

Shop Manual

BULLDOZER

D61EX -23

D61PX -23

SERIAL NUMBERS

D61EX-30001

D61PX-30001

and up

KOMATSU

SHOP MANUAL

BULLDOZER

D61EX-23 D61PX-23

Model	Serial Number
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D61EX-23 D61PX-23	30001 and up
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Foreword, safety and general information (ALL-0370-001-A-00-A)

Important safety notice (ALL-1120-012-A-01-A)

(Rev. 2012/10)

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manual describes the effective and safe servicing and repair methods recommended by Komatsu. Some of these methods require the use of the special tools designed by Komatsu for the specific purpose.
- The symbol mark  is used for such matters that require special cautions during the work. The work indicated by the caution mark should be performed according to the instructions with special attention to the cautions. Should hazardous situation occur or be anticipated during such work, be sure to keep safe first and take every necessary measure.

General precautions

 Inappropriate handling causes an extreme danger. Read and understand what is described in the operation and maintenance manual before operating the machine. Read and understand what is described in this manual before starting the work.

- Before performing any greasing or repairs, read all the safety labels stuck to the machine. For the locations of the safety labels and detailed explanation of precautions, see the operation and maintenance manual.
- Locate a place in the repair workshop to keep the 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, water or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- When performing any work, always wear the safety shoes and helmet. Do not wear loose work cloths, or clothes with buttons missing.
 1. Always wear the protective eyeglasses when hitting parts with a hammer.
 2. Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any work with 2 or more workers, always agree on the working procedure before starting. While working, always keep conversations of the work between your fellow workers and your self on any step of the work. During the work, hang the warning tag of "UNDER WORKING" in the operator's compartment.
- Only qualified workers must perform the work and operation which require license or qualification.
- Keep the tools in good condition. And learn the correct way to use the tools, and use the proper ones among them. Before starting the work, thoroughly check the tools, lift truck, service vehicle, etc.
- If welding repairs is required, always have a trained and experienced welder with good

knowledge of welding perform the work. When performing welding work, always wear welding gloves, apron, shielding goggles, cap, etc.

- Before starting work, warm up your body thoroughly to start work under good condition.
- Avoid continuing work for long hours and take rests with proper intervals to keep your body in good condition. Take a rest in a specified safe place.

Safety points

1	Good arrangement
2	Correct work clothes
3	Observance of work standard
4	Practice of making and checking signals
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

Preparation

- Before adding oil or making any repairs, place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If it is not possible to lower the equipment to the ground, insert the lock pin or use blocks to prevent the work equipment from falling. And be sure to lock all the work equipment control levers and hang a warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.
- Remove all of mud and oil from the steps or other places used to get on and off the machine completely. Always use the handrails, ladders of

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steps when getting on or off the machine. Never jump on or off the machine. When the scaffold is not provided, use steps or stepladder to secure your footing.

Precautions during work

- For the machine equipped with the battery disconnect switch, check that the system operating lamp is turned off before starting the work. Then, turn the battery disconnect switch to OFF (○) position and remove the switch key. For the machine not equipped with the battery disconnect switch, remove the cable from the battery before starting the work. Be sure to remove the negative end (-) of the battery cable first.
- Release the remaining pressure in the circuits completely before the work when the parts in the circuits of oil, fuel, coolant and air are disconnected or removed. When the cap of the oil filter, drain plug or oil pressure pickup plug is removed, loose them slowly to prevent the oil from spurting out.
- When removing or installing the checking plug or the piping in the fuel circuit, wait 30 seconds or longer after the engine is shut down and start the work after the remaining pressure is released from the fuel circuit.
- Immediately after the engine is shut down, the coolant and oil in the circuits are hot. Be careful not to get scalded by the hot coolant and oil. Start the work after checking that the coolant and oil are cooled down sufficiently.
- Start the work after the engine is shut down. Be sure to shut down the engine when working on or around the rotating parts in particular. When checking the machine without shutting down the engine (measuring oil pressure, rotational speed, oil or coolant temperature), take extreme care not to get caught in the rotating parts or the working equipment.
- The hoist or crane must be used to sling the components weighing 25 kg or heavier. Check the slings (wire rope, nylon sling, chain and hook) for damage before the work. Use the slings with ample capacity and install them to the proper places. Operate the hoist or crane slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
- When removing the part which is under internal pressure or reaction force of the spring, always leave 2 bolts in diagonal positions. Loosen those 2 bolts gradually and alternately and release the pressure, then, remove the part.
- When removing the part, be careful not to break or damage the electrical wiring. The damaged wiring may cause electrical fires.
- When removing piping, prevent the fuel or oil from spilling out. If any fuel or oil drips onto the floor, wipe it off immediately. Fuel or oil on the floor can cause you to slip and can even cause fires.
- As a general rule, do not use gasoline to wash parts. Do not use gasoline to clean the electrical parts, in particular.
- Reinstall the parts removed to their original places. Replace the damaged parts and the parts which must not be used with new ones. When installing the hoses and wiring harnesses, be careful that they are not damaged by contacting with other parts when the machine is operated.
- When connecting the high pressure hoses and tubes, make sure that they are not twisted. The damaged high pressure hoses and tubes are very dangerous when they are installed. So, be extremely careful when connecting the high pressure pipings. In addition, check that their connections are correct.
- When assembling or installing the parts, be sure to tighten the bolts to the specified torque. When installing the protective parts such as guards, or the parts which vibrate violently or rotate at high speeds, be sure to check that they are installed correctly.
- When aligning 2 holes, never insert your fingers or hand into the holes. Align the holes with care so that your fingers are not caught in the hole.
- When measuring hydraulic pressure, check that the measuring tools are correctly installed.
- Pay attention to safety when removing and installing the tracks of the track type machines. When removing the track, it separates suddenly. The workers should not stand at either end of the track.
- If the engine is operated for a long time in a closed place which is not ventilated well, you may suffer from gas poisoning. Accordingly, open the windows and doors to ventilate the place well.

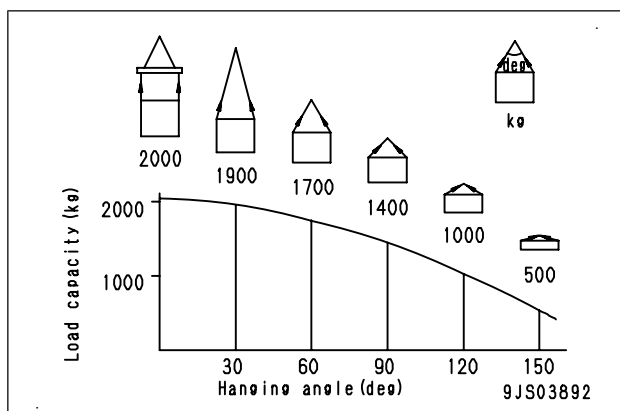
Precautions for slinging work and making signals

- Only one appointed worker must make signals and co-worker must communicate with each other frequently. The appointed signaler must make specified signals clearly at the place where the signaler is well seen from the operator's seat and where the signaler can see the working condition easily. The signaler must always stand in front of the load and guide the operator safely.
 1. Do not stand under the load.
 2. Do not step on the load.
- Check the slings before starting sling work.

- Keep putting on the gloves during sling work. (Put on the leather gloves, if available.)
- Measure the weight of the load by the eye and check its center of gravity.
- Use the proper sling according to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
- Do not sling a load with 1 wire rope only. If do so, the load may rotate or the sling gets loose and the sling may slip off. Install 2 or more wire ropes symmetrically.

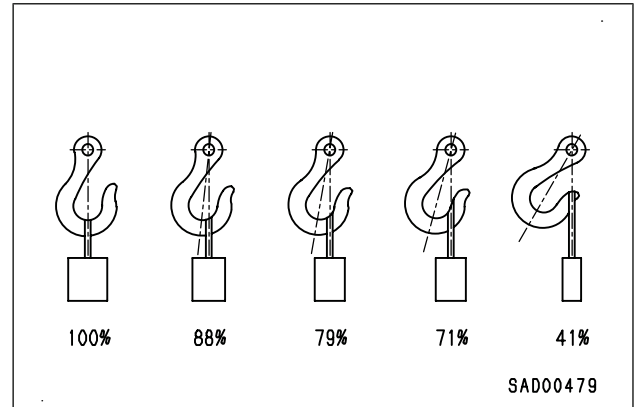
⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original slinging position on the load, which can result in a dangerous accident.

- Hanging angle must be 60 deg. or smaller as a rule.
- When hanging a heavy load (25kg or heavier), the hanging angle of the rope must be narrower than that of the hook.
- ★ When slinging a load with 2 ropes or more, the larger the hanging angle is, the larger the tension of each rope. The figure bellow shows the variation of allowable load in kg when hoisting is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1,000kg} a load vertically, at various hanging angles. When the 2 ropes sling a load vertically, up to 2,000 kg of total weight can be suspended. This weight is reduced to 1,000 kg when the 2 ropes make a hanging angle of 120 deg.. If the 2 ropes sling a 2,000 kg load at a hanging angle of 150 deg., each rope is subjected to a force as large as 4,000 kg.



- When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.
- Use the specified eye bolts and fix wire ropes, chains, etc. to them with shackles, etc.

- Apply wire ropes to the middle part of the hook.
- ★ Slinging near the tip of the hook may cause the rope to slip off the hook during hoisting. The strength of the hook is maximum at its central part.




- Do not use twisted or kinked wire ropes.
- When slinging up a load, observe the following.
 1. Wind up the rope slowly until the wire rope tensions. When putting your hands on the wire ropes, do not grasp them but press them down from above. If you grasp them, your fingers may be caught.
 2. After the wire ropes are stretched, stop the crane and check the condition of the slung load, wire ropes, and pads.
 3. If the load is unstable or the wire rope or chains are twisted, lower the load and lift it up again.
 4. Do not lift up the load at an angle.
- When lowering a load, pay attention to the following.
 1. When lifting down a load, stop it temporarily at 30 cm above the floor, and then lower it slowly.
 2. Check that the load is stable, and then remove the sling.
 3. Remove kinks and dirt from the wire ropes and chains used for the sling work, and put them in the specified place.

Precautions for using mobile crane

- ★ Read the Operation and Maintenance Manual of the crane carefully in advance and operate the crane safely.

Precautions for using overhead traveling crane

- ⚠ The hoist or crane must be used to sling the components weighing 25 kg or heavier. A part weighing 25 kg or heavier in "disassembly and assembly" section is indicated with the symbol of .

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- Before starting work, check the wire ropes, brake, clutch, controller, rails, over winding prevention device, ground fault circuit interrupter for electric shock prevention, crane collision prevention device, and energizing warning lamp, and check the following safety items.
- Observe the signals for sling work.
- Operate the hoist at a safe place.
- Be sure to check the directions of the direction indication plate (north, south, east and west) and the operating button.
- Do not sling a load at an angle. Do not move the crane while the slung load is swinging.
- Do not raise or lower a load while the crane is moving longitudinally or laterally.
- Do not drag a sling.
- When lifting up a load, stop it just after it leaves the ground and check safety, and then lift it up.
- Consider the travel route in advance and lift up a load to a safe height.
- Place the control switch in a position where it will not be an obstacle to work and passage.
- After operating the hoist, do not swing the control switch.
- Remember the position of the main switch so that you can turn off the power immediately in an emergency.
- Shut down the main switch when the hoist stops because of a blackout. When turning on a switch which is turned OFF by the ground fault circuit interrupter for electric shock prevention, check that the devices related to that switch are not in operating condition.
- If you find an obstacle around the hoist, stop the operation.
- After finishing the work, stop the hoist at the specified position and raise the hook to at least 2 meters above the floor. Do not leave the sling attached to the hook.

Selecting wire ropes

- Select adequate ropes depending on the weight of the parts to be hoisted, referring to the table below

Wire rope (JIS G3525, 6 x 37 - Type A)

(Standard Z twist wire ropes without galvanizing)

Nominal diameter of rope	Allowable load	
	kN	ton
mm		
10	8.8	0.9
12	12.7	1.3
14	17.3	1.7
16	22.6	2.3
18	28.6	2.9
20	35.3	3.6
25	55.3	5.6
30	79.6	8.1
40	141.6	14.4

Nominal diameter of rope	Allowable load	
	kN	ton
mm		
50	221.6	22.6
60	318.3	32.4

- ★ The allowable load is calculated as one sixth of the breaking load of the rope to be used (safety coefficient: 6).

Precautions for disconnecting and connecting hoses and tubes in air conditioner circuit

Disconnection

⚠ When replacing the air conditioner unit, air conditioner compressor, condenser or receiver drier, etc., collect the refrigerant (air conditioner gas: R134a) from the air conditioner circuit before disconnecting the air conditioner hoses.

- ★ Ask a qualified person for collecting, adding and filling operations of the refrigerant (air conditioner gas: R134a). (Only registered persons can work.)
- ★ Never release the refrigerant (air conditioner gas: R134a) to the atmosphere.

⚠ If refrigerant gas (air conditioner gas: R134a) gets in your eyes, you may lose your sight. And if it touches your skin, you may suffer from frostbite. Put on protective eyeglasses, gloves and working clothes with long sleeves while collecting the refrigerant or filling the air conditioner circuit with the refrigerant.

- When loosening the nuts fixing air conditioner hoses and tubes, be sure to use 2 wrenches; use one wrench to fix and use the other one to loosen the nut.

Connection

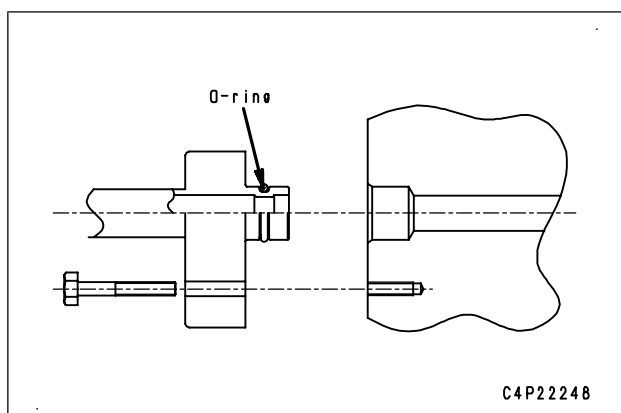
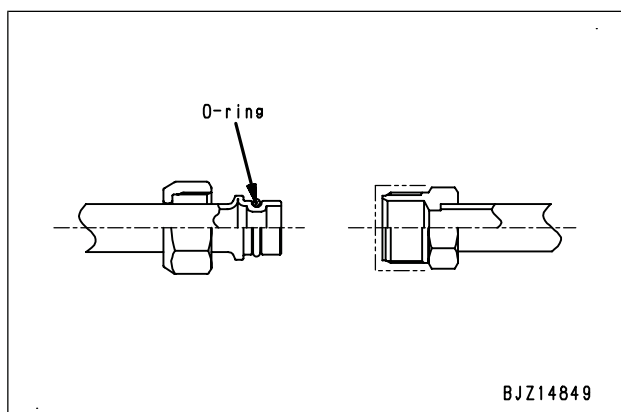
- When installing the hose for the air conditioner circuit, take care not to allow invasion of dirt, dusts and water into the hose.
- Check that the O-rings are fitted to the joints when connecting the air conditioner piping.
- Once an O-ring is used, it is deformed and deteriorated. Accordingly, do not reuse it.
- When removing the O-rings, use a soft tool so that the piping is not damaged.
- Check that the O-ring is not damaged or deteriorated.
- Apply compressor oil for refrigerant (R134a) to the O-ring.
 - ★ However, do not apply oil to the threaded part of a bolt, nut or union.

Manufacturer	Part name
DENSO	ND-OIL8
VALEO THERMAL SYSTEMS	ZXL100PG (equivalent to PAG46)
SANDEN	SP-10

- When tightening nuts of the air conditioner hoses and tubes, be sure to use 2 wrenches. Use one wrench to fix and tighten the nut with the other wrench to the specified torque (Use a torque wrench for tightening).

★ Example of fitting of O-ring

- An O-ring is fitted to every joint of the air conditioner piping.



**For tightening torques, see "Others",
 "Precautions for disconnection and connection
 of air conditioner piping".**

00 Index and foreword

Foreword, safety and general information

Precautions to prevent fire (ALL-0000-17B-K-03-A)

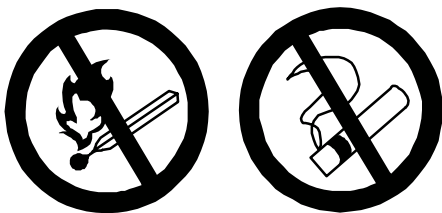
- **Fire caused by fuel, oil, coolant or window washer fluid**

Do not bring any flame or fire close to flammable substances such as fuel, oil, coolant or window washer fluid. There is danger that they may catch fire. Always observe the following.

- Do not smoke or use any flame near fuel or other flammable substances.
- Shut down the engine before adding fuel.
- Do not leave the machine when adding fuel or oil.
- Tighten all the fuel and oil caps securely.
- Be careful not to spill fuel on overheated surfaces or on parts of the electrical system.
- After adding fuel or oil, wipe up any spilled fuel or oil.
- Put greasy rags and other flammable materials into a safe container to maintain safety at the workplace.
- When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline. There is danger that they may catch fire.
- Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.
- Determine well-ventilated areas for storing oil and fuel. Keep the oil and fuel in the specified place and do not allow unauthorized persons to enter.
- When performing grinding or welding work on the machine, move any flammable materials to a safe place before starting.



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- **Fire caused by accumulation or attachment of flammable material**

- Remove any dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated or attached to or around the engine exhaust manifold, muffler, or battery, or on the undercovers.
- To prevent fires from being caught, remove any flammable materials such as dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated around the cooling system (radiator, oil cooler) or on the undercover.

- **Fire coming from electric wiring**

Short circuits in the electrical system can cause fire. Always observe the following.

- Keep all the electric wiring connections clean and securely tightened.
- Check the wiring every day for looseness or damage. Reconnect any loose connectors or refasten wiring clamps. Repair or replace any damaged wiring.

- **Fire caused by piping**

Check that all the clamps for the hoses and tubes, guards, and cushions are securely fixed in position.

If they are loose, they may vibrate during operation and rub against other parts. There is danger that this may lead to damage to the hoses and cause high-pressure oil to spurt out, leading to fire and serious personal injury or death.

- **Fire around the machine due to highly heated exhaust gas**

Some machines are equipped with KDPF (Komatsu Diesel Particulate Filter).

KDPF is a system for purifying soot in exhaust gas. Its exhaust gas discharged during purification process (regeneration) can be at higher temperature than that from existing models. Do not bring any flammable material close to the outlet of the exhaust pipe.

- When there are thatched houses, dry leaves or pieces of paper near the work site, set the system to disable the regeneration before starting work to prevent fire hazards due to highly heated exhaust gas.

See the operation and maintenance manual for the setting procedure.

- **Explosion caused by lighting equipment**

- When checking fuel, oil, battery electrolyte, or coolant, always use lighting equipment with anti-explosion specifications.
- When taking the electrical power for the lighting equipment from the machine itself, follow the instructions in the operation and maintenance manual.

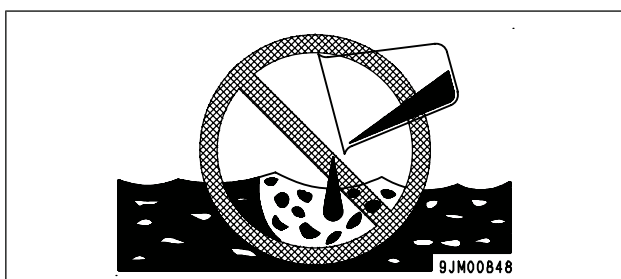
Action if fire occurs (ALL-0000-17A-K-01-A)

- Turn the starting switch to OFF position to stop the engine.
- Use the handrails and steps to get off the machine.
- Do not jump off the machine. You may fall or suffer serious injury.
- The fume generated by a fire contains harmful materials which have a bad influence on a human body when they are sucked.
Don't breathe a fume.
- After a fire, there may be harmful compounds left. If it touches your skin it may have a bad influence on your body.
Be sure to wear rubber gloves when handle the materials left after the fire.
The material of the gloves, which is recommended is polychloroprene (Neoprene) or polyvinyl chloride (in the lower temperature environment).
When wearing cotton-work-gloves, wear rubber gloves under them.

Dispose of waste materials (ALL-0000-99A-K-02-A)

To prevent pollution, pay full attention to the way to dispose of waste materials.

- Always put the oil and coolant drained from the machine in containers. Never drain the oil and coolant directly onto the ground or dump into the sewage system, rivers, the sea, or lakes.
- Observe the related laws and regulations when disposing of harmful objects such as oil, fuel, coolant, solvent, filters, and batteries.



Some kinds of rubber and plastics may produce poisonous gas harmful to human body when they are burned.

- As for rubber, plastics, or parts (hoses, cables, and wiring harnesses, etc.) which contain those materials, ask the industrial waste treatment firms for their disposals in accordance with the local regulations.

00 Index and foreword

Foreword, safety and general information

How to read the shop manual (ALL-0320-010-A-01-A)

(Rev. 2012/10)

- Some attachments and optional parts described in this shop manual may not be arranged for certain areas. Contact your Komatsu distributor if one or some of them are required.
- Materials and specifications are subject to change without notice.
- The shop manuals are available for "Machine part" and "Engine part". For the engine, see the shop manual for the same model of the engine as the one which is mounted on the machine.

Composition of shop manual

- This shop manual describes the technical information required for the services performed in a workshop. The shop manual is divided into the following chapters for the convenience of use.

00. Index and foreword

- This section includes the index, foreword, safety and basic information.

01. Specification

- This section explains the specifications of the machine.

10. Structure and function

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

20. Standard value table

- The standard values for a new machine and trouble shooting are indicated. This standard value table is used for testing and adjusting, and determining a failure at troubleshooting.

30. Testing and adjusting

- This section describes the measuring tools and how to measure, and how to adjust various parts. As for the standard value and failure criterion, see the standard value table.

40. Troubleshooting

- This section describes the troubleshooting in a suspected area when a failure occurs and the remedy for the failure. Troubleshooting is described by each failure mode.

50. Disassembly and assembly

- This section explains the procedures for removing, installing, disassembling, and assembling each part or component and the special tools for the works as well as precautions for doing them safely. In addition, tightening torque, and quantity and weight of coating material, oil, grease, and coolant required for the works are also explained.

60. Maintenance standard

- This section describes the maintenance standard values for each component. This section gives the criterion values for each component and required remedy at disassembly or maintenance.

80. Appendix







- The structure and function, testing and adjusting, and troubleshooting for all of the other components or equipment which can not be separately classified are explained together in the appendix.

90. Diagrams and drawings

- This section gives hydraulic circuit diagrams and electrical circuit diagrams.

Symbol

Important safety and quality portions are marked with the following symbols so that the shop manual is used practically.

Symbol	Item	Remarks
	Safety	The special safety precautions required for performing work are described.
★	Caution	The special technical precautions or other precautions for preserving standards required when performing work are described.
	Weight	The weight of part or component and the cautions required when selecting hoisting wire or when working posture is important are indicated.
	Tightening torque	The tightening torques that require special attention during assembly work are indicated.
	Coat	The places to be coated with adhesives, grease, etc. during assembling are indicated.
	Oil, coolant	The places where oil, coolant, etc. must be added and the quantity to be added are indicated.
	Drain	Places where oil, coolant, etc. must be drained and the quantity to be drained are indicated.

Unit

- In this shop manual, the units are indicated with International System of units (SI).
- For reference, Gravitational System of units which is used to be used is indicated in parentheses of { }.

00 Index and foreword

Foreword, safety and general information

Explanation of terms for maintenance standard (ALL-0330-006-A-01-A)

(Rev. 2012/10)

- The chapter of maintenance standard shows judgement criteria to determine the products to be replaced or to be reused. The judgement criteria are described by using the following terms.

Standard dimension and tolerance

- To be accurate, the finished dimension of a part is slightly different from one to another.
- The finished dimension of a part specifies the allowable difference from the standard dimension which is set first.
- The dimension set as the standard is called the standard dimension and the range of difference from this standard dimension is called the "tolerance".
- An indication example of a standard dimension and tolerance is shown in the following table. (The standard dimension is entered on the left side and the tolerance is entered with a positive or negative symbol on the right side)

Example:

Standard dimension	Tolerance
120	-0.022
	-0.126

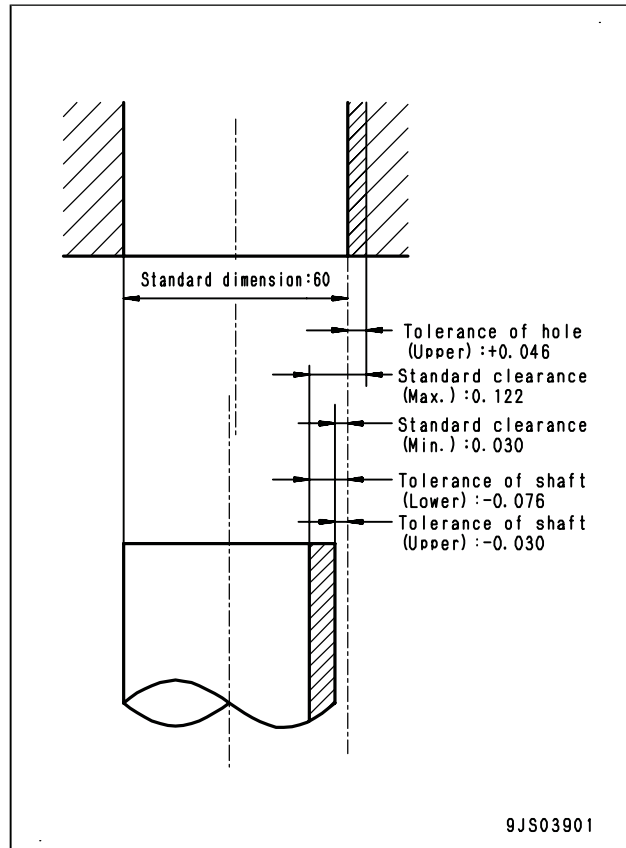
- The tolerance may be indicated in the text and a table as "standard dimension (upper limit of tolerance/lower limit of tolerance)." Example: 120(-0.022/-0.126)
- Usually, the dimension of a hole and the dimension of a shaft to be inserted into the hole are indicated by the same standard dimension and different tolerances of the hole and shaft. The tightness of fit is decided by the tolerance.
- An indication example of a shaft and hole is shown in the following table. (The standard dimension is entered on the left side and the tolerance of the shaft is entered with a positive or negative symbol at the center and that of the hole on the right side)

Standard dimension	Tolerance	
	Shaft	Hole
60	-0.030	+0.046
	-0.076	0

Standard clearance and standard value

- The clearance made when new parts are assembled is called the standard clearance, which is indicated by the range from the minimum clearance to the maximum clearance.
- When some parts are repaired, the clearance is generally adjusted to the standard clearance.
- The values indicating performance and function of new products or equivalent are called the "standard value", which is indicated by a range or a target value.

- When some parts are repaired, the value of performance/function is set to the standard value.



Standard interference

- When the diameter of a hole of a part shown in the given standard dimension and tolerance table is smaller than that of the shaft to be inserted, the difference between those diameters is called the "interference".
- Subtract the maximum dimension of the hole from the minimum dimension of the shaft and call it (A). Subtract the minimum dimension of the hole from the maximum dimension of the shaft and call it (B). The range between (A) and (B) is the "standard interference".
- After repairing or replacing some parts, measure the dimension of their hole and shaft and check that the interference is in the standard range.

Repair limit and allowable value or allowable dimension

- The dimensions of parts change because of the wear or deformation while they are used. When the dimension changes exceeding certain value,

the parts can not be used any longer. This value is called "repair limit".

- If a part is worn to the repair limit, it must be replaced or repaired.
- The performance and function of the products lower while they are used. When the value of the performance and function lowers exceeding a certain limit and it influences the operation etc., this value is called the allowable value or allowable dimension.
- A product whose dimension is out of the allowable value, must be repaired. However, since the allowable values are generally estimated through various tests or experiences in most cases, the judgement must be made in consideration of the operating condition and customer's requirement.

Allowable clearance

- Parts can be used until the clearance between them is increased to a certain limit. The limit at which those parts cannot be used is called the "allowable clearance".
- If the clearance between the parts exceeds the allowable clearance, they must be replaced or repaired.

Allowable interference

- The allowable maximum interference between the hole of a part and the shaft of another part to be assembled is called the "allowable interference".
- The allowable interference shows the repair limit of the part of smaller tolerance.
- The parts whose interferences are out of the allowable interference must be replaced or repaired.

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Foreword, safety and general information

Handling equipment of fuel system devices (PC-AD00-2A4-K-00-A)

(Rev. 2012/01)

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

Use care for working environment

- Avoid filter change or repairing the machine in rain or high winds, or at places where there is a lot of dust.

Sealing openings

- Plug the pipes and the openings of the components which are removed with the caps, tapes, vinyl bags, etc. to prevent foreign material from entering. Never perform repair works under the condition that the openings are left as they are or plugged with cloths as foreign material may enter or environment may be polluted by the oil leaked. Do not discard the waste oil somewhere or other. Hand it over to your customer for disposal, or dispose it by yourself.

How to clean parts when dirt is stuck

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

Precautions for replacing fuel filter cartridge

- Be sure to use the Komatsu genuine fuel filter cartridge.
- The common rail fuel injection system (CRI) consists of more precise parts than the parts used in the conventional fuel injection pump and nozzle. In order to prevent foreign material from entering this system, the filter employs a specially high performance of filter element. If a filter element other than the genuine one is used, the fuel system may have a failure. Accordingly, never use such a filter element.

Handling of intake system parts (PC220-A900-2A4-K-00-A)

(Rev.2013/10)

- The Komatsu Variable Geometry Turbocharger consists of more precise parts (variable mechanism) than the parts used in the conventional turbocharger. If foreign material enters this system, it may cause a failure. Use special care to prevent entry of the foreign material when servicing the air intake system.

Be careful of working environment

- Avoid the repair work of the machine in rain or strong wind or at the places where there is a lot of dust.

Sealing openings

- Plug the pipes and the openings of the components which are removed, with the caps, tapes, vinyl bags, etc. to prevent foreign material from entering. Never perform repair works under the condition that the openings are left open or plugged with rag since foreign material may enter.

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Foreword, safety and general information

Handling of hydraulic equipment (ALL-C000-2A4-P-01-A)

(Rev. 2012/10)

- With the increase in pressure and precision of the hydraulic components, the most common cause of a failure is dirt (foreign material) in the hydraulic circuit. Therefore, the special care must be taken when adding hydraulic oil, or when disassembling or assembling the hydraulic components.

Be careful of working environment

- Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or at places where there is a lot of dust.

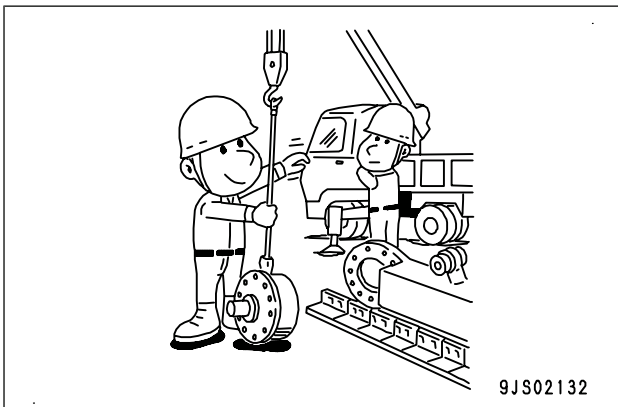
Disassembly and maintenance work in the field

- When disassembly or maintenance work of the hydraulic is performed in the field, there is danger of dust entering the components. It is also difficult to check the performance of the components after repairs, so it is desirable to use the component exchange service. The disassembly and assembly of the hydraulic components must be performed in the specially arranged dustproof workshop and the performance test of the components must be performed with the special testing equipment.



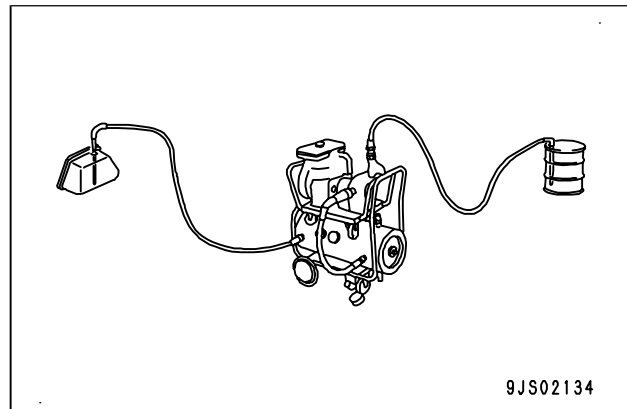
Preventing intrusion of foreign materials during refilling operations.

- Care must be taken when adding hydraulic oil so that foreign material does not enter. Keep the oil filler port and the area around it, oil supply pump and oil container clean. If an oil cleaning device is used, it is possible to remove the dirt that is collected during storage. It is a surer means.



Plugging of opening (prevention of flowing out of oil)

- Plug the pipes and the openings of the components which are removed (when plugs are not prepared, seal with caps, tapes, vinyl bags, etc.) to prevent entry of foreign material and flowing out of oil. Never leave the openings of the pipes and hoses without being covered or plugged with cloth as foreign material may enter them or environment may be polluted by the oil leaked. Do not discard the waste oil somewhere or other. Hand it over to your customer for disposal, or dispose it by yourself.

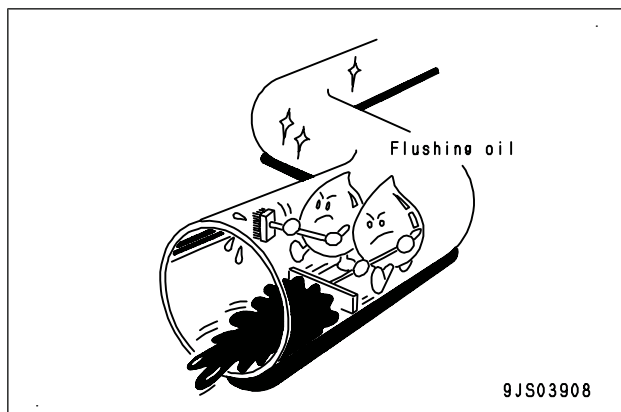


Replacing hydraulic oil while its temperature is high

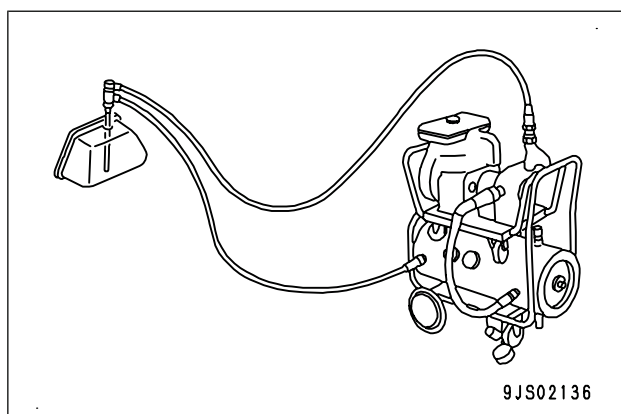
- When the hydraulic oil is warm, it flows easily. In addition, sludge can also be drained from the circuit together with the oil. So, it is better to change the hydraulic oil while it is warm. When changing the hydraulic oil, the old oil must be drained as much as possible. (Drain the oil not only from the hydraulic tank, but also from the filter housing and the drain plug hole in the circuit.) If the old oil is left in the system, the contaminant and sludge in the oil mix with the new oil and shorten the life of the new hydraulic oil.

Flushing operations

- After disassembling the equipment or when changing the hydraulic oil with new one, flush the system to remove the contaminant and sludge left in the hydraulic circuit as well as the oil which includes them. Normally, flushing is performed twice. Primary flushing is performed by use of the flushing oil and the secondary flushing is performed by use of the specified hydraulic oil.

**Cleaning operations**

- After repairing the hydraulic equipment (pump, control valve, etc.) or when the machine is in operation, perform oil cleaning to remove the sludge or contaminant in the hydraulic oil circuit. The oil cleaning equipment can remove the ultra fine (approximately 3 μm) particles that the filter built in the hydraulic equipment can not remove. So, it is an extremely effective device.



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Method of disconnecting and connecting of push-pull type coupler (ALL-

C930-001-P-00-A)

(Rev. 2012/01)

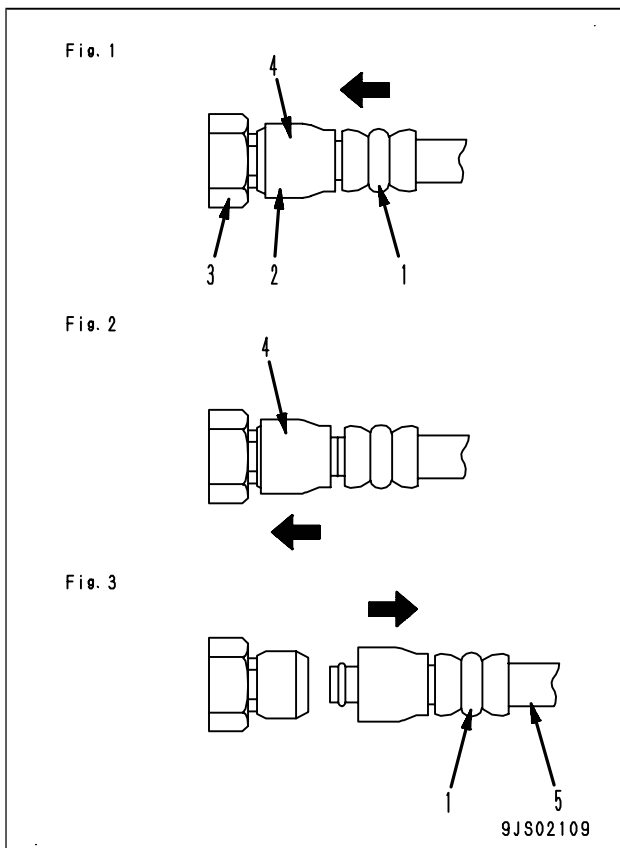
⚠ Loosen the oil filler cap of the hydraulic tank slowly to release the remaining pressure in the hydraulic tank.

⚠ Even if the remaining pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil container.

Type 1 (ALL-C930-925-P-01-A)

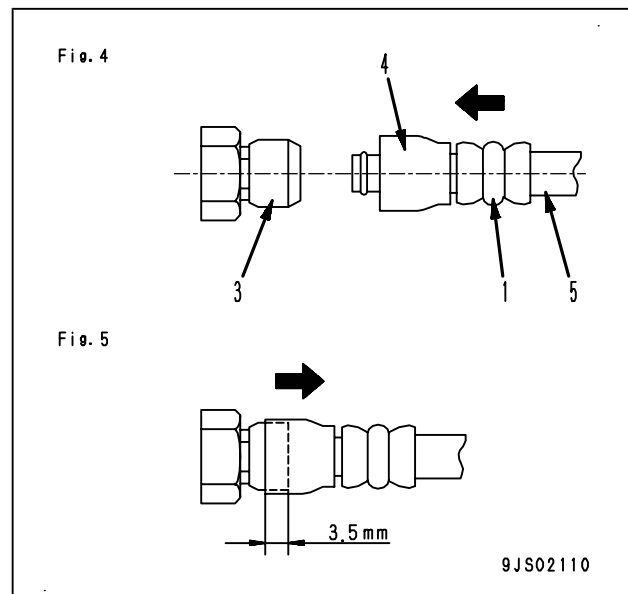
Disconnection

1. Hold adapter (1) and push hose joint (2) into mating adapter (3). (Fig. 1)
 - ★ It can be pushed in by approximately 3.5mm.
 - ★ Do not hold rubber cap portion (4).
2. While pushing hose joint (2) into adapter (3), push rubber cap (4) against adapter (3) until "click" is heard. (Fig. 2)
3. Hold hose adapter (1) or hose (5) and pull it out. (Fig. 3)
 - ★ Since some hydraulic oil flows out, prepare an oil container.



Connection

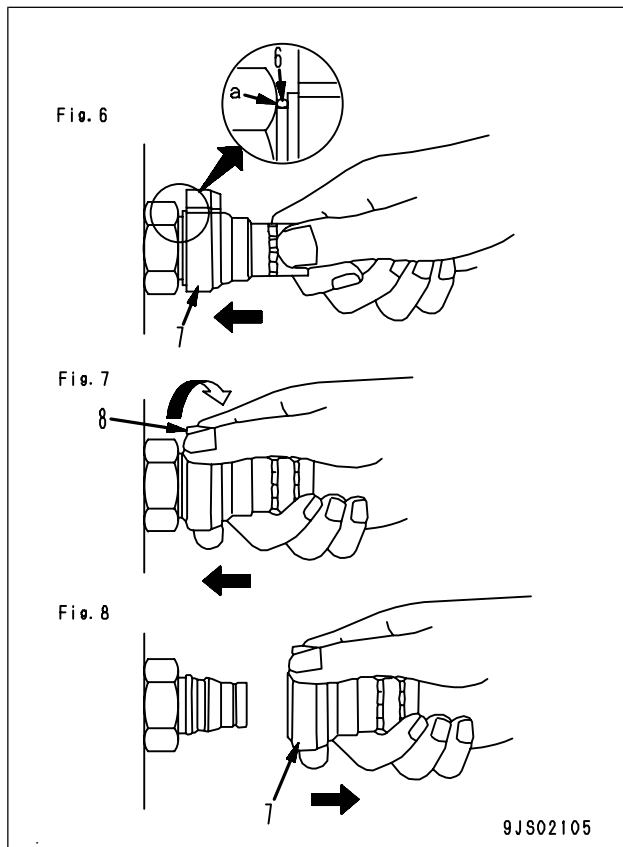
1. Hold hose adapter (1) or hose (5) and insert it in mating adapter (3) aligning them with each other. (Fig. 4)
 - ★ Do not hold rubber cap part (4).
2. After inserting the hose fitting in the adapter on the other side perfectly, pull it back to check the connecting condition. (Fig. 5)
 - ★ When the hose fitting is pulled back, the rubber cap will move approximately 3.5mm toward the hose, however, it is not a problem.



