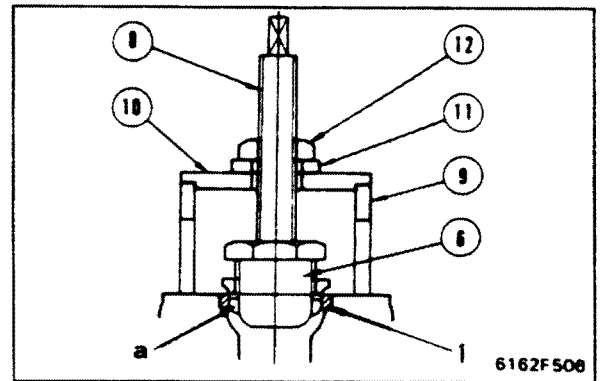
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615002

- 3) Adjust the position of the grinder so that the center of grindstone ⑤ will be at the center of seat insert (1), then tighten the set screw to secure the grinder.
- 4) Rotate the grindstone and move slowly until it contacts insert (1).



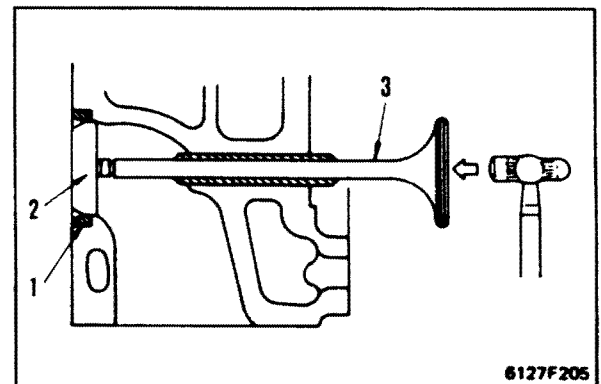
- 5) Press the grindstone against the inside of the insert, move it in a circular pattern, and make a groove about 1 mm deep.
- 6) Push in the three claws (a) on puller head ⑥ of tool A by hand to insert it inside insert (1).
- 7) Tighten screw ⑧ to press the three claws against the groove on the inside surface of the insert.  
★ When the claws contact the groove completely, stop tightening.
- 8) Place bridge ⑨ over the puller head, then place plates ⑩ and ⑪ on the bridge. Tighten nut ⑫ to pull out the insert.



615002

● **When welding a bar to the insert to remove the seat insert**

- 1) Weld bar (1) of radius approx.  $\phi$  10, that is 0.1 – 0.5 mm shorter than the inside diameter to the inside diameter of insert (2).  
★ Be careful not to let the welding metal stick to the head itself.
- 2) When the temperature of the weld goes down to around room temperature, insert an old valve (3) in the reverse direction, and tap the head of the valve with a small hammer to knock out the insert.  
★ If the valve is hit too hard, the weld may break.

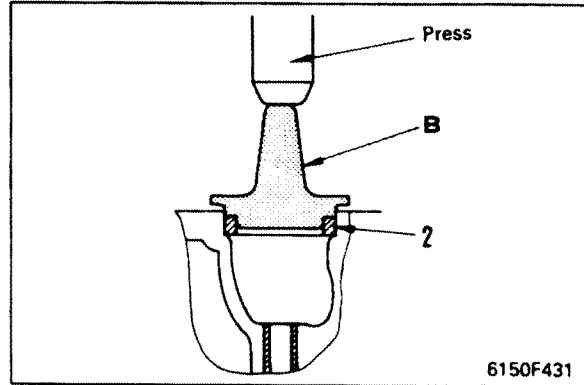


2. Press fitting the valve seat insert

● When not grinding and correcting the press fitting surface for the valve seat insert

1) Using tool B, press fit standard valve seat insert (2).

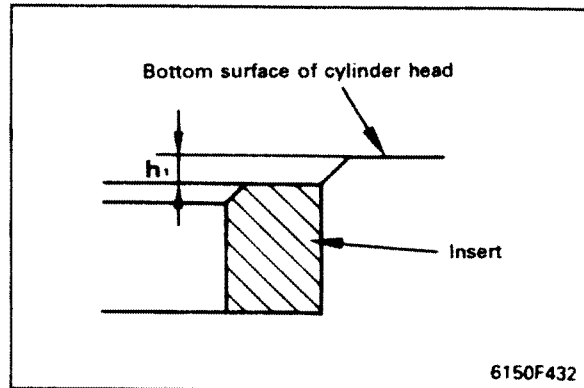
- ★ Do not use a hammer to press fit.
- ★ Press-fitting force for valve seat (intake, exhaust sides): Approx. 1 ton



6150F431

2) Check the depth of the insert from the bottom surface of the cylinder head.

- ★ Depth of the insert h1 (intake and exhaust sides)
  - : 3.78 – 4.08 mm (intake)
  - : 3.10 – 3.40 mm (exhaust)



6150F432

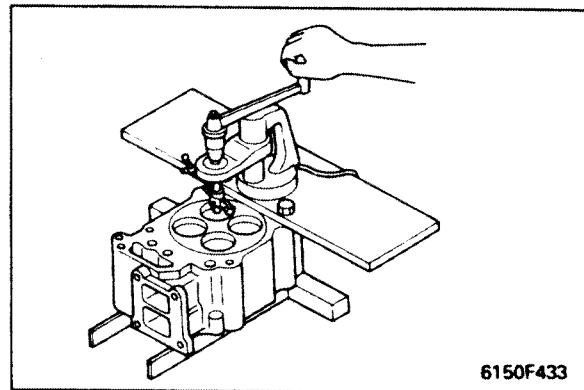
3. Machining valve seat insert mounting hole to oversize

1) Using tools C<sub>1</sub> and C<sub>2</sub>, grind the hole to a one size larger oversize.

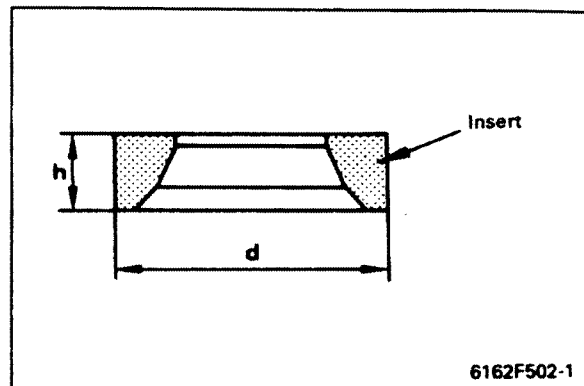
- ★ Machine within a range of 1.0 mm oversize.
- If it is more than 1.0 mm, replace the cylinder head.

● Dimensions of insert and mounting hole

Insert		Unit: mm	
	Valve	O.D. (d)	Height (h)
S.T.D.	Intake	47.50 <sup>+0.100</sup> / <sub>+0.090</sub>	7.5 <sup>0</sup> / <sub>-0.1</sub>
	Exhaust	46.5 <sup>+0.080</sup> / <sub>+0.070</sub>	7.5 <sup>0</sup> / <sub>-0.1</sub>
0.25 O.S.	Intake	47.75 <sup>+0.100</sup> / <sub>+0.090</sub>	7.5 <sup>0</sup> / <sub>-0.1</sub>
	Exhaust	46.75 <sup>+0.080</sup> / <sub>+0.070</sub>	7.5 <sup>0</sup> / <sub>-0.1</sub>
0.50 O.S.	Intake	48.0 <sup>+0.100</sup> / <sub>+0.090</sub>	7.62 <sup>0</sup> / <sub>-0.1</sub>
	Exhaust	47.0 <sup>+0.100</sup> / <sub>+0.090</sub>	7.62 <sup>0</sup> / <sub>-0.1</sub>
0.75 O.S.	Intake	48.25 <sup>+0.100</sup> / <sub>+0.090</sub>	7.75 <sup>0</sup> / <sub>-0.1</sub>
	Exhaust	47.25 <sup>+0.080</sup> / <sub>+0.070</sub>	7.75 <sup>0</sup> / <sub>-0.1</sub>
1.00 O.S.	Intake	48.5 <sup>+0.100</sup> / <sub>+0.090</sub>	7.88 <sup>0</sup> / <sub>-0.1</sub>
	Exhaust	47.5 <sup>+0.080</sup> / <sub>+0.070</sub>	7.88 <sup>0</sup> / <sub>-0.1</sub>



6150F433



6162F502-1

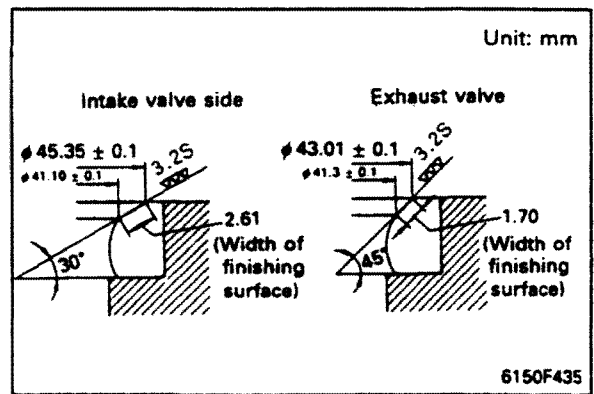
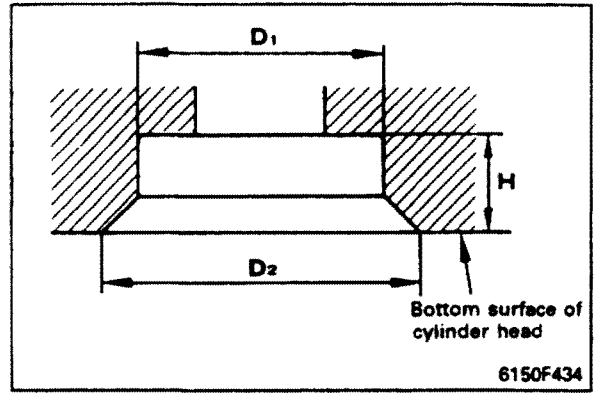
615002

Mounting hole for valve seat insert

Unit: mm

	Valve	D <sub>1</sub>	D <sub>2</sub>	H
S.T.D.	Intake	47.5 <sup>+0.020</sup> / <sub>-0.010</sub>	50.30 ± 0.2	11.38 ± 0.1
	Exhaust	46.5 <sup>+0.020</sup> / <sub>-0.010</sub>	49.30 ± 0.2	10.7 ± 0.1
0.25 O.S.	Intake	47.75 <sup>+0.020</sup> / <sub>-0.010</sub>	50.55 ± 0.2	11.38 ± 0.1
	Exhaust	46.75 <sup>+0.020</sup> / <sub>-0.010</sub>	49.55 ± 0.2	10.7 ± 0.1
0.50 O.S.	Intake	48.0 <sup>+0.020</sup> / <sub>-0.010</sub>	50.80 ± 0.2	11.5 ± 0.1
	Exhaust	47.0 <sup>+0.020</sup> / <sub>-0.010</sub>	49.80 ± 0.2	10.82 ± 0.1
0.75 O.S.	Intake	48.25 <sup>+0.020</sup> / <sub>-0.010</sub>	51.05 ± 0.2	11.63 ± 0.1
	Exhaust	47.25 <sup>+0.020</sup> / <sub>-0.010</sub>	50.05 ± 0.2	10.95 ± 0.1
1.00 O.S.	Intake	48.5 <sup>+0.020</sup> / <sub>-0.010</sub>	51.30 ± 0.2	11.76 ± 0.1
	Exhaust	47.5 <sup>+0.020</sup> / <sub>-0.010</sub>	50.30 ± 0.2	11.08 ± 0.1

- ★ Inside surface roughness: 12.5S max.
- ★ Mounting hole bottom roughness: 12.5S max.
- ★ Concentricity of valve guide hole and insert: 0.07 mm (T.I.R) max.



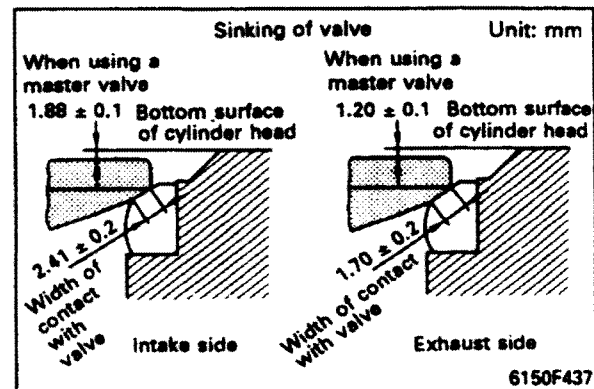
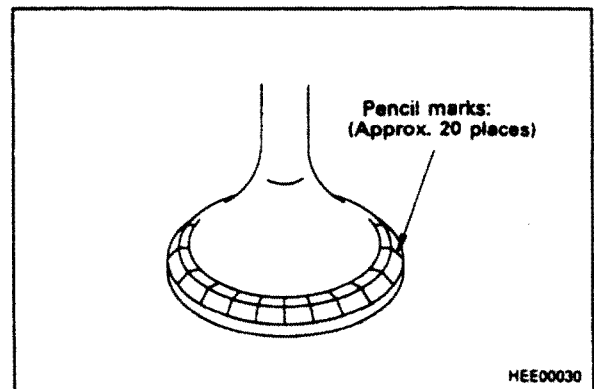
4. Finishing insert seat surface

- 1) Using tools C<sub>1</sub>, C<sub>3</sub>, and C<sub>4</sub>, finish the insert seat surface to the dimensions shown in the diagram.
  - ★ When inserting the pilot into the valve guide, select a pilot that will enter and leave no clearance.

- 2) Fit the seat surface using the compound.

5. Final check

- Coat the seat surface thinly with minimum (red lead), and insert a new valve into the valve guide. Put it lightly in contact with the valve insert surface, and rotate 10°, then check the contact surface with the valve insert. Confirm that the contact is uniform with no breaks.
- Another way is to mark the new valve with pencil marks as shown in the diagram, insert into the valve guide, bring into light contact with the valve insert surface, and rotate 10°. Check that the pencil marks are erased uniformly around the whole circumference.
- ★ If a vacuum tester is available, carry out an airtightness test to check.



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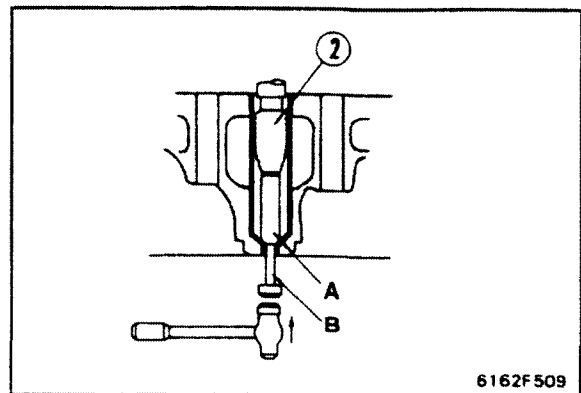
## REPLACING NOZZLE HOLDER SLEEVE

### Special tools

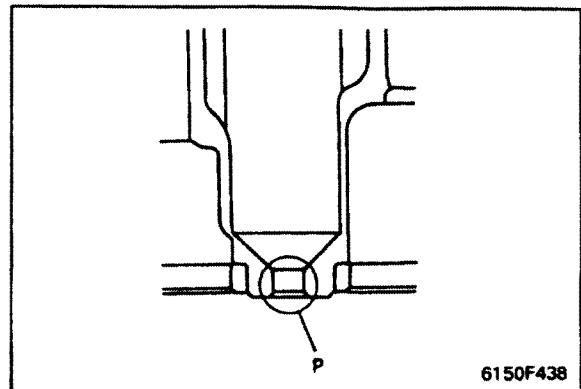
	Part No.	Part Name	Q'ty
A	795-600-1191	Push bar	1
B	795-600-1180	Push bar	1
C	795-600-1540	Sleeve driver	1
D	795-600-1410	Rolling tool	1
E	795-901-1210	Sleeve holder	1
F	795-600-1420	Sleeve expander	1
G	795-901-1230	Guide bushing	1
H	795-600-1430	Sleeve cutter	1

### 1. Removing the sleeve

- 1) Insert push bar A inside the sleeve.
- 2) Using sleeve extraction tap ②, cut tap to about 25 mm depth from top face of sleeve. Add oil while cutting.  
★ Sleeve extraction tap: M2.5, P = 1.5
- 3) Insert push bar B from the bottom of the head and tap with the hammer to remove the sleeve.  
★ Remove the sleeve material cleanly from portion P of the cylinder head.



6162F509



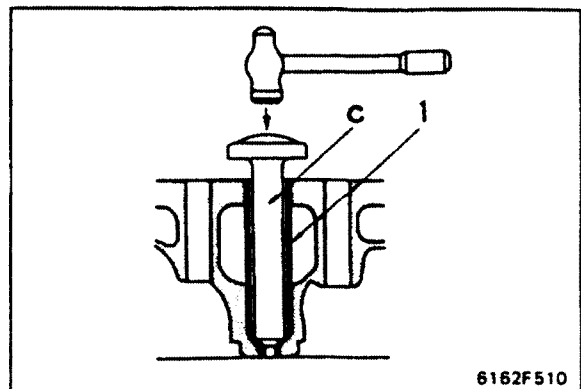
6150F438

### 2. Press-fitting the sleeve

Insert sleeve (1) into the cylinder head, then using sleeve driver C, tap lightly until the sleeve is completely in close contact with the seat surface.

- ★ Before installing the sleeve, clean the sleeve and seat.
- ★ Apply adhesive to the seat around the sleeve.

 Adhesive: LT-2

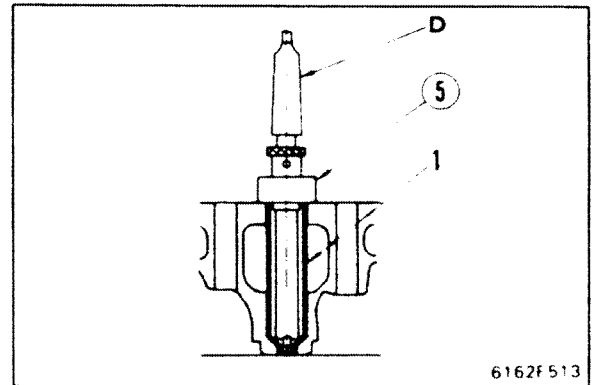


6162F510

**3. Roll-fitting the taper section of sleeve**

Using rolling tool **D**, roll-fit the taper section of the sleeve.

- ★ Set the roll-fitting amount with stopper **5** of the expander.
- ★ Install the expander to a radial drilling machine or upright drilling machine to roll-fit with its own weight.
- ★ Rotating speed: 200 to 300 rpm.

**4. Roll-fitting press-fitting portion at top of sleeve**

1) Using sleeve holder **E**, tighten the sleeve from the bottom surface of the cylinder.

Sleeve holder: 20 Nm (2 kgm)

2) Using sleeve expander **F**, carry out rolling to caulk the press-fitting portion.

- ★ Rotating speed: 450 rpm
- ★ Inside diameter:  $23.9 \pm 0.1$  mm
- ★ Amount of insertion of roller (**h**):

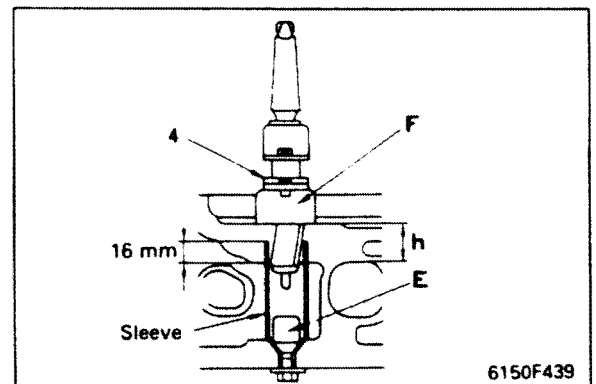
31 mm

- ★ Adjust the inside diameter with stopper **4**, and fix the position.

3) After rolling, turn in the reverse direction and remove the sleeve expander.

4) Remove the sleeve holder.

5) Roll the sleeve taper portion again.

**5. Spot-facing the inside seat of the sleeve**

1) Using guide bushing **G** as the guide, spot-face the seat with sleeve cutter **H**.

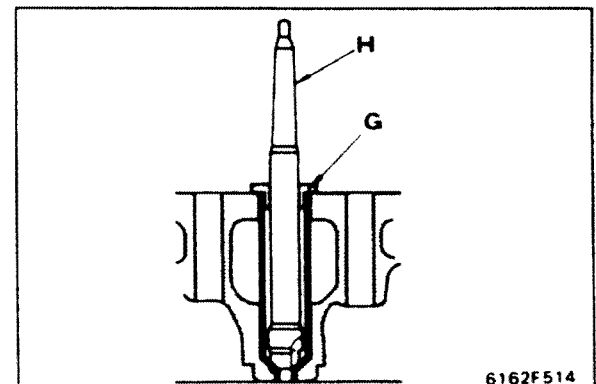
- ★ When grinding the seat surface, insert the nozzle holder, check that the protrusion is within the standard value, and cut a little more each time.

- ★ Rotating speed: 500 to 600 rpm

- ★ Protrusion of nozzle (S.T.D.)

3.35 – 4.25 mm

2) Remove all the metal chips and dust from the machined surface.

**6. Checking the leakage from the seat**

Carry out a water pressure or air pressure test to check that there is no leakage from the sleeve seat surface or upper press-fitting portion.

- ★ When checking for leakage from the seat surface, install a used nozzle holder.

## REPLACING VALVE GUIDE

### Special tools

	Part No.	Part Name	Q'ty
A	795-100-1531	Valve guide remover	1
B	795-100-1661	Valve guide driver (for intake)	1
C	795-100-1670	Valve guide driver (for exhaust)	1

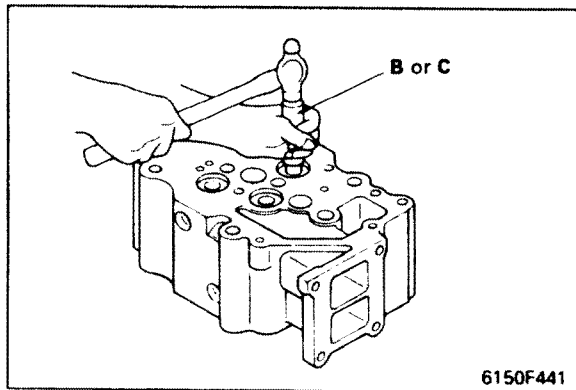
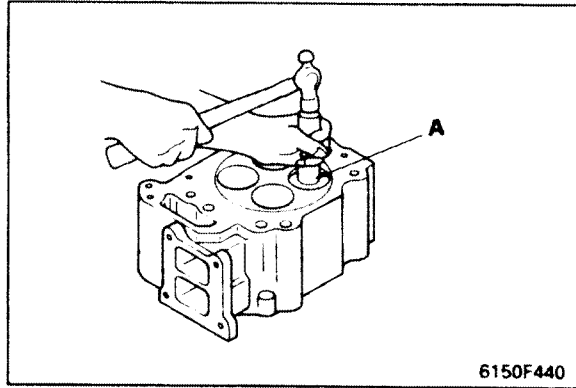
### 1. Removing the valve guide

Remove the valve guide with valve guide remover A.