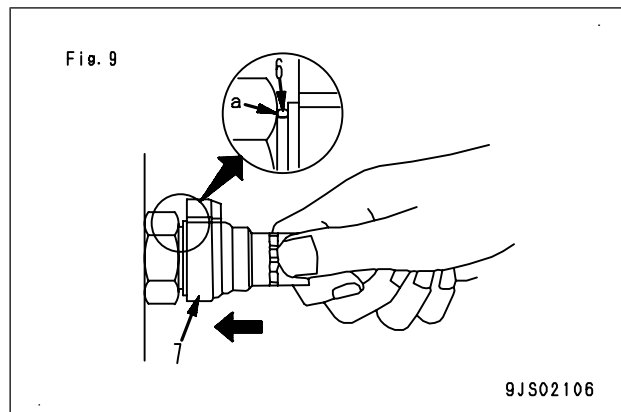
Type 2 (ALL-C930-925-P-02-A)

Disconnection

1. While holding the fitting, push body (7) in straight until sliding prevention ring (6) hits contact surface (a) at the hexagonal part on the male side. (Fig. 6)
2. While keeping the condition of Step 1, turn lever (8) to the right (clockwise). (Fig. 7)
3. While keeping the conditions of Steps 1 and 2, pull out whole body (7) to disconnect it. (Fig. 8)


Connection

1. While holding the fitting, push body (7) in straight until sliding prevention ring (6) hits contact surface (a) at the hexagonal part on the male side to connect it. (Fig. 9)



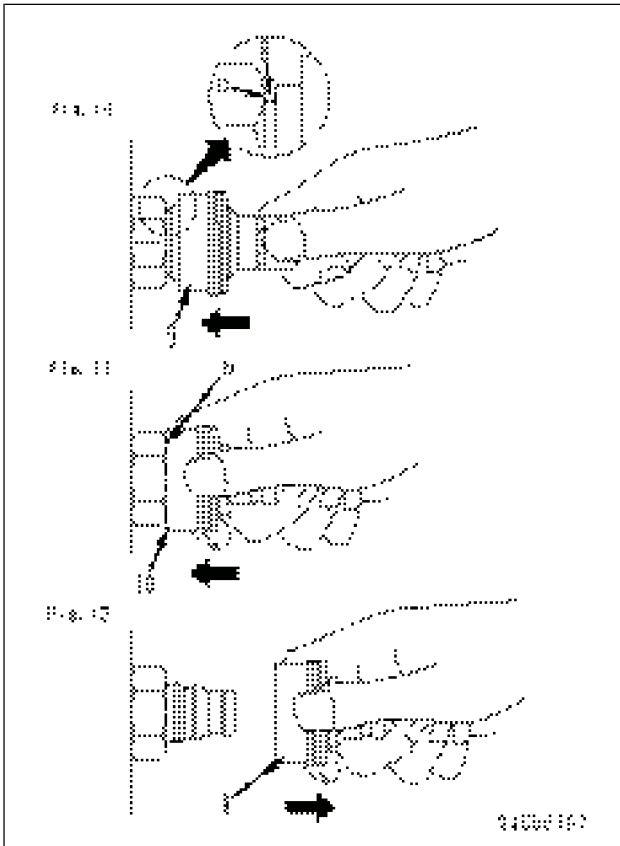
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Type 3 (ALL-C930-925-P-03-A)

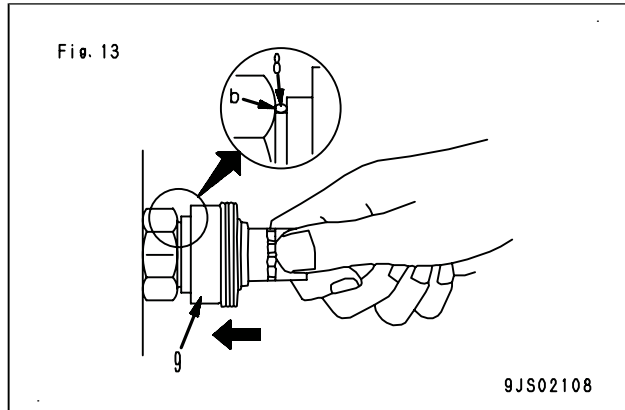
Disconnection

1. While holding the fitting, push body (9) in straight until sliding prevention ring (8) hits contact surface (b) at the hexagonal portion on the male side. (Fig. 10)
2. While keeping the condition of Step 1, push cover (10) straight until it hits contact surface (b) of the hexagonal portion on the male side. (Fig. 11)
3. While keeping the conditions of Steps 1 and 2, pull out whole body (9) to disconnect it. (Fig. 12)



Connection

1. While holding the fitting, push body (9) in straight until sliding prevention ring (8) hits contact surface (a) at the hexagonal portion on the male side to connect them. (Fig. 13)



Handling of electrical equipment (ALL-E000-2A4-P-01-A)

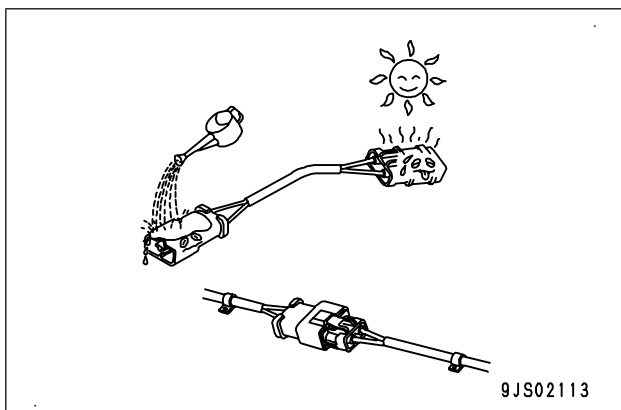
(Rev. 2012/11)

- To maintain the performance of the machine over a long period, and to prevent failures or troubles before they occur, correct "operation", "maintenance and inspection" "troubleshooting", and "repairs" must be performed. This section deals particularly with correct repair procedures for mechatronics components and is aimed at improving the quality of repairs. For this purpose, it describes the working procedures in "Handling of electrical equipment".

Precautions for handling electric equipment

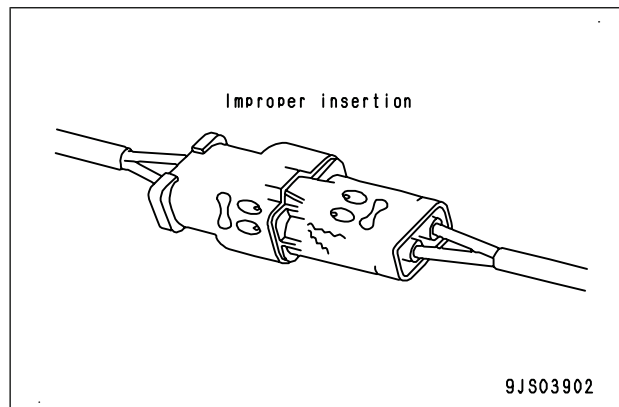
Handling wiring harnesses and connectors

- Wiring harnesses consist of wires connecting one component to another component, connectors used for connecting and disconnecting one wire from another wire, and protectors or tubes used for protecting the wires.
- Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer deformation or damage. For this reason, it is necessary to be extremely careful when handling the wiring harnesses.



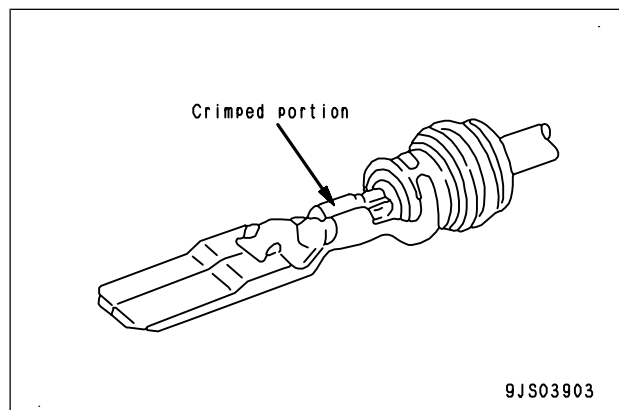
Main failures occurring in wiring harness Defective contact of connectors (defective contact between male and female connectors)

- Problems with defective contact are likely to occur because the male connector is not properly inserted into the female connector, or because one or both of connectors are deformed or the position is not correctly aligned, or because there is corrosion or oxidization of the contact surfaces. The corroded or oxidized contact surfaces may become shiny again (and contact may become normal) by connecting and disconnecting the connectors approximately 10 times.



Defective crimping or soldering of connectors

- The pins of the male and female connectors are attached to wires by crimping or soldering. If excessive force is applied to the wire, the joining area may become loose, which may result in a defective connection or breakage.

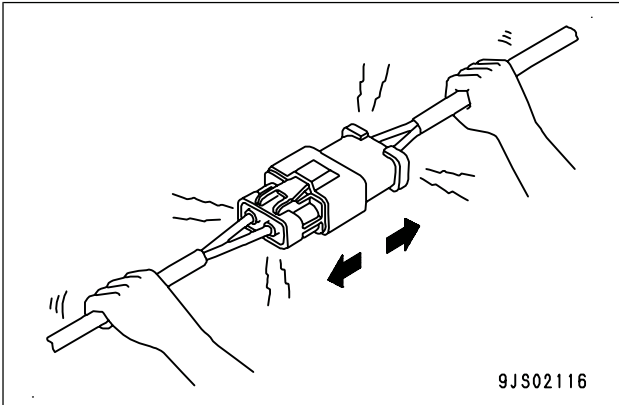


Disconnections in wiring

- If the wiring harness is pulled to disconnect the connector, or the components are lifted with a crane while the wiring harness is still connected, or a heavy object hits the wiring harness, the crimping of the connector may separate, or the soldering may be damaged, or the wiring harness may be broken.

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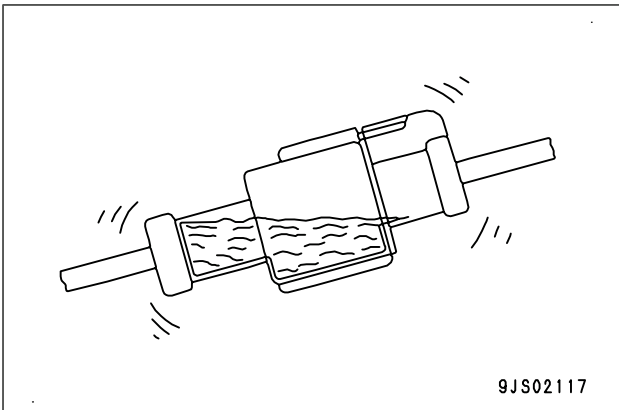


9JS02116

High-pressure water entering connector

- The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet. Accordingly, take care not to spray water over the connector.

The connector is designed to prevent water from entering, but once water does enter, it is difficult to drain it. If water should get into the connector, the pins will be short-circuited by the water. So if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



9JS02117

Entry of water, mud or dirt when disconnecting a connector

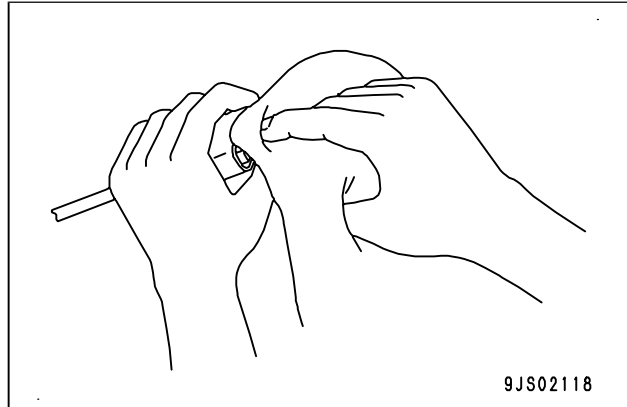
- If any water, mud or dirt is stuck to the outside surface of a connector, it can enter inside the connector when the connector is disconnected. Before disconnecting the connector, wipe off any stuck water or dirt by using a piece of dry cloth or blow it with compressed air.

Oil, mud or dirt stuck to connector

- If any oil or grease is stuck to the connector and an oil film is formed on the mating surface of the male and female pins, the oil prevents electricity from passing through, resulting in defective contact. If any oil or grease, mud or dirt is stuck to the connector, wipe it off with a dry cloth or

blow it with compressed air and spray it with electrical contact restorer.

- ★ When wiping the joint portion of the connector, be careful not to apply excessive force or deform the pins.
- ★ If there is oil or water in the compressed air, it causes the contacts to become dirtier. So, remove the oil and water from the compressed air completely before cleaning the connector with the compressed air.

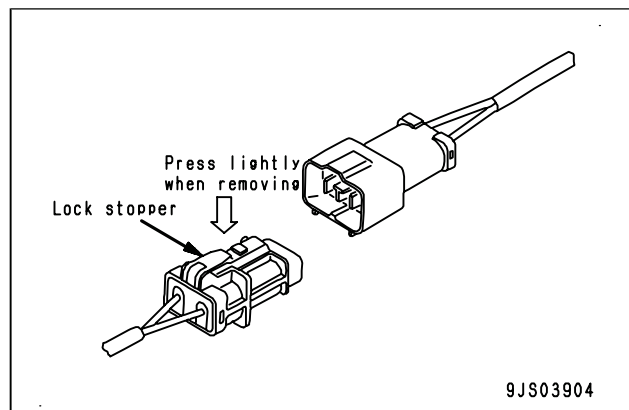


9JS02118

Removing, installing, and drying connectors and wiring harnesses

Disconnecting connectors

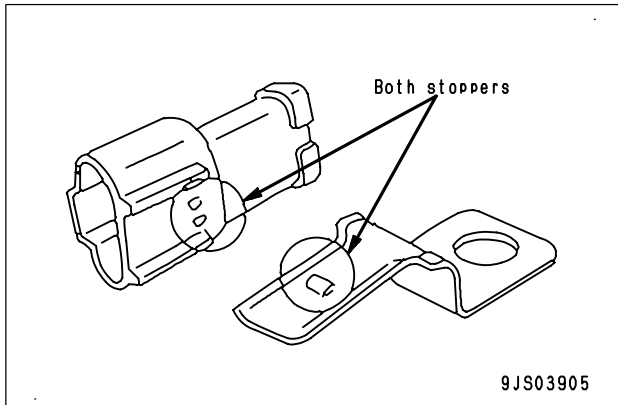
- Hold the connectors when disconnecting.
 - Disconnect connectors by holding the connector bodies. For the connectors held by a screw, loosen the screw fully, then hold the male and female connectors with each hand respectively and pull them apart horizontally. For the connectors with lock stopper, press down the stopper with your thumb and pull the connectors apart.
 - ★ Never pull the connector with one hand.



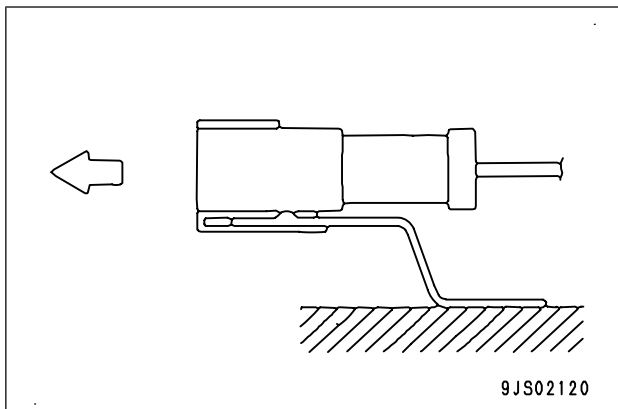
9JS03904

- When removing from clips

- Both of the connector and clip have stoppers, which are engaged with each other when the connector is connected.

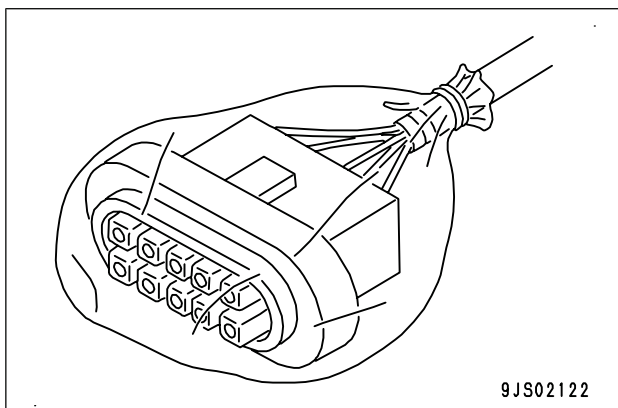


- When removing a connector from a clip, pull the connector in a parallel direction to the clip for removing stoppers.
- ★ If the connector is pried up and down or to the right and left, the housing may break.



3. Action to take after removing connectors

- After removing the connector, cover it with the vinyl bag to prevent entry of dust, dirt, oil or water in the contact portion.
- ★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.



Connecting connectors

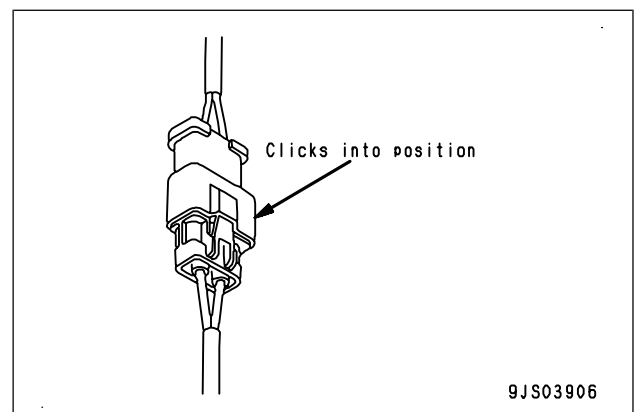
1. Check the connector visually.

- Check that there is no oil, dirt or water stick to the connector pins (joint portion).
- Check that the connector pins are free from deformation, defective contact, corrosion, or damage.
- Check that external surfaces of the connectors are free from damage or breakage.

- ★ If any oil, water or dirt is stuck to the connector, wipe it off with a dry cloth. If any water is inside the connector, warm the connector and the inside of the wiring harness with a dryer. But be careful not to make it too hot as it causes short circuit.
- ★ If there is any damage or breakage, replace the connector.

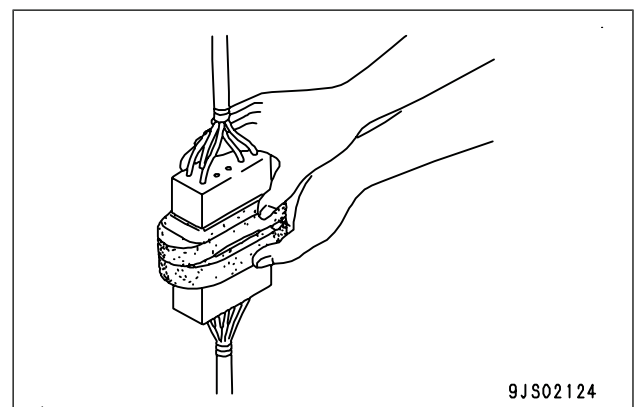
2. Fix the connector securely.

- Align the connectors correctly, and fit them securely. For the connectors with the lock stopper, push in the connectors until "click" is heard.



3. Correct the protrusion of the boot and misalignment of the wiring harness

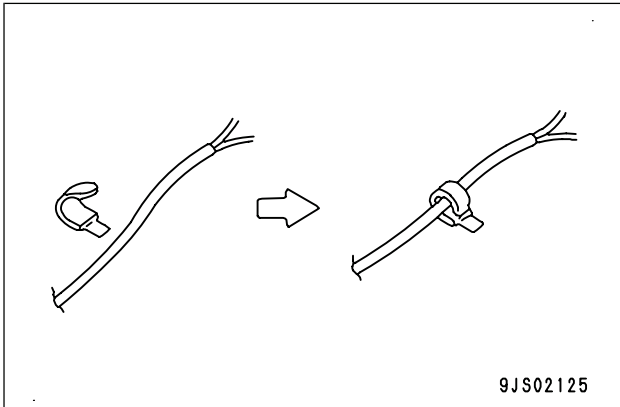
- For connectors fitted with the boot, correct any extrusion of the boot. In addition, if the wiring harness or the clamp is out of the position, put it in its original position.
- ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.



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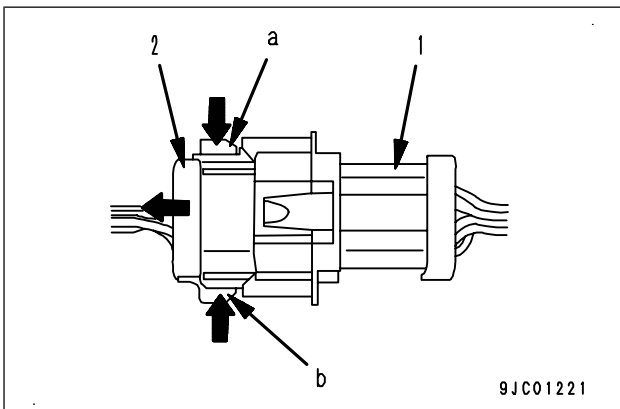
- If the connector clamp is removed, be sure to return it to its original position. And check that it is securely installed.



Handling of Deutsch connector (DT8-pin, DT12-pin)

Disconnection

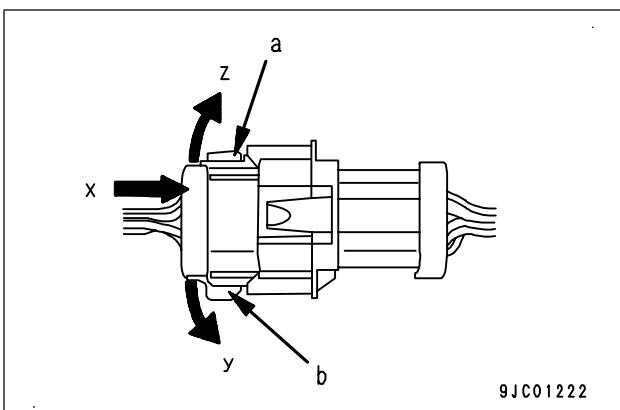
1. While pressing locks (a) and (b) from each side respectively, pull out female connector (2).



Connection

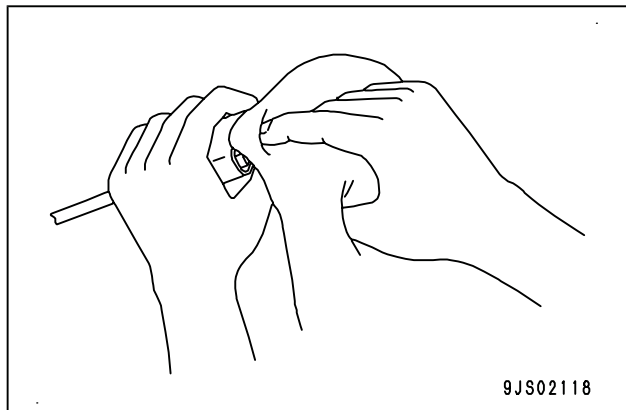
1. Push in female connector (2) horizontally until the lock clicks. (Arrow: x)
2. Since locks (a) and (b) may not be set completely, push in female connector (2) with curving movement until the locks are set normally. (Arrow: x, y, and z)

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



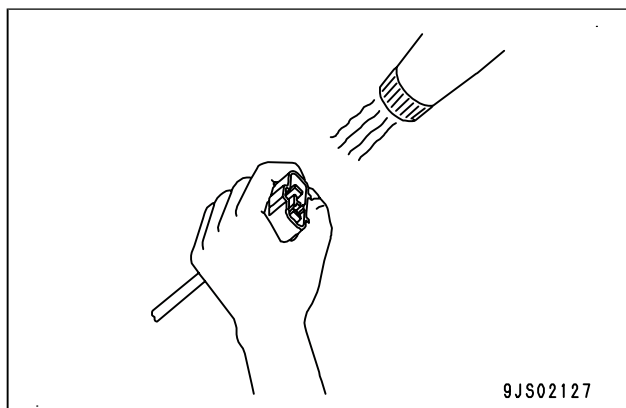
Drying wiring harness

- If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing by using steam. If the wire harness must be washed in water, do not apply high pressure water or steam directly to the wiring harness. If water gets directly on the connector, do as follows.
 1. Disconnect the connector and wipe off the water with a dry cloth.
 - ★ If the connector is to be blown with dry compressed air, there is a risk that oil in the air may cause defective contact of the conditioner, remove oil and water in the air before starting air blow.



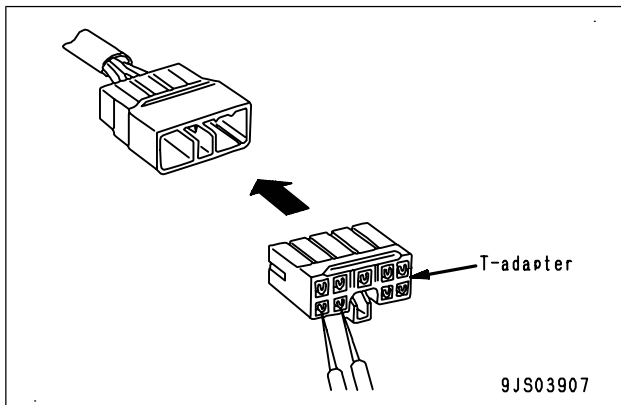
2. Dry the inside of the connector with a dryer. If water gets inside the connector, use a dryer to dry the connector.

- ★ Hot air from the dryer can be used, but regulate the time to use hot air in order to prevent the connector or related parts from becoming too hot, as it causes deformation or damage to the connector.



3. Perform a continuity test on the connector. After drying, leave the wiring harness disconnected and perform a continuity test to check for any short circuits between pins caused by water.

- ★ After the connector is completely dried, blow the contact restorer and reassemble them.



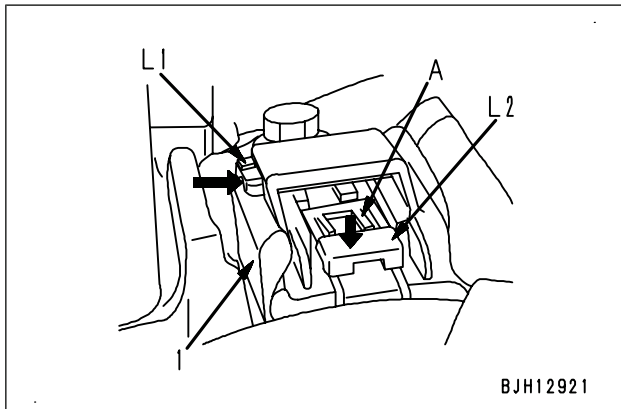
Handling of connectors used on engine

Slide, lock type (FRAMATOME-3, FRAMATOME-2)

Disconnection

1. Slide lock (L1) to the right.
2. While pressing lock (L2), pull out connector (1) toward you.

- ★ In the case that even if lock (L2) is pressed, connector (1) cannot be pulled out toward you unless part A floats, float part A with a small flat-head screwdriver while pressing lock (L2), and then pull out connector (1) toward you.



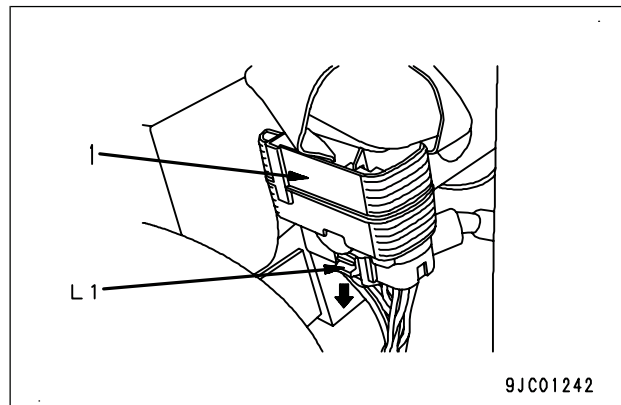
Connection

1. Insert the connector securely until a click is heard.

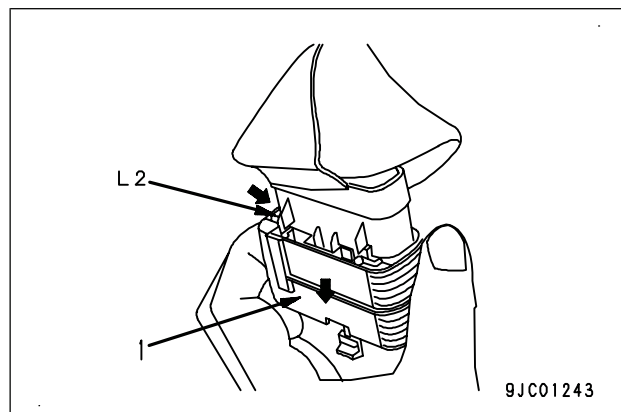
(FRAMATOME-24)

Disconnection

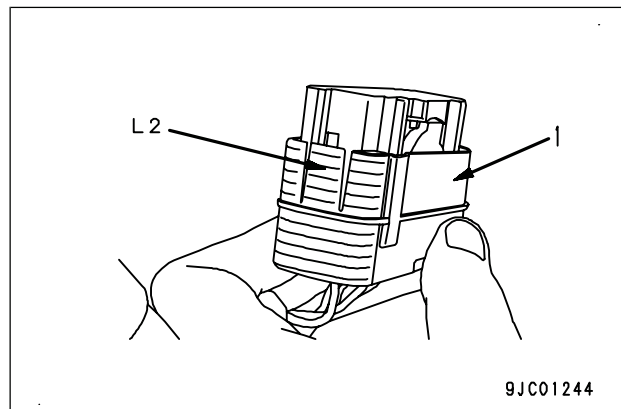
1. Slide down lock (red) (L1).



2. While pressing lock (L2), pull out connector (1).



- ★ Lock (L2) is located in the back of connector (1).



Connection

1. Insert the connector securely until a click is heard.

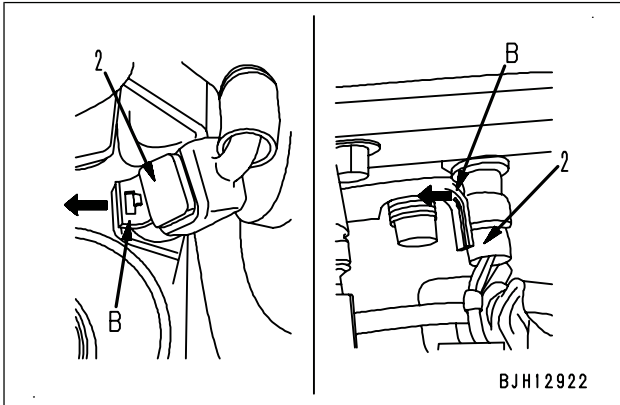
Pull lock type (PACKARD-2)

Disconnection

1. Disconnect the connector (2) by pulling lock (B) (on the wiring harness side) of connector (2) outward.

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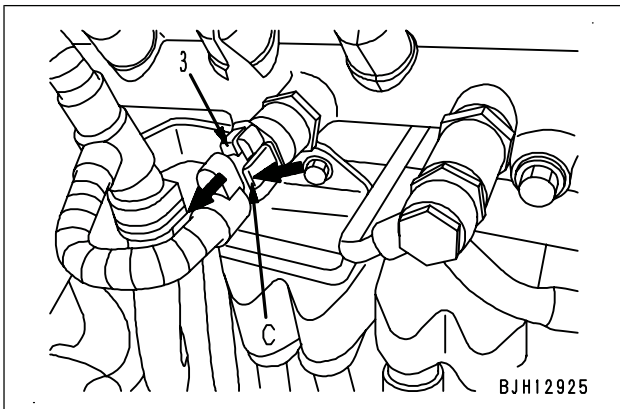
Connection

1. Insert the connector securely until a click is heard.

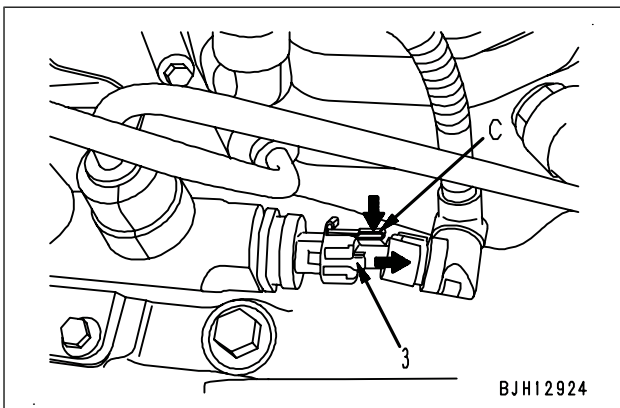
Push lock type (BOSCH-3)

Disconnection

1. While pressing lock (C), pull out connector (3) in the direction of the arrow.
 - 114 series

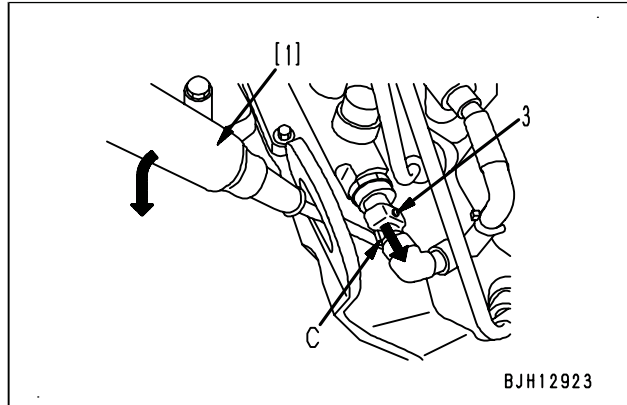


- 107 series



- ★ If the lock is located on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

While pushing up lock (C) of the connector with flat-head screwdriver [1], pull out connector (3) in the direction of the arrow.



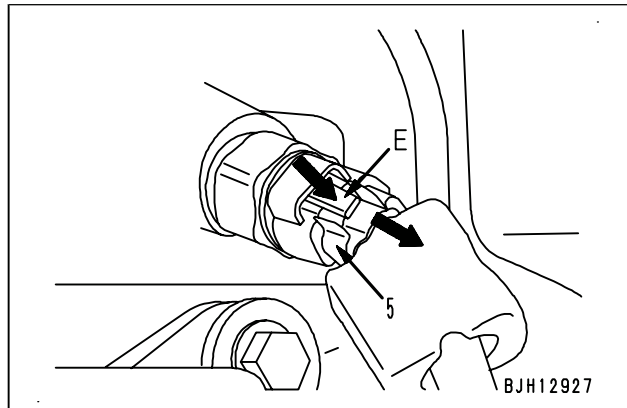
Connection

1. Insert the connector securely until a click is heard.

(AMP-3)

Disconnection

1. While pressing lock (E), pull out connector (5) in the direction of the arrow.



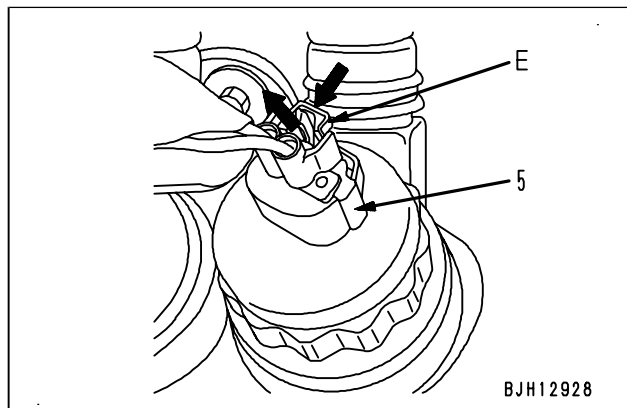
Connection

1. Insert the connector securely until a click is heard.

(SUMITOMO-2)

Disconnection

1. While pressing lock (E), pull out connector (5) in the direction of the arrow.



Connection

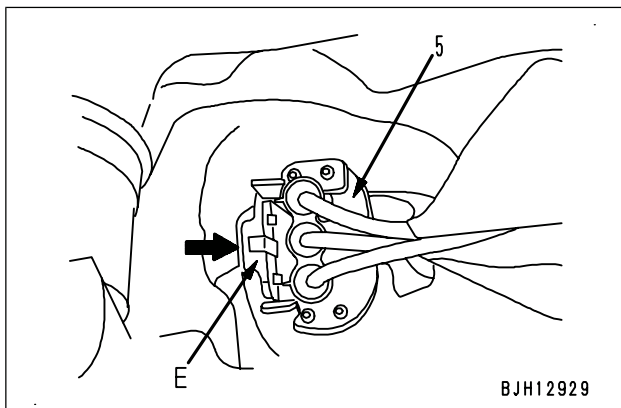
1. Insert the connector securely until a click is heard.

(SUMITOMO-3)

Disconnection

1. While pressing lock (E), pull out connector (5) in the direction of the arrow.

★ Pull the connector straight up.



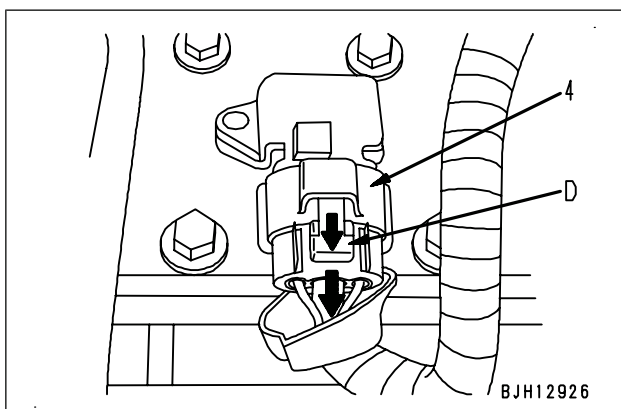
Connection

1. Insert the connector securely until a click is heard.

(SUMITOMO-4)

Disconnection

1. While pressing lock (D), pull out connector (4) in the direction of the arrow.



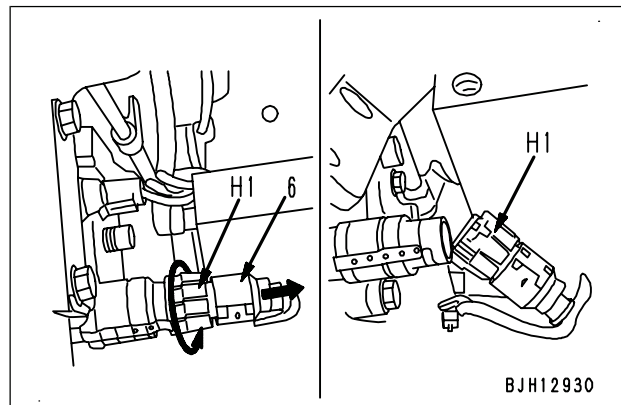
Connection

1. Insert the connector securely until a click is heard.

Turn-housing type (Round green connector) (CANNON-4)

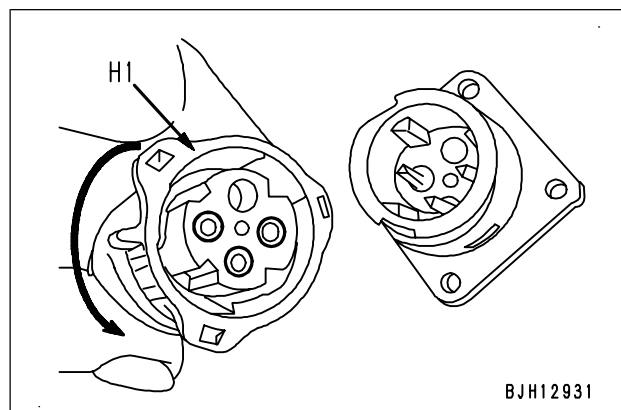
Disconnection

1. Turn housing (H1) in the direction of the arrow.
 - ★ Unlock the connector by turning housing (H1). When the lock is released, the housing is felt tight to turn.
2. Pull out housing (H1) in the direction of the arrow.
 - ★ Housing (H1) is left on the wiring harness side.

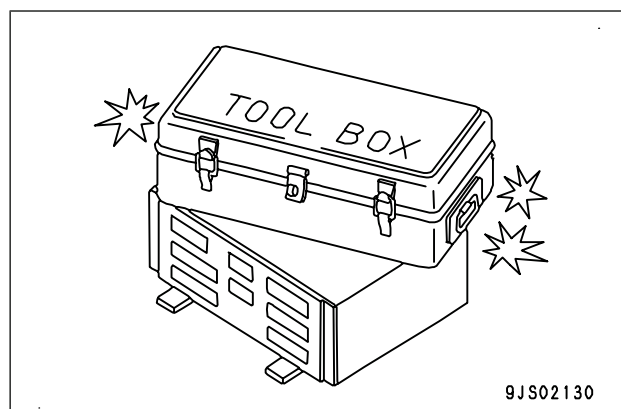


Connection

1. Insert the connector to the end while aligning its groove to the other.
2. Turn housing (H1) in the direction of the arrow until "clicks".

**Handling controller**

- The electronic circuits for control including the microcomputers are assembled in the controller. These electronic circuits in the controller must be handled with care as they control the machine.
- Do not place objects on top of the controller.

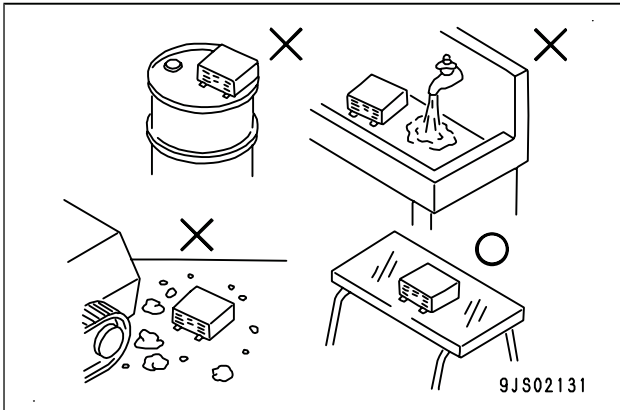


- Cover the control connectors with tape or a vinyl bag. Never touch the connector contacts.
- During rainy weather, do not leave the controller in a place where it is exposed to rain.
- Do not place the controller on oil, water, or soil, or in a place that can be heated to a high

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temperature even for a short period of time.
(Place it on a suitable dry stand.)



- Precautions when performing arc welding
When performing arc welding on the machine body, disconnect all the wiring harness connectors connected to the controller. Put the arc welding ground to the place close to the welding point.

Precautions for troubleshooting electrical circuits

- Be sure to turn the starting switch to "OFF" position before disconnecting or connecting the connectors.
- Before performing troubleshooting, check all the related connectors for loose connection.
 - ★ Check the related connectors for their performance by disconnecting and connecting them several times.
- Be sure to connect all the disconnected connectors before proceeding to the next step.
 - ★ If the starting switch is turned to "ON" position with the connectors disconnected, the failure which is not related to the part which is actually failed.
- When performing the troubleshooting for the circuit (measurement of voltage, resistance, continuity, current, etc.), shake the related wiring harnesses and connectors several times and check that the multimeter reading does not change.
 - ★ If there is any value change on the multimeter, there may be a defective contact in the circuit.

How to read electric wire code (ALL-E500-030-P-00-A)

(Rev. 2012/10)

- In the electrical circuit diagram, material, thickness and color of each electric wire are indicated by symbols. The wire code is helpful in understanding the electrical circuit diagram.

Example) AEX 0.85 L: Indicates blue, heat-resistant, low-voltage wire for automobile, having nominal No. of 0.85

AEX	Indicates type of wire by symbol. Type, symbol, and material of wire are shown in Table 1. (Since the use of AV and AVS wires depends on size (nominal No.), their symbols are not indicated on the diagram.)
0.85	Indicates size of wire by nominal No. Size (Nominal No.) is shown in Table 2.
L	Indicates color of wire by color code. Color codes are shown in Table 3.

Type, symbol, and material

- AV and AVS are different in thickness and outside diameter of the coating. CAVC has a circular compressed conductor. It differs from AV and AVS in the outside diameter of conductor and thickness of the coating. And AEX is similar to AV in thickness and outside diameter of the coating but different from AV and AVS in material of the coating.

(Table 1)

Type	Sym- bol	Conductor material	Insulator material	Temperature range (°C) in use	Example of use
Low-voltage wire for automobile	AV	Annealed copper for electric appliance	Soft polyvinyl chloride	-30 to +60	For large current wiring (nominal No. 5 and above)
Thin-cover low-voltage wire for automobile (Type 1)	AVS				General wiring (nominal No. 3 and lower)
Thin-cover low-voltage wire for automobile (Type 2)	CAVS				For mid- to small-size excavators (nominal No. 1.25 and lower)
Heat- resistant low- voltage wire for automobile	AEX		Heat-resistant cross linked polyethylene	-50 to +110	General wiring for extremely cold weather specification Wiring at high ambient temperature place

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Dimensions

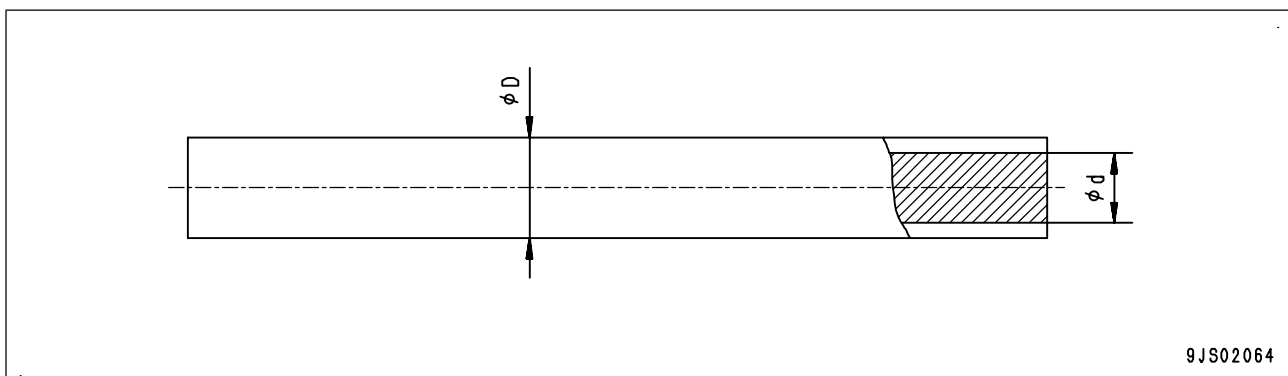
(Table 2)

Nominal No.		0.5f	(0.5)	0.75f	(0.85)	1.25f	(1.25)	2f	2	3f	3	5	
Conductor	Number of strands/ Diameter of strand	20/ 0.18	7/0.32	30/ 0.18	11/ 0.32	50/ 0.18	16/ 0.32	37/ 0.26	26/ 0.32	58/ 0.26	41/ 0.32	65/ 0.32	
	Cross-sectional area (mm ²)	0.51	0.56	0.76	0.88	1.27	1.29	1.96	2.09	3.08	3.30	5.23	
	d (approx.)	1.0		1.2		1.5		1.9	1.9	2.3	2.4	3.0	
Coating D	AVS	Standard	2.0		2.2		2.5		2.9	2.9	3.5	3.6	—
	AV	Standard	—		—		—		—	—	—	—	4.6
	AEX	Standard	2.0		2.2		2.7		3.0	3.1	—	3.8	4.6

Nominal No.		8	15	20	30	40	50	60	85	100	
Conductor	Number of strands/ Diameter of strand	50/0.45	84/0.45	41/0.80	70/0.80	85/0.80	108/ 0.80	127/ 0.80	169/ 0.80	217/ 0.80	
	Cross-sectional area (mm ²)	7.95	13.36	20.61	35.19	42.73	54.29	63.84	84.96	109.1	
	d (approx.)	3.7	4.8	6.0	8.0	8.6	9.8	10.4	12.0	13.6	
Coating D	AVS	Standard	—	—	—	—	—	—	—	—	
	AV	Standard	5.5	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6
	AEX	Standard	5.3	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6

Nominal No.		0.5f	0.5	0.75f	0.85	1.25f	1.25	
Conductor	Number of strands/ Diameter of strand	—	7/round compression	—	11/round compression	—	16/round compression	
	Cross-sectional area (mm ²)	—	0.56	—	0.88	—	1.29	
	d (approx.)	—	0.9	—	1.1	—	1.4	
Coating D	CAVS	Standard	—	1.6	—	1.8	—	2.1

★ "f" of nominal No. denotes "flexible".



9JS02064

Color codes table

(Table 3)

Color Code	Color of wire	Color Code	Color of wire
B	Black	LgW	Light green & White
Br	Brown	LgY	Light green & Yellow
BrB	Brown & Black	LR	Blue & Red
BrR	Brown & Red	LW	Blue & White
BrW	Brown & White	LY	Blue & Yellow
BrY	Brown & Yellow	O	Orange
Ch	Charcoal	P	Pink
Dg	Dark green	R	Red
G	Green	RB	Red & Black
GB	Green & Black	RG	Red & Green
GL	Green & Blue	RL	Red & Blue
Gr	Gray	RW	Red & White
GR	Green & Red	RY	Red & Yellow
GW	Green & White	Sb	Sky Blue
GY	Green & Yellow	Y	Yellow
L	Blue	YB	Yellow & Black
LB	Blue & Black	YG	Yellow & Green
Lg	Light green	YL	Yellow & Blue
LgB	Light green & Black	YR	Yellow & Red
LgR	Light green & Red	YW	Yellow & White

★ Remarks: In a color code consisting of 2 colors, the first color is the color of the background and the second color is the color of the marking.

Examples)

GW means that the background is "Green" and marking is "White".

Types of circuits and color codes

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

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Precautions when performing operation (ALL-1160-927-A-00-A)

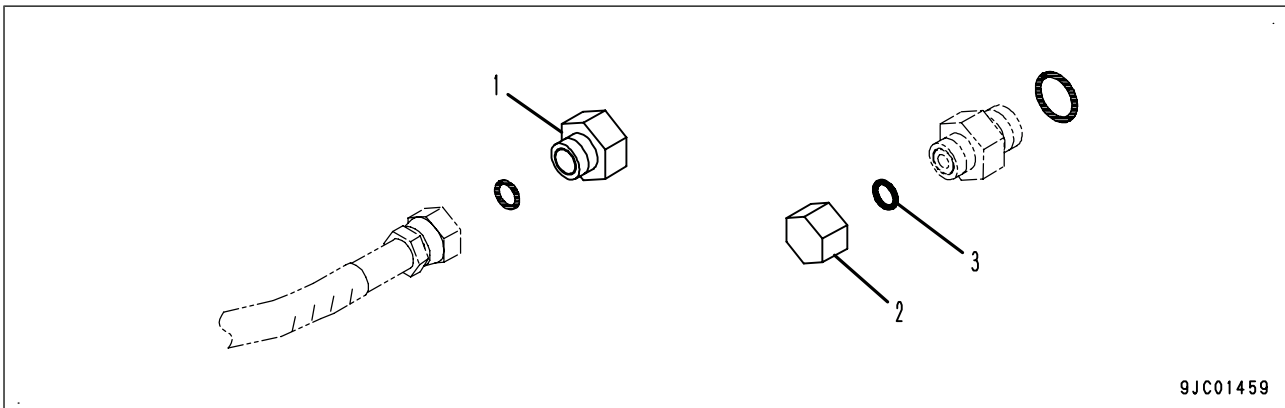
(Rev. 2012/11)

- When performing "testing and adjusting" of the machine, "removal and installation" and "disassembly and assembly" of the components, observe the following general cautions.

Precautions for removal and disassembly work

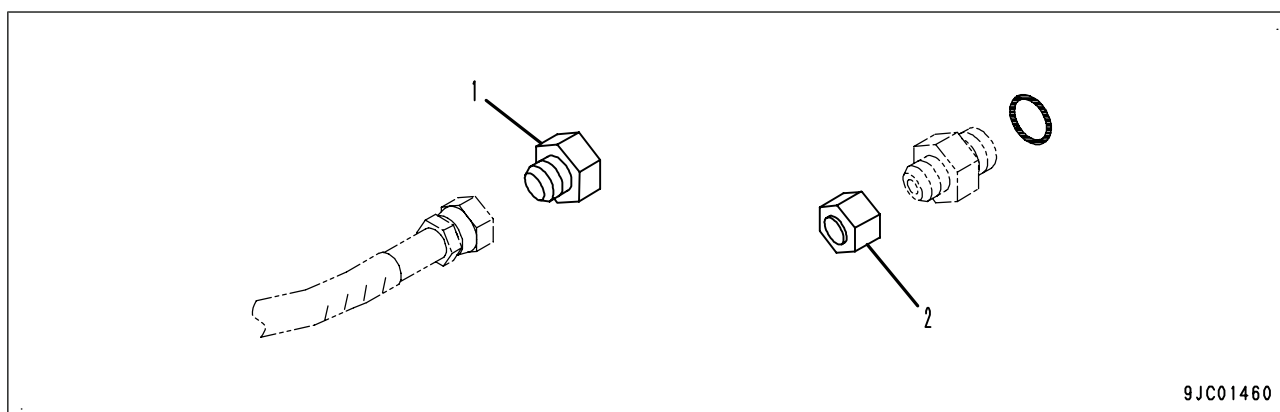
- If the cooling water contains coolant, dispose of it correctly as chemicals. Do not drain it to the sewage rashly.
- After disconnecting the hoses or tubes, plug them to prevent dirt or dust from entering.
- When draining oil, prepare a container with sufficient capacity.
- Check the match marks which indicate the installing position, and put match marks on the places where they seem necessary before removal of the components to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors. Do not pull the wires.
- Attach the tags to wires and hoses to show their installing positions to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep them in a safe place.
- When hoisting the components, prepare the slings with sufficient strength.
- When using forcing screws to remove any component, tighten the forcing screws uniformly and alternately.
- Before removing any component, clean the surrounding area and cover the component to prevent any foreign material from entering after removal.
- After disconnecting the piping or removing a pipe joint, install the following plugs.
 - ★ The O-rings in the table are emergency parts used for disassembly or transportation of the machine. When assembling, confirm the part numbers in the parts book and use the parts conforming to the using condition.

Disconnection of face seal type hoses and tubes



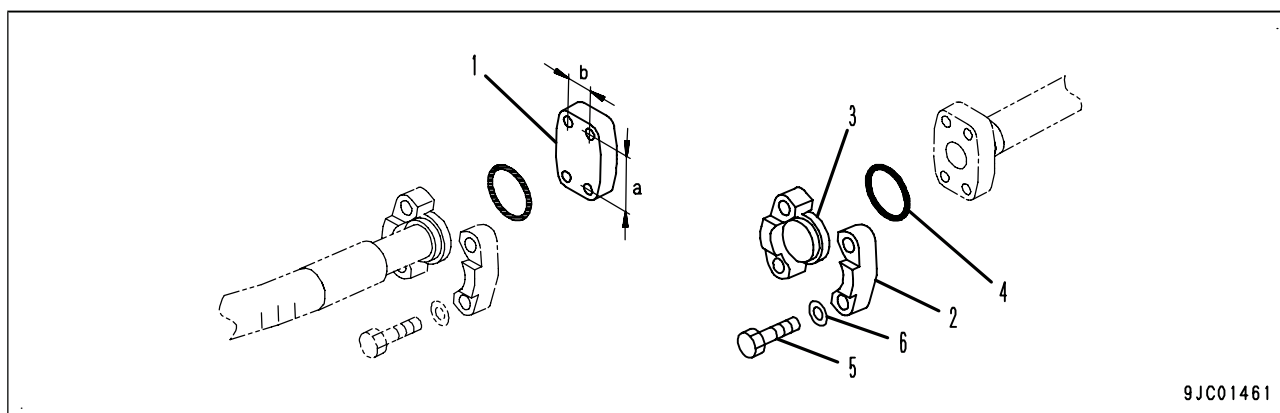
9JC01459

Nominal No.	Hose side	Pipe joint side	O-ring (3)
	Plug (1)	Nut (2)	
02	07376-70210	02789-00210	02896-11008
03	07376-70315	02789-00315	02896-11009
04	07376-70422	02789-00422	02896-11012
05	07376-70522	02789-00522	02896-11015
06	07376-70628	02789-00628	02896-11018

Disconnection of taper seal type hoses and tubes


9JC01460

Nominal No.	Hose side	Pipe joint side
	Plug (1)	Nut (2)
02	07376-50210	07222-00210
03	07376-50315	07222-00312
04	07376-50422	07222-00414
05	07376-50522	07222-00515
06	07376-50628	07222-00616
10	07376-51034	07222-01018
12	07376-51234	07222-01219
14	07376-51443	07222-01422

Disconnection of split flange type hoses and tubes


9JC01461

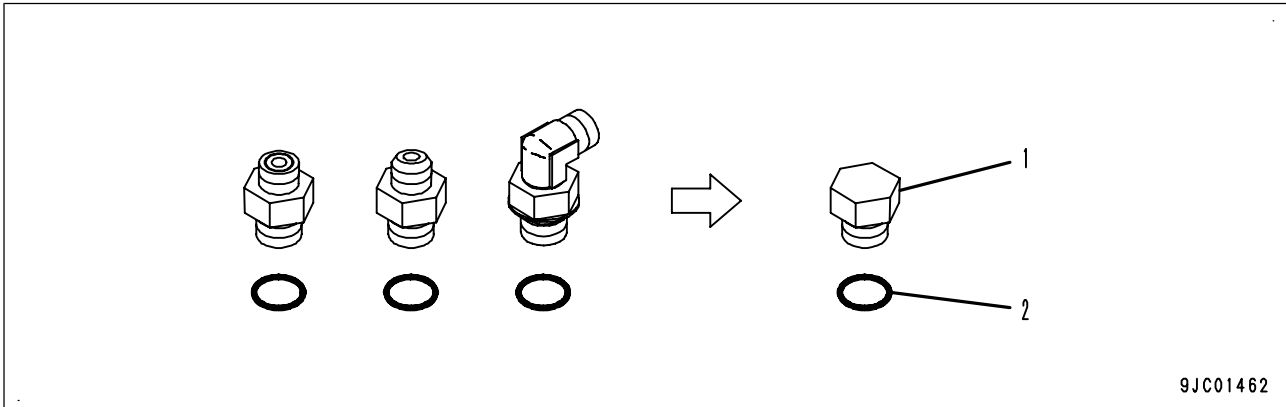
No-minimal No.	Bolt pitch (mm)		Hose side	Tube side		O-ring (4)	Bolt (5)	Washer (6)
	a	b	Flange (1)	Split flange (2)	Sleeve head (3)			
04	38.1	17.5	07379-00400	07371-30400	07378-10400	07000-12021	01010-80825	01643-50823
05	42.9	19.8	07379-00500	07371-30500	07378-10500	07000-13022	01010-80830	01643-50823
06	47.6	22.2	07379-00640	07371-30640	07378-10600	07000-13025	07372-51035	01643-51032
10	52.4	26.2	07379-01044	07371-31049	07378-11000	07000-13032	07372-51035	01643-51032
12	58.7	30.2	07379-01250	07371-31255	07378-11200	07000-13038	07372-51035	01643-51032
	66.7	31.8	07379-01260	07371-51260	07378-11210	07000-13038	01010-81245	01643-51232
14	69.9	35.8	07379-01460	07371-31465	07378-11400	07000-13048	07372-51240	01643-51232

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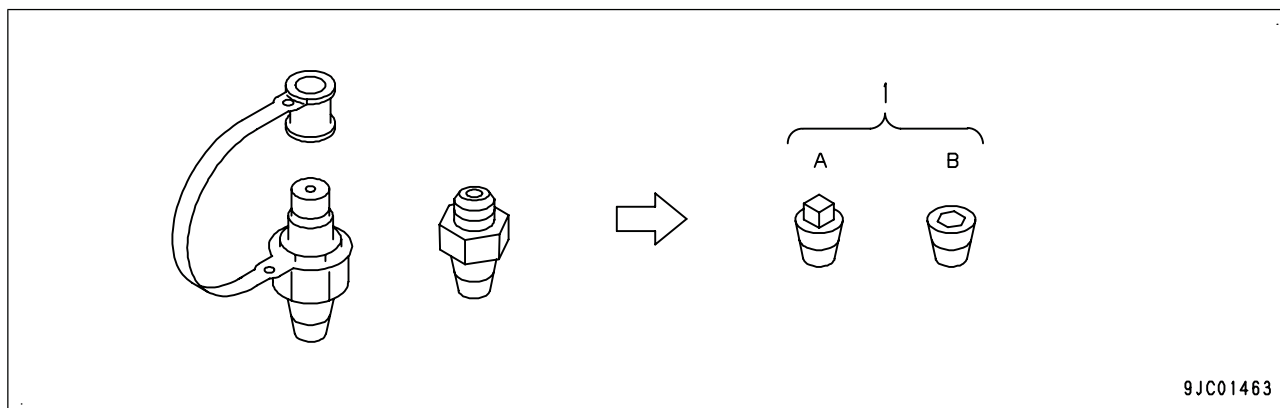
Nominal No.	Bolt pitch (mm)		Hose side	Tube side		O-ring (4)	Bolt (5)	Washer (6)
	a	b	Flange (1)	Split flange (2)	Sleeve head (3)			
20	79.4	36.5	07379-01470	07371-51470	07378-11410	07000-13048	01010-81455	01643-31445
	77.8	42.8	07379-02071	07371-32076	07378-12000	07000-12060	07372-51240	01643-51232
	96.8	44.5	07379-02080	07371-52080	07378-12010	07000-12060	01010-81865	01643-31845
24	88.9	50.8	07379-02484	07371-12484	07378-12400	07000-12070	07372-51240	01643-51232
30	106.4	62	07379-03010	07371-13010	07378-13000	07000-12085	07372-51650	01643-51645
34	120.6	69.8	07379-03411	07371-13411	07378-13400	07000-12100	07372-51650	01643-51645
40	130.2	77.8	07379-04012	07371-14012	07378-14000	07000-12110	07372-51650	01643-51645
50	152.4	92	07379-05011	07371-15011	07378-15000	07000-12135	07372-51655	01643-51645

Removal of pipe joints of O-ring boss type



Nominal No.	Plug (1)	O-ring (2)
08	07040-10807	07002-10823
10	07040-11007	07002-11023
12	07040-11209	07002-11223
14	07040-11409	07002-11423
16	07040-11612	07002-11623
18	07040-11812	07002-11823
20	07040-12012	07002-12034
24	07040-12412	07002-12434
30	07041-13012	07002-13034
33	07040-13316	07002-13334
36	07041-13612	07002-13634
42	07040-14220	07002-14234
52	07040-15223	07002-15234

Removal of pipe joints of taper pipe thread type



9JC01463

Nominal No.	Nominal thread size	Plug (1)	
		Square head type (A)	Hexagonal socket head (B)
01	R $\frac{1}{8}$	07042-00108	07043-00108
02	R $\frac{1}{4}$	07042-00211	07043-00211
03	R $\frac{3}{8}$	07042-00312	07043-00312
04	R $\frac{1}{2}$	07042-00415	07043-00415
06	R $\frac{3}{4}$	07042-00617	07043-00617
10	R1	07042-01019	07043-01019
12	R1 $\frac{1}{4}$	07042-01222	07043-01222
14	R1 $\frac{1}{2}$	07042-01422	07043-01422
20	R2	07042-02026	07043-02026

Precautions for installation and assembly work

- Tighten the bolts and nuts (sleeve nuts) to the specified torque (KES), unless otherwise specified.
- Install the hoses without twist and interference, and securely fasten the clamps located in-between if they are.
- Replace all of the gaskets, O-rings, cotter pins, and lock plates with new parts.
- Bend the cotter pins and lock plates securely.
- When applying adhesive, clean and degrease the part, and apply 2 to 3 drops of adhesive to the threaded part.
- When applying liquid gasket, clean and degrease the surface, and apply it uniformly after making sure that the surface is free from dirt or damage.
- Clean all of the parts, and repair any damage, dents, burrs, or rust found on them.
- Coat the rotating parts and sliding parts with engine oil.
- Coat the surfaces of the press-fitting parts with molybdenum disulfide lubricant (LM-P).
- After installing the snap ring, check that the snap ring is settled in the ring groove completely.
- When connecting wiring harness connectors, clean the connectors to remove oil, dirt, or water, then connect them securely.
- Use the eye bolts with no fatigue and deformation and screw them in securely. Match the directions of the eyes and the hook.
- When installing split flanges, tighten the bolts uniformly and alternately to prevent excessive tightening on one side.
- As a rule, apply liquid gasket (LG-5) or liquid sealant (LS-2) to the threaded part of each taper male screws which receives pressure.
However, if the threaded part is difficult to degrease, you may use a seal tape.
- When winding a seal tape onto a right-handed taper male screw, wind it clockwise in the advancing direction of the threads, seeing from the screw end and starting at the third thread.
 - ★ If you wind the seal tape in the opposite direction, it becomes loose and comes off or its end part is pushed out, and that can cause oil leakage.

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- ★ When the hydraulic cylinder is used for the first time after reassembly of the hydraulic equipment such as the hydraulic cylinder, pump, etc. and piping after removing them for repair, be sure to perform air bleeding of the hydraulic circuit according to the following procedure.
 1. Start the engine, and run it at low idle.
 2. Repeat the operation to extend and retract each cylinder of the work equipment to approximately 100 mm before the stroke end 4 to 5 times.
 3. Operate the hydraulic cylinder 3 to 4 times to the end of its stroke.
- ★ After the completion of repair and when operating the machine which is stored long term, perform the air bleeding with the same procedure as the one described above.

Precautions at the time of completing work

Refilling of coolant, oil and grease

- When the coolant is drained, tighten the drain valve securely, then refill the coolant reservoir with the coolant Komatsu recommends to the specified level. Start the engine to circulate the coolant in the piping, and add the coolant to the specified level again.
- When the hydraulic components are removed and installed, refill the oil reservoir with the oil Komatsu recommends to the specified level. Start the engine to circulate the oil in the piping, and add the oil to the specified level again.
- If the hydraulic piping or hydraulic equipment is removed, be sure to bleed air from the system after rebuilding the parts, by referring to "Testing and adjusting".
- Supply the specified amount of grease to the work equipment parts.

Testing installed condition of cylinder heads and manifolds

- Check the cylinder head and intake and exhaust manifold mountings for looseness.
- If any bolt is loose, retighten it.
 - ★ For the tightening torques, see the "Disassembly and assembly".

Testing of engine piping for damage and looseness

Intake and exhaust system	Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for air suction and exhaust gas leakage. If any part is loosely installed or damaged, retighten the bolts or repair the parts.
Cooling system	Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for water leakage. If any part is loosely installed or damaged, retighten the bolts or repair the parts.
Fuel system	Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for fuel leakage. If any part is loosely installed or damaged, retighten the bolts or repair the parts.

Check of KDPF or muffler and exhaust pipe for damage and looseness

- Visually check the KDPF or muffler, exhaust pipe and their mounting parts for a crack and damage. If any part is damaged, replace it.
- Check the mounting bolts, nuts, and clamps of the KDPF or muffler, exhaust pipe and their mounting parts for looseness.
If any part is loosely installed, retighten the bolts.

Check of KDPF or muffler function

- Check the KDPF or the muffler for unusual noise comparing to the noise when they are new.
If any unusual noise is heard, repair KDPF or muffler, referring to "Troubleshooting" and "Disassembly and assembly".

Practical use of KOMTRAX (ALL-Q210-13V-K-00-A)

(Rev. 2012/10)

KOMTRAX system transmits various machine information by use of the radio communication and KOMTRAX operator can refer this information in the office and provide various services to the customers.

When KOMTRAX is installed on the machine, the machine information can be checked through the KOMTRAX system and the testing and troubleshooting can be performed efficiently.

(KOMTRAX may not be installed on the machine in some countries or areas.)

Merit of using KOMTRAX

- The working place of the machine can be checked in the map on PC.
- Operation information such as service meter reading, operating hours, fuel consumption, occurred caution and failure code can be checked.
- The hours used and replacement time of consumable parts of the machine such as fuel filter, hydraulic oil filter, hydraulic oil and engine oil can be checked.
- The information of machine working condition (idling time, traveling time, digging time, relieving time, etc.) can be checked and the machine operating condition can be presumed with these information.
- Various reports such as "Fuel saving operation support", "Summary of operation", etc. can be generated and utilized as an advice as well for the user and operator.

How to use KOMTRAX practically

With KOMTRAX, following support activities will be available.

1. Quick response to sudden request of repair
 - 1) When receiving a repair request from a user, check the displayed caution and failure code, etc. through KOMTRAX.
 - 2) Arrange the necessary tools, replacement parts, etc, immediately in accordance with the displayed failure code.
 - 3) By using the map of KOMTRAX, find the location of the failed machine and visit the customer there.
2. Proactive maintenance
 - 1) Check the service summary screen of KOMTRAX, and find the machine which has high priority failure code indicated by a red or yellow flag.
 - 2) Check the condition of the machine with the customer and make a plan to visit.
 - 3) Arrange necessary tools, replacement parts, etc, immediately in accordance with the displayed failure code.
3. Practice of periodic maintenance and periodic inspection service
 - 1) Check the service summary screen of KOMTRAX, and find the machine of which the usage limits for the consumable parts indicated by red flags are over.
 - 2) Submit an estimate sheet for the consumable parts to be replaced and the labor cost for the replacement work to the customer.
 - 3) Propose the periodic inspection (PM clinic, etc.) according to the service meter reading.

How to operate KOMTRAX

For the operating method of each screen of KOMTRAX, see "Global KOMTRAX Web Reference Manual (For Key Person)".

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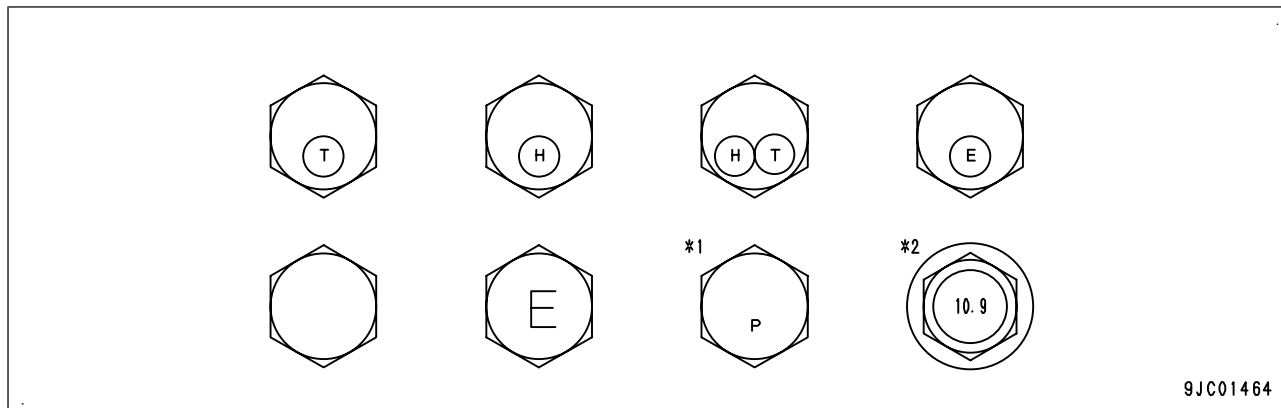
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Standard tightening torque table (ALL-M140-03B-P-01-A)

(Rev. 2012/10)

Table of tightening torque for bolts and nuts

Unless otherwise specified, tighten the metric bolts and nuts to the torque shown in the table below.

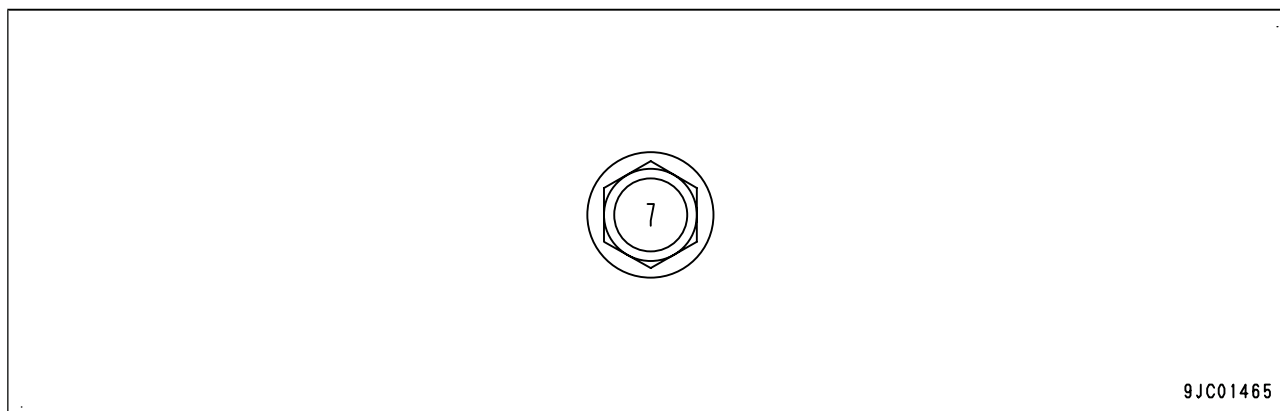


Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})
6	10 (*2) 10	11.8 to 14.7 {1.2 to 1.5}
8	13 (*2) 12	27 to 34 {2.8 to 3.5}
10	17 (*1, *2) 14	59 to 74 {6.0 to 7.5}
12	19 (*1, *2) 17	98 to 123 {10.0 to 12.5}
14	22	157 to 196 {16 to 20}
16	24 (*1) 22	245 to 309 {25 to 31.5}
18	27	343 to 427 {35 to 43.5}
20	30	490 to 608 {50 to 62}
22	32	662 to 829 {67.5 to 84.5}
24	36	824 to 1,030 {84 to 105}
27	41	1,180 to 1,470 {120 to 150}
30	46	1,520 to 1,910 {155 to 195}
33	50	1,960 to 2,450 {200 to 250}
36	55	2,450 to 3,040 {250 to 310}
39	60	2,890 to 3,630 {295 to 370}

*1: Split flange bolt.

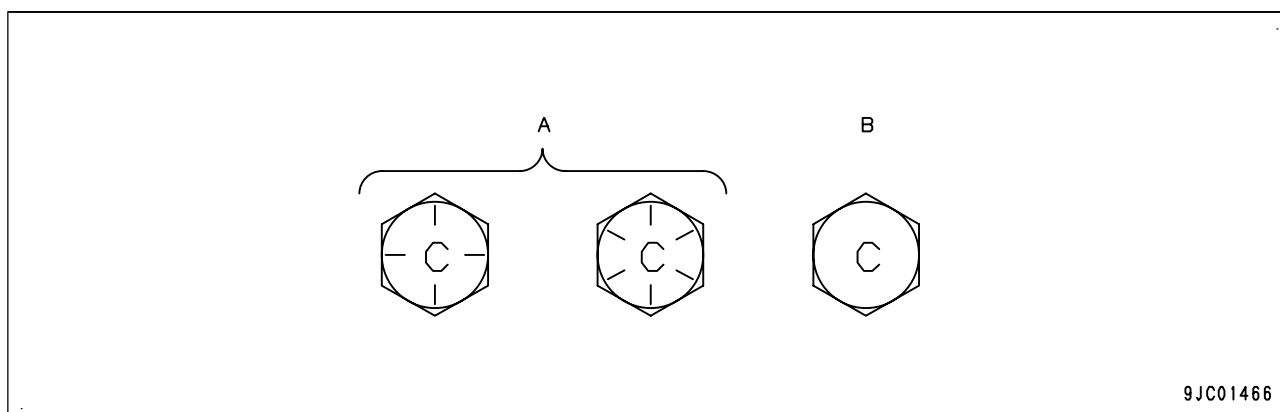
*2: Flanged bolt.

- ★ Tighten the following flanged bolt on which "7" is stamped on its top to the tightening torque shown in the following table.



Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})
6	10	5.9 to 9.8 {0.6 to 1.0}
8	12	13.7 to 23.5 {1.4 to 2.4}
10	14	34.3 to 46.1 {3.5 to 4.7}
12	17	74.5 to 90.2 {7.6 to 9.2}

Unless otherwise specified, tighten the unified coarse threaded bolts and nuts to the torque shown in the table below.

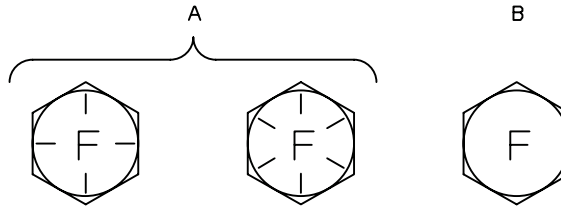


Type of bolt Nominal No. - threads per inch, type of thread	A		B	
	Tightening torque (Nm {kgm})		Tightening torque (Nm {kgm})	
	Range	Target	Range	Target
1/4-20UNC	9.8 to 14.7 {1 to 1.5}	12.7 {1.3}	2.9 to 3.9 {0.3 to 0.4}	3.43 {0.35}
5/16-18UNC	24.5 to 34.3 {2.5 to 3.5}	29.4 {3}	6.9 to 8.8 {0.7 to 0.9}	7.8 {0.8}
3/8-16UNC	44.1 to 58.8 {4.5 to 6}	52.0 {5.3}	9.8 to 14.7 {1 to 1.5}	11.8 {1.2}
7/16-14UNC	73.5 to 98.1 {7.5 to 10}	86.3 {8.8}	19.6 to 24.5 {2 to 2.5}	21.6 {2.2}
1/2-13UNC	108 to 147 {11 to 15}	127 {13}	29.4 to 39.2 {3 to 4}	34.3 {3.5}
9/16-12UNC	157 to 216 {16 to 22}	186 {19}	44.1 to 58.8 {4.5 to 6}	51.0 {5.2}
5/8-11UNC	226 to 294 {23 to 30}	265 {27}	63.7 to 83.4 {6.5 to 8.5}	68.6 {7}
3/4-10UNC	392 to 530 {40 to 54}	461 {47}	108 to 147 {11 to 15}	127 {13}
7/8-9UNC	637 to 853 {65 to 87}	745 {76}	177 to 235 {18 to 24}	206 {21}
1-8UNC	883 to 1,196 {90 to 122}	1,040 {106}	245 to 333 {25 to 34}	284 {29}
1 1/8-7UNC	1,187 to 1,608 {121 to 164}	1,393 {142}	333 to 451 {34 to 46}	392 {40}
1 1/4-7UNC	1,598 to 2,157 {163 to 220}	1,873 {191}	451 to 608 {46 to 62}	530 {54}
1 1/2-6UNC	2,354 to 3,177 {240 to 324}	2,765 {282}	657 to 892 {67 to 91}	775 {79}

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Unless otherwise specified, tighten the unified fine threaded bolts and nuts to the torque shown in the table below.

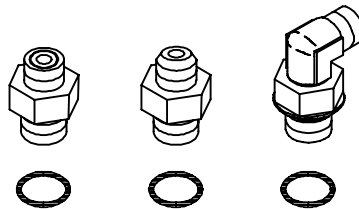


9JC01467

Type of bolt Nominal No. - threads per inch, type of thread	A		B	
	Tightening torque (Nm {kgm})		Tightening torque (Nm {kgm})	
	Range	Target	Range	Target
1/4-28UNF	14.7 to 19.6 {1.5 to 2}	17.7 {1.8}	3.9 to 4.9 {0.4 to 0.5}	4.41 {0.45}
5/16-24UNF	34.3 to 39.2 {3.5 to 4}	37.3 {3.8}	7.8 to 9.8 {0.8 to 1}	8.8 {0.9}
3/8-24UNF	53.9 to 68.6 {5.5 to 7}	61.8 {6.3}	14.7 to 19.6 {1.5 to 2}	16.7 {1.7}
7/16-20UNF	83.4 to 108 {8.5 to 11}	96.1 {9.8}	24.5 to 29.4 {2.5 to 3}	26.5 {2.7}
1/2-20UNF	127 to 167 {13 to 17}	147 {15}	34.3 to 49.0 {3.5 to 5}	41.2 {4.2}
9/16-18UNF	186 to 245 {19 to 25}	216 {22}	49.0 to 68.6 {5 to 7}	58.6 {6}
5/8-18UNF	255 to 343 {26 to 35}	294 {30}	73.5 to 98.1 {7.5 to 10}	83.4 {8.5}
3/4-16UNF	441 to 598 {45 to 61}	520 {53}	127 to 167 {13 to 17}	147 {15}
7/8-14UNF	716 to 961 {73 to 98}	843 {86}	196 to 265 {20 to 27}	226 {23}
1-14UNF	1,020 to 1,373 {104 to 140}	1,196 {122}	284 to 382 {29 to 39}	333 {34}
1 1/8-12UNF	1,353 to 1,844 {138 to 188}	1,598 {163}	382 to 520 {39 to 53}	451 {46}
1 1/4-12UNF	1,804 to 2,432 {184 to 248}	2,118 {216}	510 to 686 {52 to 70}	598 {61}
1 1/2-12UNF	2,707 to 3,658 {276 to 373}	3,177 {324}	765 to 1,030 {78 to 105}	892 {91}

Table of tightening torque for O-ring boss piping joints

★ Unless otherwise specified, tighten the pipe joint for O-ring boss to the torque shown in the table below.



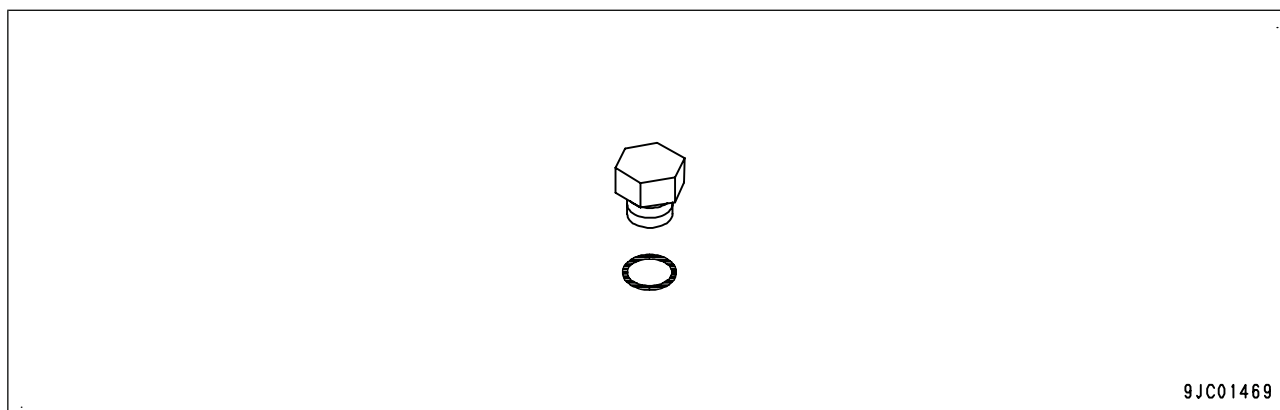
9JC01468

Nominal No.	Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})	
			Range	Target
02	14	Varies depending on type of connector.	35 to 63 {3.5 to 6.5}	44 {4.5}
—	18		59 to 98 {6.0 to 10.0}	78 {8.0}
03, 04	20		84 to 132 {8.5 to 13.5}	103 {10.5}
05, 06	24		128 to 186 {13.0 to 19.0}	157 {16.0}

Nominal No.	Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})	
			Range	Target
10, 12	33		363 to 480 {37.0 to 49.0}	422 {43.0}
14	42		746 to 1,010 {76.0 to 103}	883 {90.0}

Table of tightening torque for O-ring boss plugs

★ Unless otherwise specified, tighten the plug for O-ring boss to the torque shown in the table below.



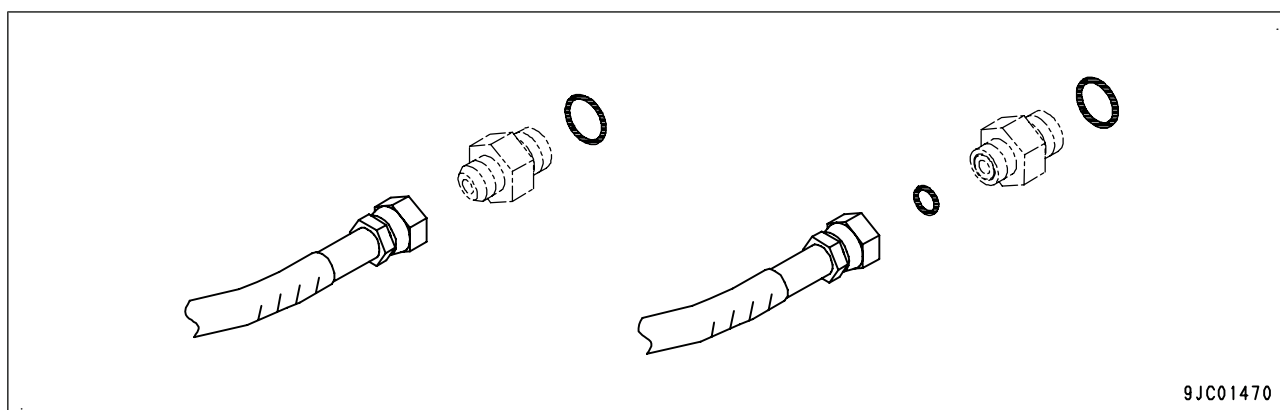
9JC01469

Nominal No.	Thread diameter (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})	
			Range	Target
08	8	14	5.88 to 8.82 {0.6 to 0.9}	7.35 {0.75}
10	10	17	9.8 to 12.74 {1.0 to 1.3}	11.27 {1.15}
12	12	19	14.7 to 19.6 {1.5 to 2.0}	17.64 {1.8}
14	14	22	19.6 to 24.5 {2.0 to 2.5}	22.54 {2.3}
16	16	24	24.5 to 34.3 {2.5 to 3.5}	29.4 {3.0}
18	18	27	34.3 to 44.1 {3.5 to 4.5}	39.2 {4.0}
20	20	30	44.1 to 53.9 {4.5 to 5.5}	49.0 {5.0}
24	24	32	58.8 to 78.4 {6.0 to 8.0}	68.6 {7.0}
30	30	32	93.1 to 122.5 {9.5 to 12.5}	107.8 {11.0}
33	33	—	107.8 to 147.0 {11.0 to 15.0}	127.4 {13.0}
36	36	36	127.4 to 176.4 {13.0 to 18.0}	151.9 {15.5}
42	42	—	181.3 to 240.1 {18.5 to 24.5}	210.7 {21.5}
52	52	—	274.4 to 367.5 {28.0 to 37.5}	323.4 {33.0}

Table of tightening torque for hose (taper seal type and face seal type)

★ Unless otherwise specified, tighten the hose fittings (taper seal type and face seal type) to the torque shown in the table below.