### 2. Press-fitting the valve guide

- 1) Press-fit the valve guide until the tip of valve guide driver B or C contacts the cylinder head.
- 2) Confirm that the protrusion of the valve guide is within specification.  
★ Protrusion of valve guide:

$20.0 \pm 0.2 \text{ mm}$



## REPLACING CROSS HEAD GUIDE

### Special tools

	Part No.	Part Name	Q'ty
A	795-130-3300	Cross head guide puller	1
B	790-471-1120	Cross head guide driver	1

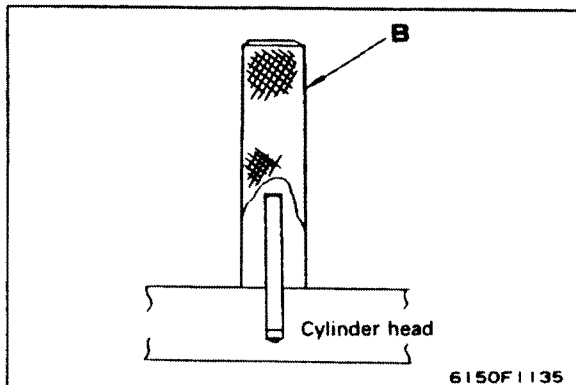
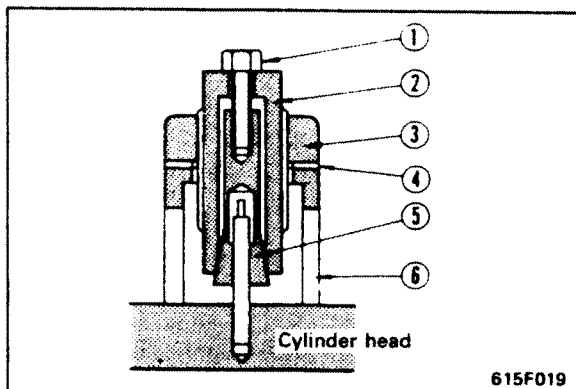
### 1. Removing the cross head guide

- Using cross head guide puller A, pull out the cross head guide.
  - 1) As shown in the figure, hold the cross head guide with collet ⑤ of the puller.
  - 2) Tighten the collet with bolt ① to lock sleeve ②.
  - 3) Rotate nut ③ and pull out the cross head guide.
  - 4) Remove burns, fins, etc. from the mounting place of the cross head guide and clean it.

### 2. Press-fitting the cross head guide

- Using cross head guide driver B, press fit the cross head guide.  
★ Protrusion of cross head guide:

$45.5 \pm 0.25 \text{ mm}$



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## GRINDING THE VALVE

### Special tool

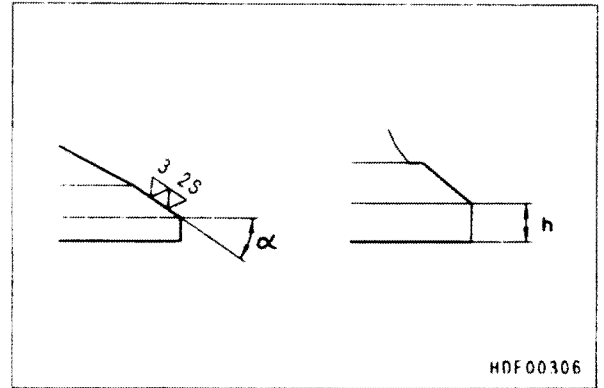
	Part No.	Part Name	Q'ty
A	- (Purchase)	Valve refacer	1

#### 1. Grinding the seat surface

- Grind the seat surface with valve refacer A.
  - ★ Angle of valve seat ( $\alpha$ ): Intake valve: 30°  
Exhaust valve: 45°

#### 2. Checking after grinding

- Confirm that the thickness of the valve head, protrusion of the valve, and the contact surface of the valve seat are within specification.
  - ★ Allowable thickness of valve head ( $h$ )
    - Intake valve: 1.7 mm
    - Exhaust valve: 1.2 mm
  - ★ Sinking distance of valve
    - SA6D125-2: 1.88  $\pm$  0.1 mm (Intake)
    - : 1.20  $\pm$  0.1 mm (Exhaust)



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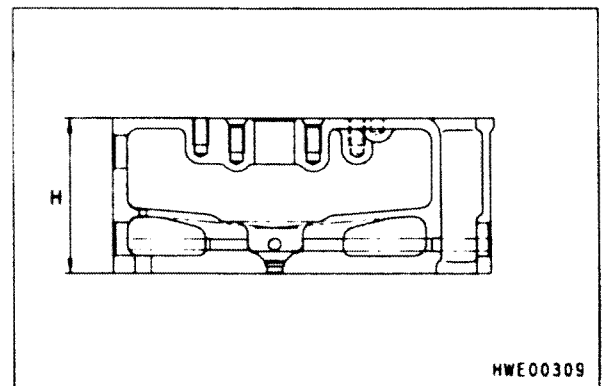
## GRINDING THE FITTING FACE OF CYLINDER HEAD

#### 1. Grinding

- 1) Remove the valve seat insert. See the section of replacement of valve seat insert.
- 2) Remove the distortion and corrosion of the cylinder head by grinding within the allowable limit of height H, then stamp the letter "R" on the left side of the cylinder head.
  - ★ Cylinder head height H
    - Basic height: 105  $\pm$  0.05 mm
    - ★ Limit after grinding: 104.65 mm
    - ★ Permissible limit for one grinding repair work: 0.10 - 0.15 mm
    - ★ Roughness of surface: 6 S max.
    - ★ Flatness: 0.05 mm max.
    - ★ Height difference among cylinder heads: 0.15 max.
- 3) Fit an oversize insert one rank larger. See the section of replacing valve seat insert.

#### 2. Check after grinding

Confirm that the sinking distance of the valve is within the standard range. Grind for adjustment, if necessary.



# REPLACING CAM BUSHING

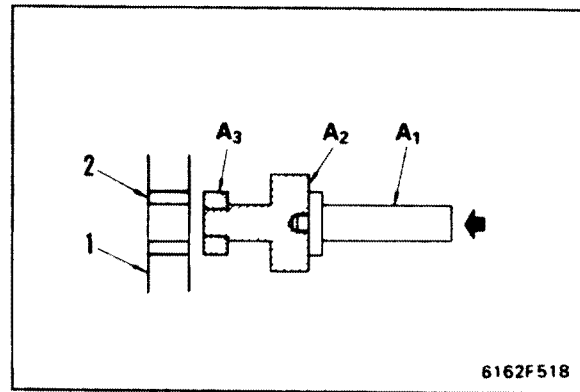
## Special tools

	Part No.	Part Name	Q'ty
<b>A</b>	795-225-1200	Push tool	1
	1	795-225-1310	Push bar
	2	795-225-1210	Push tool
<b>A</b>	3	795-225-1220	Collar
	4	795-225-1230	Guide
	5	795-103-0400	Grip

★ Before replacing the cam bushing, remove the plug from the rear of the cylinder block.

### 1. Pulling out No. 1, 7 bushings

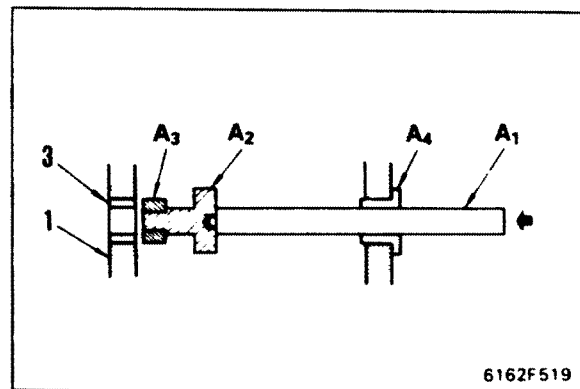
- Assemble push tool **A<sub>2</sub>**, collar **A<sub>3</sub>**, and push bar **A<sub>1</sub>** of push tool **A**, then tap the push bar and remove bushing (2) from cylinder block (1).



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### 2. Pulling out No. 2, 6 bushings

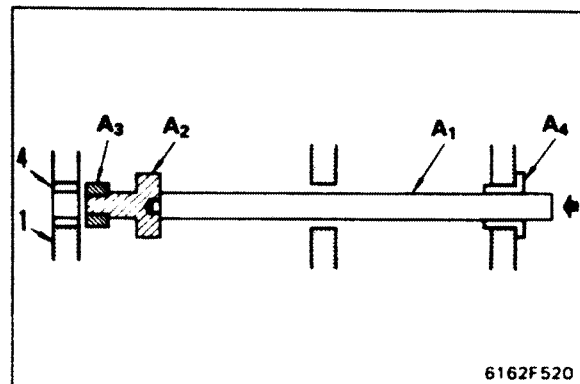
- Assemble push bar **A<sub>1</sub>**, push tool **A<sub>2</sub>**, collar **A<sub>3</sub>**, and guide **A<sub>4</sub>** of push tool **A**, then tap the push bar and remove bushing (3) from cylinder block (1).



6162F519

### 3. Pulling out No. 3, 4, 5 bushings

- Assemble push bar **A<sub>1</sub>**, push tool **A<sub>2</sub>**, collar **A<sub>3</sub>**, and guide **A<sub>4</sub>** of push tool **A**, then tap the push bar and remove bushing (4) from cylinder block (1).



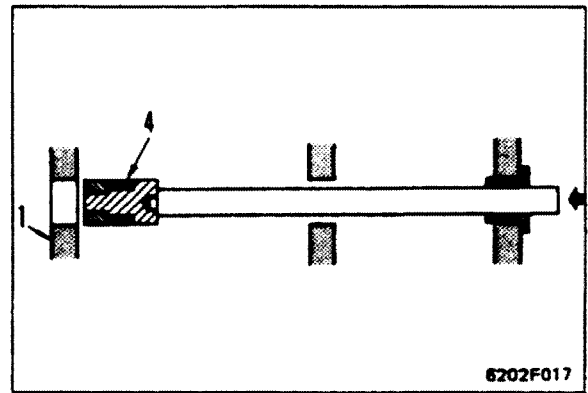
6162F520

615002

- After pulling out the bushing, remove all burrs and clean all dirt and dust from the bushing mounting hole.

1. Press fitting No. 3, 4, 5 bushings

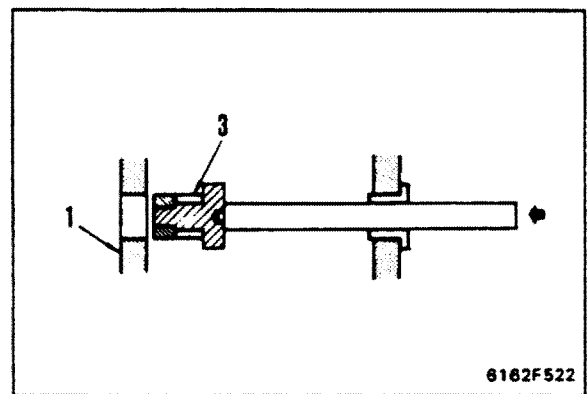
- Assemble bushing (4) to tool A, then press fit the bushing until the oil hole in cylinder block (1) is aligned with the oil hole in the bushing.



6202F017

2. Press fitting No. 2, 6 bushings

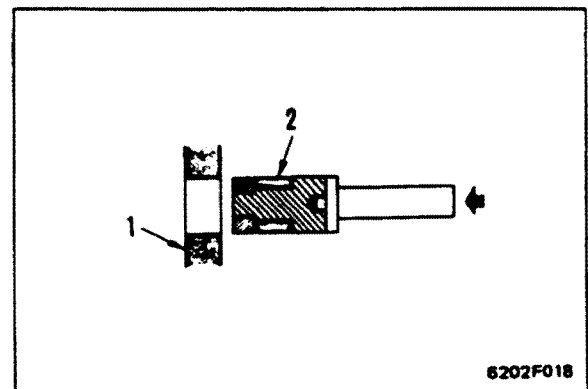
- Assemble bushing (3) to tool A, then press fit the bushing until the oil hole in cylinder block (1) is aligned with the oil hole in the bushing.



6162F522

3. Press fitting No. 1, 7 bushings

- Assemble bushing (2) to tool A, then press fit the bushing until the oil hole in cylinder block (1) is aligned with the oil hole in the bushing.



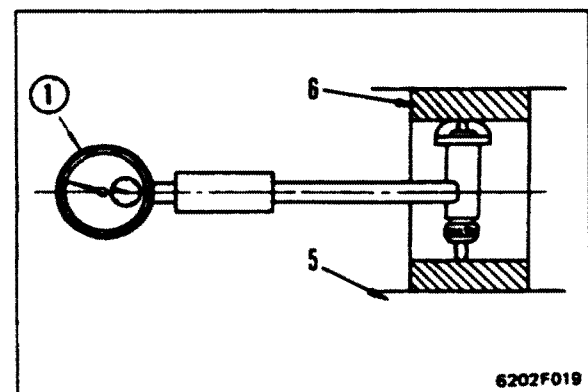
6202F018

- Using inside gauge ①, measure the inside diameter of the bushing.
- Check the clearance between the bushing and the shaft, and if the clearance is not within the standard range, or if the shaft does not pass through smoothly, correct the inside diameter of the bushing with a reamer.
  - After correcting the inside diameter of the bushing with a reamer, clean all chips from the oil hole and oil groove.

★ Inside diameter of cam bushing:  $60^{+0.070}_0$  mm

★ Clearance at camshaft journal:

0.080 – 0.180 mm



6202F019

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## REPLACING CAM GEAR

- ★ Heating temperature for cam gear:  
220 to 240 °C
- Heating time: More than 30 minutes

## REPLACING FLYWHEEL RING GEAR

**⚠** Take care not to let the flywheel fall.

### 1. Removing the ring gear

- Make a groove on the tooth bottom surface of the ring gear with a grinder, then crack the gear with a chisel.

**⚠** Take care in handling the grinder and chisel.

### 2. Press-fitting the ring gear

- 1) Check the fitting surface of the ring gear. If any flaw is found, repair it with an oilstone.
- 2) Heat the ring gear at the specified temperature for the specified time for shrinkage fitting.
  - ★ Heating temperature for ring gear:  
max. 200°C
  - Heating time: More than 30 minutes
- 3) With the chamfered side of ring gear facing the flywheel, fit it until its side contacts the flywheel.

## PRESSURE TEST

- If the area round the head has been corrected, test as follows.

### Special tools

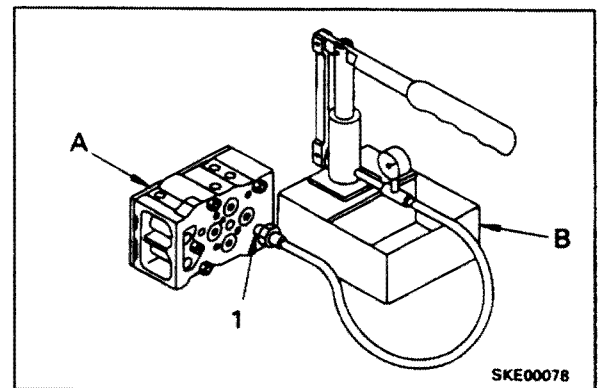
	Part No.	Part Name	Q'ty
A	790-553-1500	Coolant tester kit	1
B	79A-471-1050	Pump ass'y	1

#### 1. Water pressure test

- 1) Tighten the nozzle holder assembly to the specified torque.
  - 2) Assemble tool A and tool B, and connect a hose to flange (1).
  - 3) Apply water pressure (0.35 – 0.4 MPa (3.5 – 4.0 kg/cm<sup>2</sup>)) for approx. 10 minutes, and check for any leakage from around the head.
- ★ It is preferable to warm the whole cylinder head and carry out the test with hot water (82 – 93 °C).

#### 2. Air pressure test

- 1) Tighten the nozzle holder assembly to the specified torque.
  - 2) Connect the pump hose to flange (1).
  - 3) Place the head in a water bath, apply air pressure (0.3 – 0.35 MPa (3.0 – 3.5 kg/cm<sup>2</sup>)) for approx. 30 seconds, and check for any air leakage in the water.
- ★ If the above test shows that there are cracks around the nozzle holder and plugs, replace the cylinder head.


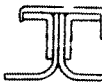
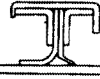
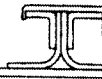




# REPLACING ENGINE REAR SEAL

**Special tools**

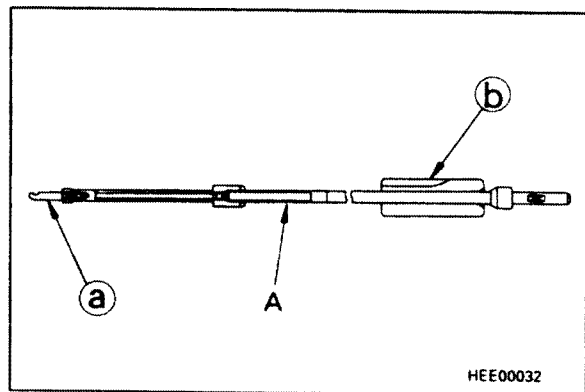
	Part No.	Part Name	Q'ty
<b>A</b>	795-931-1100	Seal puller assembly	1
<b>B</b>	795-931-1210	Sleeve jig (for assembly)	1
<b>C</b>	795-931-1220	Sleeve jig (for assembly)	1

Type	Single lip seal (for dry type)	Double lip seal (for wet type)
	Flywheel end is dry specifi- cation	Flywheel end is wet specifi- cation
Standard (when shipped from factory)		
With sleeve (for repair when shaft wear is large)		

- ★ The types of engine rear seal (Teflon seal) are shown on the right.
- For details of disassembly and assembly of the flywheel and flywheel housing (1), see DISASSEMBLY AND ASSEMBLY.

**1. Removing seal**

- 1) Hook tip **a** of tool **A** under the metal ring of seal (2), then remove it with the impact force of slide hammer **b**.
  - ★ Before removing seal (2), knock seal (2) in to free it from flywheel housing (1) and make it easy to remove.
  - ★ Be careful not to scratch or damage crankshaft (3).
  - ★ Do not use a drill. If a drill is used, metal particles will get inside the engine.

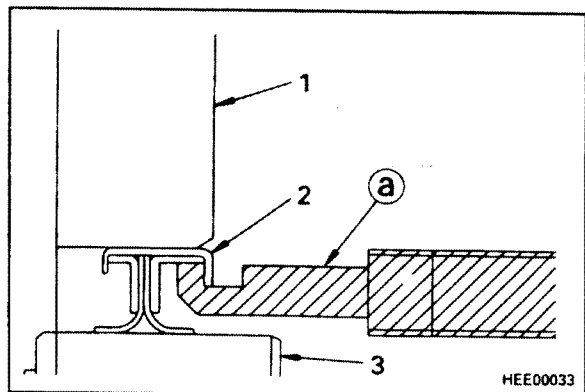


**2. Removing sleeve (when equipped with sleeve)**

- 1) For details of the method of removing the sleeve, see REPLACING WEAR SLEEVE, REMOVING SLEEVE.

**3. Checking wear of shaft**

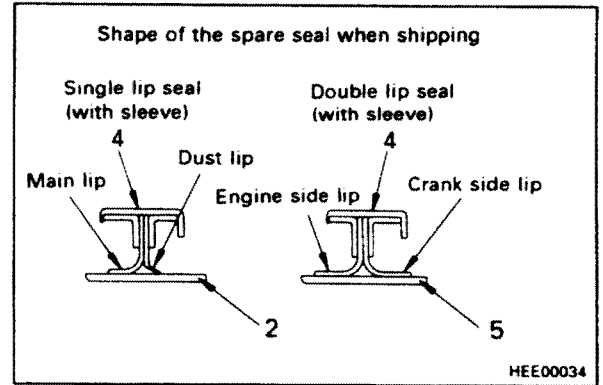
- 1) If the wear is only seen as luster (when touched with the flat of the finger, the wear cannot be detected; wear depth: approx. 10 μm or less) and there are no scratches or other damage, the part can be used again.
- 2) In any case other than the above, install a seal with sleeve.




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**4. Install seal with sleeve (when equipped with sleeve)**

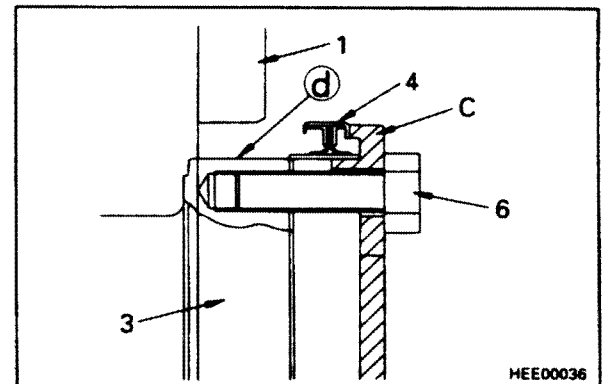
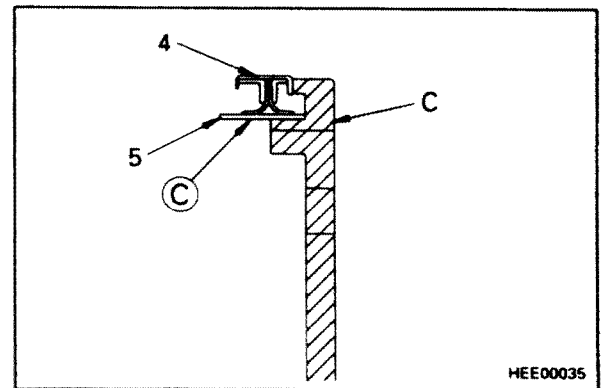
- The shape of the spare seal when shipping is as shown in the right.
  - ★ Handle seal (4) and sleeve (5) as an assembly. Do not separate them.



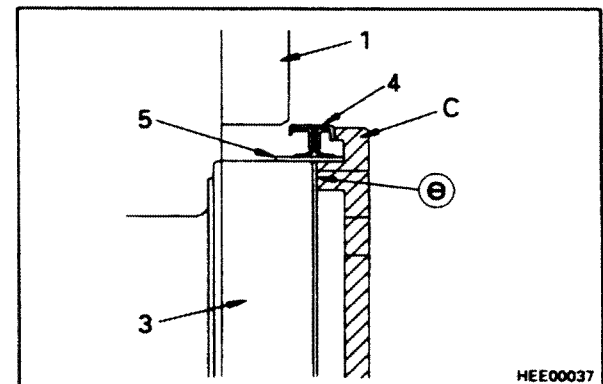
- 1) Coat inside surface (c) of sleeve (5) with gasket sealant, then set on tool C.
  - ★ Before assembling seal (4), remove all scratches, burrs, flashes, and rust from the end face corner and sliding face (d) of lip of crankshaft shaft (3) and fly-wheel housing (1).
  - ★ Do not coat the area between sleeve (5) and seal lip (d) with oil.

 Gasket sealant : LG-7

- 2) Put sleeve (5) in contact with the end face of crankshaft (3), tighten uniformly with bolts (6), and assemble sleeve (5) and seal (4) as one unit.
  - ★ Tightening bolt (6): 01050-31645 (x 3)

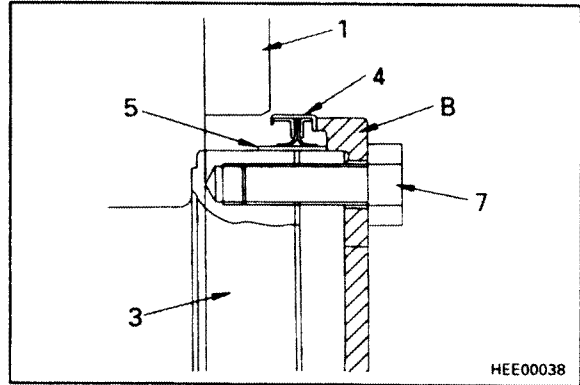


- 3) Press fit sleeve (5) and seal (4) until tool C contacts end face (e) of crankshaft (3).
  - ★ Remove tool C when it contacts end face (e) of crankshaft (3).