★ The table is applied to the threads coated with engine oil (wet threads)



9JC01470

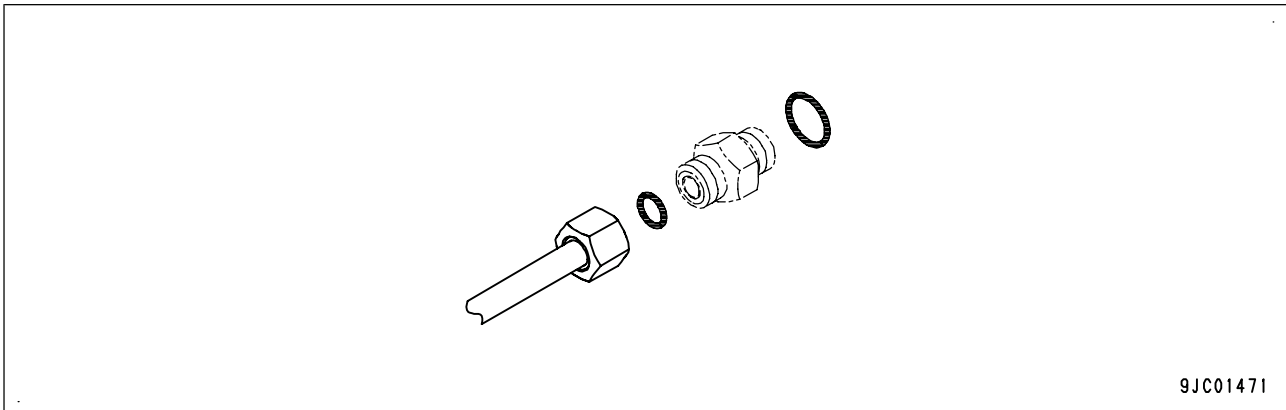
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Nominal No. of hose	Width across flats (mm)	Tightening torque (Nm {kgm})		Taper seal	Face seal	
		Range	Target	Thread size (mm)	Nominal No. - threads per inch, type of thread	Thread root diameter (mm) (reference)
02	19	34 to 54 {3.5 to 5.5}	44 {4.5}	—	9/16-18UN	14.3
		34 to 63 {3.5 to 6.5}	44 {4.5}	14	—	—
03	22	54 to 93 {5.5 to 9.5}	74 {7.5}	—	11/16-16UN	17.5
	24	59 to 98 {6.0 to 10.0}	78 {8.0}	18	—	—
04	27	84 to 132 {8.5 to 13.5}	103 {10.5}	22	13/16-16UN	20.6
05	32	128 to 186 {13.0 to 19.0}	157 {16.0}	24	1-14UNS	25.4
06	36	177 to 245 {18.0 to 25.0}	216 {22.0}	30	1 3/16-12UN	30.2
(10)	41	177 to 245 {18.0 to 25.0}	216 {22.0}	33	—	—
(12)	46	197 to 294 {20.0 to 30.0}	245 {25.0}	36	—	—
(14)	55	246 to 343 {25.0 to 35.0}	294 {30.0}	42	—	—

Table of tightening torque for face seal joints

- ★ The tightening torque table below applies to the seal joint (sleeve nut type)
- ★ The table is applied to the threads coated with engine oil (wet threads).



9JC01471

Outside diameter of pipe (mm)	Width across flats (mm)	Tightening torque (Nm {kgm})		Face seal	
		Range	Target	Nominal No. - threads per inch, type of thread	Thread root diameter (mm) (reference)
8	19	14 to 16 {1.4 to 1.6}	15 {1.5}	9/16-18UN	14.3
10	22	24 to 27 {2.4 to 2.7}	25.5 {2.6}	11/16-16UN	17.5
12	24 {27}	43 to 47 {4.4 to 4.8}	45 {4.6}	13/16-16UN	20.6
15 {16}	30 {32}	60 to 68 {6.1 to 6.8}	64 {6.5}	1-14UNS	25.4
22 {20}	36	90 to 95 {9.2 to 9.7}	92.5 {9.4}	1 3/16-12UN	30.2

Reference: The face seal joint of the dimension in () is also used, depending on the specification.

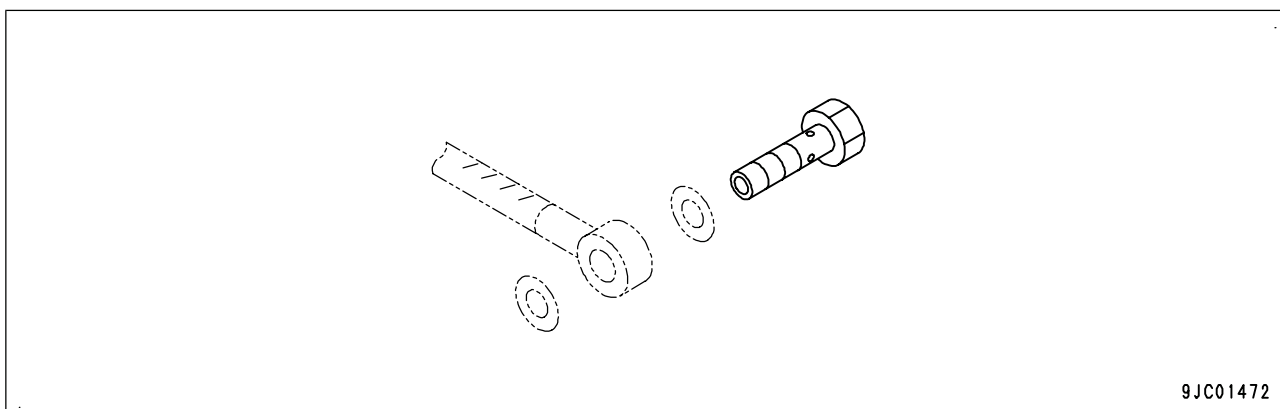
Tightening torque table for bolts and nuts on 102,107 and 114 series engines

- ★ Unless otherwise specified, tighten the metric threads bolts and nuts used on the 102, 107 and 114 series engines to the torques shown in the table below.

Thread diameter (mm)	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}
14	—

Tightening torque table for 102, 107, and 114 series engines (joint bolts)

- ★ Unless otherwise specified, tighten the metric joint bolts used on the 102, 107, and 114 series engines to the torque shown in the table below.



9JC01472

Thread diameter (mm)	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 }

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

- ★ Unless otherwise specified, tighten the National taper pipe threaded (NPT) screws used on the 102, 107, and 114 series engines to the torques shown in the table below.

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

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List of abbreviation (ALL-0360-005-A-00-A)

(Rev. 2013/03)

- This list of abbreviations includes the abbreviations used in the text of the shop manual for parts, components, and functions whose meaning is not immediately clear. The spelling is given in full with an outline of the meaning.
- Abbreviations that are used in general society may not be included.
- Special abbreviations which appear infrequently are noted in the text (marked with ★).
- This list of abbreviations consists of 2 parts. The first part is a list of the abbreviations used in the text of the manual, and the second part is a list of the abbreviations used in the circuit diagrams.

List of abbreviations used in the shop manual

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*), or equipment/device)	Explanation
ABS	Anti-skid Brake System	Travel and brake (HD, HM)	With this function, when the tires skid (wheels stop rotating), the brakes are released, and when the wheels start to rotate, the brakes are applied again.
AISS	Automatic Idling Setting System	Engine	This function automatically sets the idle speed.
AJSS	Advanced Joystick Steering System	Steering (WA)	A lever is used to perform the steering operations instead of a steering wheel. Moreover, it shifts gear and changes direction (FORWARD or REVERSE).
ARAC	Automatic Retarder Accelerator Control	Travel and brake (HD, HM)	When the accelerator pedal is released while the machine is traveling downhill, this function automatically applies the retarder with a constant braking force.
ARSC	Automatic Retarder Speed Control	Travel and brake (HD, HM)	When the accelerator pedal is released while the machine is traveling downhill, this function automatically applies the retarder to ensure that the machine speed does not accelerate above the speed set by the operator.
ASR	Automatic Spin Regulator	Travel and brake (HD, HM)	When the tires spin on soft ground surfaces, this function automatically uses the optimum braking force to drive both wheels.
ATT	Attachment	Work equipment	A device that can be fixed onto a machine in order to enable it to do different jobs.
BCV	Brake cooling oil control valve	Brake (HD)	When the retarder is not being used, this valve bypasses part of the brake cooling oil to reduce the load on the hydraulic pump.
CAN	Controller Area Network	Communication and electronic control	One of communication standards that is used in the network on the machine.
CDR	Crankcase Depression Regulator	Engine	A regulator valve which is installed to KCCV ventilator. It is written as CDR valve and it is not used independently.
CLSS	Closed-center Load Sensing System	Hydraulic system	This system can simultaneously actuate multiple actuators regardless of the load (provides better combined operation than O.L.S.S.).
CRI	Common Rail Injection	Engine	Engine controller electronically controls supply pump, common rail, and injector. This function maintains optimum fuel injection amount and fuel injection timing.
ECM	Electronic Control Module	Electronic control system	Electronic control device uses the signals from the sensors on the machine. This signal indicates the optimum actuation to the actuators. (Same as E.C.U.)

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*), or equipment/device)	Explanation
ECMV	Electronic Control Modulation Valve	Transmission (D, HD, WA, etc.)	Proportional electromagnetic valve that gradually increases oil pressure to engage clutch and reduces transmission shock.
ECSS	Electronically Controlled Suspension System	Travel (WA)	This system ensures smooth high-speed travel by absorbing vibration of machine during travel with hydraulic spring effect of accumulator.
ECU	Electronic Control Unit	Electronic control system	Electronic control device uses the signals from the sensors on the machine. This signal indicates the optimum actuation to the actuators. (Same as E.C.M.)
EGR	Exhaust Gas Recirculation	Engine	This function recirculates part of exhaust gas to combustion chamber in order to reduce combustion temperature, controls emission of NOx.
EMMS	Equipment Management Monitoring System	Machine monitor	This system allows data (filter, oil replacement interval, malfunctions on machine, failure code, and failure history) from each sensor on the machine to be checked on the monitor.
EPC	Electromagnetic Proportional Control	Hydraulic system	This mechanism allows actuators to be operated in proportion to the current supplied.
FOPS	Falling Object Protective Structure	Cab and canopy	This structure protects the operator's head from falling objects. (Falling Object Protective Structure) This performance is standardized as ISO 3449.
F-N-R	Forward-Neutral-Reverse	Operation	Forward-Neutral-Reverse
GNSS	Global Navigation Satellite System	Communication	A general term for positioning system using satellites such as GPS, GALILEO, etc.
GPS	Global Positioning System	Communication (KOMTRAX, KOMTRAX Plus)	This system uses satellites to determine the current location on the earth.
HSS	Hydrostatic Steering System	Steering (D)	This function uses a combination of hydraulic motor and bevel shaft to control difference in travel speed of right and left tracks. Accordingly machine can turn without using steering clutch.
HST	Hydro Static Transmission	Transmission (D, WA)	This function uses a combination of hydraulic pump and hydraulic motor to shift the speed range steplessly without using gears.
ICT	Information and Communication Technology	Intelligent Machine Control	A general term for the engineering and its socially applied technology of information processing and communication.
IMA	Inlet Metering Actuator	Engine	This valve is installed at inlet port of pump, and it adjusts fuel intake amount in order to control fuel discharge of supply pump. Same as I.M.V.
IMU	Inertial Measurement Unit	Intelligent Machine Control	This is a device to detect the angular velocity and acceleration of the 3 axes that control motions.
IMV	Inlet Metering Valve	Engine	This valve is installed at inlet port of pump, and it adjusts fuel intake amount in order to control fuel discharge of supply pump. Same as I.M.V. (I.M.A.)
KCCV	Komatsu Closed Crankcase Ventilation	Engine	This mechanism separates oil in blowby gas and returns it to the intake side to afterburn it there. It primarily consists of filters.

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Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*), or equipment/device)	Explanation
KCSF	Komatsu Catalyzed Soot Filter	Engine	This filter captures soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	The catalyst used for purifying exhaust gas. This is built in KDPF or assembled with the muffler.
KDPF	Komatsu Diesel Particulate Filter	Engine	This component is used to purify the exhaust gas. KDOC (catalyst) and KCSF (filter to capture soot) are built-in it. It is installed in place of the conventional muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM system)	This function recovers the drive force of the wheels by braking automatically with the optimum force and at the same time activates the inter-axle differential lock when the wheels idle while the machine travels on the soft ground road.
KVGT	Komatsu Variable Geometry Turbocharger	Engine	The turbocharger on which the cross-section area of the exhaust passage is made variable.
LCD	Liquid Crystal Display	Machine monitor	Image display equipment such as a monitor which assembles in the liquid crystal element.
LED	Light Emitting Diode	Electronic parts	It refers to semiconductor element that emits light when the voltage is applied in forward direction.
LIN	Local Interconnect Network	Communication and electronic control	One of communication standards that is used in the network on the machine
LS	Load Sensing	Hydraulic system	Function that detects differential pressure of pump and controls discharge amount corresponding to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	One of communication standards that is used in the network on the machine
MAF	Mass Air Flow	Engine	This indicates engine intake air flow. It is not used independently but it is used as combined with sensor. Mass air flow sensor can be called as MAF sensor.
MMS	Multimedia Messaging Service	Communication	Service that allows transmission and reception of short messages consisting of characters or voice or images between cell phones.
NC	Normally Closed	Electric and hydraulic systems	Device actuated to open electric or hydraulic circuits that are normally closed if not actuated.
NO	Normally Open	Electric and hydraulic systems	Device actuated to close electric or hydraulic circuits that are normally open if not actuated.
OLSS	Open-center Load Sensing System	Hydraulic system	Hydraulic system that can operate multiple actuators at the same time, regardless of the load.
PC	Pressure Compensation	Hydraulic system	A function used to correct oil pressure.
PCCS	Palm command control system	Steering (D)	System in which a controller instantly analyses data from each lever, pedal, and dial, and performs optimum electronic control of the engine and transmission.
PCV	Pre-stroke Control Valve	Engine	This valve is installed at inlet port of pump and it adjusts fuel intake amount in order to control fuel discharge amount of supply pump.

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*), or equipment/device)	Explanation
PPC	Proportional Pressure Control	Hydraulic system	Used for controlling proportional pressure. This system moves actuators in proportion to the oil pressure.
PPM	Piston Pump and Motor	Hydraulic system (D, PC, etc.)	Piston pump and motor.
PTO	Power Take Off	Power transmission	Power take-off mechanism
PTP	Power Tilt and power Pitch dozer	Work equipment (D)	This function performs hydraulic control of the tilt and pitch of the bulldozer blade.
ROPS	Roll-Over Protective Structure	Cab and canopy	If a machine tips over, this structure protects the operator with the seat belt fastened from being crushed. (Operator Protective Structure When Tipping) This performance is standardized as ISO 3471.
SI	Le Systeme International d' Unites (International unit system)	Unit	Abbreviation for the "International System of Units". It is the universal unit system and "a single unit for a single quantity" is the basic principle applied.
SOL	Solenoid	Electric system	It refers to an actuator consisting of a solenoid and an iron core that is moved by the magnetic force when the solenoid is energized.
TWV	2-Way Valve	Hydraulic and electric systems	Solenoid valve that switches over direction of flow.
VFT	Variable Flow Turbocharger	Engine	Turbocharger variable in route of exhaust passage.

*1: Code for applicable machine family

D: Bulldozer

HD: Dump truck

HM: Articulated dump truck

PC: Hydraulic excavator

WA: Wheel loader

List of abbreviations used in the circuit diagrams

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

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

Conversion table (ALL-2150-931-A-00-A)

(Rev. 2012/10)

Method of using the conversion table

- The unit conversion table enables the simple conversion in the figures between the different units. For further details of the method of use of the conversion table, see the examples given below.

Example: Method of using the conversion table to convert a unit from millimeters to inches

Conversion of 55 mm into inches

- Locate the number 50 in the vertical column at the left side, take this as (A), and then draw a horizontal line from (A).
- Locate the number 5 in the row across the top, take this as (B), then draw a vertical line down from (B).
- Take the point where the 2 lines cross as (C). This point (C) gives the value when converting the unit from millimeters to inches. Therefore, 55 mm = 2.165 in.

Conversion of 550 mm into inches

- The number 550 does not appear in the table, so divide it by 10 (move the decimal point one place to the left) to get 55 mm.
- Then convert 55 mm to 2.165 in by the same procedure as above.
- 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 get the original value. This gives 550 mm = 21.65 in. Therefore, 550 mm = 21.65 in.

Millimeters to inches

		1 mm = 0.03937 in									
		(B)									
		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
							(C)				
(A)	50	1.969	2.008	2.017	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	2.847	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

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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

Kilograms to pounds

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

ℓ to U.S. Gallons

1 ℓ = 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	14.793	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

ℓ to U.K. Gallons

1 ℓ = 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	1,005
140	1,013	1,020	1,027	1,034	1,042	1,049	1,056	1,063	1,071	1,078
150	1,085	1,092	1,099	1,107	1,114	1,121	1,128	1,136	1,143	1,150
160	1,157	1,165	1,172	1,179	1,186	1,193	1,201	1,208	1,215	1,222
170	1,130	1,237	1,244	1,251	1,259	1,266	1,273	1,280	1,288	1,295
180	1,302	1,309	1,316	1,324	1,331	1,338	1,345	1,353	1,360	1,367
190	1,374	1,382	1,389	1,396	1,403	1,410	1,418	1,425	1,432	1,439

00 Index and foreword**Foreword, safety and general information****kg/cm² to lb/in²**1 kg/cm² = 14.2233 lb/in²

	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	1,010	1,024	1,038	1,053	1,067	1,081	1,095	1,109	1,124
80	1,138	1,152	1,166	1,181	1,195	1,209	1,223	1,237	1,252	1,266
90	1,280	1,294	1,309	1,323	1,337	1,351	1,365	1,380	1,394	1,408
100	1,422	1,437	1,451	1,465	1,479	1,493	1,508	1,522	1,536	1,550
110	1,565	1,579	1,593	1,607	1,621	1,636	1,650	1,664	1,678	1,693
120	1,707	1,721	1,735	1,749	1,764	1,778	1,792	1,806	1,821	1,835
130	1,849	1,863	1,877	1,892	1,906	1,920	1,934	1,949	1,963	1,977
140	1,991	2,005	2,020	2,034	2,048	2,062	2,077	2,091	2,105	2,119
150	2,134	2,148	2,162	2,176	2,190	2,205	2,219	2,233	2,247	2,262
160	2,276	2,290	2,304	2,318	2,333	2,347	2,361	2,375	2,389	2,404
170	2,418	2,432	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,546
180	2,560	2,574	2,589	2,603	2,617	2,631	2,646	2,660	2,674	2,688
190	2,702	2,717	2,731	2,745	2,759	2,773	2,788	2,802	2,816	2,830
200	2,845	2,859	2,873	2,887	2,901	2,916	2,930	2,944	2,958	2,973
210	2,987	3,001	3,015	3,030	3,044	3,058	3,072	3,086	3,101	3,115
220	3,129	3,143	3,158	3,172	3,186	3,200	3,214	3,229	3,243	3,257
230	3,271	3,286	3,300	3,314	3,328	3,343	3,357	3,371	3,385	3,399
240	3,414	3,428	3,442	3,456	3,470	3,485	3,499	3,513	3,527	3,542

Temperature
Conversion of Fahrenheit to Celsius

- A simple way to convert a Fahrenheit temperature reading into a Celsius temperature reading or vice versa is to see the number in the center column of the following table. The figures on the following table show the temperatures in both Fahrenheit and Celsius.
- When converting from Fahrenheit to Celsius degrees, consider the center column to be a table of Fahrenheit temperatures and read the corresponding Celsius temperature in the column at the left.
- When converting from Celsius to Fahrenheit degrees, consider the center column to be a table of Celsius values, and read the corresponding Fahrenheit temperature on the right.

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

-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	177.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	30	86.0	18.3	65	149.0	37.8	100	212.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0

00 Index and foreword

Foreword, safety and general information

SHOP MANUAL

BULLDOZER

D61EX-23 D61PX-23

Model	Serial Number
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D61EX-23 D61PX-23	30001 and up
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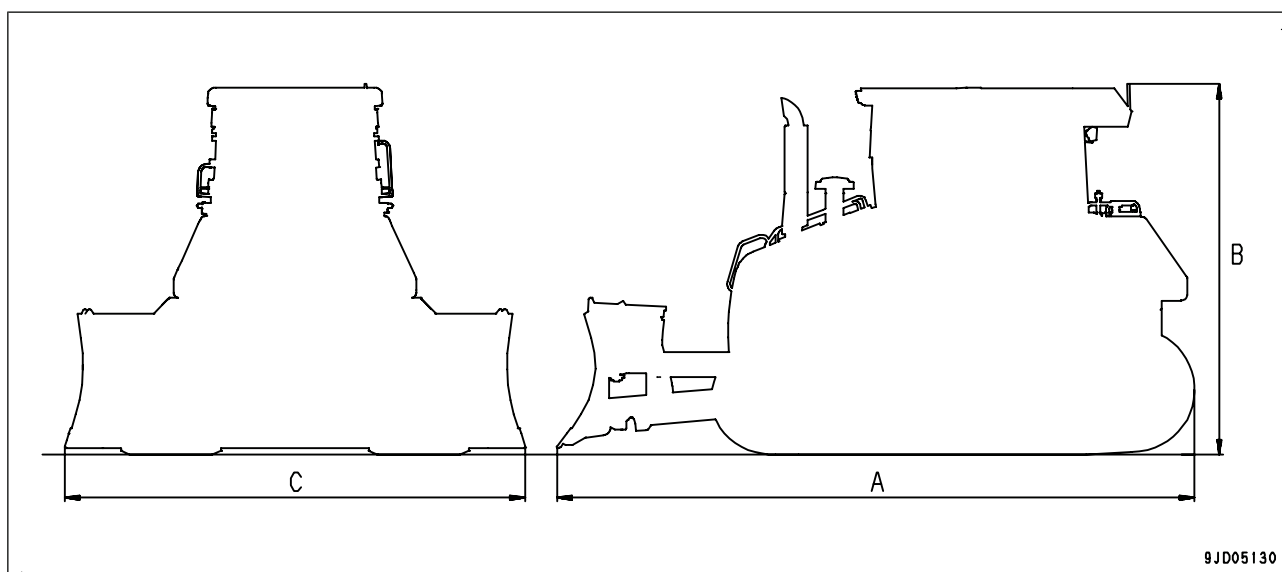
01 Specification

01 Specification

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Specifications (ALL-2111-001-A-00-A)**Specification drawing** (ALL-2110-001-A-00-A)**D61EX-23** (D61EX_23-2110-931-A-00-A)

Power angle power tilt dozer with ROPS cab

	Item	Unit	D61EX-23
			600 mm single grouser shoe
	Machine weight	kg	17,700
	Engine model	—	Komatsu SAA6D107E-2 diesel engine
	Engine rated horsepower	kW {HP}/ min ⁻¹ {rpm}	127 {170} / 2,200 {2,200} 126 {169} / 2,200 {2,200} 125 {168} / 2,200 {2,200}
	• SAE J1995 (gross) (*1)		
	• ISO 14396		
	• ISO 9249/SAE J1349 (net) (*2)		
A	Overall length	mm	5,480
B	Overall height (including KOMTRAX antenna)	mm	3,180
C	Overall width	mm	3,250
	Travel speed (Quick shift mode)	Forward (1st/2nd/3rd)	3.4 / 5.6 / 9.0
		Reverse (1st/2nd/3rd)	4.1 / 6.5 / 9.0
	Travel speed (Variable shift mode)	Forward	0.8 to 9.0
		Reverse	0.8 to 9.0

*1: Indicates the value of the basic engine (without cooling fan).

*2: Indicates the value at the minimum cooling fan speed.

★ The engine rated horsepower is indicated in the net value and gross value. The gross denotes the flywheel horsepower measured on the basic engine unit, while the net denotes the value measured of an engine under the condition essentially the same as that when it is installed on a machine.

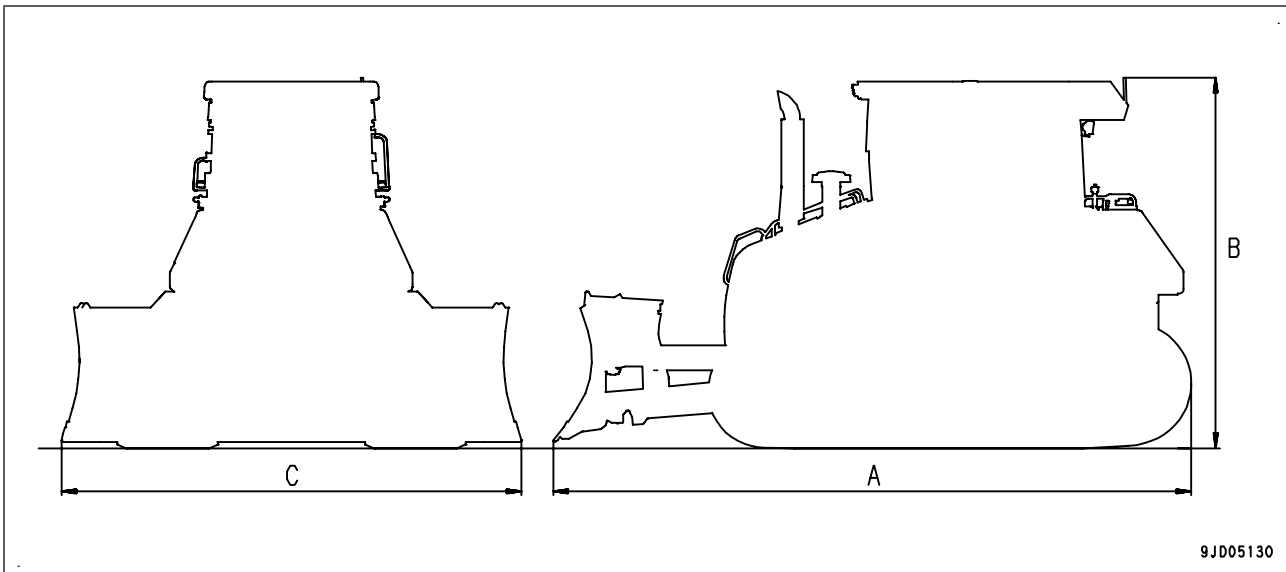
★ Following shows the rated horsepower (net) at the maximum cooling fan speed.

113 kW {152 HP}/2,200 min⁻¹ {2,200 rpm}

01 Specification

Specification drawing

D61PX-23 (D61PX_23-2110-931-A-00-A)



Power angle power tilt dozer with ROPS cab

Item	Unit	D61PX-23	
		860 mm single grouser s	
Machine weight	kg		18,580
Engine model	-		Komatsu SAA6D107E-2 c
Engine rated horsepower	kW {HP}/min ⁻¹ {rpm}		127 {170} / 2,200 {
• SAE J1995 (gross) (*1)			126 {169} / 2,200 {
• ISO 14396			125 {168} / 2,200 {
• ISO 9249/SAE J1349 (net) (*2)			
A Overall length	mm		5,480
B Overall height (including KOMTRAX antenna)	mm		3,180
C Overall width	mm		3,860
Travel speed (Quick shift mode)	Forward (1st/2nd/3rd)	km/h	3.4 / 5.6 / 9.0
	Reverse (1st/2nd/3rd)	km/h	4.1 / 6.5 / 9.0
Travel speed (Variable shift mode)	Forward	km/h	0.8 to 9.0
	Reverse	km/h	0.8 to 9.0

*1: Indicates the value of the basic engine (without cooling fan).

*2: Indicates the value at the minimum cooling fan speed.

★ The engine rated horsepower is indicated in the net value and gross value. The gross denotes the flywheel horsepower measured on the basic engine unit, while the net denotes the value measured of an engine under the condition essentially the same as that when it is installed on a machine.

★ Following shows the rated horsepower (net) at the maximum cooling fan speed.

113 kW {152 HP}/2,200 min⁻¹ {2,200 rpm}

Specifications (ALL-2111-001-A-01-A)**D61EX-23** (D61EX_23-2111-931-A-00-A)

Machine model	Unit	D61EX-23
Serial number		600 mm single grouser shoe 30001 and up

Weight

Machine weight	kg	
Bare tractor and ROPS cab		15,530
Bare tractor, dozer frame, and ROPS cab (without blade)		16,700
Bare tractor, power angle and power tilt dozer, and ROPS cab		17,700

Performance

Min. turning radius	—	[Counter-rotation turn]
Gradeability	deg.	30
Stability (front, rear, right, left)		35
Travel speed	km/h	
<ul style="list-style-type: none"> • Quick shift mode <ul style="list-style-type: none"> Forward (1st/2nd/3rd) Reverse (1st/2nd/3rd) • Variable shift mode <ul style="list-style-type: none"> Forward Reverse 		3.4 / 5.6 / 9.0 4.1 / 6.5 / 9.0 0.8 to 9.0 0.8 to 9.0
Ground pressure	kPa {kg/cm ² }	
Bare tractor and ROPS cab		40.5{0.41}
Bare tractor, dozer frame, and ROPS cab (without blade)		43.3{0.44}
Bare tractor, power angle and power tilt dozer, and ROPS cab		45.9{0.47}

01 Specification

Specifications

Machine model	Unit	D61EX-23
		600 mm single grouser shoe
Serial number		30001 and up

Dimensions

Overall length		
Bare tractor and ROPS cab		4,940
Bare tractor, dozer frame, and ROPS cab (without blade)	mm	5,055
Bare tractor, power angle and power tilt dozer, and ROPS cab (blade full angling)		6,100
Overall width		
Bare tractor		2,500
Power angle and power tilt dozer	mm	3,250
When blade is angled fully		2,970
Overall height		
When ROPS cab is installed (including KOMTRAX antenna)	mm	3,180
When ROPS cab is installed (including radio antenna)		3,010
Track gauge		1,900
Length of track on ground		3,165
Shoe width (Standard track shoe)	mm	600
Min. ground clearance		390

Engine

Name	—	SAA6D107E-2
Type	—	4-cycle, water-cooled, in-line vertical, common rail, turbocharged, and air- aftercooled type
No. of cylinders - bore x stroke	mm	6 - 107 × 124
Total piston displacement	ℓ {cc}	6.69 {6,690}
Performance		
Engine rated horsepower		
• SAE J1995 (gross) (*1)	kW {HP}/ min ⁻¹ {rpm}	127 {170} / 2,200 {2,200}
• ISO 14396		126 {169} / 2,200 {2,200}
• ISO 9249/SAE J1349 (net) (*2)		125 {168} / 2,200 {2,200}
Max. torque (*2)	Nm {kgm}/ min ⁻¹ {rpm}	753 {76.8} / 1,400 {1,400}
Max. speed with no load	min ⁻¹ {rpm}	2,280 {2,280}
Min. speed with no load		975 {975}
Fuel consumption rate at rated horsepower	g/kWh {g/HPH}	216 {161}
Starting motor	—	24 V, 5.5 kW
Alternator	—	24 V, 60 A
Battery (*3)	—	12 V, 140 Ah x 2 pieces
Radiator core type	—	Corrugated aluminum

*1: Indicates the value of the basic engine (without cooling fan).

*2: Indicates the value at the minimum cooling fan speed.

*3: The battery capacity (Ah) is indicated in the 5-hour rate.

★ The engine rated horsepower is indicated in the net value and gross value. The gross denotes the flywheel horsepower measured on the basic engine unit, while the net denotes the value measured of an engine under the condition essentially the same as that when it is installed on a machine.

Machine model	Unit	D61EX-23
Serial number		600 mm single grouser shoe 30001 and up

- ★ Following shows the rated horsepower (net) at the maximum cooling fan speed.
113 kW {152 HP}/2,200 min⁻¹ {2,200 rpm}

01 Specification**Specifications**

Machine model	Unit	D61EX-23
Serial number		600 mm single grouser shoe
		30001 and up

Power train

HST pump		
• Main pump		
Type x quantity	—	Variable displacement swash plate piston type x 2
Discharge	cm ³ /rev	125 × 2
Set pressure	MPa {kg/cm ² }	41.2 {420}
• Charge pump		
Type x quantity	—	Fixed displacement gear type x 1
Discharge	cm ³ /rev	56
Set pressure	MPa {kg/cm ² }	17.2 {175}
HST motor		
Type x quantity	—	Variable displacement bent axis piston type (with parking brake) x 2
Discharge	cm ³ /rev	200
Final drive	—	Double reduction type planetary gear, splash lubrication type

Undercarriage

Suspension method	—	Semi-rigid, balancing beam type
Carrier roller	—	2 (each side)
Track roller	—	8 (each side)
Track shoe		
Assembly type, single grouser,	—	Width: 600 mm, Number on each side: 42, pitch: 190 mm

Machine model	Unit	D61EX-23
Serial number		600 mm single grouser shoe 30001 and up
Work equipment hydraulic system		
Work equipment, cooling fan pump		
Type x quantity	—	Variable displacement swash plate piston type x 1
Discharge	cm ³ /rev	90
Max. discharge	MPa {kg/cm ² }	27.4 {280}
Cooling fan motor		
Type	—	Fixed displacement swash plate type piston motor
Motor capacity	cm ³ /rev	28
Control valve		
Type x quantity	—	5-spool valve x 1
Operating method	—	Hydraulic pilot type
Lift cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	100
Piston rod outside diameter	mm	55
Piston stroke	mm	461
Max. distance between pins	mm	1,317
Min. distance between pins	mm	856
Tilt cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	120
Piston rod outside diameter	mm	70
Piston stroke	mm	164
Max. distance between pins	mm	919
Min. distance between pins	mm	755
Angle cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	110
Piston rod outside diameter	mm	65
Piston stroke (max.)/(effective)	mm	452/448
Max. distance between pins (max.)/(effective)	mm	1,345/1,343
Min. distance between pins (Min.)/(effective)	mm	893/895
Ripper cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	125
Piston rod outside diameter	mm	70
Piston stroke	mm	330
Max. distance between pins	mm	1,080
Min. distance between pins	mm	750
Hydraulic tank	—	Box type (external control valve type)
Hydraulic oil filter	—	Tank return side
Oil cooler	—	Air-cooled (laminated aluminum)

01 Specification**Specifications**

Machine model	Unit	D61EX-23
Serial number		600 mm single grouser shoe
		30001 and up

Work equipment

• Blade

Type	—	Hydraulic angle tilt dozer
Blade support method		Hydraulic cylinder type
Performance		
Max. lift above ground	mm	1,025
Max. drop below ground	mm	580
Max. tilt	mm	435
Max. angle	deg.	24
Dimensions		
Blade width	mm	3,250
Blade height	mm	1,195
Blade cutting angle	deg.	55

• Ripper

Type	—	Parallelogram type
Beam length	mm	2,168
Number of shanks	Piece	3
Performance		
Digging angle	deg.	55
Digging depth adjustment	—	3-stage variable
Max. digging depth	mm	665
Max. lift above ground	mm	562
Shank position (left/right)	mm	950/950

D61PX-23 (D61PX_23-2111-931-A-00-A)

Machine model	Unit	D61PX-23
Serial number		860 mm single grouser shoe 30001 and up

Weight

Machine weight	kg	
Bare tractor and ROPS cab		16,260
Bare tractor, dozer frame, and ROPS cab (without blade)		17,420
Bare tractor, power angle and power tilt dozer, and ROPS cab		18,580

Performance

Min. turning radius	—	[Counter-rotation turn]
Gradeability	deg.	30
Stability (front, rear, right, left)		35
Travel speed	km/h	
<ul style="list-style-type: none"> • Quick shift mode <ul style="list-style-type: none"> Forward (1st/2nd/3rd) Reverse (1st/2nd/3rd) • Variable shift mode <ul style="list-style-type: none"> Forward Reverse 		3.4 / 5.6 / 9.0 4.1 / 6.5 / 9.0 0.8 to 9.0 0.8 to 9.0
Ground pressure	kPa {kg/cm ² }	
Bare tractor and ROPS cab		29.4 {0.30}
Bare tractor, dozer frame, and ROPS cab (without blade)		30.3 {0.31}
Bare tractor, power angle and power tilt dozer, and ROPS cab		32.4 {0.33}

01 Specification

Specifications

Machine model	Unit	D61PX-23
		860 mm single grouser shoe
Serial number		30001 and up

Dimensions

Overall length		
Bare tractor and ROPS cab		4,960
Bare tractor, dozer frame, and ROPS cab (without blade)	mm	5,500
Bare tractor, power angle and power tilt dozer, and ROPS cab (blade full angling)		6,240
Overall width		
Bare tractor		2,990
Power angle and power tilt dozer	mm	3,860
When blade is angled fully		3,530
Overall height		
When ROPS cab is installed (including KOMTRAX antenna)		3,200
When ROPS cab is installed (including radio antenna)	mm	3,090
Track gauge		2,130
Length of track on ground		3,165
Shoe width (Standard track shoe)	mm	860
Min. ground clearance		465

Engine

Name	—	SAA6D107E-2
Type	—	4-cycle, water-cooled, in-line vertical, common rail, turbocharged, and air- aftercooled type
No. of cylinders - bore x stroke	mm	6 - 107 × 124
Total piston displacement	ℓ {cc}	6.69 {6,690}
Performance		
Engine rated horsepower		
• SAE J1995 (gross) (*1)		127 {170} / 2,200 {2,200}
• ISO 14396	kW {HP}/ min ⁻¹ {rpm}	126 {169} / 2,200 {2,200}
• ISO 9249/SAE J1349 (net) (*2)		125 {168} / 2,200 {2,200}
Max. torque (*2)	Nm {kgm}/ min ⁻¹ {rpm}	753 {76.8} / 1,400 {1,400}
Max. speed with no load		2,280 {2,280}
Min. speed with no load	min ⁻¹ {rpm}	975 {975}
Fuel consumption rate at rated horsepower	g/kWh {g/HPH}	216 {161}
Starting motor	—	24 V, 5.5 kW
Alternator	—	24 V, 60 A
Battery (*3)	—	12 V, 140 Ah x 2 pieces
Radiator core type	—	Corrugated aluminum

*1: Indicates the value of the basic engine (without cooling fan).

*2: Indicates the value at the minimum cooling fan speed.

*3: The battery capacity (Ah) is indicated in the 5-hour rate.

★ The engine rated horsepower is indicated in the net value and gross value. The gross denotes the flywheel horsepower measured on the basic engine unit, while the net denotes the value measured of an engine under the condition essentially the same as that when it is installed on a machine.

Machine model	Unit	D61PX-23
Serial number		860 mm single grouser shoe 30001 and up

- ★ Following shows the rated horsepower (net) at the maximum cooling fan speed.
113 kW {152 HP}/2,200 min⁻¹ {2,200 rpm}

01 Specification**Specifications**

Machine model	Unit	D61PX-23
Serial number		860 mm single grouser shoe
		30001 and up

Power train

HST pump		
• Main pump		
Type x quantity	—	Variable displacement swash plate piston type x 2
Discharge	cm ³ /rev	125 × 2
Set pressure	MPa {kg/cm ² }	41.2 {420}
• Charge pump		
Type x quantity	—	Fixed displacement gear type x 1
Discharge	cm ³ /rev	56
Set pressure	MPa {kg/cm ² }	17.2 {175}
HST motor		
Type x quantity	—	Variable displacement bent axis piston type (with parking brake) x 2
Discharge	cm ³ /rev	200
Final drive	—	Double reduction type planetary gear, splash lubrication type

Undercarriage

Suspension method	—	Semi-rigid, balancing beam type
Carrier roller	—	2 (each side)
Track roller	—	8 (each side)
Track shoe		
Assembly type, single grouser	—	Width: 860 mm, Number on each side: 42, Pitch: 190 mm

Machine model	Unit	D61PX-23
Serial number		860 mm single grouser shoe 30001 and up

Work equipment hydraulic system

Work equipment, cooling fan pump		
Type x quantity	—	Variable displacement swash plate piston type x 1
Discharge	cm ³ /rev	90
Max. discharge	MPa {kg/cm ² }	27.4 {280}
Cooling fan motor		
Type	—	Fixed displacement swash plate type piston motor
Motor capacity	cm ³ /rev	28
Control valve		
Type x quantity	—	4-spool valve x 1
Operating method	—	Hydraulic pilot type
Lift cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	100
Piston rod outside diameter	mm	55
Piston stroke	mm	461
Max. distance between pins	mm	1,317
Min. distance between pins	mm	856
Tilt cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	120
Piston rod outside diameter	mm	70
Piston stroke	mm	164
Max. distance between pins	mm	919
Min. distance between pins	mm	755
Angle cylinder		
Type	—	Double-acting piston type
Cylinder bore	mm	110
Piston rod outside diameter	mm	65
Piston stroke (max.)/(effective)	mm	452/448
Max. distance between pins (max.)/(effective)	mm	1,345/1,343
Min. distance between pins (Min.)/(effective)	mm	893/895
Hydraulic tank	—	Box type (external control valve type)
Hydraulic oil filter	—	Tank return side
Oil cooler	—	Air-cooled (laminated aluminum)

01 Specification**Specifications**

Machine model	Unit	D61PX-23
Serial number		860 mm single grouser shoe
		30001 and up

Work equipment

- Blade

Type	—	Hydraulic angle tilt dozer
Blade support method		Hydraulic cylinder type
Performance		
Max. lift above ground	mm	1,025
Max. drop below ground	mm	580
Max. tilt	mm	515
Max. angle	deg.	24
Dimensions		
Blade width	mm	3,860
Blade height	mm	1,155
Blade cutting angle	deg.	55

Weight table (ALL-2120-001-A-00-A)**D61EX-23** (D61EX_23-2120-931-A-00-A)

▲ This weight table is prepared for your reference when handling or transporting the components.

Unit: kg

Machine model	D61EX-23
Serial number	30001 and up
Engine and pump assembly	1,180
• Engine assembly (including mounting bracket, KDPF, exhaust piping, damper, etc.)	852
• Engine and damper assembly (excluding coolant and oil)	675
• Damper assembly	6.6
• Hydraulic pump assembly (including pump mounting parts)	354
• HST pump	260
• Work equipment/ cooling fan pump	43
• Charge pump	9
Cooling fan support bracket assembly (including cooling fan, cooling fan motor, guard, bracket, shroud, and hinge)	295
Cooling assembly	
• Radiator	60.0
• Oil cooler (including oil cooler bypass/ HST charge safety valve)	40.0
• Aftercooler	18.7
Fuel tank assembly (excluding fuel, including control valve (5V))	346
• Control valve	
• 4-spool valve (including accessories and mounting plate)	60
• 5-spool valve (machine with ripper) (including accessories and mounting plate)	66.5
Main frame assembly (including piping mounting bracket)	2,280
• Main frame	2,100
• Equalizer bar	153
• Pivot shaft (each side)	96
• Front underguard	13
• Center underguard (front)	25
• Center underguard (rear)	18
• Rear underguard	13
Track frame assembly (each side)	3,290
• Idler assembly	235
• Recoil spring assembly	208
• Track roller (single flange type)	46.4 x 6
• Track roller (double flange type)	50.6 x 2
• Carrier roller	28.2 x 2
• Final drive assembly (including sprocket)	769
• HST motor	281
Track shoe assembly (each side)	
PLUS type single grouser shoe (600 mm)	1,485
Hydraulic tank assembly (excluding hydraulic oil) (including washer tank, battery, and a part of piping)	445
power angle and power tilt dozer assembly (including center ball, pitch link, and pin)	2,080
• Blade	1,000
• Dozer frame assembly (including piping and trunnion)	1,010
• Tilt cylinder assembly	60.5
• Angle cylinder assembly	63.8
Lift cylinder assembly	45.1

01 Specification**Weight table**

		Unit: kg
Machine model	D61EX-23	
Serial number	30001 and up	
Ripper assembly	1,757	
• Ripper cylinder assembly	68.8	
ROPS cab assembly (including floor and air conditioner)	1,100	
• Operator's seat		
Mechanical suspension seat (low back)	52	
Air suspension seat (high back)	58	
Air suspension seat (low back)	49	
Rear mask assembly	80	
Engine hood assembly (including door, pre-cleaner, and air cleaner)	348	

D61PX-23 (D61PX_23-2120-931-A-00-A)

⚠ This weight table is prepared for your reference when handling or transporting the components.

Unit: kg

Machine model	D61PX-23
Serial number	30001 and up
Engine and pump assembly	1,180
• Engine assembly (including mounting bracket, KDPF, exhaust piping, damper, etc.)	852
• Engine and damper assembly (excluding coolant and oil)	675
• Damper assembly	6.6
• Hydraulic pump assembly (including pump mounting parts)	354
• HST pump	260
• Work equipment/ cooling fan pump	43
• Charge pump	9
Cooling fan support bracket assembly (including cooling fan, cooling fan motor, guard, bracket, shroud, and hinge)	295
Cooling assembly	
• Radiator	60.0
• Oil cooler (including oil cooler bypass/ HST charge safety valve)	40.0
• Aftercooler	18.7
Fuel tank assembly (excluding fuel, including control valve (5V))	346
• Control valve	
• 4-spool valve (including accessories and mounting plate)	60
Main frame assembly (including piping mounting bracket)	2,355
• Main frame	2,100
• Equalizer bar	191
• Pivot shaft (each side)	113
• Front underguard	13
• Center underguard (front)	25
• Center underguard (rear)	18
• Rear underguard	13
Track frame assembly (each side)	3,290
• Idler assembly	235
• Recoil spring assembly	208
• Track roller (single flange type)	46.4 x 6
• Track roller (double flange type)	50.6 x 2
• Carrier roller	28.2 x 2
• Final drive assembly (including sprocket)	769
• HST motor	281
Track shoe assembly (each side)	
• PLUS type single grouser shoe (860 mm)	1,830
• Swamp shoe (860 mm)	1,560
Hydraulic tank assembly (excluding hydraulic oil) (including washer tank, battery, and a part of piping)	445
power angle and power tilt dozer assembly (including center ball, pitch link, and pin)	2,240
• Blade	1,158
• Dozer frame assembly (including piping and trunnion)	1,010
• Tilt cylinder assembly	60.5
• Angle cylinder assembly	63.8
Lift cylinder assembly	45.1
ROPS cab assembly (including floor and air conditioner)	1,100

01 Specification**Weight table**

		Unit: kg
Machine model		D61PX-23
Serial number		30001 and up
• Operator's seat		
Mechanical suspension seat (low back)		52
Air suspension seat (high back)		58
Air suspension seat (low back)		49
Rear mask assembly		80
Engine hood assembly (including door, pre-cleaner, and air cleaner)		348

Table of fuel, coolant, and lubricants (D61-RA19-05A-K-03-A)

★ For details of notes (Note 1, Note 2...) in the table, see Operation and Maintenance Manual.

Reservoir	Fluid Type	Ambient Temperature, degrees Celsius										Recommended Komatsu Fluids
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104 40	122 °F 50 °C		
Engine oil pan	Engine oil for KDPF used in cold terrain (Oil Change interval 250 hours)	(Note.1)										EOS5W30-LA (KES Diesel Engine Oil)
		(Note.1)										EOS5W40-LA (KES Diesel Engine Oil)
	Engine oil for KDPF (Oil Change interval 500 hours)	(Note.1)										EO10W30-LA (KES Diesel Engine Oil)
Idler (each)	Power train oil (Note.2)	(Note.1)										TO30 (KES)
Final drive case (each)	Power train oil	(Note.1)										TO30 (KES)
Hydraulic system	Power train oil	(Note.1)										TOS5W30 (KES)
	Engine oil	(Note.1)										EO10W30-DH (KES)
Grease fitting	Hyper grease (Note.3)	(Note.1)										G2-TE (KES)
	Lithium EP grease	(Note.1)										G2-LI (KES)
Cooling system	Non-Amine Engine Coolant (AF-NAC) (Note.4)	(Note.1)										AF-NAC (KES)
Fuel tank	Diesel fuel	(Note.1)										ASTM Grade No.1-D S15
		(Note.1)										ASTM Grade No.2-D S15

AJD00415

Unit: ℓ

Applicable portion	Specified capacity	Refill capacity
Engine oil pan	29	27
Idler (each of right and left)	0.22	0.22
Final drive case (each of right and left)	8.3	8.1
Hydraulic oil system	195	101
Cooling system (including sub-tank)	45	—
Fuel tank	372	—

01 Specification

Table of fuel, coolant, and lubricants

SHOP MANUAL

BULLDOZER

D61EX-23 D61PX-23

Model	Serial Number
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D61EX-23 D61PX-23	30001 and up
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10 Structure and function

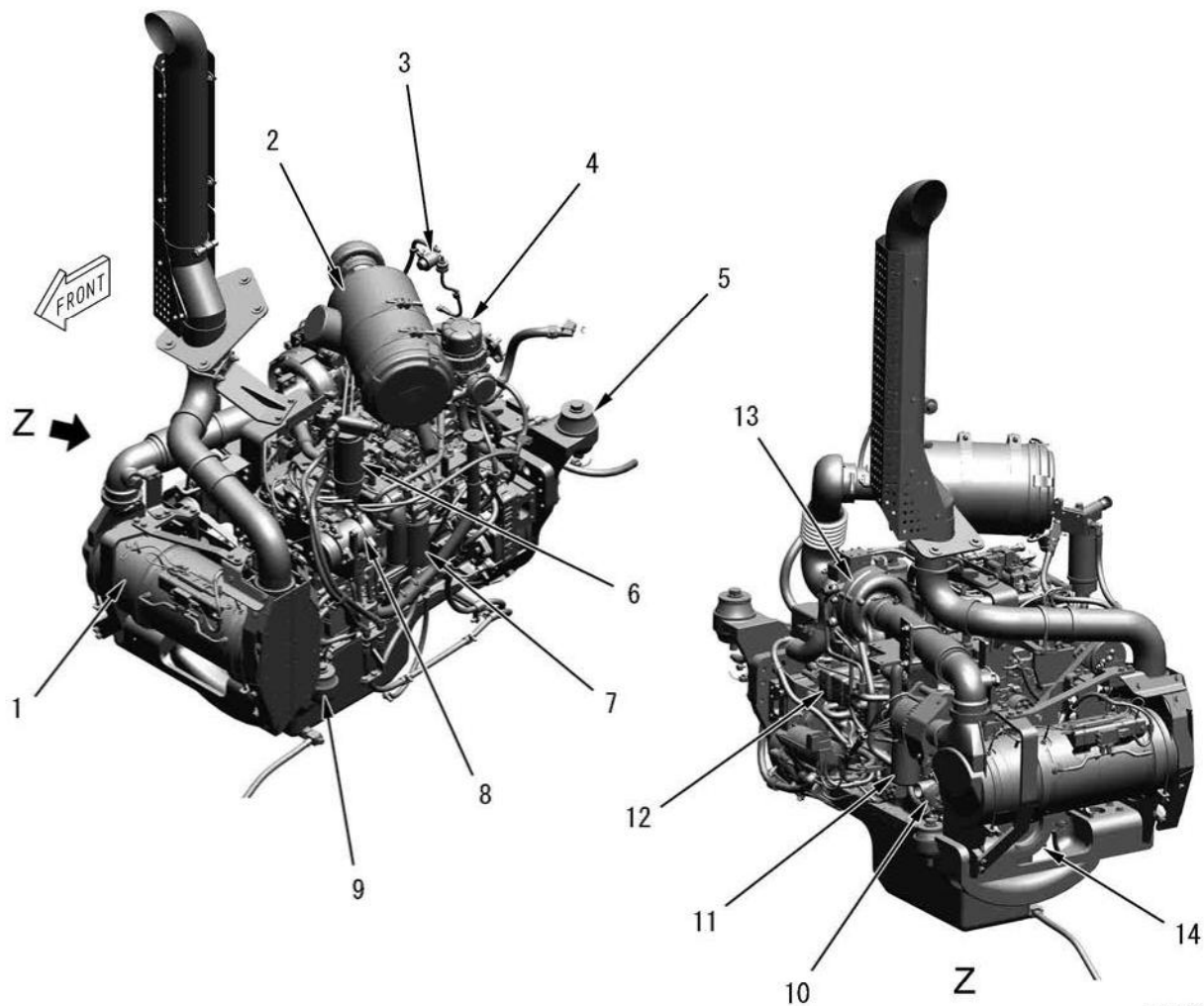
10 Structure and function

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Engine and cooling system (ALL-R401-001-K-00-A)

Engine related parts (D61-A001-041-K-00-A)


APD01827

1. KDPF
2. Air cleaner (*1)
3. Dust indicator
4. KCCV ventilator
5. Rear engine mount
6. Fuel pre-filter
7. Fuel main filter
8. Air conditioner compressor
9. Front engine mount
10. Auto-tensioner
11. Engine oil filter
12. EGR cooler
13. KVGT
14. Vibration damper (*1)

*1: For details, see Engine Shop Manual.

10 Structure and function

Engine related parts

Structure

- The cooling assembly and cooling fan are installed to the rear end of the machine. The intake air and coolant are led to the rear of the machine through the piping.
- Air conditioner compressor (8) is installed to the front of the engine and driven by the alternator belt.
- Air cleaner (2), pre-cleaner, and exhaust pipe are installed above or near the engine hood.

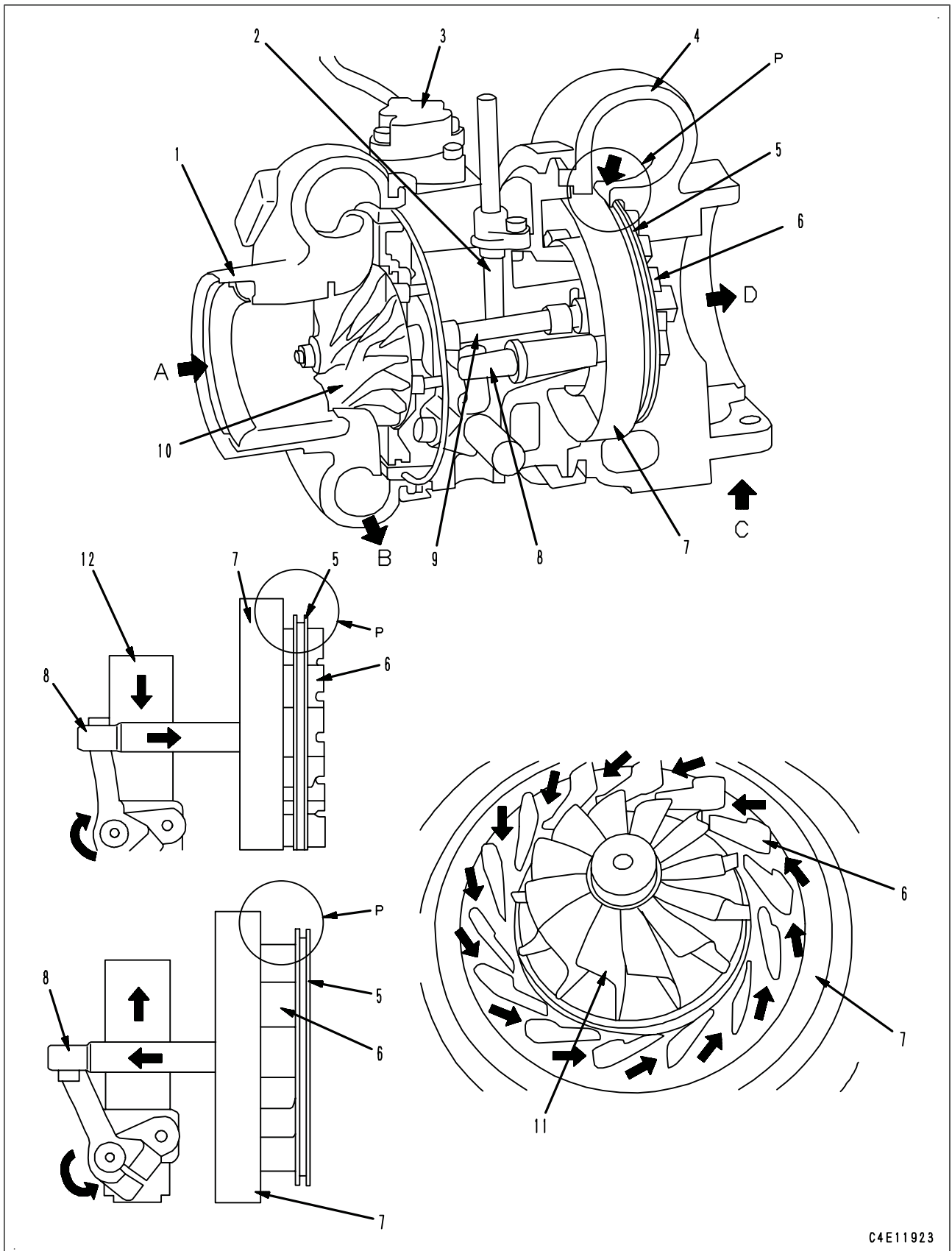
Function (D61-A001-042-K-00-A)

- KVGTT (13) is a turbocharger which can vary the cross-sectional area of its exhaust gas passage.
- EGR cooler (12) is a device which cools the exhaust gas by using the coolant.
- KGPF (1) is a device which purifies the exhaust gas with built-in KDOC (catalyzer) and KCSF (filter to catch soot).
- KCCV ventilator (4) is a mechanism which separates oil from blowby gas and returns the gas to the air intake side for afterburning. It mainly consists of filters.

KVGT (WA380-AA10-041-K-00-A)

★ KVGT: Abbreviation for Komatsu Variable Geometry Turbocharger

★ The shape is subject to machine models.



C4E11923

10 Structure and function

KVGT

1. Blower housing
2. KVGT speed sensor
3. Hydraulic actuator
4. Turbine housing
5. Plate
6. Vane
7. Nozzle ring
8. Push rod
9. Shaft
10. Blower impeller
11. Turbine impeller
12. Piston

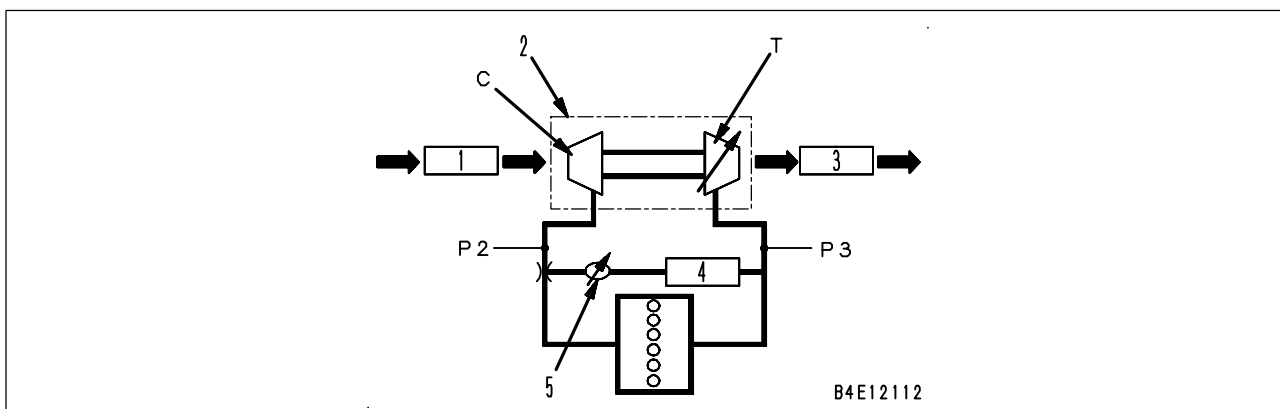
A: Air intake inlet

B: Air intake outlet

C: Exhaust inlet

D: Exhaust outlet

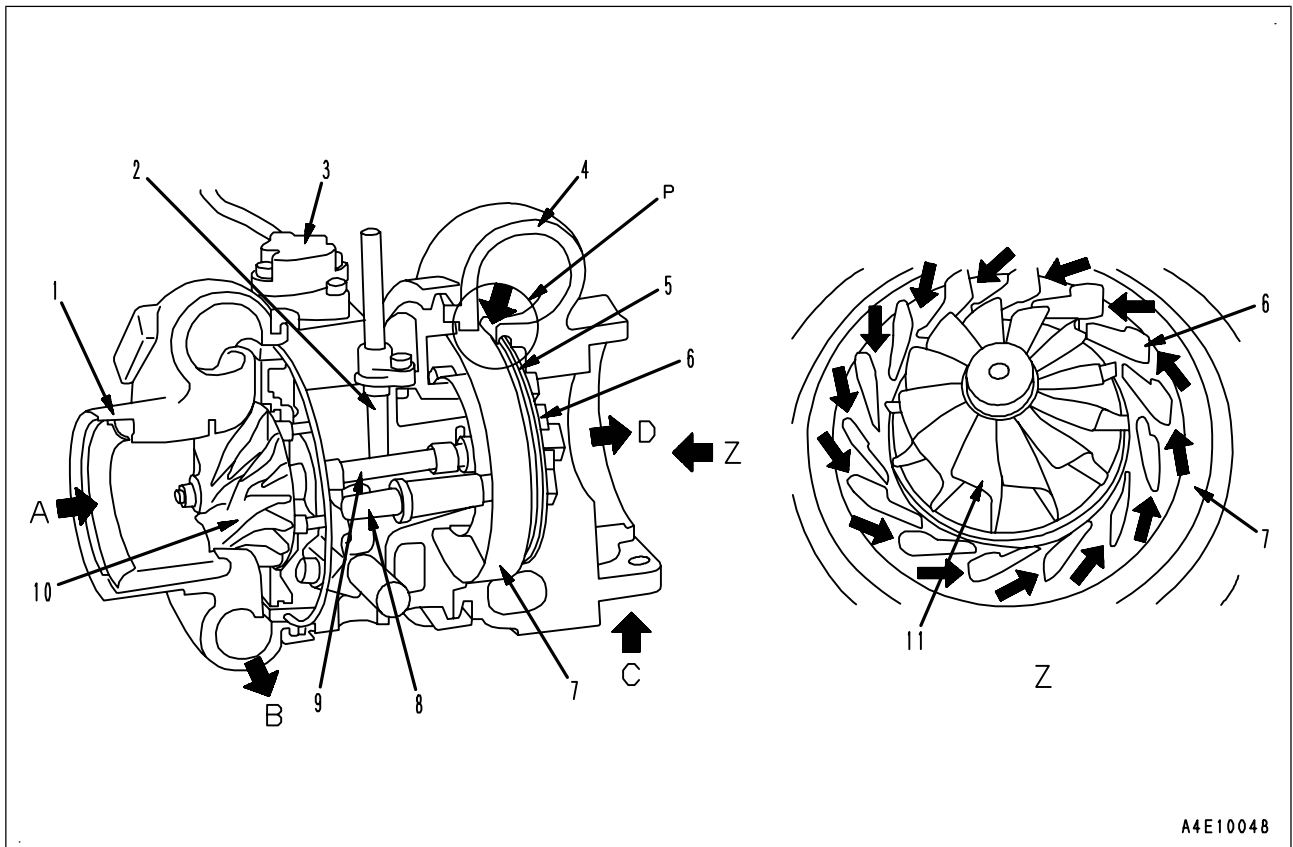
Operation (ENG107-AA10-044-K-00-A)



1. Air cleaner
2. KVGT
3. KDPF
4. EGR cooler
5. EGR valve
- C: Blower impeller
- T: Turbine impeller

- The new exhaust gas regulation not only requires to control emissions at high engine speeds but also at low engine speeds. To meet the requirements, the EGR ratio is increased. (EGR ratio = volume of EGR/ intake air flow)
- To obtain a high EGR ratio especially at low engine speeds, the turbine inlet pressure (P3) must be higher than the boost pressure (P2). A variable displacement turbocharger (KVGT), in which the exhaust gas pressure hitting the turbine impeller (T) can be adjusted, is introduced.
- The charged pressure rises faster, also contributing to suppress the generation of PM (particles) due to insufficient oxygen at low engine speeds.
- The turbine impeller (T) drives the blower impeller (C) via a shaft. In turn the blower impeller (C) sends a large amount of air to the cylinders for combustion. When the air flow from KVGT (2) increases, more fuel can be injected, and the engine output increases.
- Since the density of the air and the amount of oxygen increases when the air is cooled, more fuel can be injected, and the engine output increases.

- ★ Adequate amount of clean high quality oil is required to maintain the KVGT performance. Be sure to use Komatsu genuine high quality oil. Follow the procedures in the Operation and Maintenance Manual when replacing oil or oil filter.



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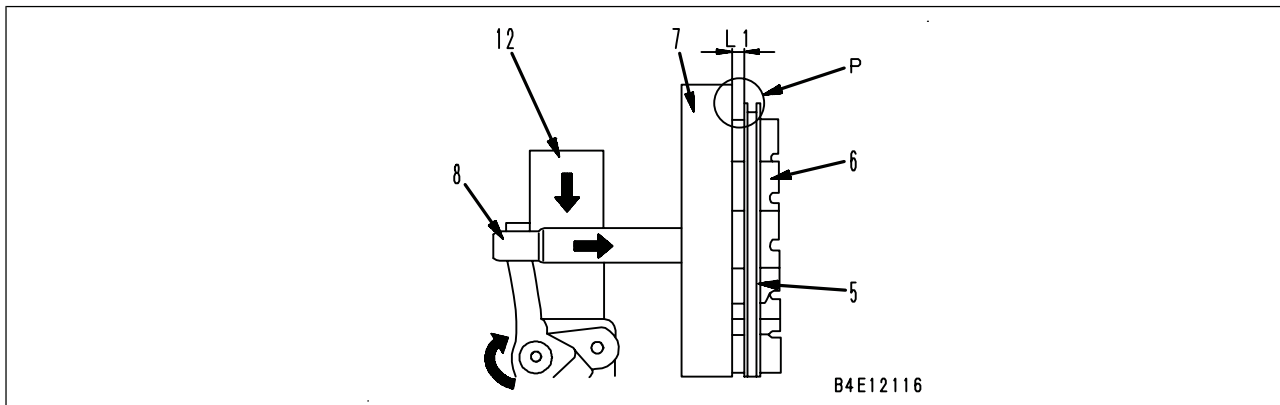
- Exhaust gas enters from (C) of turbine housing (4), flows through section (P) and out from (D). Section (P) is surrounded by plate (5) and nozzle ring (7) fixed on turbine housing (4), and vane (6).
- The passage area changes when push rod (8) slides right or left.
- The hydraulic actuator (3) moves piston (12) in the actuator up/down by using the oil pressure controlled at the EPC valve installed to the EGR valve, and also controls the right/left slide of push rod (8).
- Exhaust gas hits vane (6), and then turbine impeller (11) drives blower impeller (10) via shaft (9). This works as a compressor and the air entered from (A) is compressed and sent out from (B).
- When the exhaust gas pressure at the inlet (C) of turbine housing (4) is low (at low engine speeds), push rod (8) slides to the right to narrow section (P).
- Then the exhaust gas pressure to turbine impeller (11) increases, the turbocharger speed also increases, and more air (oxygen) is inhaled.
- The turbocharger speed is sensed by KVGT speed sensor (2).

When nozzle ring is closed

- At low engine speeds, exhaust gas inlet passage (P) is narrowed (L1). (Not completely closed)
- When the turbine inlet pressure increases while the nozzle ring is closed, the flow speed to the turbine increases and the turbocharger speed increases.

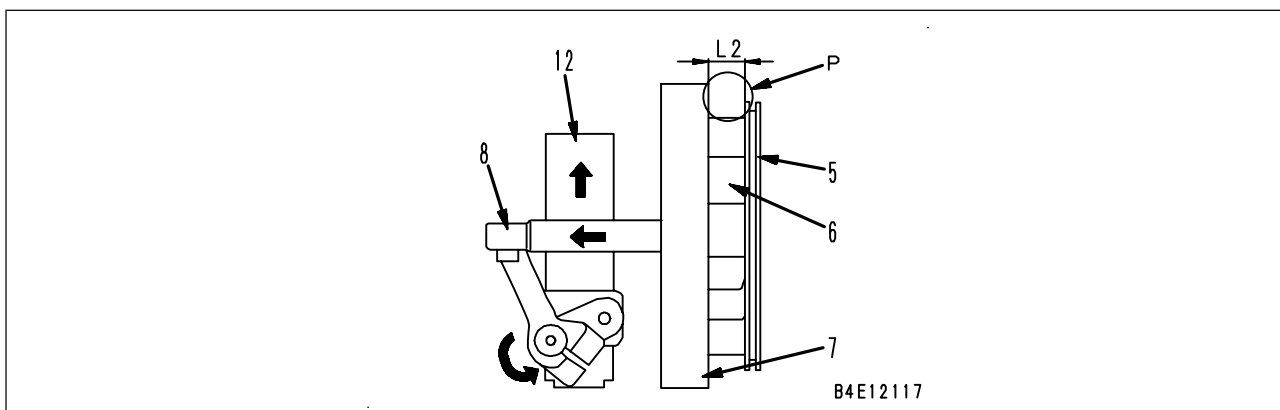
10 Structure and function

KVGT



When nozzle ring is open

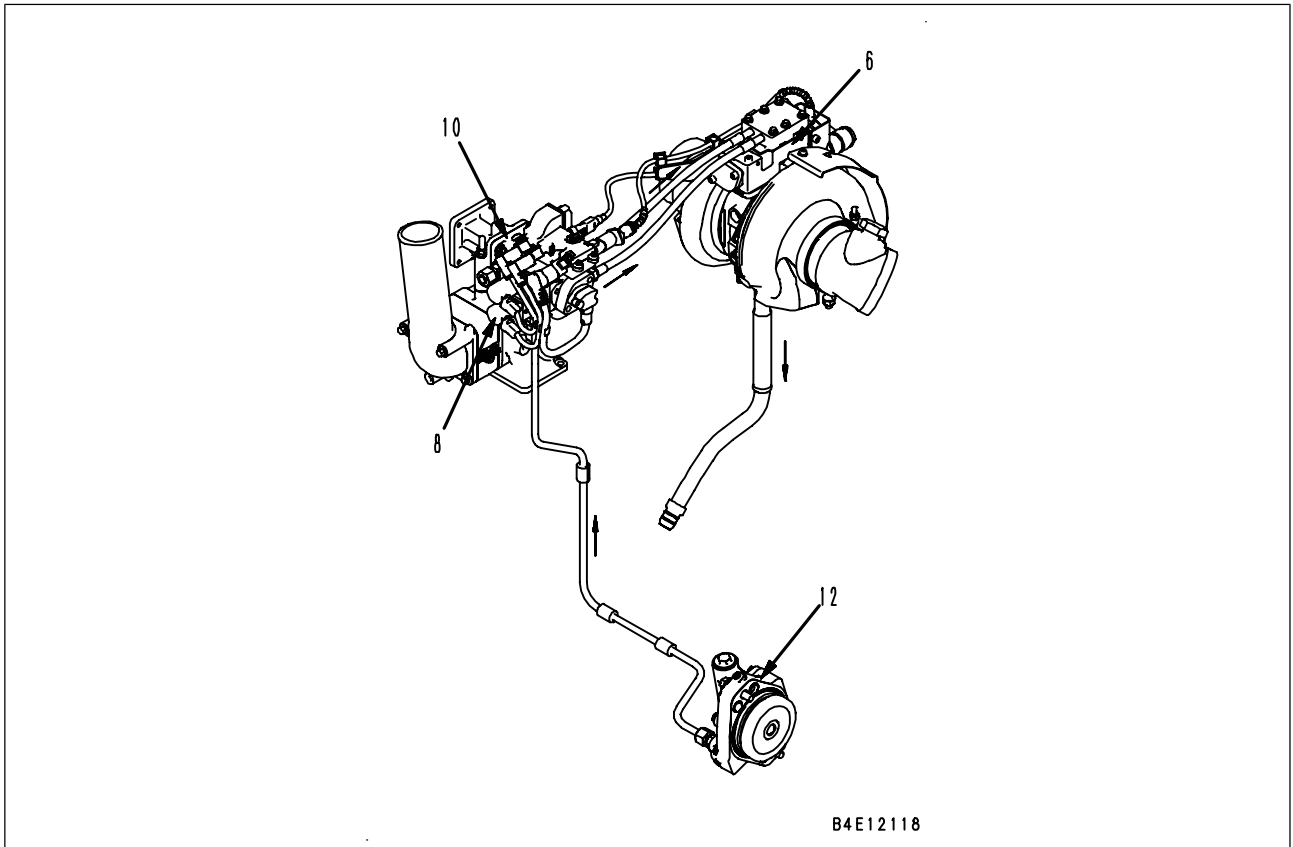
- At high engine speeds, exhaust gas inlet passage (P) is widened (L2).
- As the engine speed and the turbine inlet pressure (exhaust gas pressure) increases, exhaust gas inlet passage (P) widens (L2) to effectively apply the exhaust gas pressure to turbine impeller (11).



- ★ Nozzle ring (7), vane (6), and push rod (8) are integrated and slide together but do not rotate.
- ★ KVGT position sensor is installed to hydraulic actuator (3). The KVGT position sensor is calibrated together with the variable mechanism in the KVGT, and values are stored in the memory inside the KVGT position sensor. If any of the hydraulic actuator (3), KVGT position sensor, or KVGT body fails, replace the whole KVGT.

Hydraulic actuator operation

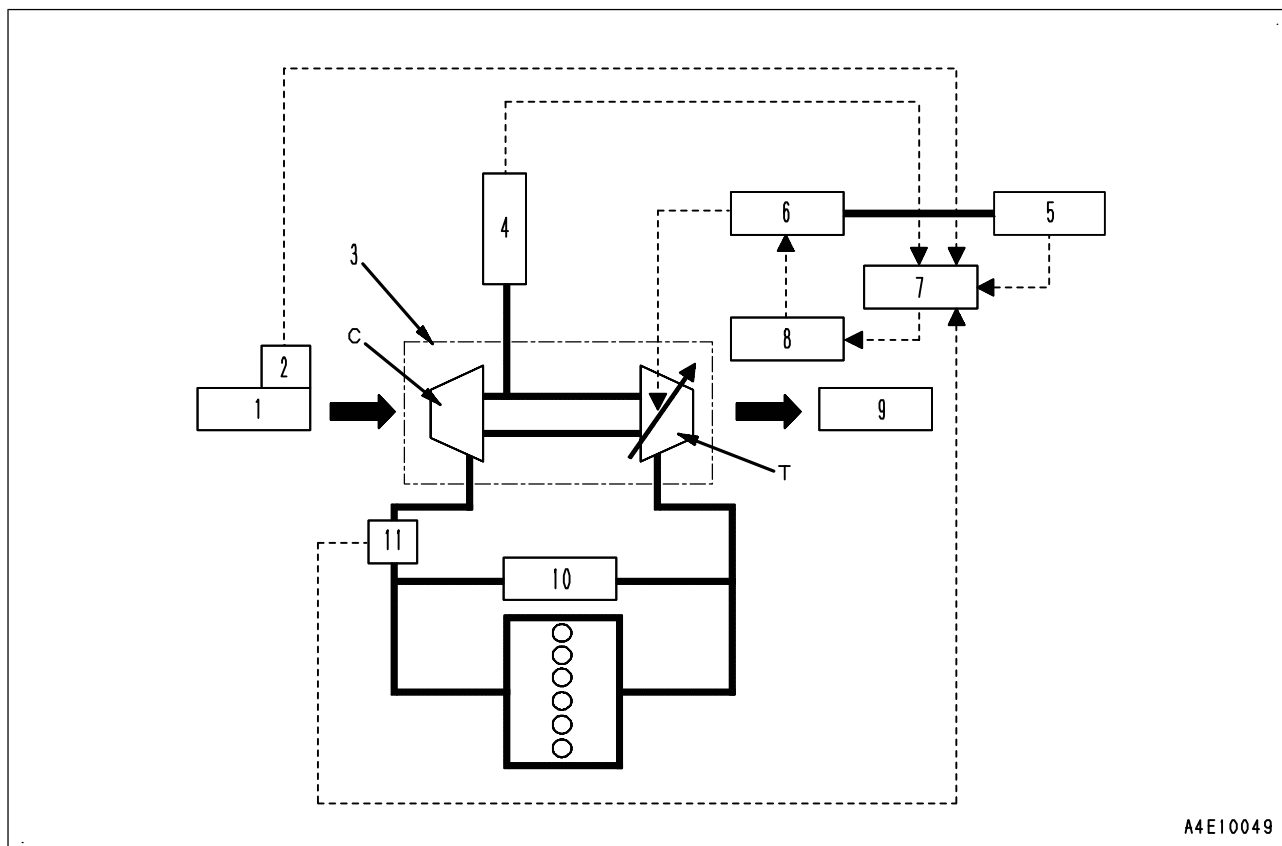
- Hydraulic actuator (6) is moved by the oil pressure controlled by EPC valve (8) installed to EGR valve (10).
- The force for the movement is the oil pressure supplied from boost oil pump (12).
- ★ The shape in the following figure is subject to machine models.



- Position of hydraulic actuator (6) is sensed by KVT position sensor (5) and the signals are fed back to engine controller (7).

10 Structure and function

KVGT



1. Air cleaner
 2. Mass air flow and temperature sensor
 3. KVGT
 4. KVGT speed sensor
 5. KVGT position sensor
 6. Hydraulic actuator
 7. Engine controller
 8. EPC valve (for KVGT)
 9. KDPF
 10. EGR system (EGR cooler, EGR valve)
 11. EGR orifice temperature sensor
 12. Boost oil pump
- C: Blower impeller
T: Turbine impeller

KVGT control system

- Based on information from KVGT position sensor (5), mass air flow and temperature sensor (2), and KVGT speed sensor (4), etc., the engine controller (7) moves hydraulic actuator (6) by using the oil pressure controlled by EPC valve (8), to move the piston.
- A good response at high altitudes is maintained by sensing high elevations with the ambient pressure sensor, and automatically controlling the fuel injection and the KVGT.
- The KVGT is protected by controlling its speed to prevent overspeeds.

Lubrication

- Cooled oil from the engine oil cooler is sent through the supply pipe to the KVGT for lubrication.
- Oil is sent to the bearing housing to lubricate the shaft bearing and thrust bearing.
- Return oil is drained from the return pipe connected to the bottom of the bearing housing and falls to the oil pan.

Cooling

- Coolant from the cylinder block enters the center housing to cool the KVG1.
- Coolant return flows from the center housing and joins the flow at the EGR cooler outlet piping, then flows through the water inlet connector to the water pump.

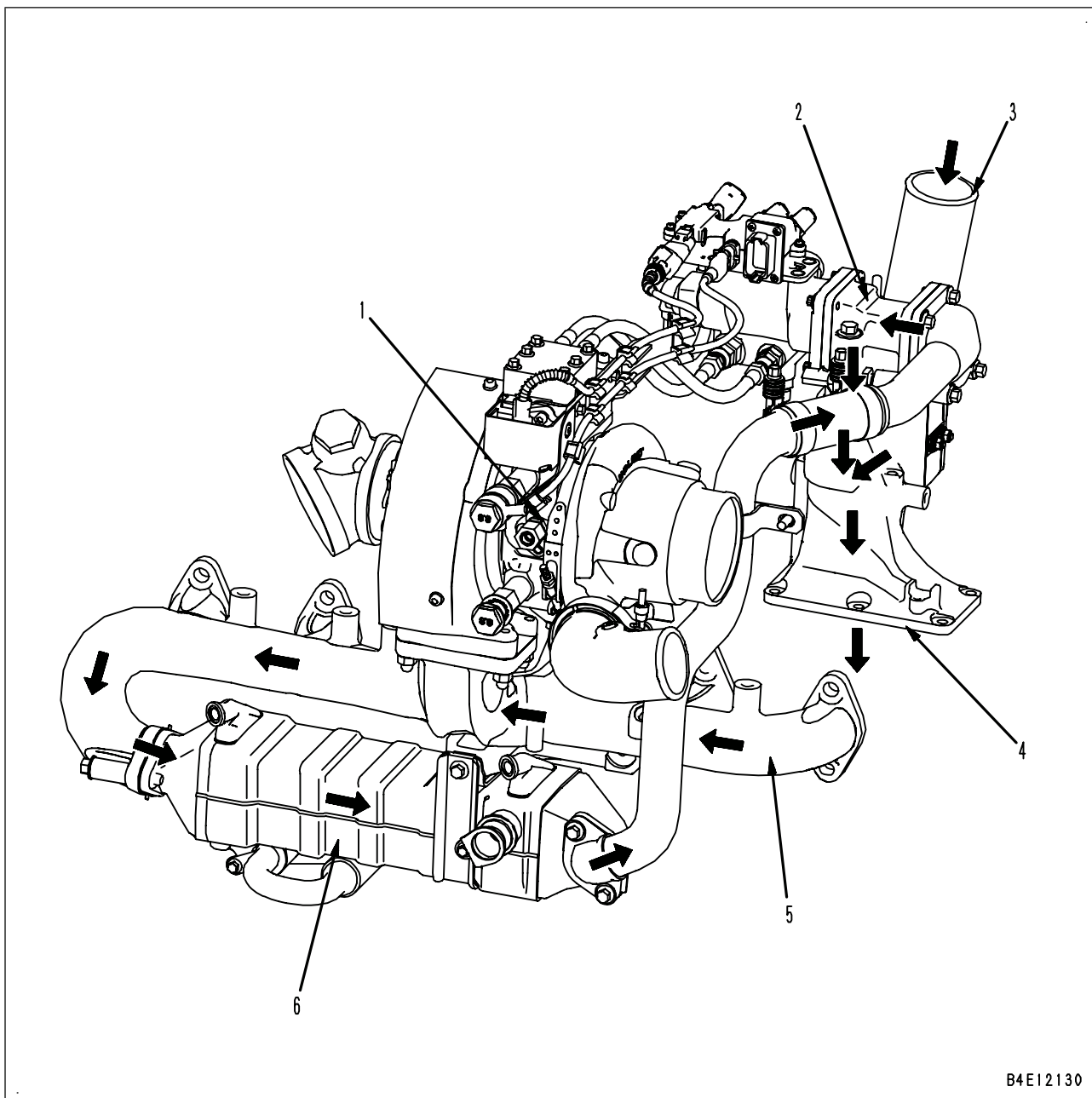
10 Structure and function

EGR system piping drawing

EGR system piping drawing (WA380-A9J0-04D-K-00-A)

★ EGR: Abbreviation for Exhaust Gas Recirculation

★ The shape is subject to machine models.



1. KVGT
2. EGR valve
3. Air intake pipe
4. Air intake connector
5. Exhaust manifold
6. EGR cooler

Function (ENG107-A9J0-042-K-00-A)

- EGR valve (driven hydraulically)
Controls the gas flow from the exhaust system to the air intake system. Since the exhaust pressure is higher than the boost pressure, the exhaust gas flows to the air intake side.
- EGR cooler

Cools the exhaust gas.

Engine coolant is used for cooling.