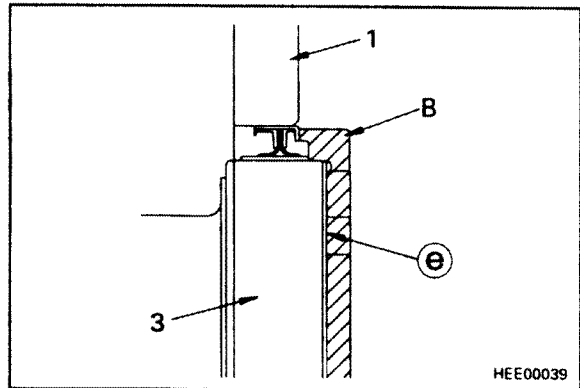


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- 4) Replace with tool **B**, tighten again uniformly with bolts (7), and start to press fit sleeve (5) and seal (4).
  - ★ Tightening bolt (7) : 01050-31625 (x 3)

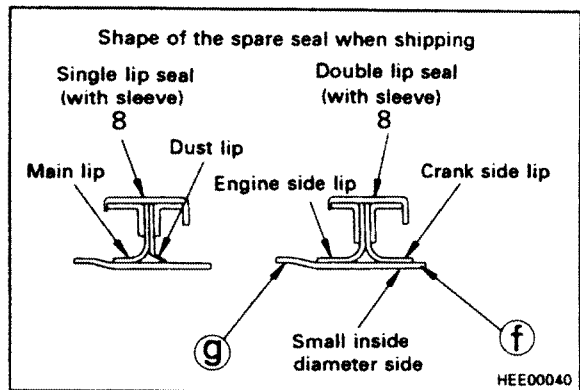


- 5) Press fit until tool **B** contacts end face (e) of crankshaft (3).
  - ★ Wipe off all the gasket sealant that is squeezed out to the outside circumference.

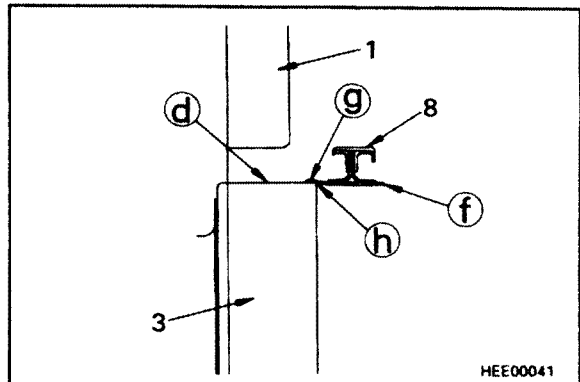


**5. Installing standard seal**

- The shape of the spare seal when shipping is as shown in the right.
  - ★ Do not separate seal (8) and plastic inner tube/assembly guide (f) until seal (8) is assembled. (The guide also acts to protect the seal lip.)

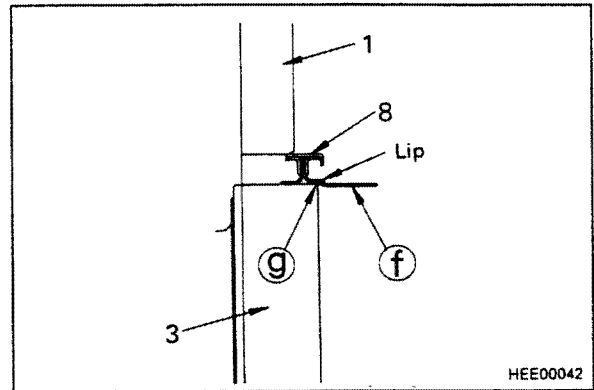


- 1) Put large inside diameter (g) of plastic inner tube (f) in contact with end face (h) of crankshaft (3).
  - ★ Be careful not to mistake the direction.
  - ★ Before assembling seal (8), remove all scratches, burrs, flashes, and rust from the end face corner and sliding face (d) of lip of clutch shaft (3) and flywheel housing (1).

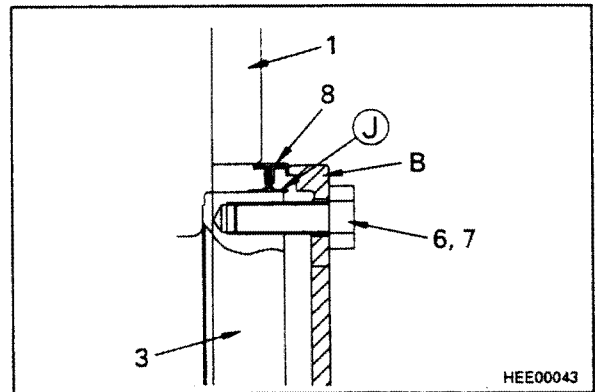


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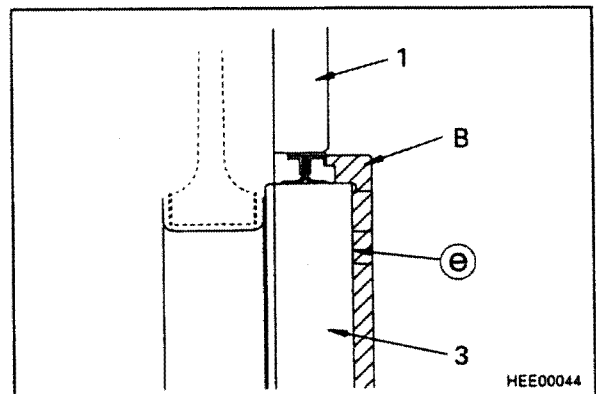
- ★ Wipe off all the oil from the sliding surface.
- 2) Push in the metal ring of seal (8) uniformly with both hands until it feels that it has passed inside diameter large end ⑨ of plastic tube ①.
- 3) Remove plastic tube ①, taking care not to damage the lip.



- 4) Put tool B in contact as shown in the diagram on the right, then tighten uniformly with the bolts.
  - ★ Tightening bolt (6) : 01050-31645 (x 3)
  - ★ Tightening bolt (7) : 01050-31625 (x 3)
  - ★ Be careful not to damage the tip of lip ①.



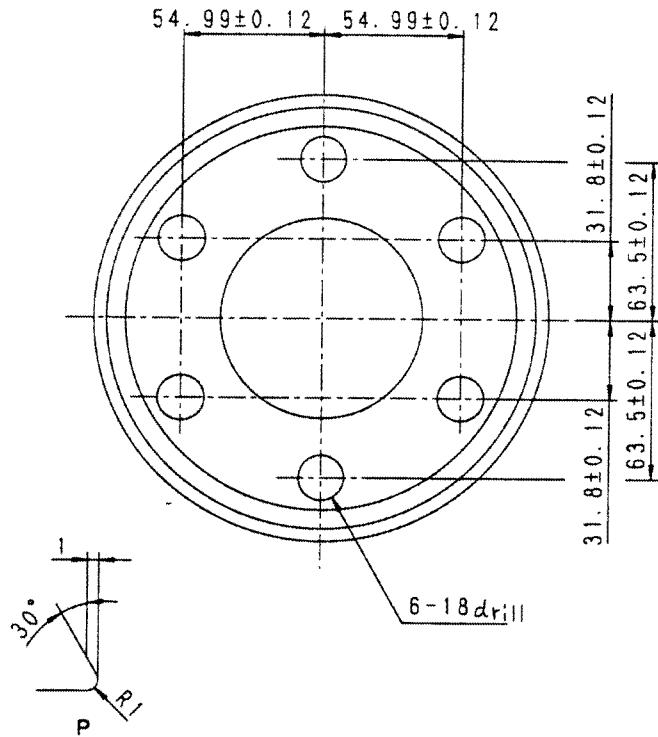
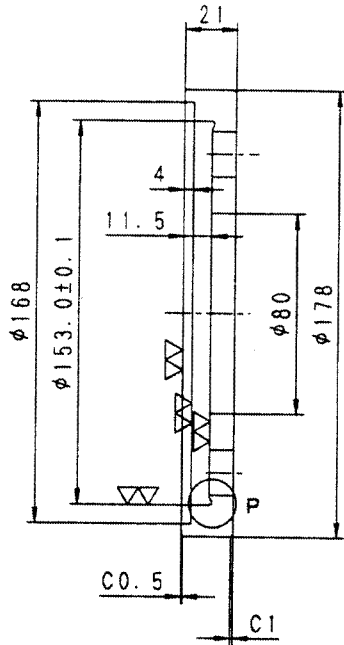
- 5) Press fit until tool B contacts end face ③ of crankshaft (3).
  - ★ Wipe off all the gasket sealant that is squeezed out to the outside circumference.



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TOOL B (795-931-1210)

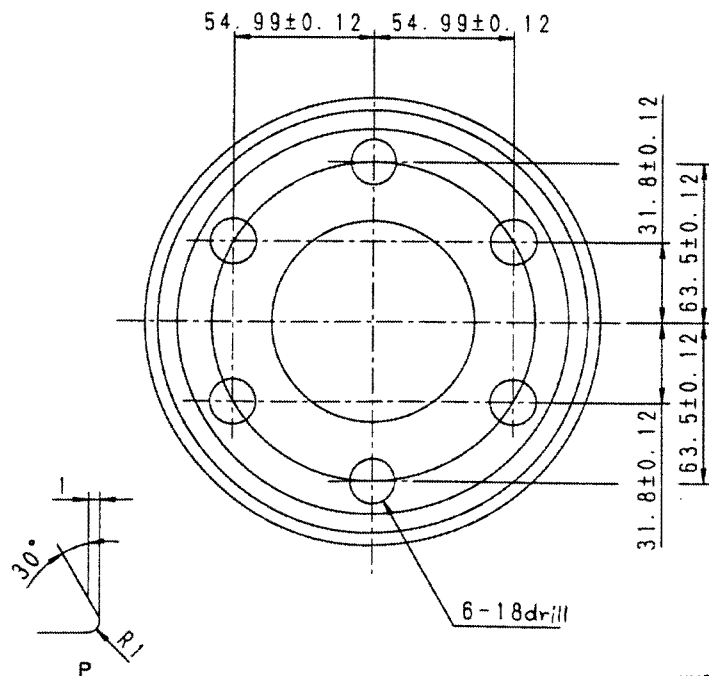
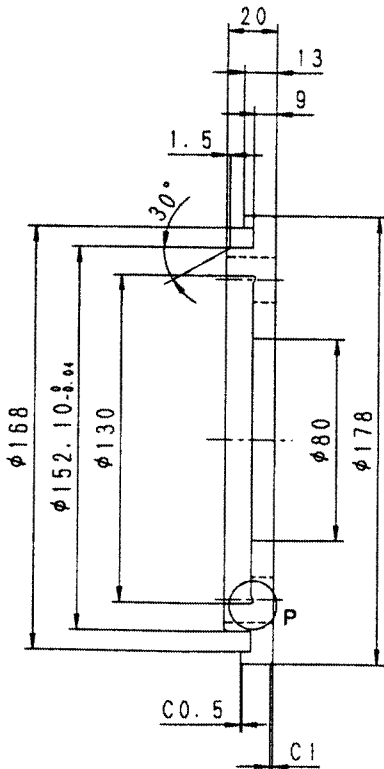
Unit: mm



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TOOL C (795-931-1220)

Unit: mm



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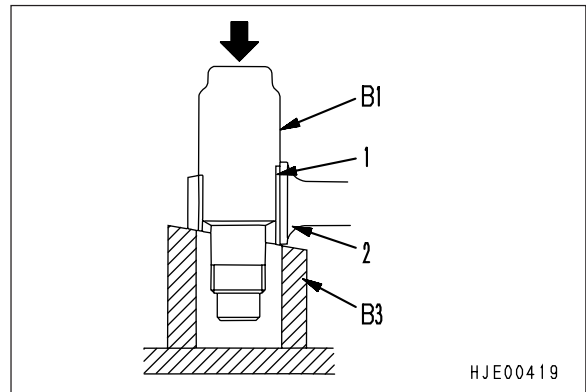
# REPLACING CONNECTING ROD SMALL END BUSHING

## Special tools

	Part No.	Part Name	Q'ty
A	795-903-1201	Push tool assembly	1
B	1	795-903-1211	Push tool
	2	795-903-1220	Push tool
	3	795-903-1230	Block
	4	795-903-1240	Nut

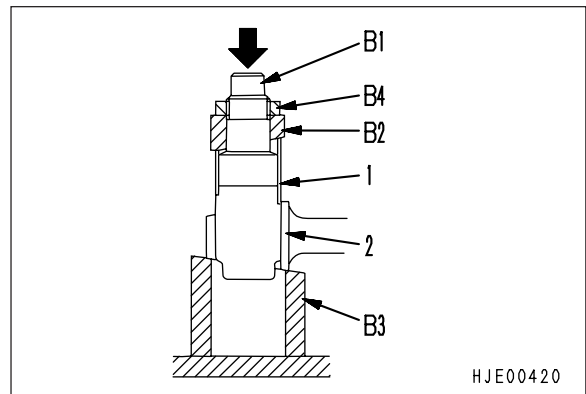
### 1. Removal of connecting rod bushing

- 1) Set connecting rod (2) on tool **B3**.
  - 2) Using tools **B1** and **B3**, remove connecting rod bushing (1) with a press.
- ★ After removing the bushing, remove any burrs or dirt, and clean the mounting hole of the bushing.



### 2. Press fitting connecting rod bushing

- 1) Set connecting rod (2) on tool **B3**.
  - 2) Assemble connecting rod bushing (1) to tool **B1**, then set tool **B2** and secure with tool **B4** so that it does not move.
  - ★ Align the connecting rod bushing oil hole and the connecting rod oil hole.
  - 3) Push tool **B1** with a press and press fit connecting rod bushing (1).
- The bushing is supplied as a semi-finished product, so the inside diameter is too small and the piston pin will not go in.
  - After press fitting the bushing, machine the inside diameter of the bushing with a reamer or honing machine in accordance with the MAINTENANCE STANDARD.
  - ★ After machining, remove all the metal particles from the oil hole and oil groove.



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# REPLACING MAIN BEARING CAP


- When replacing the main bearing cap, machine the semi-finish product to the following dimensions, then install.


**Correction parts**

Part No.	Part Name
6150-29-1210	Main bearing caps other than No. 7
6150-29-1250	No. 7 main bearing cap

**1. Machining inside diameter of main bearing cap**

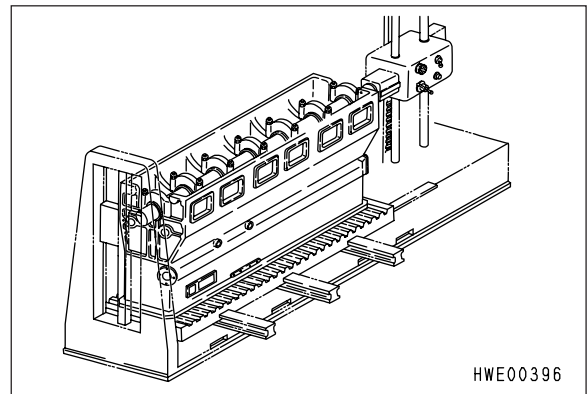
- Remove the cylinder liner.
- Install the replacement main bearing cap to the cylinder block, and tighten to the specified torque.

 Main bearing cap mounting bolt:  
Coat seat face of threaded portion with engine oil

 Main bearing cap mounting bolt:  
Unit: Nm {kgm}

Order	Target	Range
1st step	98 {10}	88 – 108 {9 – 11}
2nd step	196 {20}	191 – 201 {19.5 – 20.5}
3rd step	Tighten a further 90°	90° <sup>+30°</sup> <sub>0</sub>

- ★ Align the cylinder block and main bearing cap notch.
- Set a cylinder block mounting jig on the table of a horizontal boring machine, fit the cylinder liner mounting hole of the cylinder block to the standard line on the jig, and install the cylinder block.
  - Of the main bearing caps to be used again, take the one with the longest pitch and put a dial gauge in contact with the inside diameter at two places to align the center of the boring machine arbor.

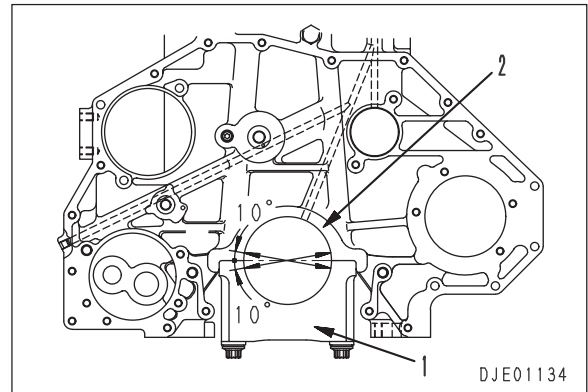


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- 5) Check the machined inside diameter of bearing cap (1) and grind a little at a time.
  - ★ Grind until the bit touches the inside surface of cylinder block (2).
  - ★ Inside diameter of main bearing cap
    - ① Machining dimension  
Tolerance:  $116^{+0.015}_0$  mm
    - ② Inside diameter of cap when main bearing cap is tightened to specified torque after machining  
Tolerance:  $116^{+0.013}_{-0.009}$  mm

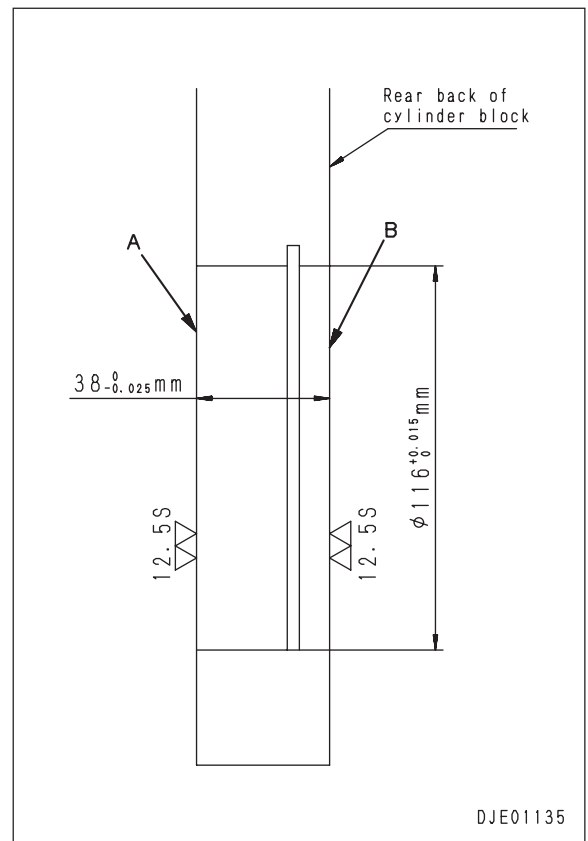
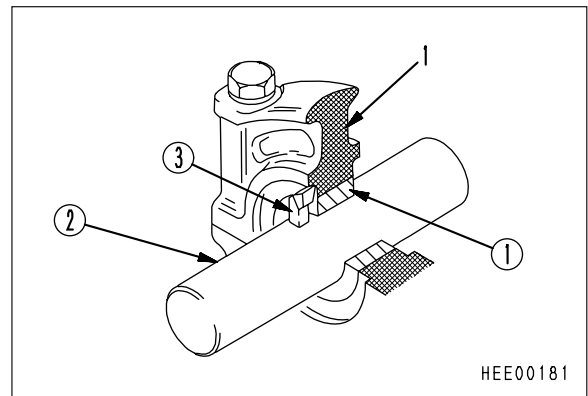
(Up-down range of 10° at mating surface of main bearing cap)

  - ★ Finishing roughness: Within 10 S
  - ★ Do not grind the inside face of the cylinder block.



**2. Machining width of main bearing cap (Only when machining No. 7 main bearing cap)**

- 1) Insert cast iron bushing (1), then pass arbor (2) through.
  - 2) Install facing bit (3) to the arbor.
  - 3) Grind A portion of cap (1) until the bit touches the cylinder block (2) face.
  - 4) Grind B portion of the opposite side in the same way.
- ★ Roughness of thrust bearing mounting surface: Within 12.5 S
  - ★ Do not grind the cylinder block.
  - ★ Width of main bearing cap  
Tolerance:  $38^{0}_{-0.025}$  mm

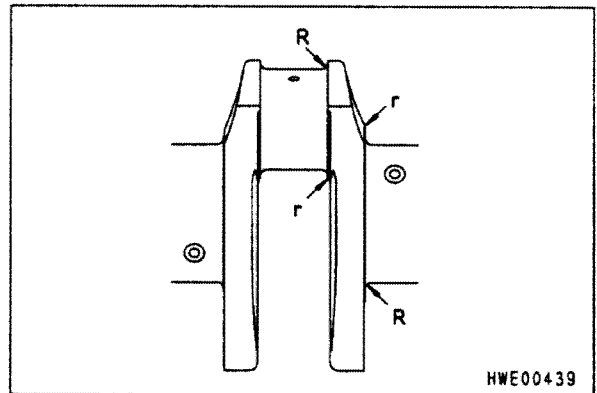


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## GRINDING CRANKSHAFT

- ★ When grinding the crankshaft to correct wear, light seizure or damage, grind to an undersize.
- ★ If there is curvature of the crankshaft, it is preferable to replace the crankshaft and not to grind it to an undersize. (There are problems with balancing.)
  - ★ Do not try to correct a bent crankshaft with a press. When the engine is run, the crankshaft will gradually return to its bent shape.
  - ★ The journal portion has been given induction hardening, so do not try to repair it by bead welding to plating.
- ★ Unevenly worn crankshaft will bend or be unbalanced even if repaired, so always replace unevenly worn crankshaft.
- ★ Measure the part for grinding to decide the undersize dimension.
- ★ Judge from the measured dimension, and if the undersize dimension will exceed the repair limit, replace the crankshaft.
- ★ When repairing the plating of the damaged surface, repair only the following places.
  - 1) Rear seal journal portion
  - 2) Crankshaft gear mount
- ★ When correcting damage to the crankshaft, pay particular attention when finishing the R portion of the fillet and shoulder r (see the diagram on the right) and the R at the inlet port of the oil hole.



HWE00439

★ **Necessary equipment and jigs for grinding**

- 1) Magnetic flaw detector
- 2) Shore hardness gauge
- 3) Etching kit (quantity for one check of traces of seizure)
  - i) 4% nitric acid solution: 250 g
  - ii) 2% hydrochloric + acetone solution: 250 g
  - iii) Acetone: 250 g
  - iv) Cotton wool: 1 packet
  - v) Stainless steel pincette: 1
- 4) Crankshaft milling machine
  - i) Milling machine
  - ii) V gauge, set of attachments for other grinding
  - iii) Dresser (for oil stone)
  - iv) Oil stone (reference)
    - 19A54M, 19A46M or 19A54L
    - Material: WA or A
    - Grain size: Medium, No. 46, or No. 54
    - Grade: Medium, M, L, N, or O
- 5) Crankshaft polisher
- 6) Roughness gauge
- 7) Fillet R measurement ball gauge

**1. Inspecting before grinding****1) Visual inspection**

- If any heat cracks can be seen, the hardened layer is damaged, so replace the crankshaft.
- If there is discoloration up to the unmachined shoulder near the journal face or thrust face, it shows that the crankshaft has been heated to an excessive temperature, so replace the crankshaft.
- If the wear or damage to the journal means that it cannot be corrected to an undersize, replace the crankshaft. (Skill is needed.)
- Replace the crankshaft if there is damage to any part which will affect the strength of the R portion.
- If only one of the crankshaft pin journals is worn, it will affect the balancing, so replace the crankshaft.