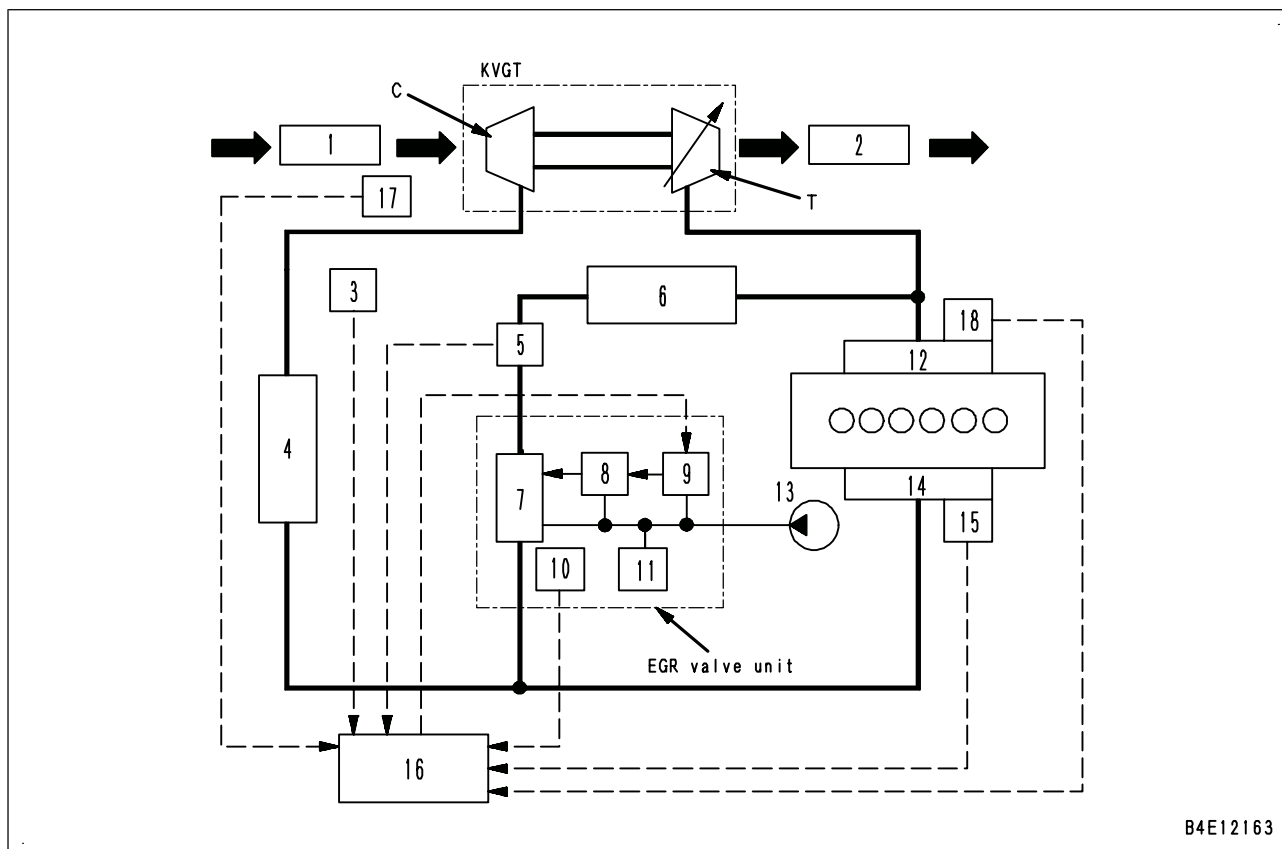
- Air intake connector
Returns the air from the air-cooled aftercooler and exhaust gas from the EGR valve to the air intake side.
- Each sensor
Controls the EGR according to the operating condition.
Troubleshoots the system.
- Controls each part of the EGR circuit and controls the EGR rate according to the operating condition to ensure clean exhaust at all times.
- Since the EGR circuit is monitored and troubleshooted, a serious trouble is prevented.

10 Structure and function

EGR system circuit diagram

EGR system circuit diagram (ENG107-A9J0-052-K-00-A)

★ EGR: Abbreviation for Exhaust Gas Recirculation



B4E12163

1. Air cleaner
 2. KDPF
 3. Ambient pressure sensor
 4. Aftercooler
 5. EGR orifice temperature sensor
 6. EGR cooler
 7. EGR valve
 8. Hydraulic actuator (power piston)
 9. EPC valve (for EGR valve)
 10. EGR valve lift sensor
 11. EPC valve (for KVGIT)
 12. Exhaust manifold
 13. Boost oil pump
 14. Air intake manifold
 15. Charge (boost) pressure and temperature sensor
 16. Engine controller
 17. Mass air flow and temperature sensor(MAF)
 18. Exhaust manifold pressure sensor
- C: Blower impeller
T: Turbine impeller

Operation (ENG107-A9J0-044-K-00-A)

- The engine controller outputs signals for opening EGR valve (7) most properly according to the load on the engine to attain both clean exhaust gas and low fuel consumption.

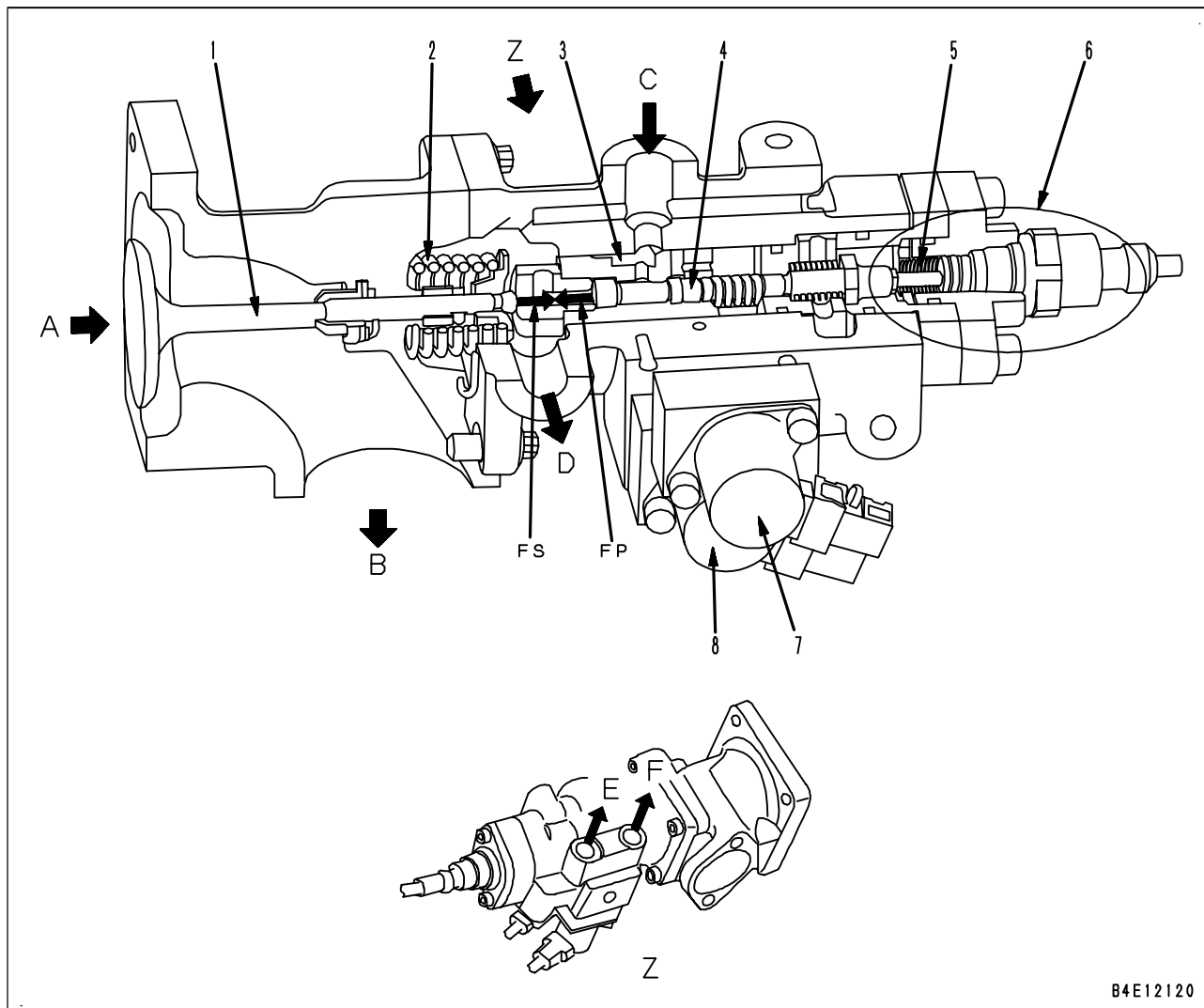
- When EGR valve (7) opens, a part of the exhaust gas (EGR gas) flows from exhaust manifold (12) through EGR piping to EGR cooler (6).
- The exhaust gas cooled by EGR cooler (6) flows through EGR valve (7) and mixes with the intake air in the air intake connector, and then flows in the air intake manifold (14).

10 Structure and function

EGR valve

EGR valve (ENG107-A9K1-041-K-00-A)

★ The shape is subject to machine models.

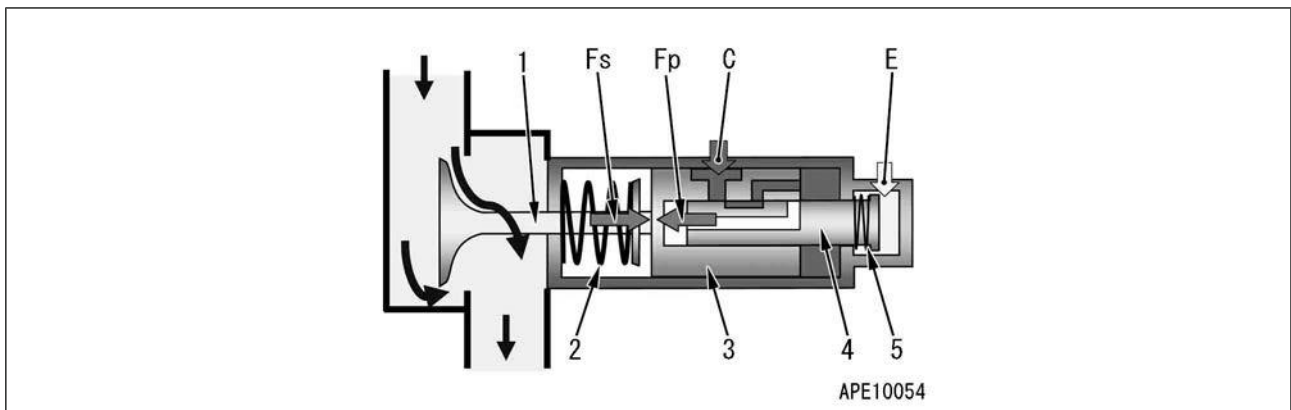


1. Valve
 2. Spring
 3. Power piston
 4. Spool
 5. Spring
 6. EGR valve lift sensor
 7. EPC valve (for EGR valve)
 8. EPC valve (for KVG T)
- A: EGR gas inlet (from EGR cooler)
 B: EGR gas outlet (to intake manifold)
 C: Servo drive oil inlet
 D: Servo drive oil outlet
 E: KVG T control oil pressure outlet
 F: KVG T drive oil pressure outlet

Structure

- The EGR valve consists of the EGR gas flow control mechanism and the EPC valves
- There are two EPC valves, one for the EGR valves control and one for the KVG T control.

Operation (ENG107-A9K1-044-K-00-A)



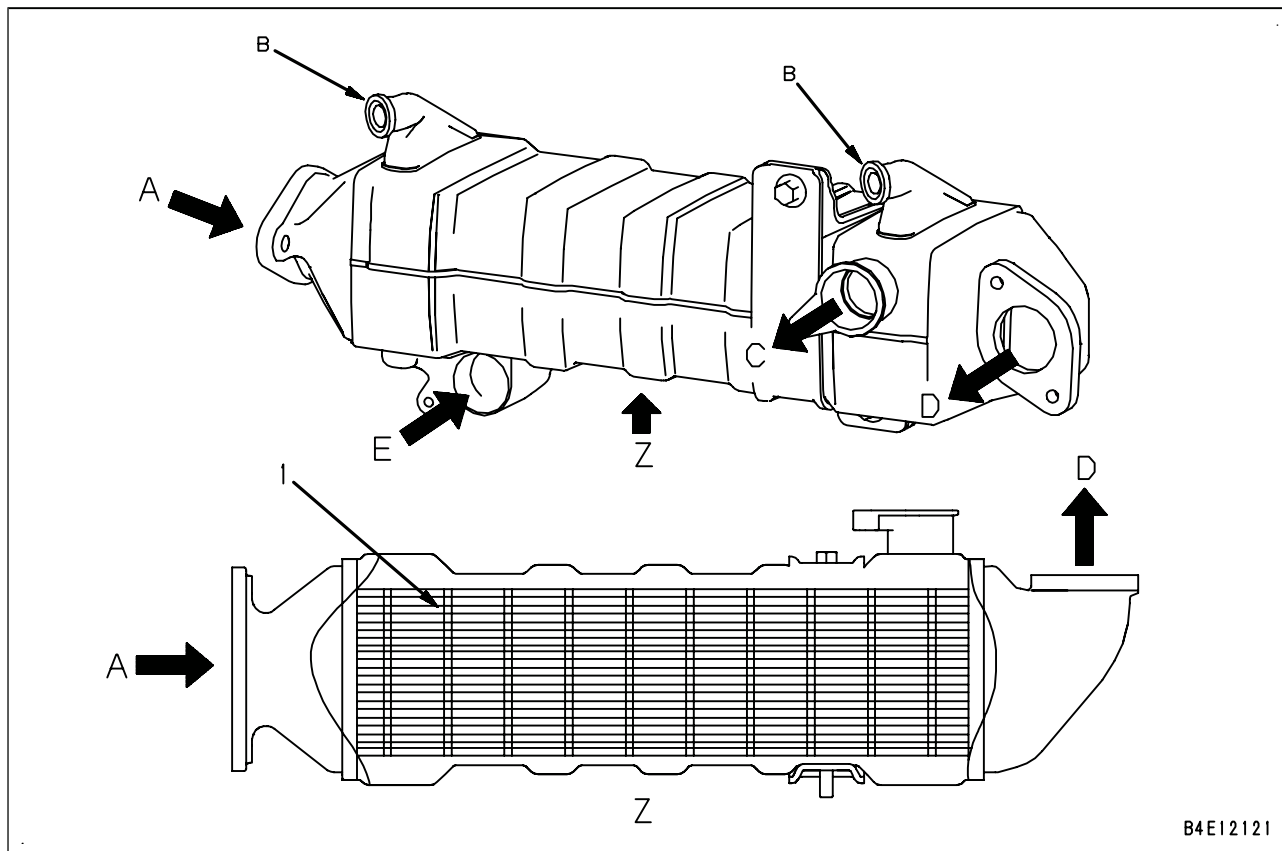
- Oil from the boost oil pump flows into the EGR valve from port (C). Control pressure from the EPC valve flows into port (E).
- Spool (4) is pressed to the right by the reaction force of spring (5), and EGR valve (1) is closed by the reaction force of spring (2). Therefore, exhaust gas from the EGR cooler does not flow to the intake side.
- To open EGR valve (1), first the control pressure from the EPC valve enters port (E). Spool (4) moves to a position where this control pressure and the force of spring (5) are balanced.
- The hydraulic circuit in power piston (3) opens, and then the oil from the boost oil pump entering from port (C) pushes power piston (3) to the left.
- Oil from the boost oil pump acts on power piston (3) and generates force (F_p).
- When force (F_p) becomes larger than reaction force (F_s) of spring (2), EGR valve (1) opens and then exhaust gas will flow to the intake side.
- Since the hydraulic circuit to spool (4) is closed by movement of power piston (3), power piston (3) stops at a position determined by spool (4).
- The valve position is controlled by the engine controller by controlling the spool position with the control pressure of the EPC valve.
- A servo mechanism prevents external force applied to valve (1) from acting on spool (4), which is in contact with power piston (3).
- Position of spool (4) is sensed by the EGR valve lift sensor.

10 Structure and function

EGR cooler

EGR cooler (ENG107-A9L0-041-K-00-A)

★ The shape is subject to machine models.



B4E12121

1. Tube

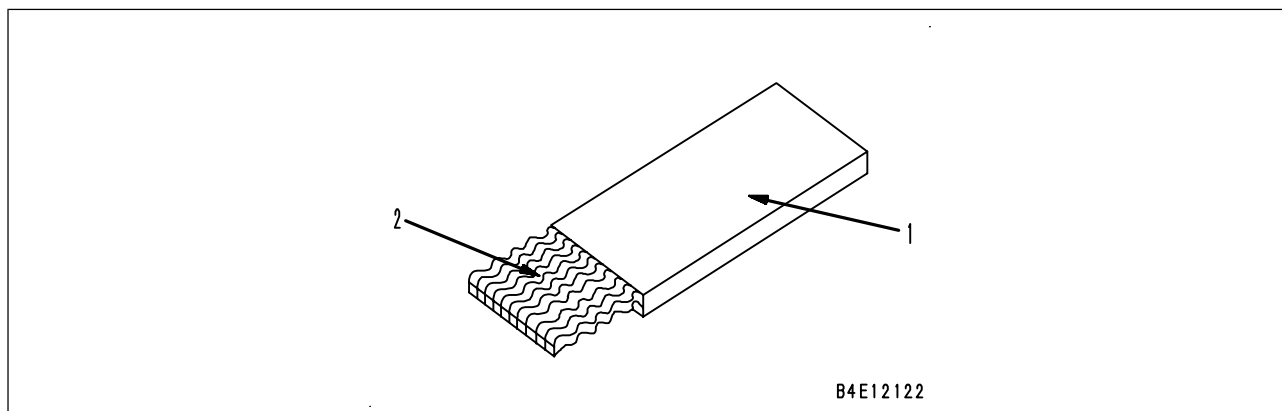
A: EGR gas inlet

B: Air vent

C: Coolant outlet

D: EGR gas outlet (to EGR valve)

E: Coolant inlet



B4E12122

1. Flat tube

2. Inner fin

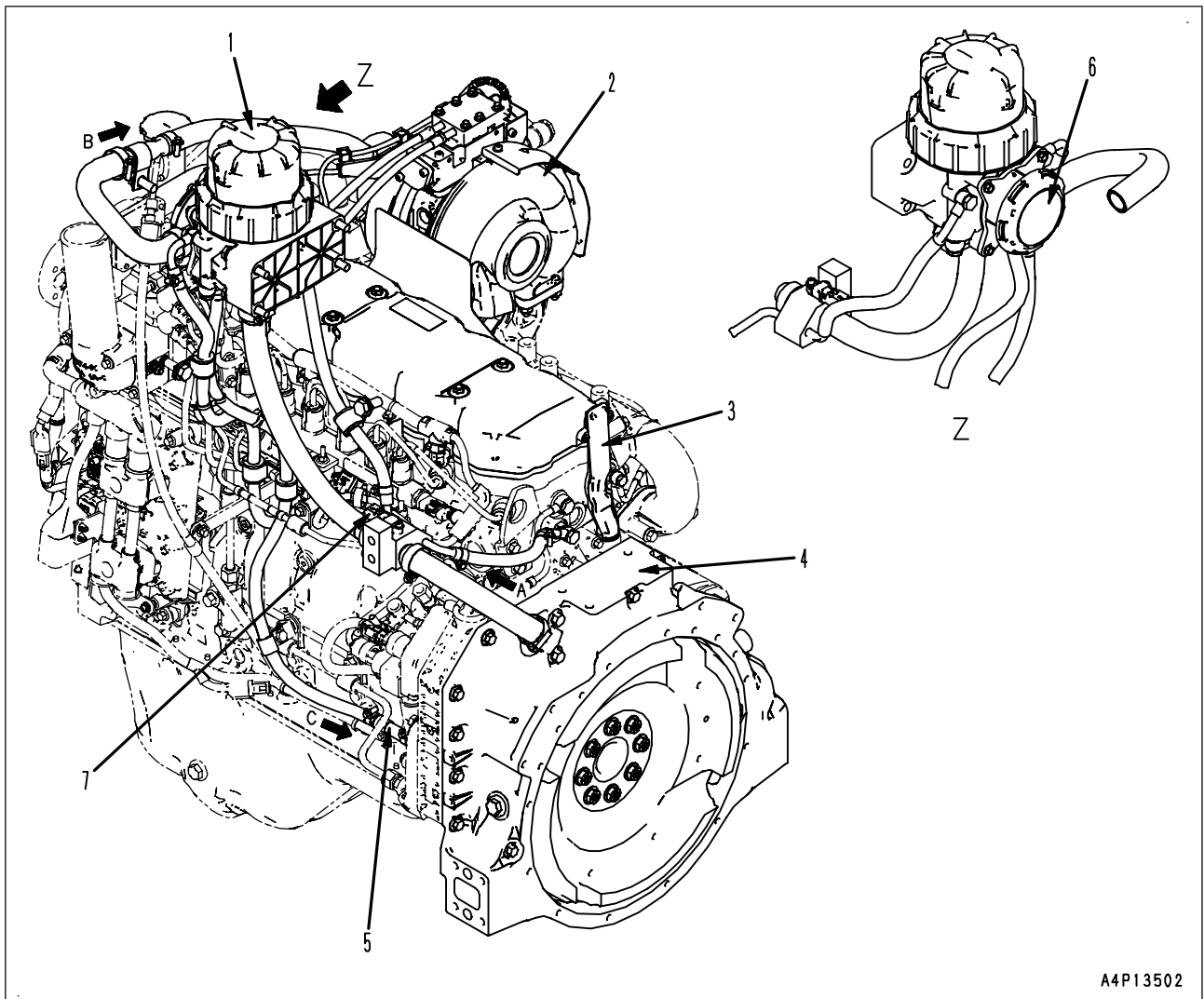
Operation (ENG107-A9L0-044-K-00-A)

- The EGR gas enters from (A) and flows through 11 flat tubes (1).
- Coolant enters from (E) and flows around flat tube (1) in shell and then goes out from (C).
- The EGR gas is effectively cooled by flat tubes (1) with inner fins (2) and flows out from EGR gas outlet (D).

KCCV layout drawing (PC200_10-A180-04D-K-00-A)

KCCV: Abbreviation for KOMATSU Closed Crankcase Ventilation

★ The shape is subject to machine models.



1. KCCV ventilator

2. KVG

3. Blowby duct

4. Flywheel housing

5. Check valve

6. CDR valve

7. Crankcase pressure sensor

A: Blowby gas (from flywheel housing)

B: Engine oil-free blowby gas (to KVG)

C: Engine oil (to oil pan)

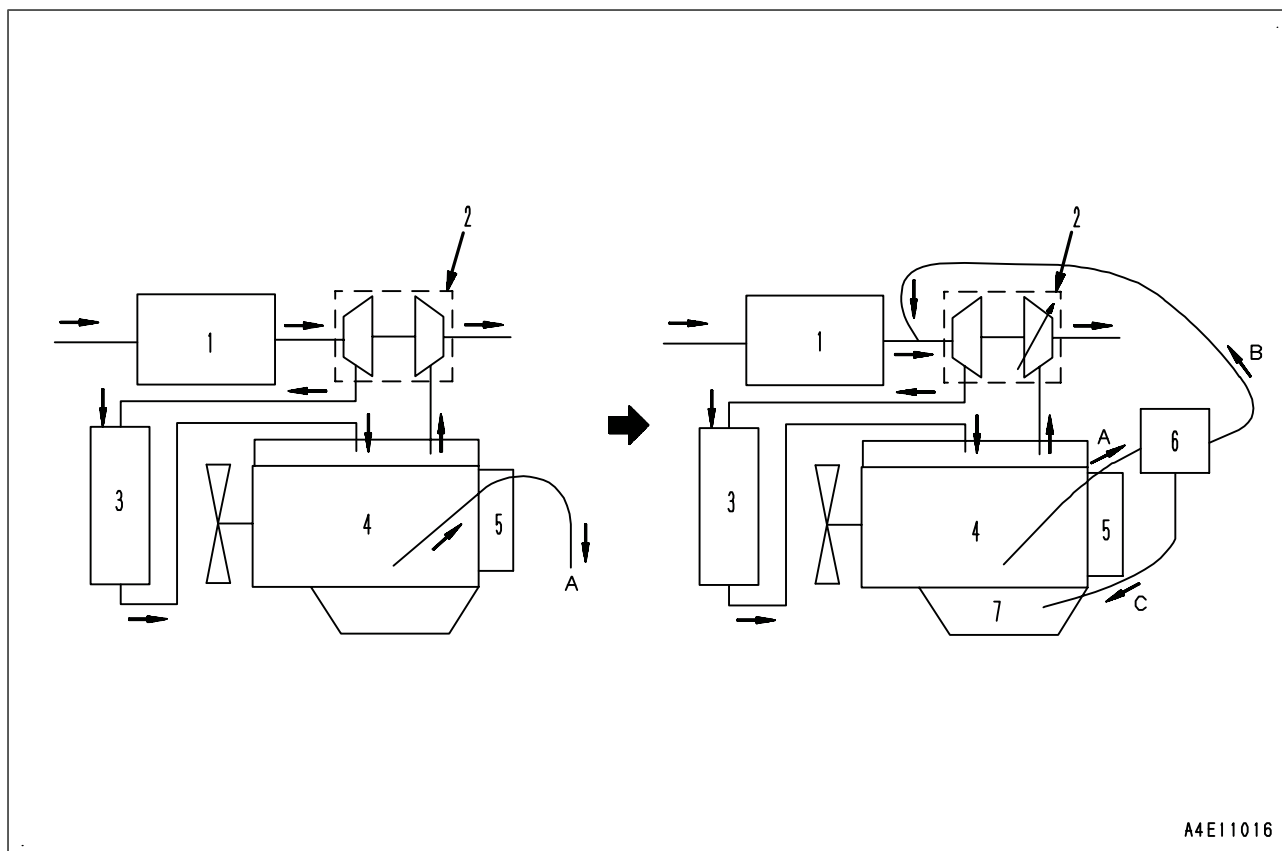
- Formerly, blowby gas has been released to the atmosphere. However, since the tightened exhaust gas regulation also regulates blowby gas, the blowby gas recirculation system is adopted.
- Since blowby gas (A) contains engine oil mist, which may cause the following problems when recirculated to KVG (2), a filter is provided at KCCV ventilator (1) to remove the oil.
 1. Degraded performance of turbocharger and aftercooler due to adherence of engine oil
 2. Abnormal engine combustion
 3. Malfunction of sensors due to adherence of engine oil

10 Structure and function

KCCV layout drawing

Operation (ENG107-A180-044-K-00-A)

- ★ The figure on the left shows the flow of blowby gas released to the atmosphere from conventional engines. The figure on the right shows the flow of blowby gas recirculated to the intake system by the KCCV ventilator.



A4E11016

1. Air cleaner

2. KVG

3. Aftercooler

4. Cylinder block (crankcase)

5. Breather

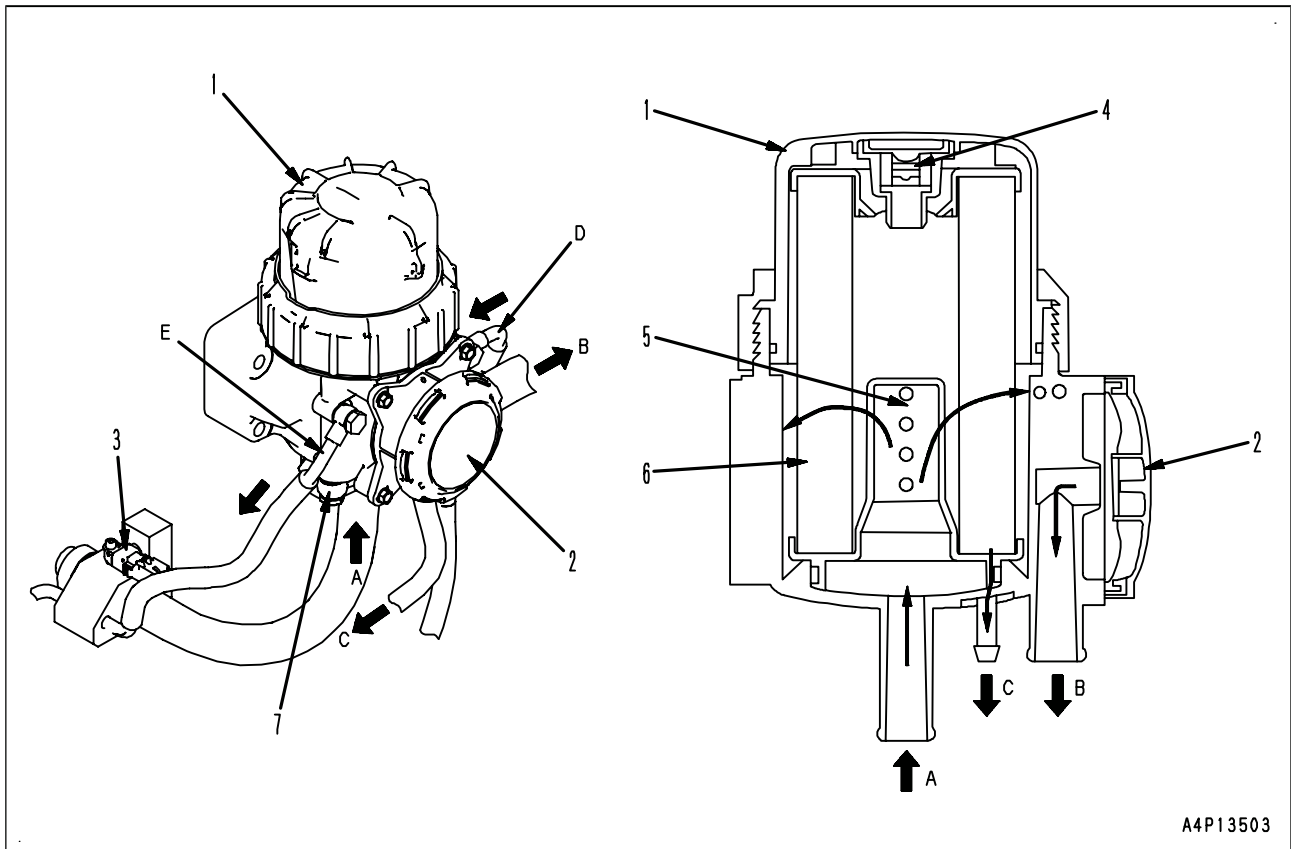
6. KCCV ventilator

7. Oil pan

- Engine oil mist is removed from blowby gas (A) in cylinder block (4) by the filter in KCCV ventilator (6), and then the cleaned gas (B) is recirculated to the intake side of the KVG.
- Removed engine oil (C) flows through a check valve and falls to the oil pan.

KCCV ventilator (PC200_10-A18H-041-K-00-A)

★ The shape is subject to machine models.



1. Case
 2. CDR valve
 3. Crankcase pressure sensor
 4. Relief valve
 5. Impactor
 6. Filter
 7. Heater tube
- A: Blowby gas inlet (from flywheel housing)
 B: Blowby gas outlet (to KVGT intake side)
 C: Oil drain port (to oil pan)
 D: Coolant inlet
 E: Coolant outlet

Function (PC200_10-A18H-042-K-00-A)

- When blowby gas is recirculated to the intake side of the KVGT, the pressure inside the crankcase becomes negative, and dust may be sucked in through the crankshaft seals. Therefore, CDR valve (regulator valve) (2) controls the pressure inside the crankcase.
- If the filter (6) in the KCCV ventilator clogs, pressure inside the crankcase increases and oil may leak, so clog of filter (6) is detected by crankcase pressure sensor (3).
- There are two types of filters (6) that differ by the filter replacement method; the top load type (removed upward) and the bottom load type (removed downward).
- Warming KCCV ventilator with the warmed engine coolant can prevent the blowby gas passage from being plugged by the frozen gas.

10 Structure and function

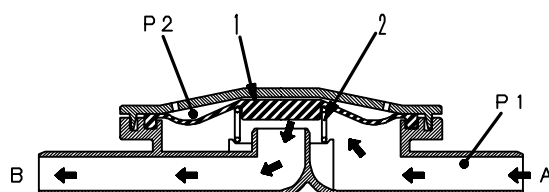
KCCV ventilator

Operation (ENG107-A18H-044-K-00-A)

- Blowby gas enters (A) and large oil particles in the engine oil mist are separated when it flows through the hole of impactor (5) in filter (6).
- Small oil particles are separated by filter (6).
- The separated oil flows along the case wall to oil drain port (C), and then flows into the oil pan.
- When the crankcase pressure becomes negative, CDR valve (2) operates to prevent the crankcase pressure from becoming excessively negative.
- The crankcase pressure sensor (3) senses the blowby gas pressure (crankcase pressure).
- If the engine controller judges from the value sensed by the crankcase pressure sensor (3) that the filter is clogged, it displays failure code CA555 and then displays CA556 if the pressure increases further.
- Relief valve (4) is installed inside case (1) and operates to protect the KCCV ventilator and engine when filter (6) is blocked.

CDR valve (ENG107-A18A-041-K-00-A)

CDR: Abbreviation for Crankcase Depression Regulator



B4E12125

1. Diaphragm

2. Spring

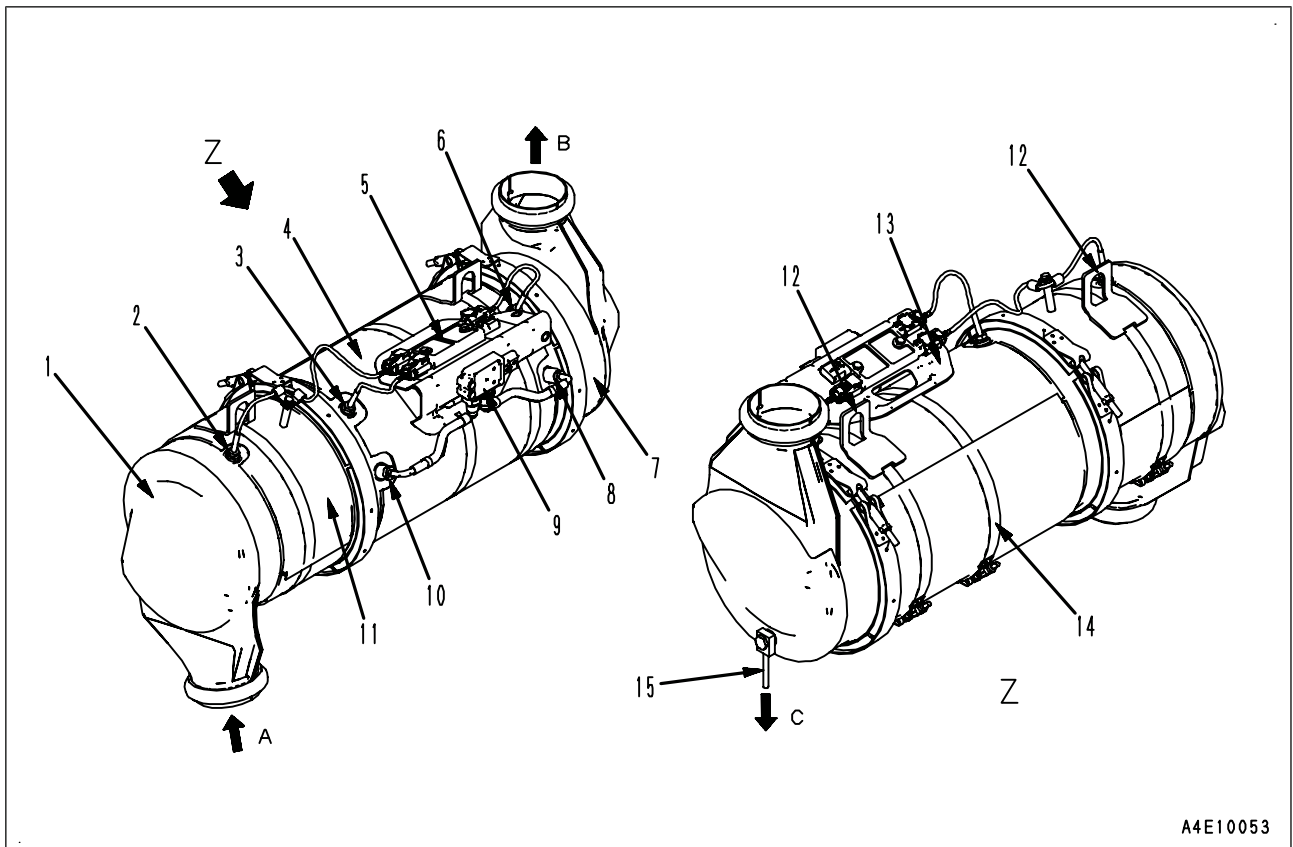
A: Crankcase side

B: KVGIT side (intake side)

- The CDR valve is a regulator valve which prevents excessive negative crankcase pressure (P1).
- Normally, diaphragm (1) is pushed up by spring (2) and blowby gas flows from crankcase side (A) to KVGIT side (intake side) (B).
- When intake air flow at KVGIT side (intake side) (B) increases and crankcase pressure (P1) decreases, the reaction force of spring (2) yields to ambient pressure (P2). The diaphragm shuts the passage and temporarily blocks the flow.
- Then, when blowby gas accumulates in the crankcase and pressure (P1) recovers, the diaphragm is pushed up again and blowby gas starts to flow again.

KDPF (WA380-A9H0-041-K-00-A)

- ★ KDPF: Abbreviation for Komatsu Diesel Particulate Filter
- ★ The shape is subject to machine models.



A4E10053

1. Inlet unit
2. KDOC inlet temperature sensor
3. KDOC outlet temperature sensor
4. KCSF unit
5. Centralized connector box
6. KDPF outlet temperature sensor
7. Outlet unit
8. KDPF differential pressure sensor port
9. KDPF differential pressure sensor
10. KDPF differential pressure sensor port
11. KDOC unit
12. Hanger bracket
13. Sensor bracket
14. Sensor bracket band
15. Water drain port

A: From KVGT

B: Exhaust

C: Water drain

- KDPF consists of inlet unit (1) which receives the exhaust gas, KDOC unit (11) which houses the oxidation catalyzer, KCSF unit (4) which houses the soot-capturing filter with catalyzer, and outlet unit (7) which contains the "weir" to discharge the exhaust gas and prevent rainwater from entering KCSF unit (4) through the outlet.
- KDOC unit (11) consists of ceramic honeycomb with oxidation catalyzer.

10 Structure and function

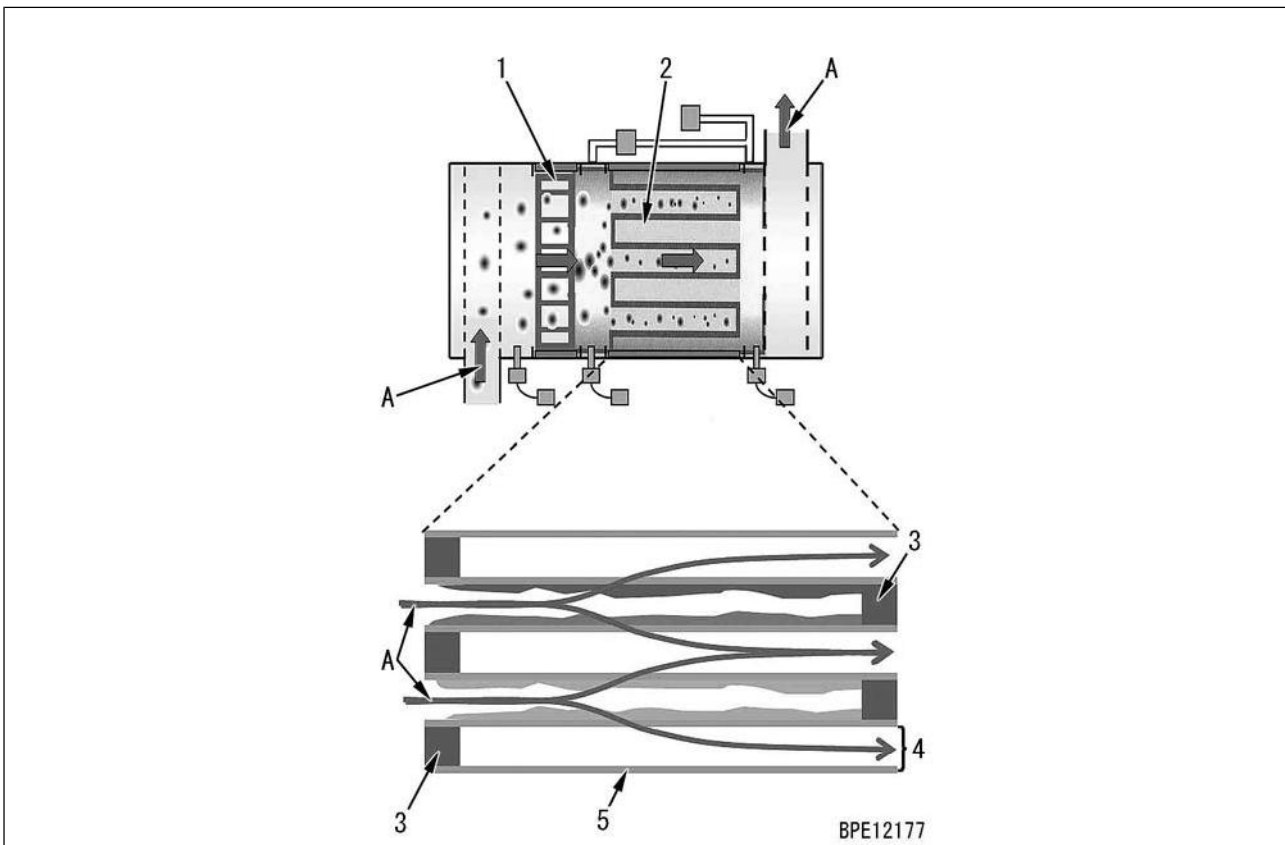
KDPF

- The ceramic honeycomb works to properly oxidize NO (nitrogen monoxide) contained in the exhaust gas into NO₂ (nitrogen dioxide) and burn the fuel injected during automatic regeneration and manual stationary regeneration (*1).
- The ceramic honeycomb is protected with a mat made of special fibers to prevent breakage of the ceramic under the vibrations from the engine and chassis. This mat also protects the outside of KDPF from being heated by the ceramic which becomes hot during operation.
- KCSF unit (4) also consists of ceramic honeycomb with oxidation catalyzer, similarly to KDOC unit (11). This ceramic honeycomb captures soot.
- Inside KCSF (4), there are many cells partitioned by ceramic walls. Cells plugged at the inlet side and cells plugged at the outlet side are alternately arranged.
- KDPF has three temperature sensors and one differential pressure sensor (integrated sensor of KDPF differential pressure sensor and KDPF outlet pressure sensor).
- The 3 temperature sensors are used to monitor the functions of KDOC (11) and KCSF (4) and troubleshoot various items by combining the sensed temperatures.
- The differential pressure sensor detects the soot level accumulated in KCSF (4) by detecting the pressure difference over KCSF. It is also used to troubleshoot many items, similarly to the temperature sensors.

*1: Soot purification (oxidation) treatment.

⚠ The surface and nearby piping of KDPF are very hot while the engine is running and for a time after the engine is stopped. When you are required to work near KDPF, take extreme care not to get burnt.