**2) Inspecting hardness of journal surface**

- Measure the hardness of the journal surface with a Shore hardness gauge. If it is not within the standard value, it shows that there has been excessive heat damage, so replace the crankshaft.

2. Inspection during grinding and after grinding

1) Inspecting R portion of fillet

- Check that the R portion of the fillet is connected smoothly to the shoulder of the journal. (See diagram.)
- Check that there are no scratches or seizure which will cause concentration of stress around the R portion of the fillet.
- Check that the R dimension of the fillet is within the specified dimension.

R dimension: Between minimum radius ball gauge and maximum radius ball gauge.

- To check the R dimension and the start of the fillet, use a pencil light and ball gauge for measuring the fillet, and check as follows.

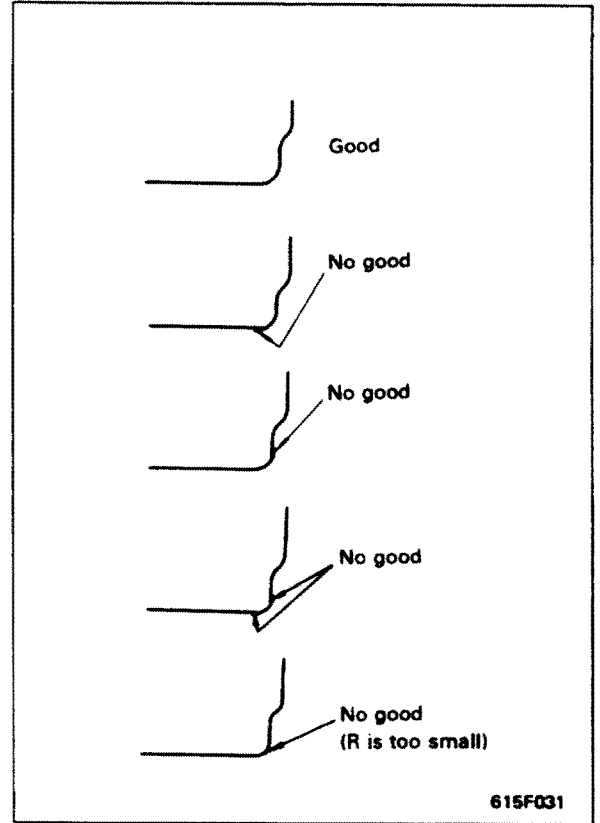
i) Move the minimum radius ball gauge gradually away from the journal surface towards the fillet and shine the light from behind the ball to check the contact point.

- If the fillet is correct, the ball will roll and always be in contact with one point.
- If the ball is in contact with two points at the same time, part of the diameter of the fillet is smaller than the minimum value, so correct it again.

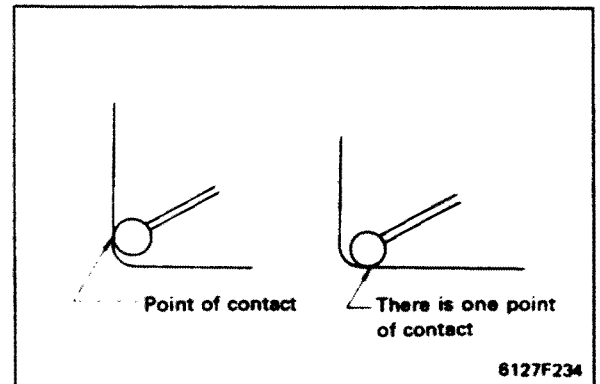
ii) Move the maximum radius ball gauge gradually away from the journal surface towards the fillet and check the contact point in the same way as for Check i).

- If the fillet is correct, the ball will always be in contact with two points at R.
- If the ball is in contact with only one point, the diameter of the fillet is larger than the maximum value, so correct it again.

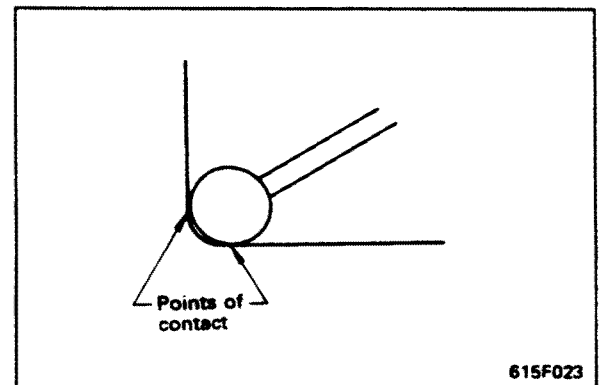
- Radius R can be adjusted by correcting the grindstone.



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615F023

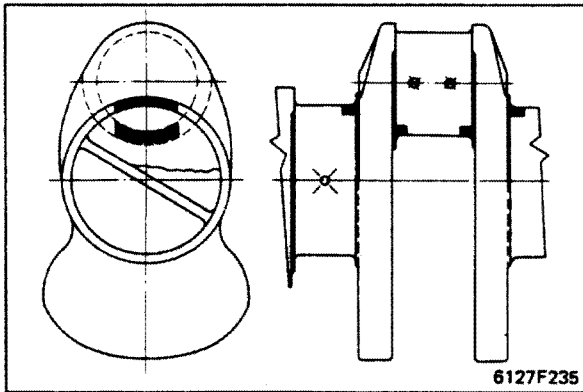
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**2) Checking for traces of seizure using etching**

- After grinding the crankshaft, carry out an etching test to confirm that there are no traces of grinding seizure.
- If bearing failure has caused any damage, seizure, or streaks in the journal portion, carry out an etching inspection to check for traces of seizure. This helps to judge if there has been any drop in hardness, and to decide the undersize dimension.
- Etching inspection is used to find out if there are any traces of seizure which cannot be found by visual check or hardness check. It is also used to find traces of grinding seizure caused by heating of the surface during grinding.
- Grinding seizure and traces of seizure in the journal or fillet portion destroy the structure of the metal because heat is applied. This normally occurs near to the surface, but it may cause concentration of stress which in turn will lead to breakage of the crankshaft.
- Procedure for etching inspection
  - i) Wipe the inspection surface clean.
  - ii) Wipe the inspection surface with a 4% nitric acid solution. Roll a piece of cotton wool into a diameter of 2 to 3 cm. Soak it in the nitric acid solution, then hold it with the pincette and wipe for 1 to 2 minutes.
  - iii) Wash off the nitric acid solution with water, then dry the surface.  
Soak some cotton wool in acetone, wipe again, then dry the surface.
  - iv) Soak some cotton wool with dilute hydrochloric acid (2% hydrochloric acid mixed in acetone) and apply for 30 sec. to 1 min. to etch the inspection surface.
  - v) Wash off the dilute hydrochloric acid with water, wipe with acetone, then dry with compressed air.
  - vi) Check the inspection surface.
    - If there is no seizure, the whole etched surface will be a uniform bright color.
    - If there are any streaks or dark patches on a bright grey surface, this shows the existence of grinding seizure.
    - If there are stripes brighter than the grey surface, this shows the existence of excessive grinding seizure.
    - If there is any suspicious pattern, polish the etched surface, and etch again.
    - If there is any seizure, the same pattern will appear when the etching is repeated.
  - vii) After the inspection, polish off the discoloration caused by the etching, then clean and dry the surface.  
To neutralize the surface, wipe with a weak solution of slaked lime or with any similar weak alkali solution.
  - viii) After drying, coat with rust-prevention oil.  
Pay particular attention to the inspection surface and oil holes.  
If the crankshaft is installed immediately in the engine, it can be coated with engine oil.
- If any seizure is found, grind off approx. 0.02 mm and correct to the next undersize.

3) **Magnetic flaw detection**

- The stress on the crankshaft is greatest at this point, so there must not be even the slightest crack.
- Carry out a magnetic flaw detection test before using the corrected crankshaft.



- Be particularly careful to check the journal fillet portion entering the danger zone of each web of the crankshaft.

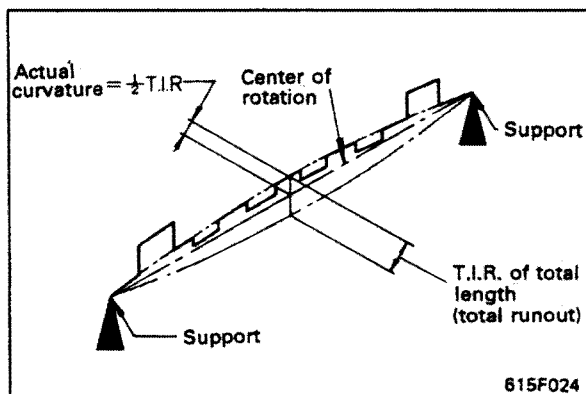
4) **Measuring curvature (measuring alignment)**

- Measure the curvature of the crankshaft after grinding and check that it is within the standard value.
- Check the curvature (alignment) at the following four places.

Before measuring the curvature of the crankshaft, check that the cylindricity and out-of-roundness are within the repair limit.

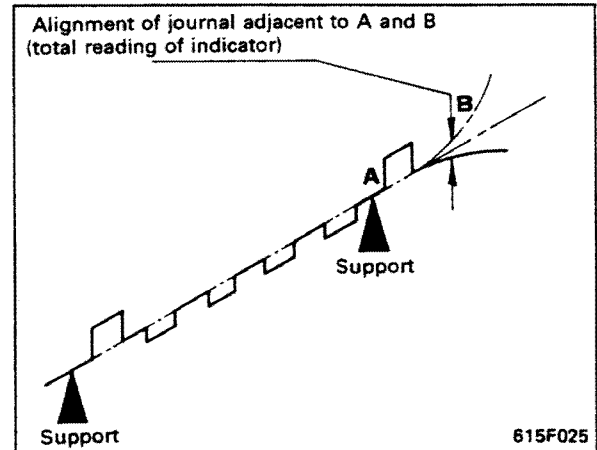
i) **Measuring alignment of total length of crankshaft**

Support the front and rear ends of the crankshaft. Rotate the crankshaft and measure the radial runout at the center main journal with a dial gauge.



ii) **Measuring alignment of adjacent journals**

Support the rear journal and the journal next to the journal to be measured. Measure the runout of the journal with a dial gauge.



iii) **Measuring alignment of front end of crankshaft**

Support the journals at the front and rear ends of the crankshaft. Measure the runout at a point within 6 mm from the front end of the crankshaft.

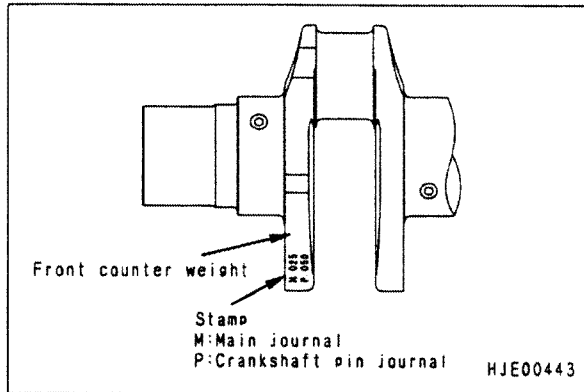
iv) **Measuring alignment of rear end of crankshaft**

Support the journals at the front and rear ends of the crankshaft. Measure the runout at a point within 6 mm from the rear end of the crankshaft.

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**3. Grinding main journal**

- ★ Grind each main journal to the same undersize dimension.
- ★ Mark the undersize dimension on the ground crankshaft as shown in the diagram to prevent any mistake in the size when assembling the bearing.

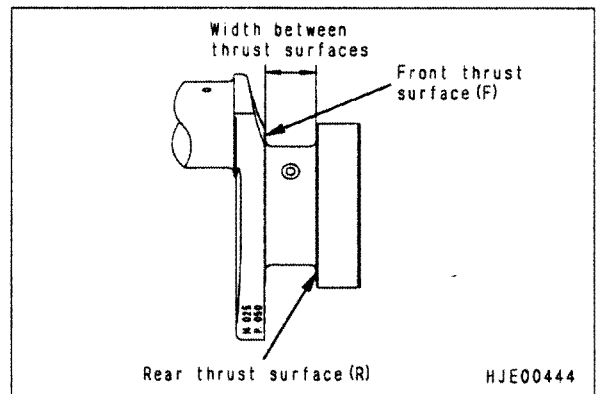


- ★ After grinding, check that the difference between the dimension of the journals is within the permitted range.

- Conditions for grinding (reference)  
 Grinding speed: 1800 – 2200 rpm  
 Feeding speed: 0.2 – 0.4 mm/min.

**4. Grinding thrust surface**

- ★ There is no particular need to grind the front and rear thrust surface to the same undersize dimension.
- ★ Mark the undersize dimension on the ground crankshaft as shown in the diagram to prevent any mistake in the size when assembling the bearing.

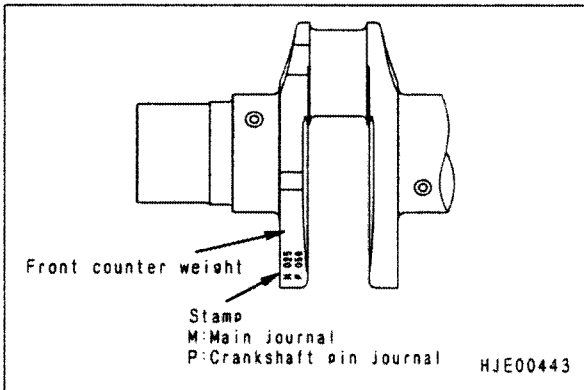


- ★ After grinding, check that the difference between the thrust widths of the journals is within the permitted range.
- ★ If the thrust surface width has been ground, check that the end play of the crankshaft is within the permitted range.

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**5. Grinding pin journal**

- ★ Grind each pin journal to the same undersize dimension.
- ★ Mark the crankshaft pin undersize dimension on the ground shaft in the same way as with the undersize mark on the main journal.

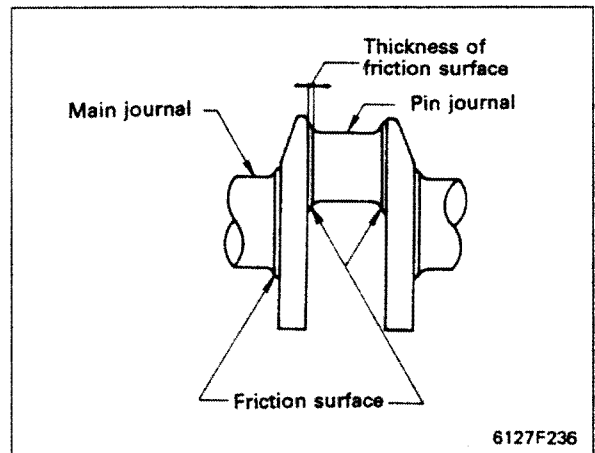


- ★ After grinding, check that the difference between the dimension of the journals is within the permitted range.

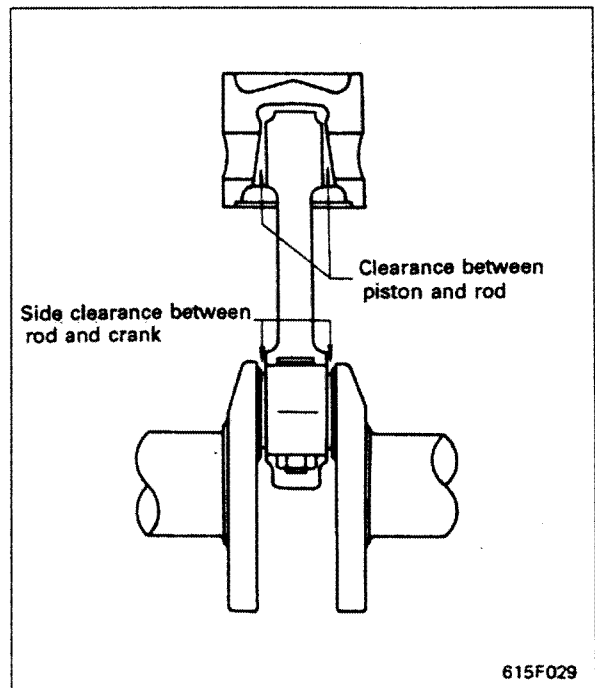
- Conditions for grinding (reference)  
Grinding speed: 1800 – 2200 rpm  
Feeding speed: 0.2 – 0.4 mm/min.

**6. Grinding main journal width and pin journal width**

- When correcting the wear surface on both sides of the main journal and pin journal, if there are streaks, scratches, or dents, correct using the minimum amount of grinding.
- Leave a thickness of at least 0.25 mm on the friction surface of the main journal.



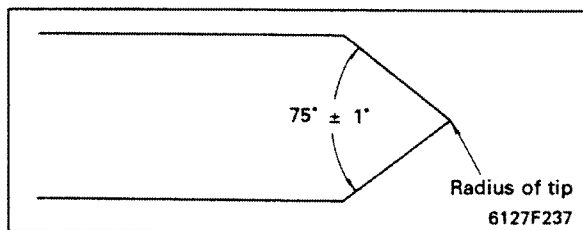
- If the width of the pin journal is too large, the connecting rod will move up and down or from side to side on the crankshaft when the engine is running. This will cause uneven wear. To avoid this, remove the minimum possible amount when grinding, and always keep strictly to the repair limit.



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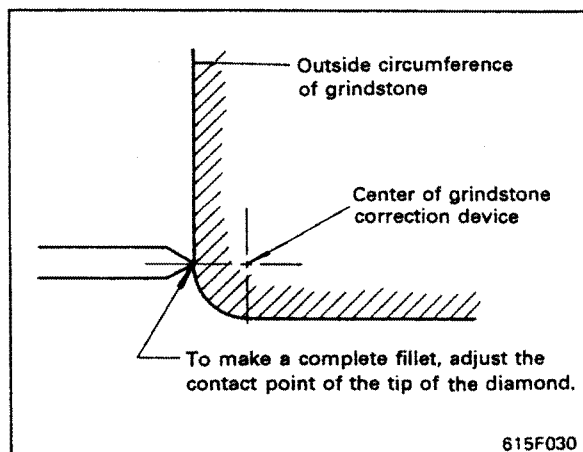
**7. Correcting grindstone**

- Apply dressing to the grindstone for each journal.
  - The start and the **R** dimension of the journal fillet have a big effect on the strength of the crankshaft, so adjust with the following grinding method.
    - 1) Grindstone dresser
      - Angle of tip:  $75^\circ \pm 1^\circ$
      - Radius of tip: See Shop Manual for each series
- Use a conical type with inset industrial diamonds.



When using the dresser, adjust so that the tip of the cone is at the center of the shank.

- 2) Adjust the diamond of the grindstone correcting device, and modified the edge of the grindstone to match the arc of the fillet.



- 3) First, correct the surface of the grindstone and record the reading of the feed dial gauge. Next, put the radius of one of the edge arcs in contact with the surface of the grindstone.
  - The final feed of the corrected surface should be finished within 0.013 mm.

- 4) Hold a small coarse grindstone in your hand and put it in contact with the front face of the grindstone. Grind lightly so that the arc at the edge contacts smoothly with the front face of the grindstone.
 

When doing this, slightly change the angle of the grindstone in your hand and put it lightly in contact with the grindstone.
- 5) When testing the start or the **R** dimension of the fillet, first grind a piece of wood as a test. Check with a ball gauge, and correct to a perfect fillet shape.
- 6) Correct the edge on the other side of the grindstone in the same way.
- 7) Make a test grinding of the crankshaft, then finally check the shape of the fillet.



**8. Prevention of grinding seizure**

- To prevent seizure when grinding, follow the precautions below strictly.
  - 1) Always put the grindstone at right angles to the crankshaft (plunge grind method) when grinding. If the grindstone is put in contact with the crankshaft and then moves to the side (bump method), there is a high risk of seizure.
  - 2) Even when using the whole width of the grindstone, avoid grinding the boss surface as far as possible.  
Finish the boss surface by polishing.  
If the grindstone contacts the boss surface, the feeding speed should be below 0.025 mm/sec.
  - 3) The cooling oil sent to the side face copy grinding device and the main jet should fully contact the grinding area. Start the flow of oil before starting to grind.
  - 4) When the crankshaft speed is approx. 50 rpm, make the standard grinding speed at the circumference of the grindstone 2000 m/min.

**9. Finishing surface**

- Finish the journal surface smoothly because this affects the fatigue strength of the crankshaft and the wear of the bearing.
- Standard surface roughness after grinding
 

Journal face, thrust surface, fillet portion:	Within 0.8 S
Pin and main boss portion:	Within 3.2 S
Tip nose portion, rear flange face:	Within 2.0 S
- When using a belt-type lapping machine, pull the emery cloth in the same direction as the rotation of the crankshaft.  
This is to avoid fine particles flying in the direction of rotation. These fine particles may cause scratches if they are caught in the crankshaft.
- Finish the area around the oil holes to the same surface roughness as the journal portion.
- Allowance for polish finishing:
 

	0.007 – 0.008 mm
--	------------------
- Rust or corrosion causes wear of the bearing, so remove all rust and corrosion completely, and coat with high-quality rust-prevention oil.
- Finishing conditions (reference)
 

Paper to use: AA #120
Shaft rotating speed: 100 rpm
Grinding speed: 36 m/min.

**10. Action after grinding**

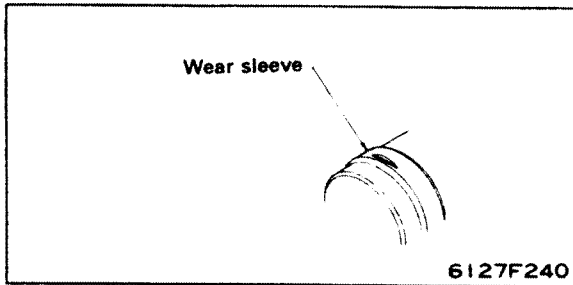
- Check again that each dimension is as specified.
- Wash each part thoroughly (particularly the oil holes) and coat the whole crankshaft with rust-prevention oil.
- Be extremely careful to avoid causing scratches or damage when handling.
- When storing for a long period, support at three points or fit a lifting tool and stand upright to prevent curvature.

## REPLACING WEAR SLEEVE (When equipped with sleeve)

- ★ If the wear sleeve is worn or damaged, replace as follows.

### 1. Removing sleeve

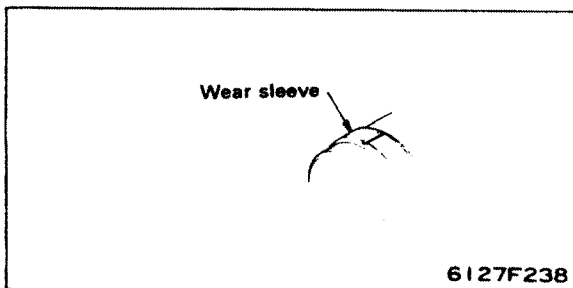
- 1) Make a groove in the sleeve with a grinder.



- 2) Put a chisel in contact with the groove in the sleeve and hit with a hammer to remove.

- ★ The interference is tight, so remove as follows.

- ① Make a V cut in the sleeve with a grinder.



- ② Split the wear sleeve at the V cut with a chisel, then remove the sleeve.

- ⚠ Be extremely careful not to let the chisel fly.

- ★ When removing the wear sleeve, be careful not to damage the shaft.

### 2. Press fitting sleeve

- 1) Check the interference between the sleeve and shaft, and confirm that it is within the standard value.

- 2) Using a sleeve driver, shrink fit the sleeve.

- ★ When using oil to heat the sleeve, use oil with a high flash point and be extremely careful not to cause any fire.