Function (ENG107-A9H0-042-K-00-A)



- A: Flow of exhaust gas
 1 KDOC (oxidation catalyzer)
 2 KCSF
 3 Sealing (ceramic)
 4 Cell
 5 Ceramic honeycomb

- KDPF is installed to meet the latest very severe emission regulations. It captures almost all PM (Particulate Matter) contained in the engine exhaust gas to clean the exhaust gas.
- KCSF (2) is made of ceramic. Inside KCSF, there are many cells partitioned by ceramic walls. Cells plugged at the inlet side and cells plugged at the outlet side are alternately arranged.
- The soot deposited in KCSF (2) are naturally oxidized and burned away by the effect of KDOC (1), in operating conditions with relatively high exhaust gas temperatures. (This is referred to as "passive regeneration".)
- On the other hand, when the exhaust temperature is relatively low, in conditions such as continued low load operations, the deposit of soot in KCSF (2) increases.
- The engine controller continuously monitors the amount of deposited soot by estimating from the operating conditions and calculating from the signals of the differential pressure sensor installed to KCSF (2).
- When the soot deposit exceeds a certain level, and the engine is operated with the exhaust gas temperature exceeding a certain level, the engine controller executes "automatic regeneration" to burn (oxidize) the soot.
- During automatic regeneration, the engine controller automatically controls the fuel injection timing and the KVGT to raise the exhaust temperature. This operation is called "exhaust temperature-raising control".
- As the exhaust temperature increases, the engine controller automatically performs calculations based on the exhaust temperature at KDOC (1) inlet and flow of the exhaust gas, so that KCSF (2) can efficiently burn (oxidize) the soot.
- KDOC (1) burns (oxidizes) the soot by utilizing the function of the catalyzer.
- Automatic regeneration is not performed when regeneration is executed from the machine monitor, or when the outside air temperature is extremely low, and when the exhaust gas temperature is not high enough to burn soot because the engine has been operated at low loads for a while. Thus, soot deposit in the KCSF (2) will increase.
- If the soot deposit in the KCSF (2) exceeds a certain level, it will be necessary to perform "manual stationary regeneration" to burn away (oxidize) the soot in the KCSF (2).
- If the soot deposit exceeds the acceptable level, the exhaust gas flow will be restricted. This can increase fuel consumption, degrade engine combustion, or cause other problems.
- If the soot deposit exceeds the limit to safely perform "manual stationary regeneration", the KDPF fails and replacement becomes unavoidable. Make sure to follow the procedures in the Operation and Maintenance Manual when performing "manual stationary regeneration"

Types of regeneration (WA380-A9H0-042-K-00-A)

★ Regeneration refers to a process of purifying (oxidizing) the soot deposited in the soot collecting filter (KCSF) inside the KDPF.

1. Passive regeneration

When the exhaust temperature is relatively high, the catalyst effect of the KDOC to oxidize soot will be stronger and the soot deposit in the KCSF will be naturally burned away.

2. Active regeneration

1) Automatic regeneration

If the soot deposit exceeds a certain level, the engine controller switches to exhaust temperature-raising control (*1), performs fuel dosing (*2), and automatically starts the regeneration process. Another type of automatic regeneration is performed by the engine controller at certain intervals, regardless of the amount of soot deposited in the KCSF.

*1: The fuel injection timing and the KVGT are controlled to raise the exhaust temperature.

*2: Fuel is injected to increase the exhaust temperature and accelerate the regeneration process. No. 1, 2, and 3 injectors are used for fuel dosing.

2) Manual stationary regeneration

When the exhaust temperature does not reach a certain level due to the machine operating condition, or when regeneration is disabled by the operator, automatic regeneration will not be performed and the soot deposit in the KCSF may increase. In such conditions, the machine monitor displays a manual stationary regeneration request on the screen. The operator must perform regeneration by operating the machine monitor on its screen. A regeneration feature is also provided for the technician who should use this feature from the machine monitor menu after engine controller replacement, KDPF replacement, and KCSF ash cleaning. (= Regeneration for service)

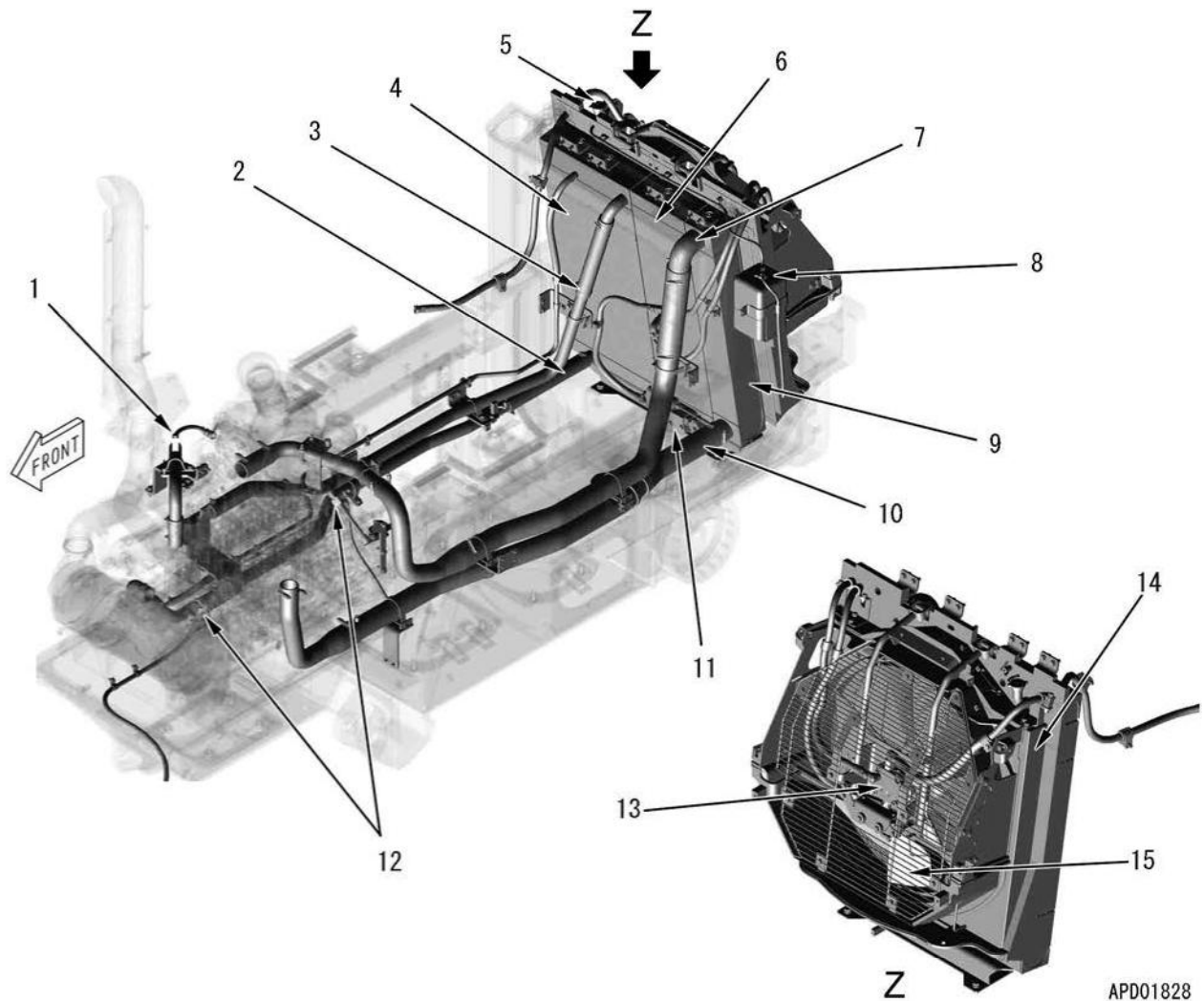
- A KDPF drying feature is provided to prevent excessive accumulation of unburned fuel in the KDPF when the machine is operated for a long time with low exhaust temperature.

10 Structure and function

KDPF

- When certain conditions are met, the engine controller automatically switches control to increase the exhaust temperature to dry the KCSF. If some of the conditions for automatic drying are not met, manual stationary regeneration may be requested.
 - ★ Follow the procedures in the Operation and Maintenance Manual when starting and stopping KDPF regeneration.
 - ★ Be sure to use ultra-low-sulfur diesel fuel. Non-specified fuels may cause KDPF failure.
 - ★ Be sure to use the specified Komatsu genuine oil for the KDPF. Non-specified oils may cause KDPF clogging in a short time, resulting in increased fuel consumption or KDPF failure.
 - ★ Do not modify the KDPF itself or exhaust pipes. Modifications disturb normal operation of the KDPF, leading to a failure.
 - ★ Do not apply impacts to the KDPF by stepping on, dropping, or striking it. The KDPF contains a ceramic honeycomb, which can be damaged by strong impacts.
 - ★ The engine controller performs automatic regeneration even when the amount of soot deposit is low. Since this is programmed to maintain the KDPF performance, this is normal.
 - ★ During automatic regeneration and manual stationary regeneration, the KVGT automatically operates and the engine sound changes. The flow of exhaust gas through the KDPF changes and the exhaust sound changes, but this is normal.
 - ★ During automatic regeneration and manual stationary regeneration, especially at low temperatures, white smoke may come out from the exhaust pipe for a short time, but this is normal. Be sure to perform regeneration at a well ventilated place since carbon monoxide can be produced.
 - ★ During automatic regeneration and manual stationary regeneration, a strange odor may be smelled from the exhaust pipe, but this is normal.
 - ★ During automatic regeneration and manual stationary regeneration, the exhaust temperature at the exhaust pipe can exceed 650 °C. Make sure that there is no flammable material near the exhaust system to prevent fire. Make sure that nobody is standing in front of the exhaust pipe, and pay sufficient attention to safety of the environment.
 - ★ KDPF temperature values are shown below for reference.

	DOC_In (KDOC inlet temperature sensor)	DOC_Out (KDOC outlet temperature sensor)	KDPF_Out (KDPF outlet temperature sensor)
Not regenerating (idling)	100 to 250 °C		
Regenerating (under exhaust temperature-raising control: 1,000 rpm)	100 to 250 °C	400 to 550 °C	

Cooling system (D61-B000-041-K-00-A)


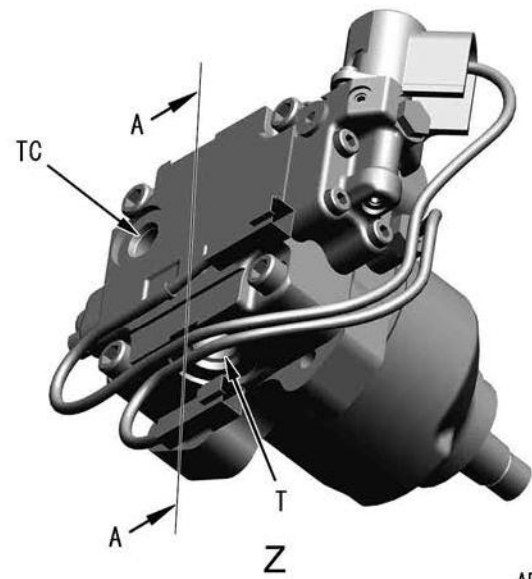
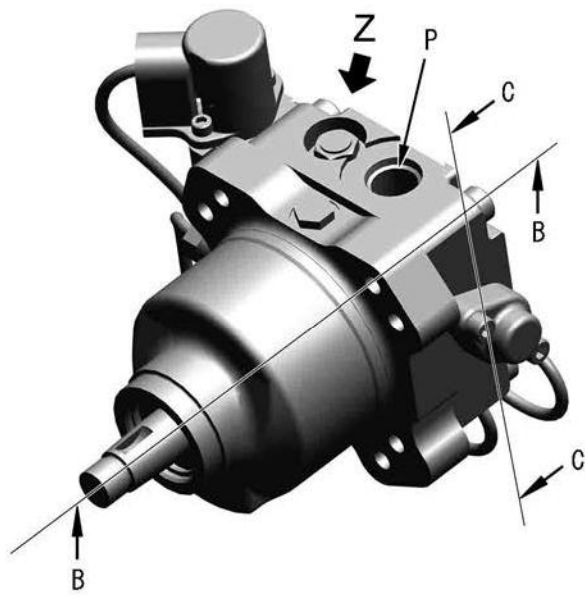
1. Bleeder
2. Radiator outlet port hose
3. Radiator inlet port hose
4. Radiator
5. Radiator cap
6. Oil cooler
7. Aftercooler inlet port
8. Reservoir tank
9. Aftercooler
10. Aftercooler outlet port hose
11. Oil cooler bypass and HST charge safety valve
12. Coolant drain valve (2 pieces)
13. Cooling fan motor
14. Shroud
15. Cooling fan

Specifications (D61-B000-030-K-00-A)

Item	Radiator	Oil cooler	Aftercooler
Core type	Laminated aluminum	Laminated aluminum	Laminated aluminum
Fin pitch (mm)	5.08/2	5.08/2	5.08/2

10 Structure and function**Cooling system**

Item	Radiator	Oil cooler	Aftercooler
Total heat dissipation area (m ²)	59.15	38.01	14.48
Cracking pressure of pressure valve (kPa {kg/cm ² })	110 ± 15 {1.1 ± 0.15}	-	-
Cracking pressure of vacuum valve (kPa {kg/cm ² })	4.8 to 10.3 {0.05 to 0.11}	-	-

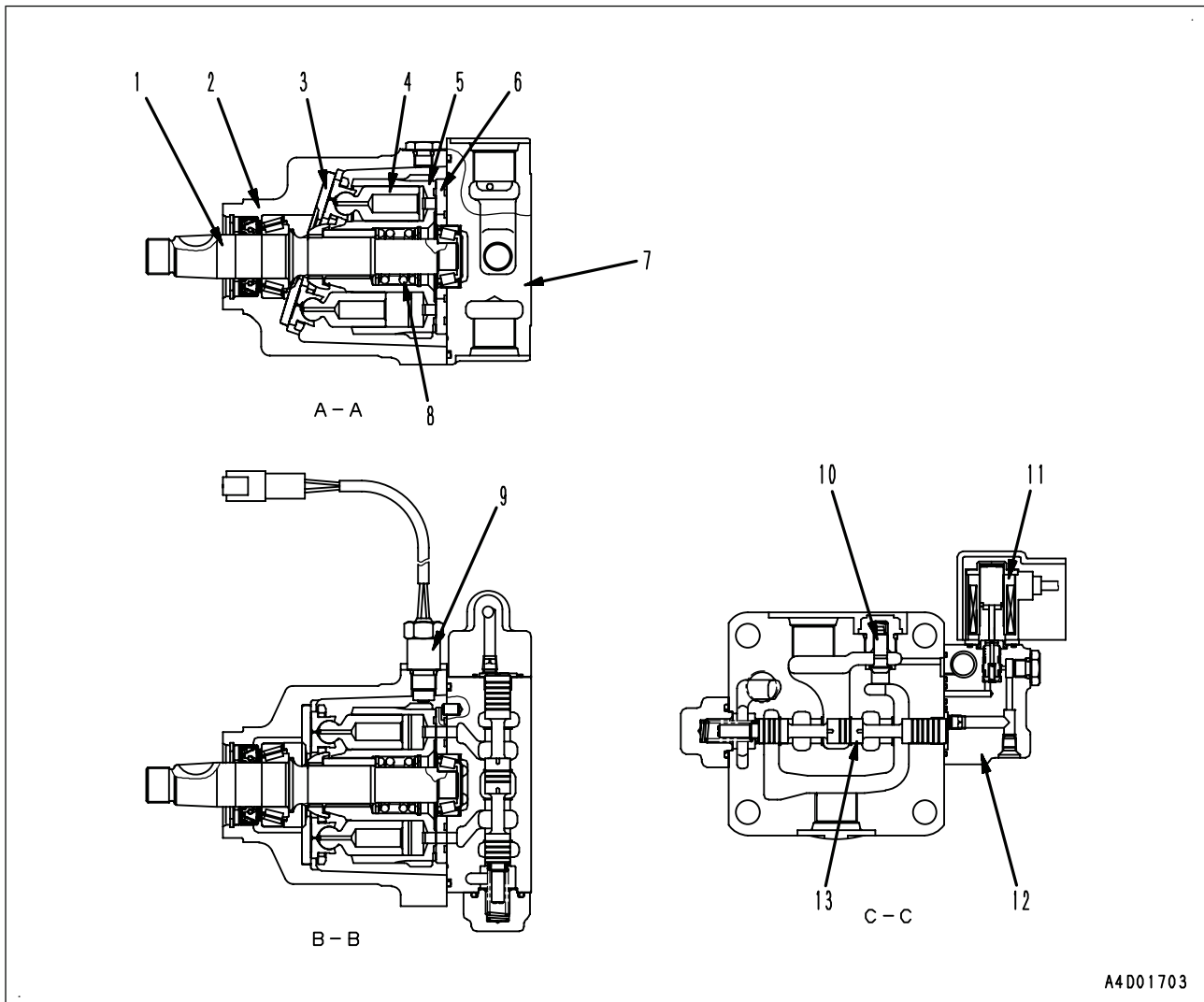
Cooling fan motor (D61-B5L0-041-K-00-A)

APD01702

P: From cooling fan pump
T: To oil cooler
TC: To hydraulic tank

10 Structure and function

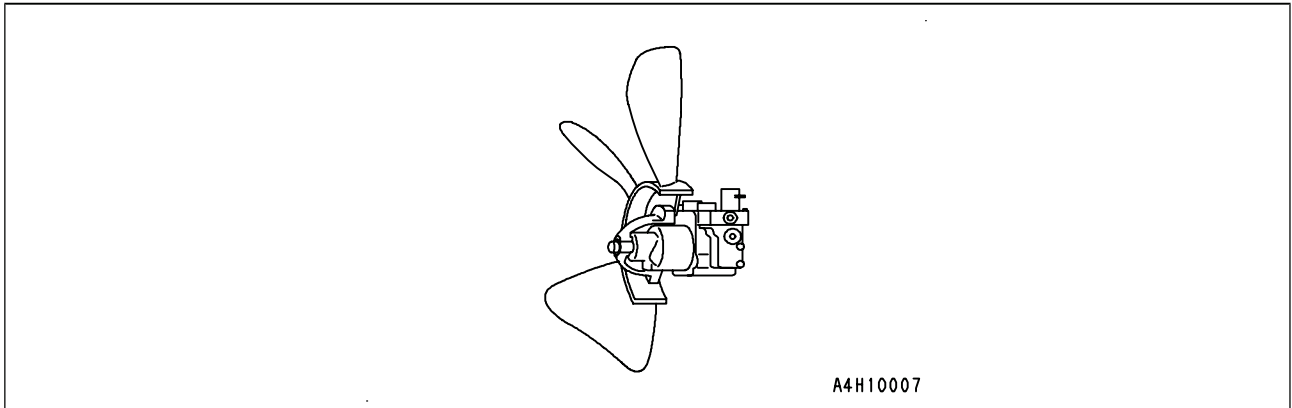
Cooling fan motor



1. Output shaft
2. Case
3. Thrust plate
4. Piston
5. Cylinder block
6. Valve plate
7. End cover
8. Center spring
9. Cooling fan speed sensor
10. Suction valve
11. Cooling fan reverse solenoid valve
12. Pilot valve
13. Spool (for reversible valve)

Structure

- This fan motor is installed within the blade width as shown in the figure.


Specifications (D61-B5L0-030-K-00-A)

Model	LMF28
Type	Fixed displacement swash plate type piston motor
Motor capacity (cm ³ /rev)	28
Rated speed (rpm)	1,700
Rated flow rate (ℓ/min)	46.2
Cracking pressure of safety valve (MPa {kg/cm ² })	24.5 {250}
Cracking pressure of check valve (MPa {kg/cm ² })	0.044 {0.45}

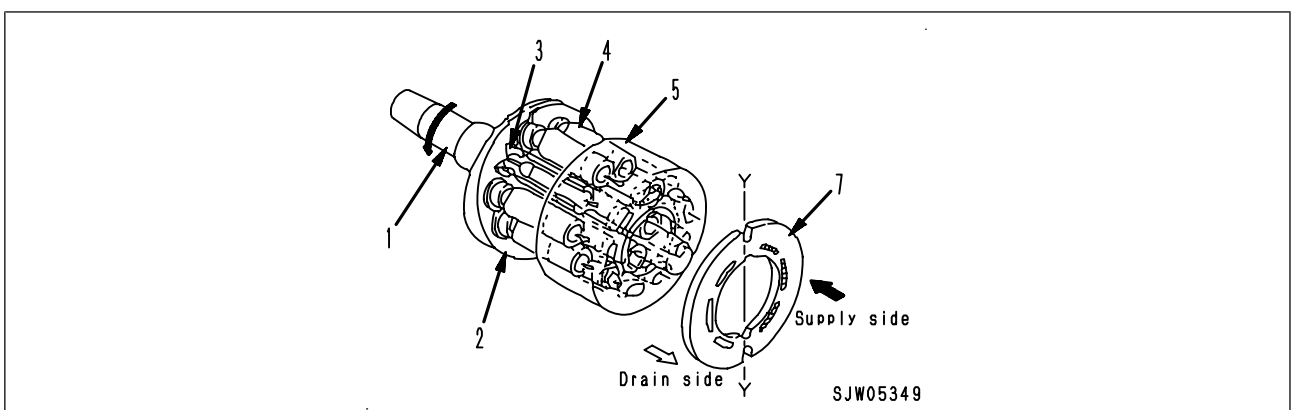
Hydraulic motor (D65-B5N0-041-K-00-A)

Function (D65-B5N0-042-K-00-A)

- This hydraulic motor is called a swash plate type axial piston motor. It converts the energy of the pressurized oil sent from the hydraulic pump into rotary motion.

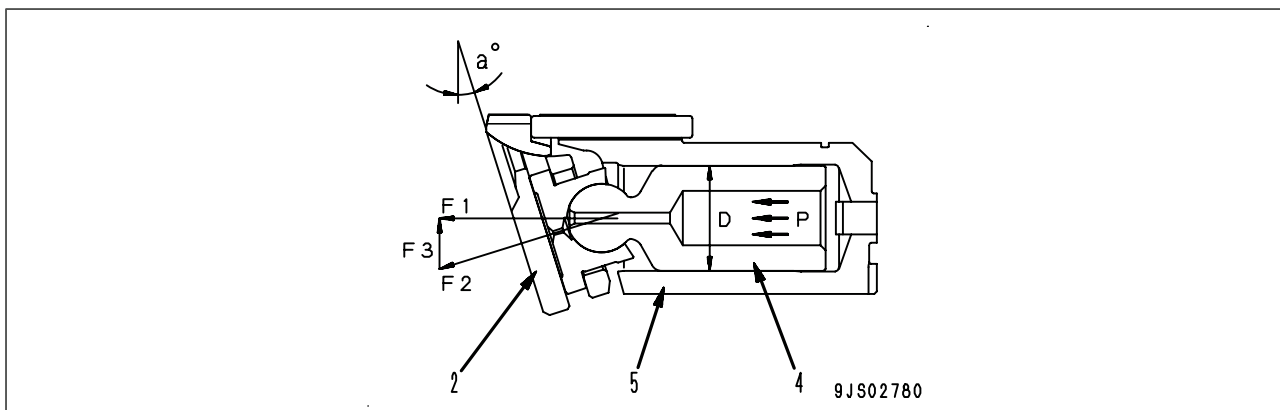
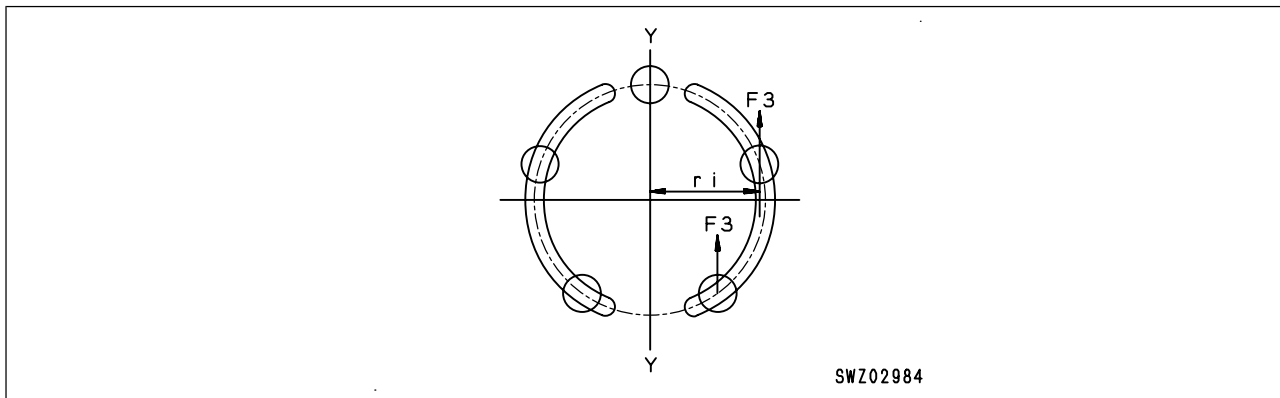
Principle of operation (D65-B5N0-04B-K-00-A)

- The pressurized oil sent from the pump flows through valve plate (7) into cylinder block (5). This pressurized oil can flow into cylinder chambers on only to one side of the (supply side) (Y - Y) line connecting the top dead center and bottom dead center of the stroke of piston (4).
- The pressurized oil sent to one side of cylinder block (5) presses piston (4) [2 or 3 pieces] and generates force (F1) [$F1 \text{ (kg)} = P \text{ (kg/cm}^2) \times \pi D^2/4 \text{ (cm}^2)$].
- This force is applied to thrust plate (2). Since thrust plate (2) is fixed at an angle of ("a") degrees to the output shaft (1), the force is divided into components (F2) and (F3).
- Among them, radial component (F3) generates torque ($T = F3 \times r_i$) against the (Y - Y) line connecting the top dead center and bottom dead center.
- The result of this torque [$T = \sum(F3 \times r_i)$] rotates cylinder block (5) through the piston (4).
- Since this cylinder block (5) is splined to the output shaft (1), the output shaft (1) rotates to transmit the torque.



10 Structure and function

Cooling fan motor



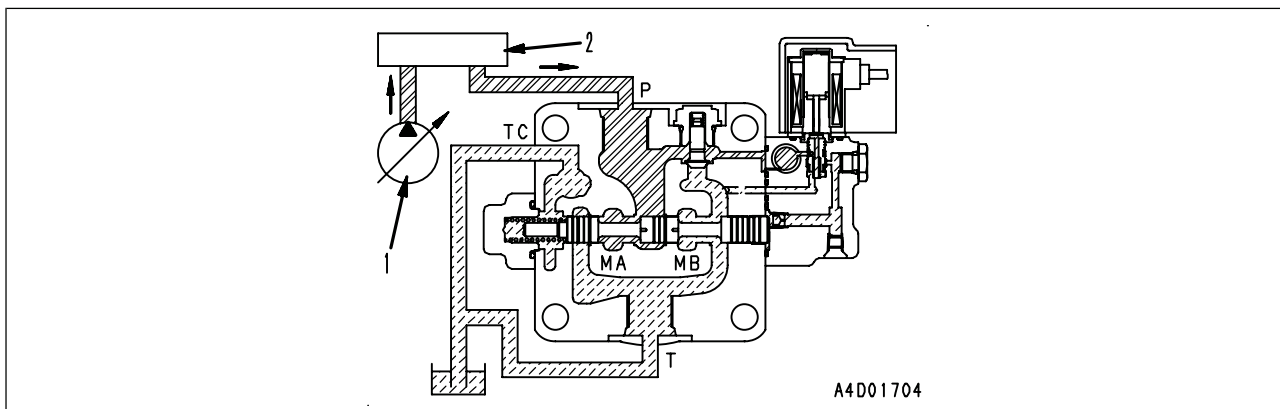
Suction valve (D61-B6D0-040-K-00-A)

Function (D61-B6D0-042-K-00-A)

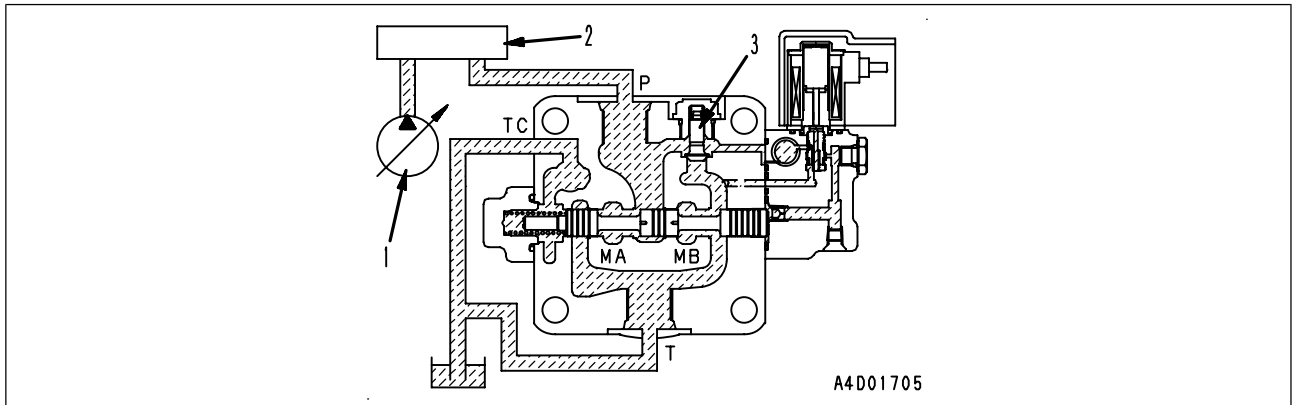
- When the pump stops rotating, the hydraulic oil does not flow into the motor. Since the motor continues rotation by the force of inertia, the pressure at the outlet of the motor increases.
- When the oil stops flowing in from inlet port (P), the suction valve sucks in the oil on the outlet side and supplies it to port (MA), compensating for the lack of oil on that side to prevent cavitation.

Operation (D61-B6D0-044-K-00-A)

1. When pump is started



2. When pump is stopped
 - The pressurized oil from work equipment/ cooling fan pump (1) is supplied to port (P) through control valve (2). When the pressure on the (MA) side increases and generates starting torque in the motor, the motor starts to rotate. The pressurized oil on the motor outlet (MB) side returns to the hydraulic tank through port (T).



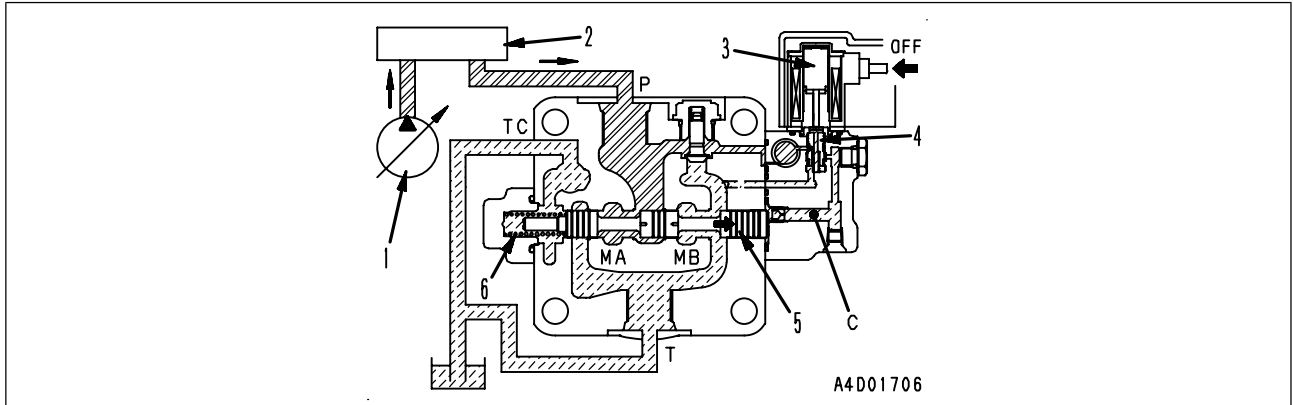
- When the engine is stopped and the input speed of work equipment/ cooling fan pump decreases to 0 rpm, no pressurized oil is supplied from work equipment/ cooling fan pump (1) to port (P) through control valve (2). As the pressurized oil is not supplied to (MA) side of the motor, the motor speed decreases gradually to stop.
- When the motor shaft is rotated by the force of inertia while the oil flow in port (P) is decreasing, the oil in port (T) on the outlet side is sent by suction safety valve (3) to the (MA) side to prevent cavitation.

Reversible valve (D61-B6E0-040-K-00-A)

Operation

1. When reversible valve ON-OFF solenoid is "de-energized"

- When reversible valve ON-OFF solenoid (3) is "de-energized", the pressurized oil sent from work equipment/ cooling fan pump (1) through control valve (2) is cut off by ON-OFF selector valve (4), and port (C) is connected to the tank circuit.
- As a result, reversible valve spool (5) is pushed to the right by reversible valve spring (6), the motor port (MA) opens, the pressurized oil flows in, and the motor begins normal rotation [clockwise].

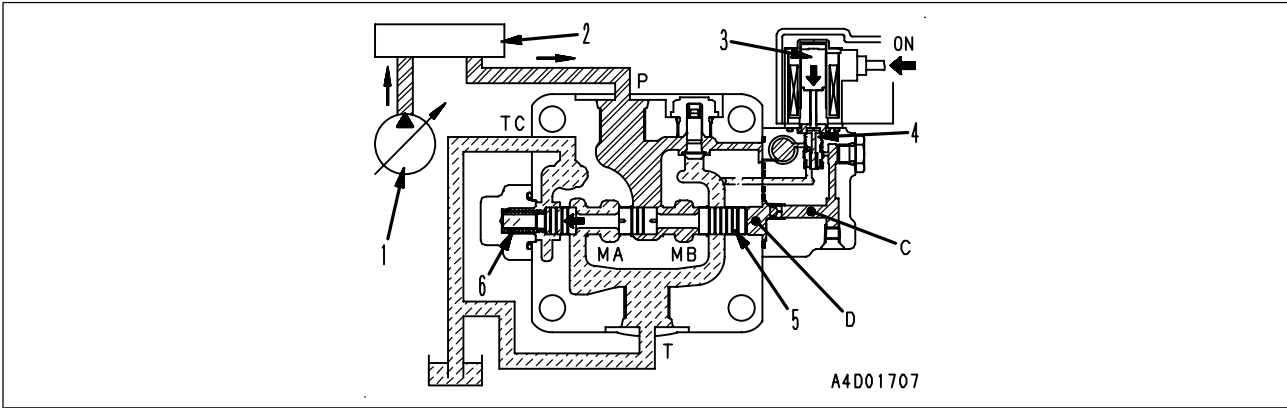


2. When reversible valve ON-OFF solenoid is "energized"

- When reversible valve ON-OFF solenoid (3) is "energized", ON-OFF selector valve (4) switches and the pressurized oil from work equipment/ cooling fan pump (1) flows through control valve (2) and port (C) into spool chamber (D).
- The pressurized oil in chamber (D) pushes reversible valve spool (3) to the left against reversible valve spring (6). As a result, motor port (MB) opens and pressurized oil flows in and the motor begins reverse rotation [counterclockwise].

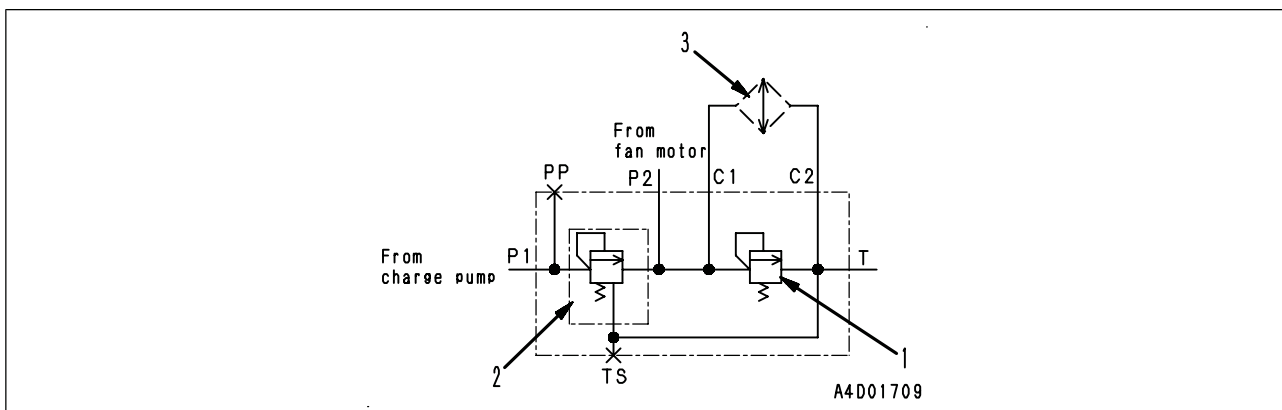
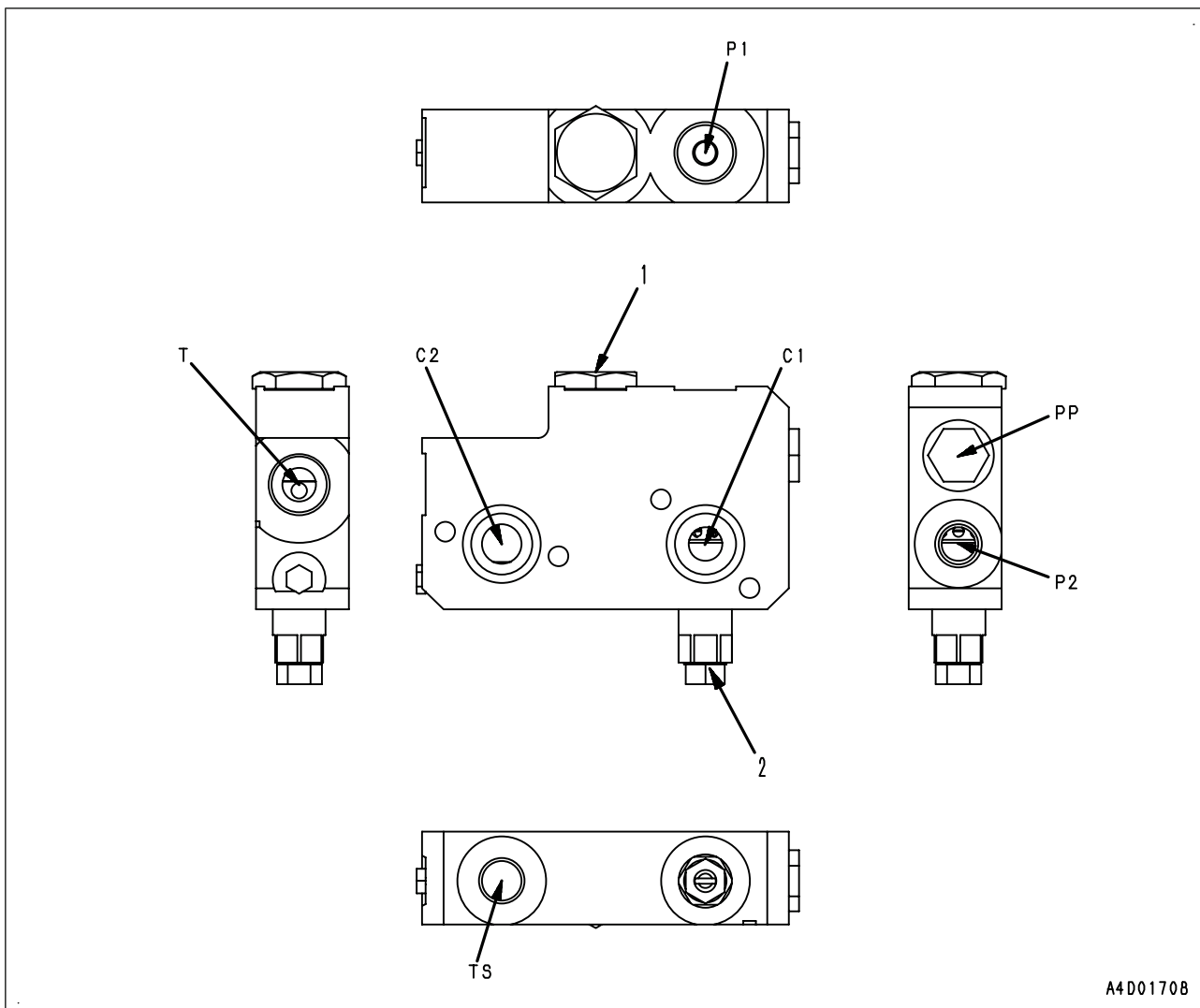
10 Structure and function

Cooling fan motor



Oil cooler bypass and HST charge safety valve (D61-B8PB-041-K-00-A)

- ★ HST: Abbreviation for Hydrostatic Transmission
- ★ This valve consists of the oil cooler bypass valve and HST charge safety valve.



10 Structure and function

Oil cooler bypass and HST charge safety valve

C1: To oil cooler inlet

C2: From oil cooler outlet

P1: From charge filter

P2: From cooling fan motor

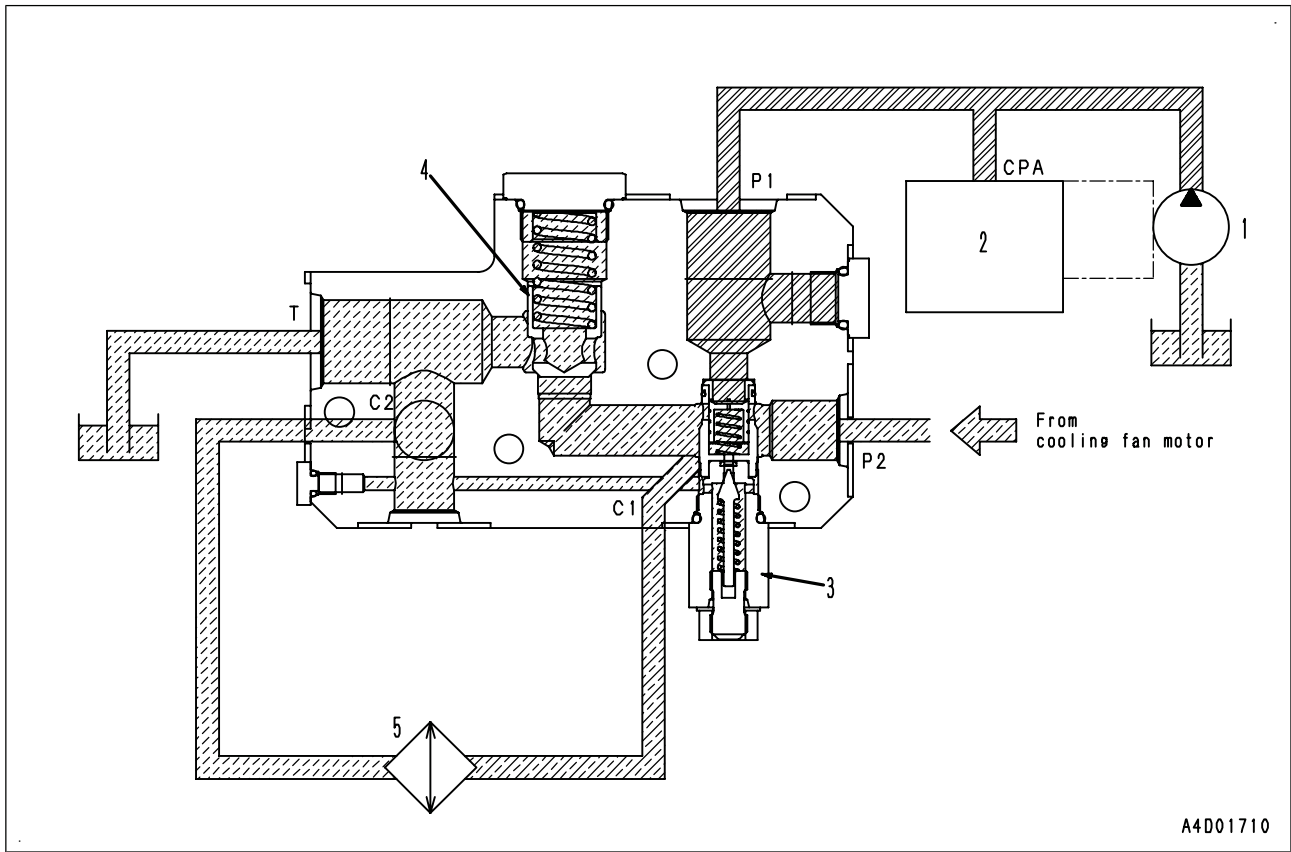
T: To hydraulic tank

TS: Plug

PP: Plug

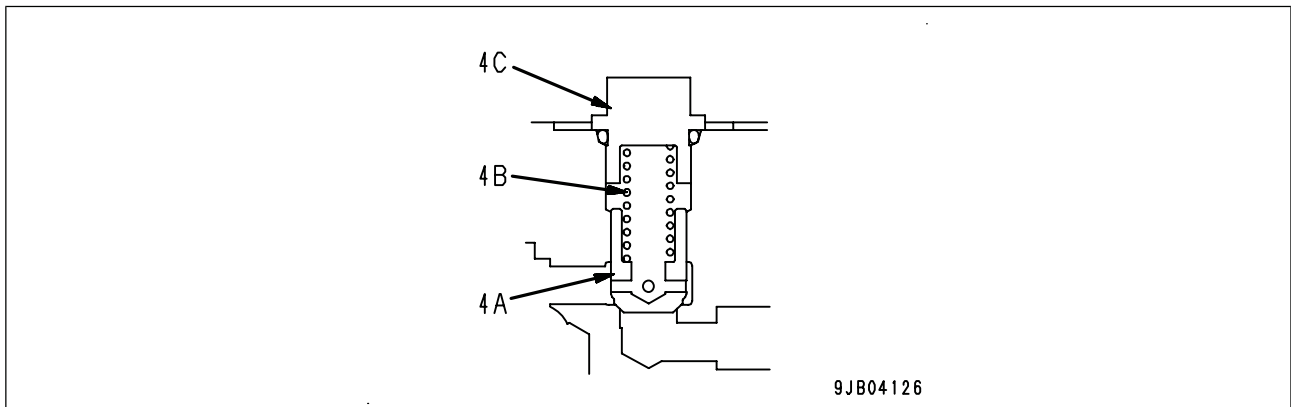
1. Oil cooler bypass valve
2. HST charge safety valve
3. Oil cooler

Oil cooler bypass valve (D61-B8PB-041-K-01-A)



A4D01710

1. Charge pump
2. HST pump
3. HST charge safety valve
4. Oil cooler bypass valve
5. Oil cooler



9JB04126

- 4A. Poppet
- 4B. Spring
- 4C. Plug

Function (D61-B8PB-042-K-00-A)

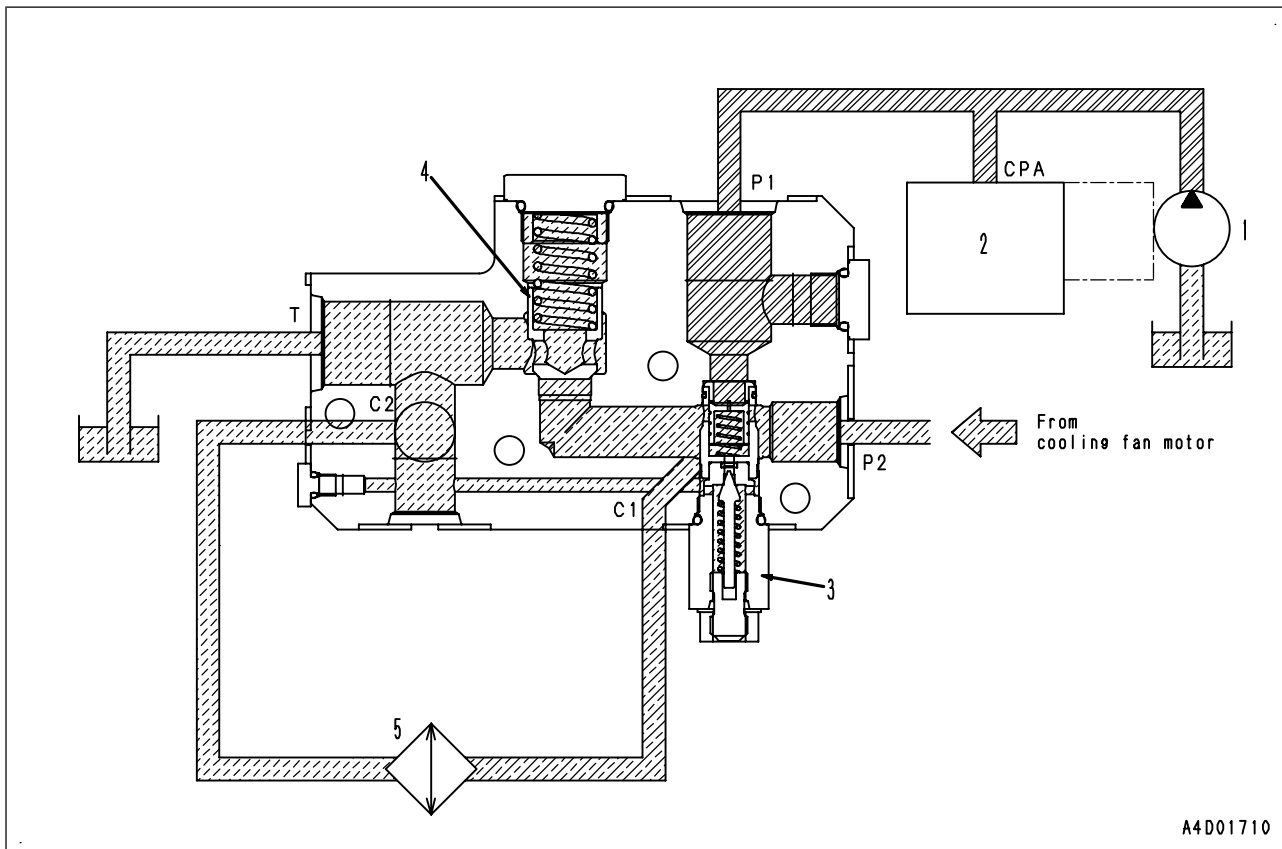
- Oil cooler bypass valve (4) is installed together with HST charge safety valve (3). It regulates oil pressure inside the oil cooler (5) to the set pressure.
Set pressure: 0.49 MPa {5 kg/cm²} (cracking pressure)

10 Structure and function

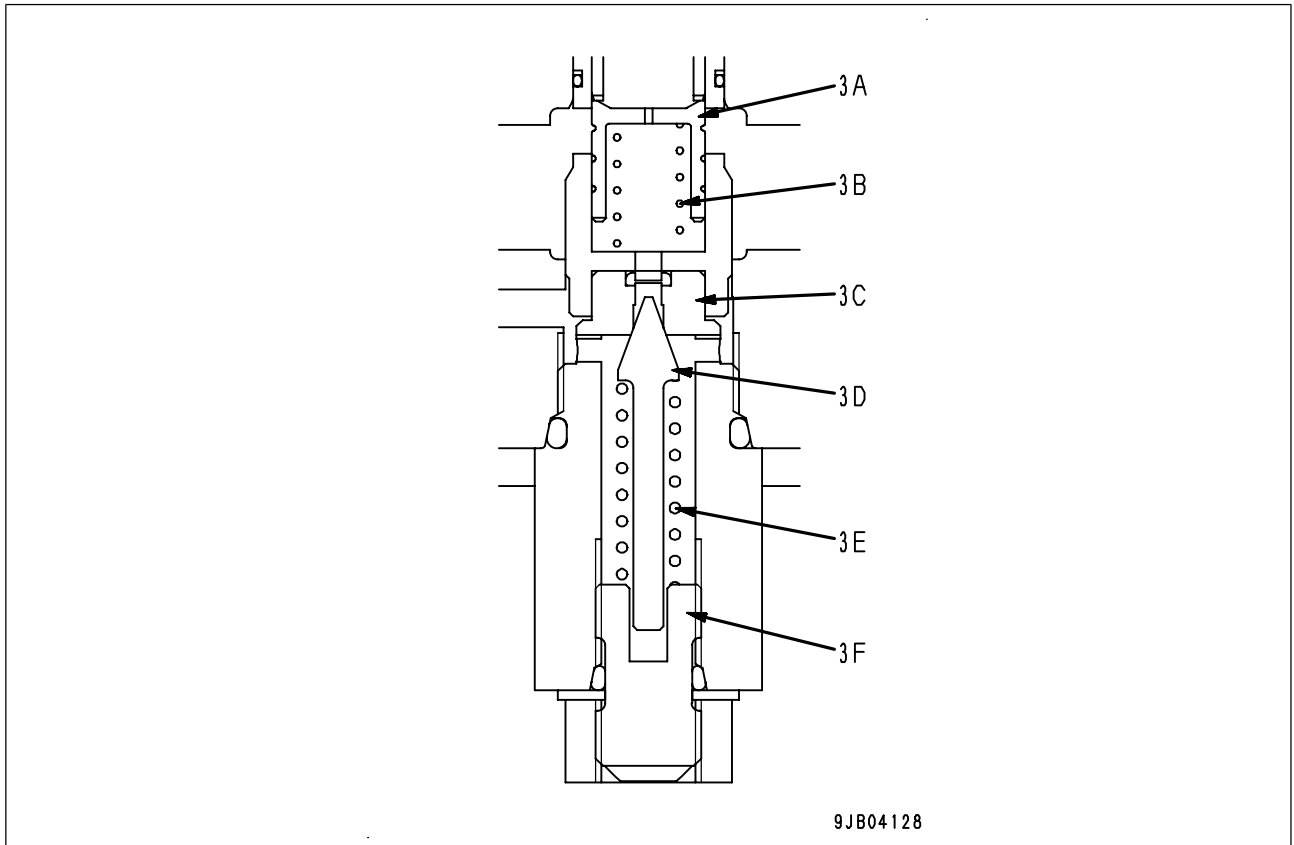
Oil cooler bypass and HST charge safety valve

HST charge safety valve (D61-C2V0-041-K-00-A)

★ HST: Abbreviation for Hydrostatic Transmission



1. Charge pump
2. HST pump
3. HST charge safety valve
4. Oil cooler bypass valve
5. Oil cooler



- 3A. Valve
- 3B. Spring
- 3C. Valve seat
- 3D. Poppet
- 3E. Spring
- 3F. Adjustment screw

Function (D61-C2V0-042-K-00-A)

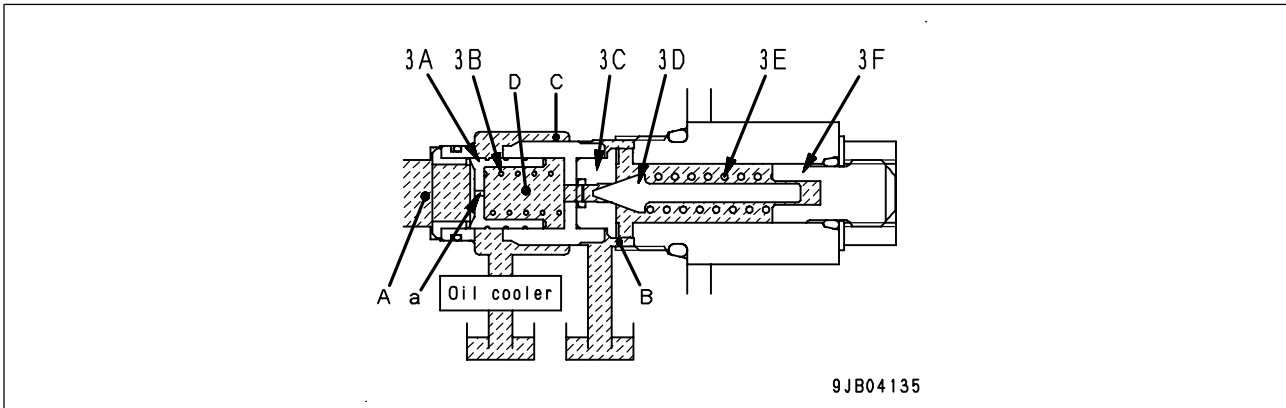
- HST charge safety valve (3) is installed together with oil cooler bypass valve (4). It regulates oil pressure inside HST charge circuit to the set pressure.
Set pressure: 2.7 MPa {28 kg/cm²} (cracking pressure)

10 Structure and function

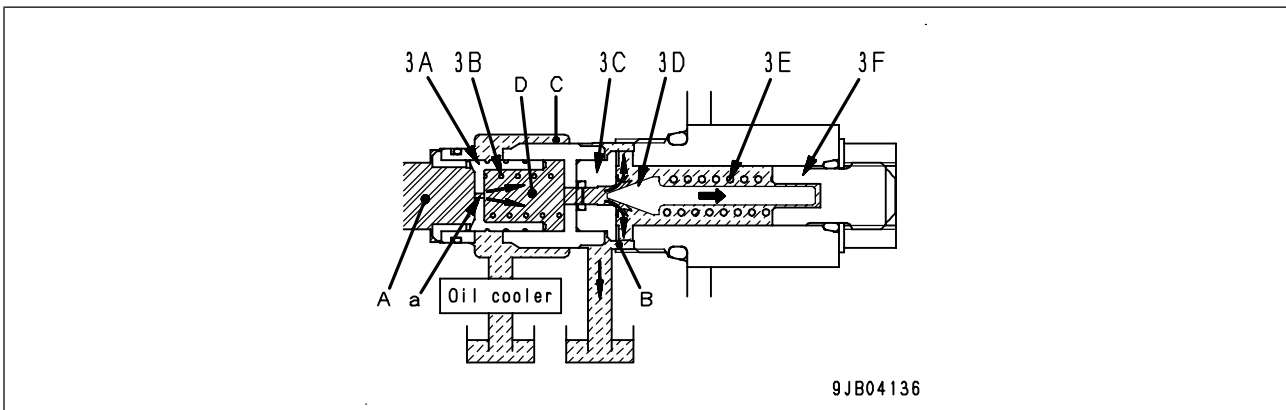
Oil cooler bypass and HST charge safety valve

Operation (D61-C2V0-044-K-00-A)

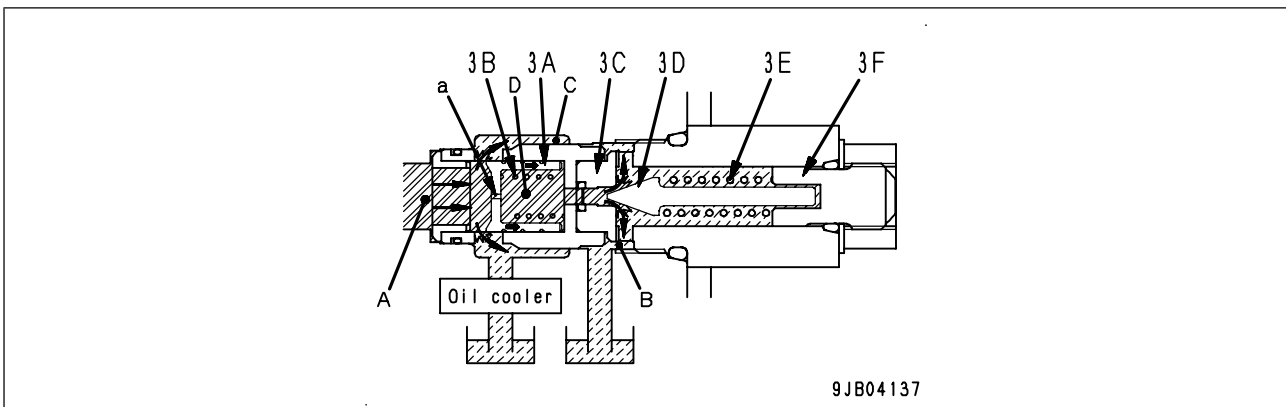
- Port (A) is connected to the charge circuit. Port (B) is connected to the drain circuit. Port (C) is connected to the tank drain circuit through the oil cooler. Oil flows through orifice (a) of valve (3A) to fill chamber (D). Poppet (3D) is in firm contact with valve seat (3C).



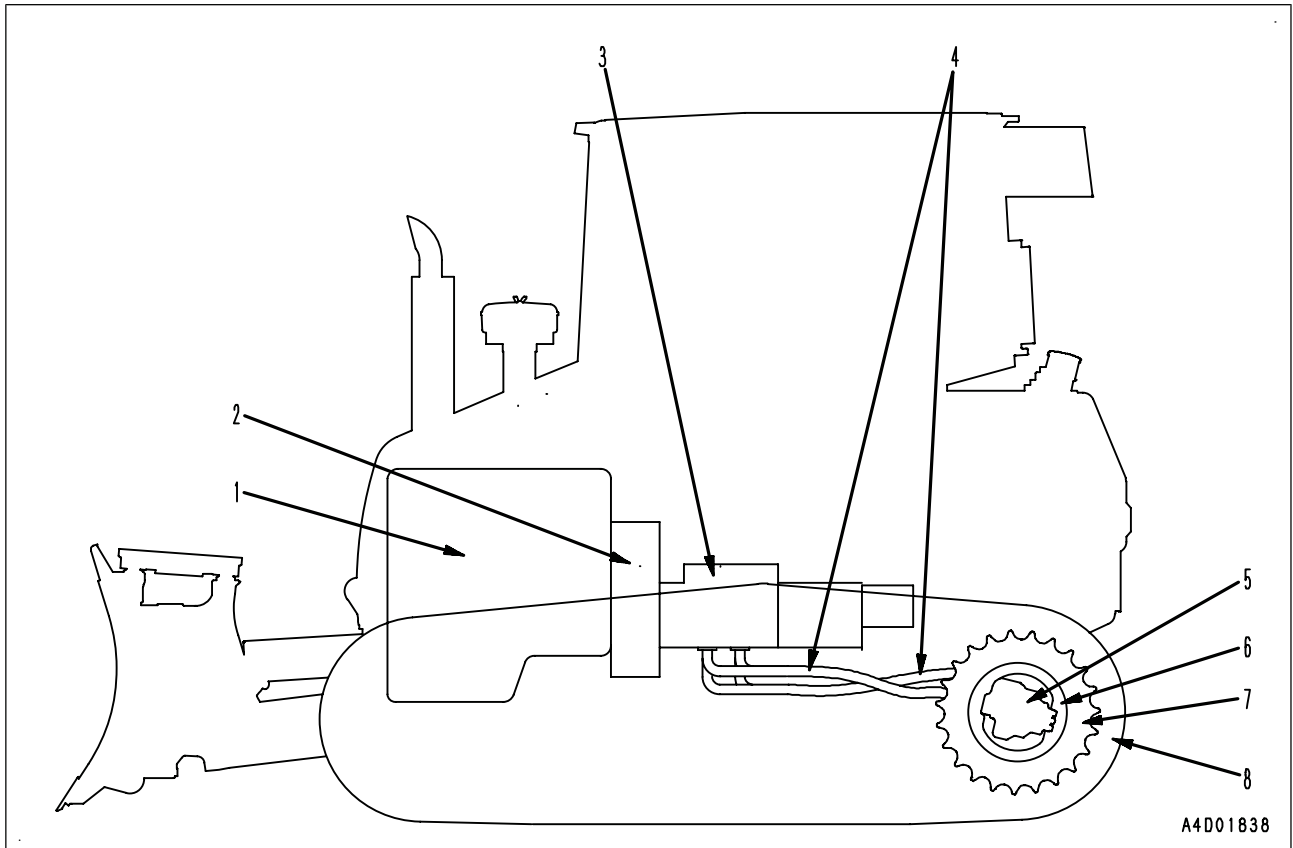
- When abnormal pressure is generated in the circuit or when the oil pressure in port (A) and chamber (D) increases to the pressure set with spring (3E) while the shuttle valve of the HST motor is in the neutral position, poppet (3D) is pushed to the right and the oil in chamber (D) flows into port (B), thus the pressure in chamber (D) decreases.



- When the oil pressure in chamber (D) decreases, orifice (a) of valve (3A) generates differential pressure between port (A) and chamber (D). Valve (3A) is pushed to the right by the pressure in port (A) and the oil in port (A) is released. As a result, the pressure in the charge circuit does not increase.



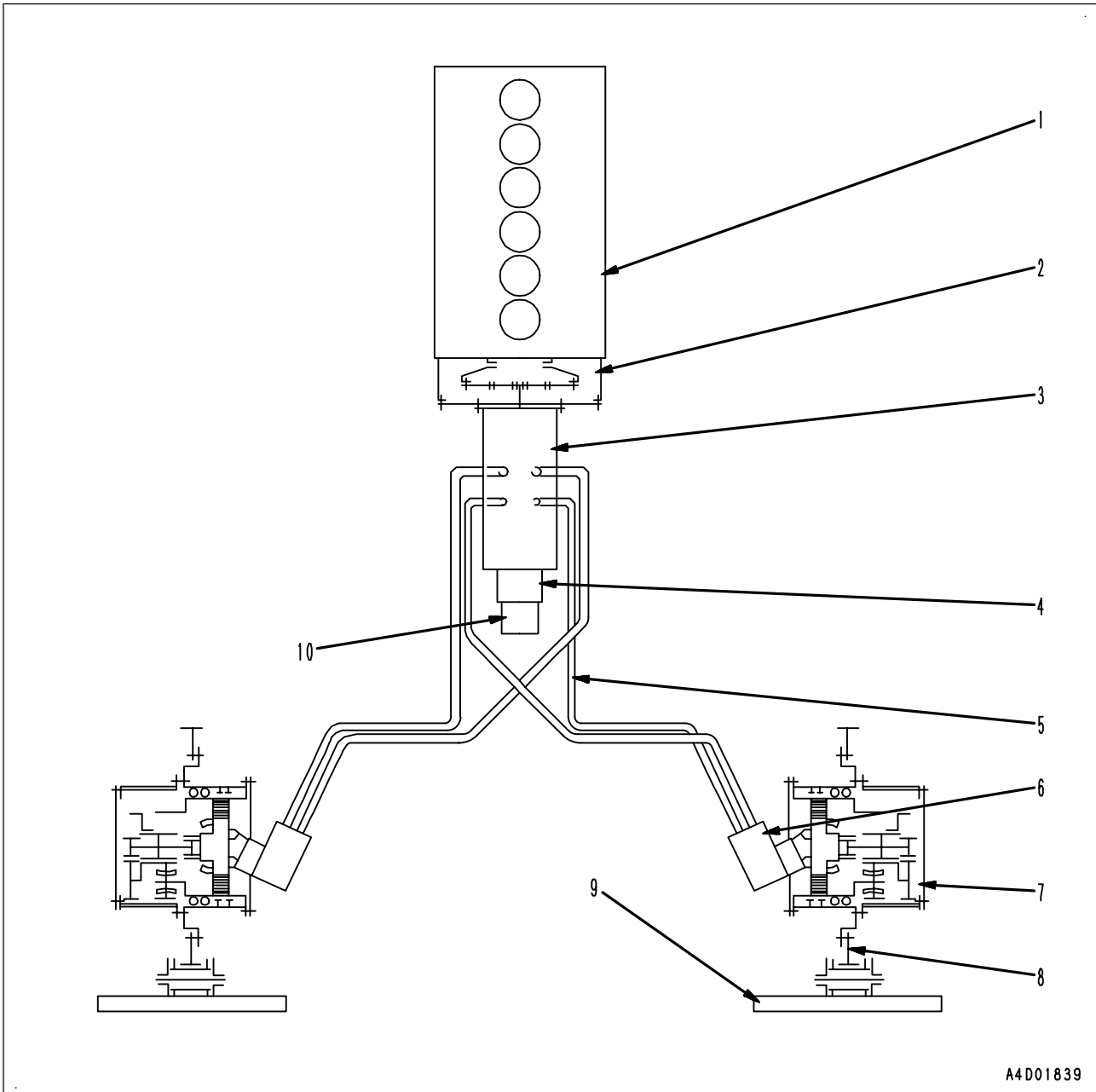
Power train (ALL-C100-001-K-00-A)

Power train system (D61-C100-041-K-00-A)

Structure

- The power generated by engine (1) is reduced in torsional vibration by damper (2), and then transmitted to the HST pump input shaft.
- In HST pump (3), the swash plate type piston pumps for the right and left travels are coupled in tandem. The hydraulic power is transmitted from each pump through high-pressure hoses (4) to right and left HST motors (5) respectively.
- HST pump (3) changes the direction and quantity of discharge steplessly by the movement of the swash plate of each pump in accordance with the operation of the joystick (steering, directional and gear shift lever) to change the rotation direction and speed of the right and left HST motors and control the travel direction and turning of the machine.
- The hydraulic power transmitted to HST motor (5) is output as mechanical power through the motor output shaft and transmitted to final drive (6).
- Final drive (6) consists of a double-stage planetary gear system, reduces the speed, and rotates sprocket (7) to drive track shoes (8).

10 Structure and function

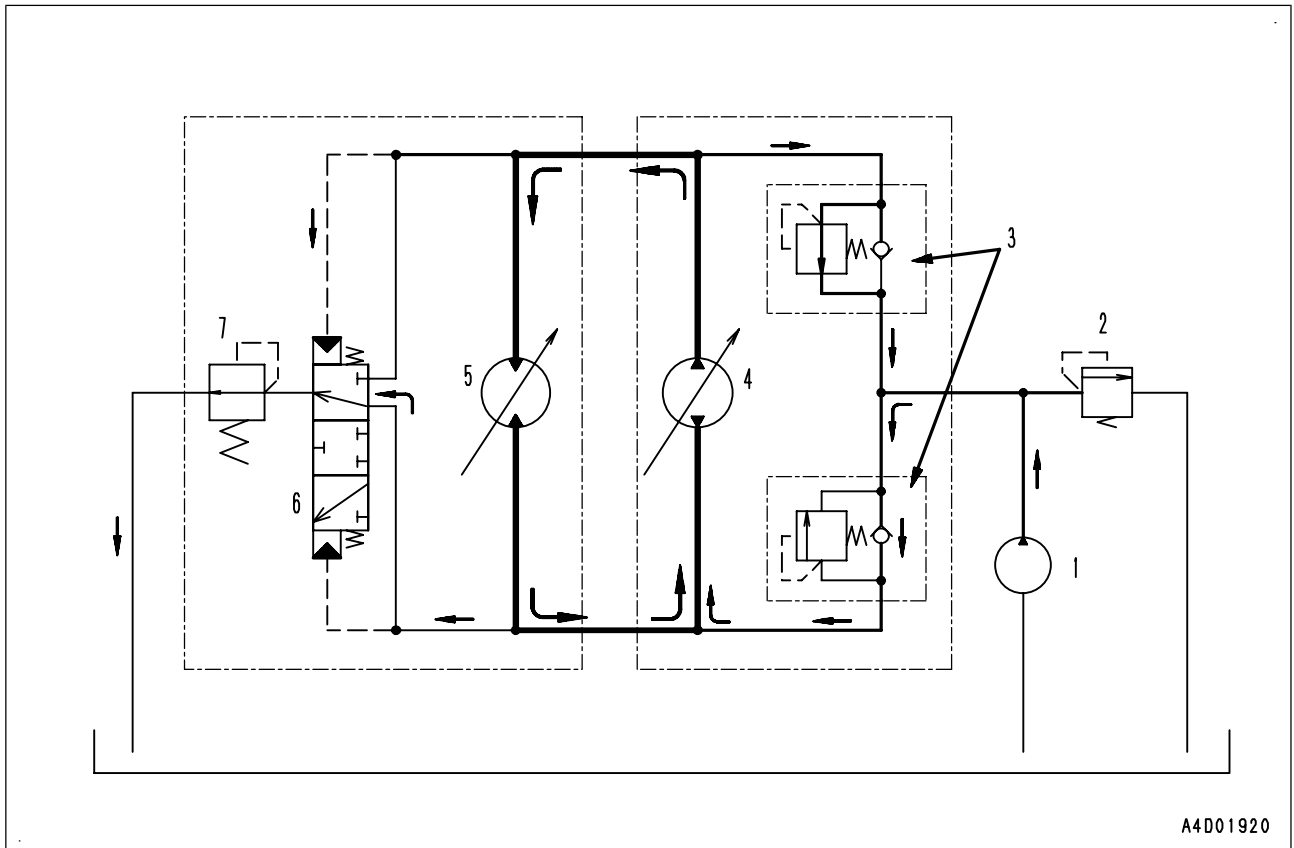
Power train system



1. Engine
2. Damper
3. HST pump
4. Work equipment/ cooling fan pump
5. High-pressure hose
6. HST motor
7. Final drive
8. Sprocket
9. Track shoe
10. Charge pump

HST closed circuit

★ HST: Abbreviation for Hydrostatic Transmission

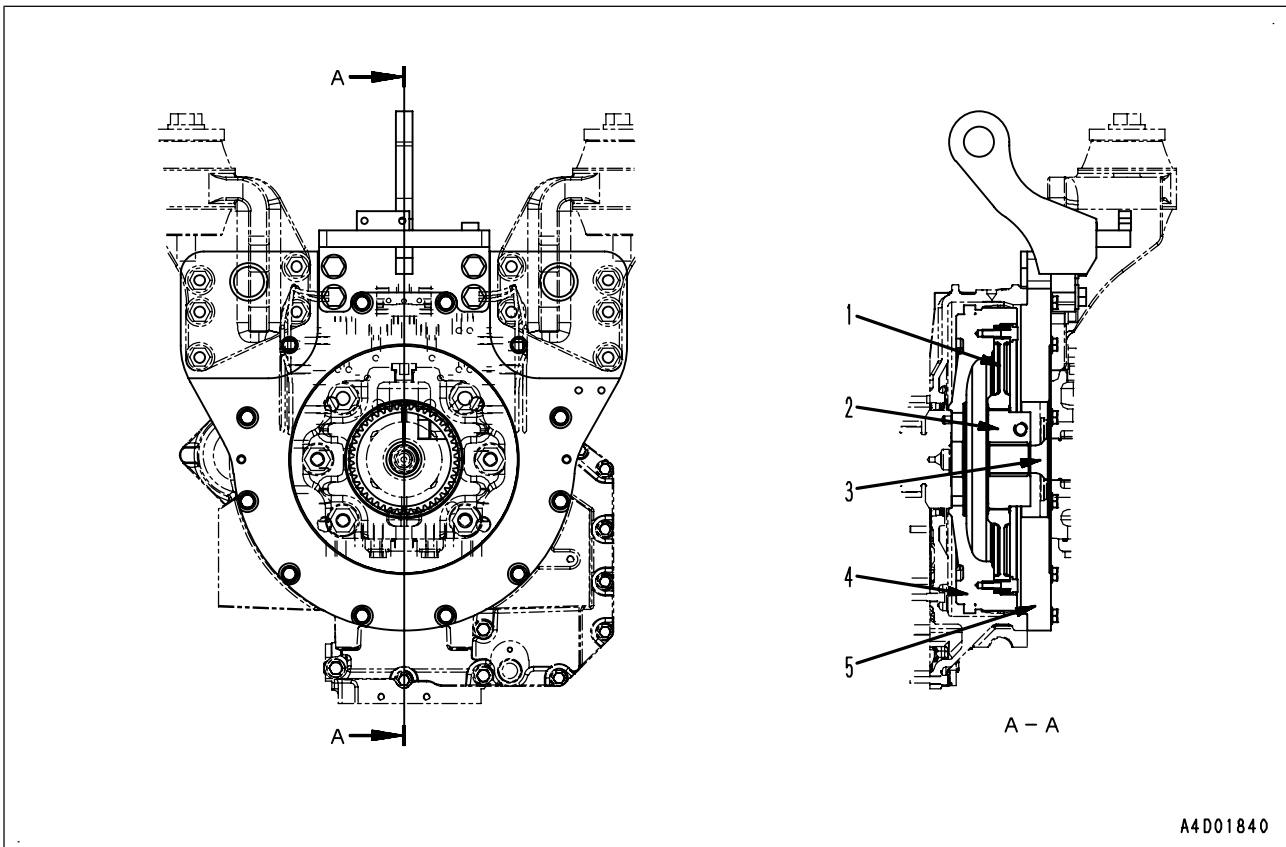


1. Charge pump
2. HST charge safety valve
3. Suction safety valve
4. HST pump
5. HST motor
6. Shuttle valve
7. Charge relief valve

10 Structure and function

Damper

Damper (D61-CB00-041-K-00-A)



A4D01840

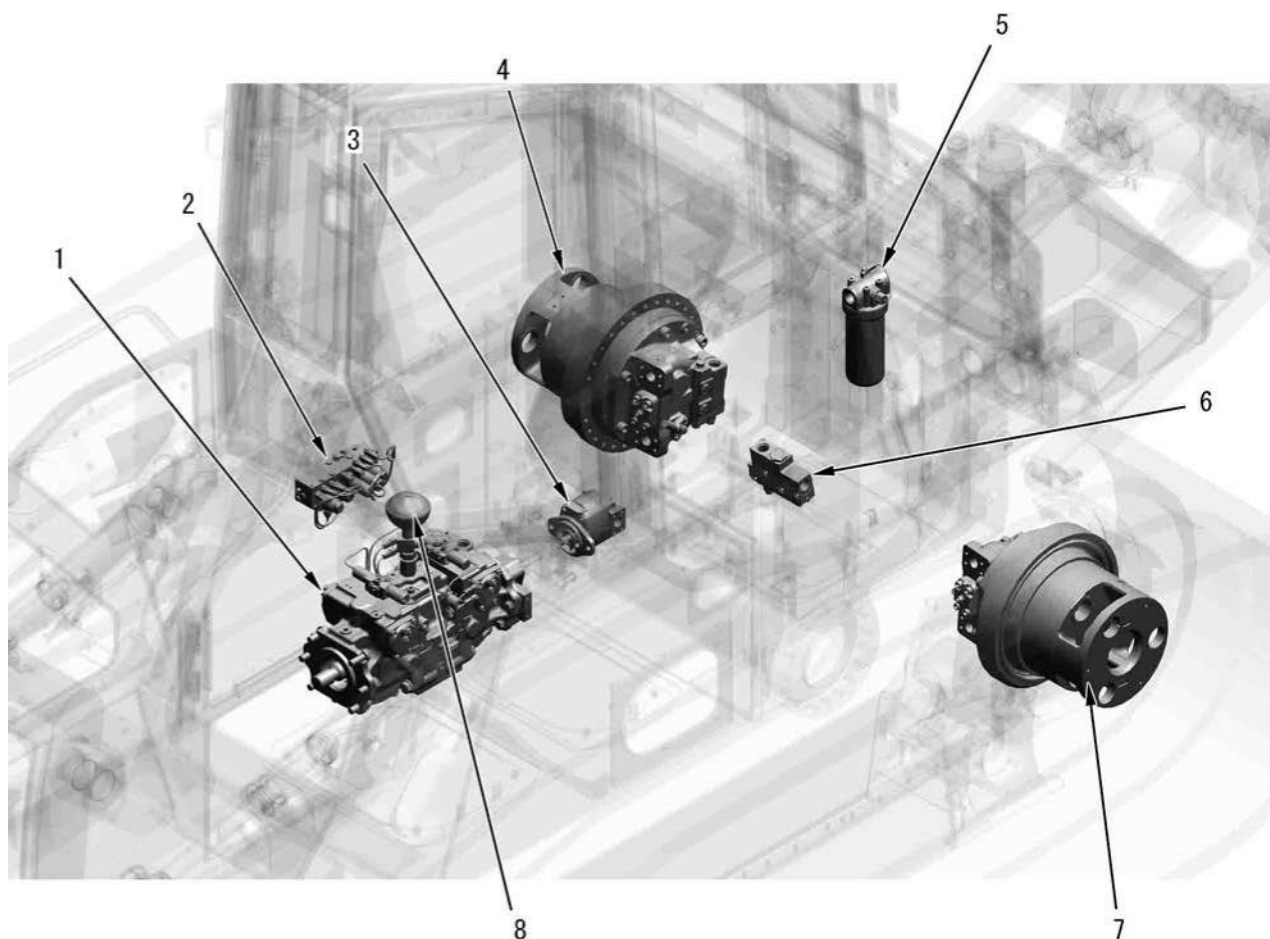
1. Coupling
2. Boss
3. HST pump input shaft
4. Flywheel
5. Cover

Function (D61-CB00-042-K-00-A)

- The damper reduces torsional vibration caused by fluctuation of the engine torque to protect the drive system after the engine from the torsional vibration.
- The power from the engine is transmitted through flywheel (4) to coupling (1). The torsional vibration of the power is absorbed by coupling (1) and the power is transmitted through boss (2) to the HST pump.

Hydraulic component layout of HST (D61-C170-04D-K-00-A)

★ HST: Abbreviation for Hydrostatic Transmission



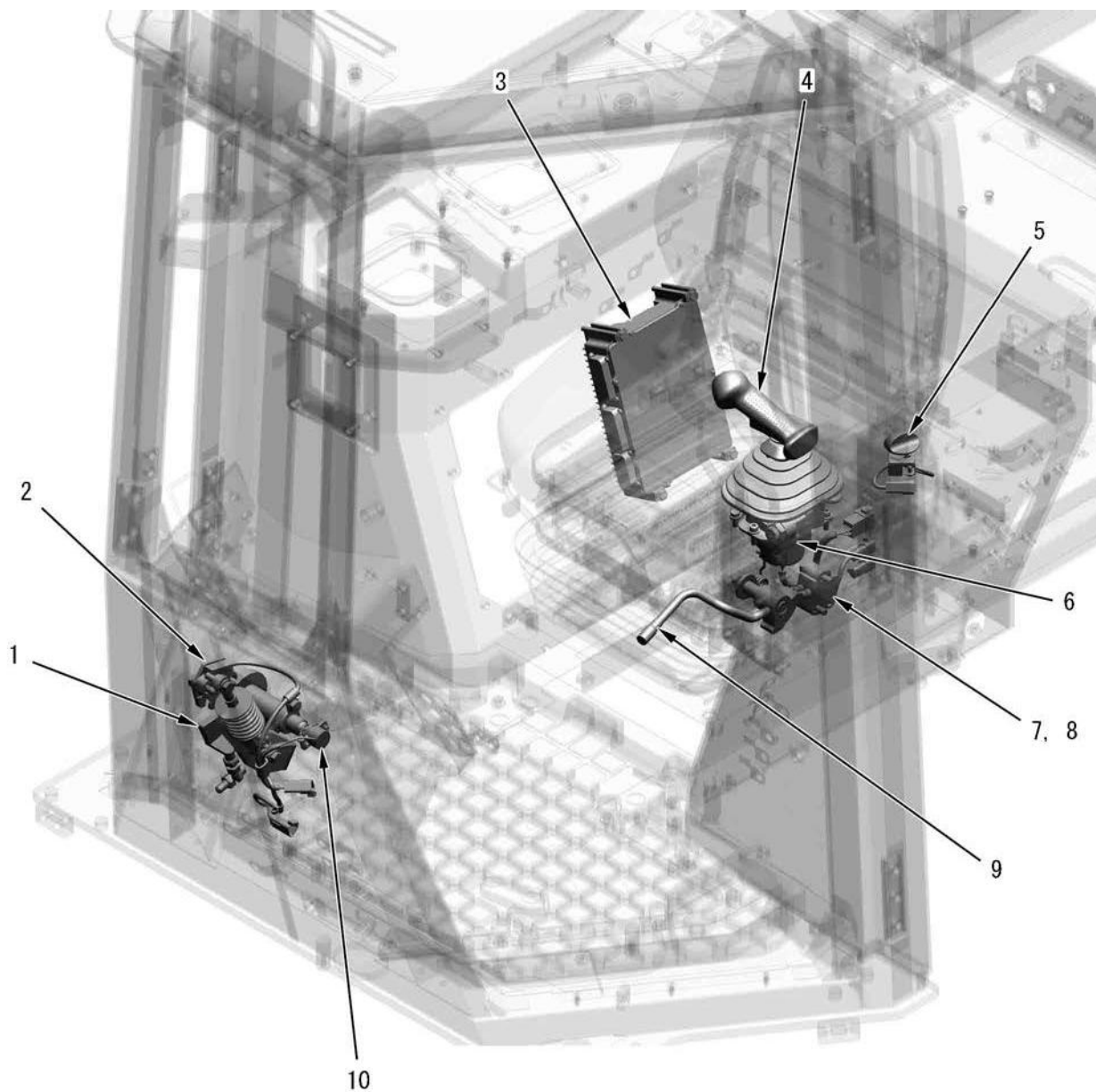
APD01711

1. HST pump
2. Solenoid valve
3. Charge pump
4. R.H. HST motor
5. Charge filter
6. Oil cooler bypass and HST charge safety valve
7. L.H. HST motor
8. Accumulator

10 Structure and function

Steering and brake control

Steering and brake control (D61-C160-041-K-00-A)



APD01841

1. Decelerator/ Brake pedal
2. Brake limit switch
3. HST controller
4. Joystick (steering, directional, and gear shift lever) (PCCS lever)
5. Fuel control dial
6. Electric steering lever
7. Parking brake limit switch 1
8. Parking brake limit switch 2
9. Parking brake lever
10. Decelerator/ Brake pedal potentiometer

Structure

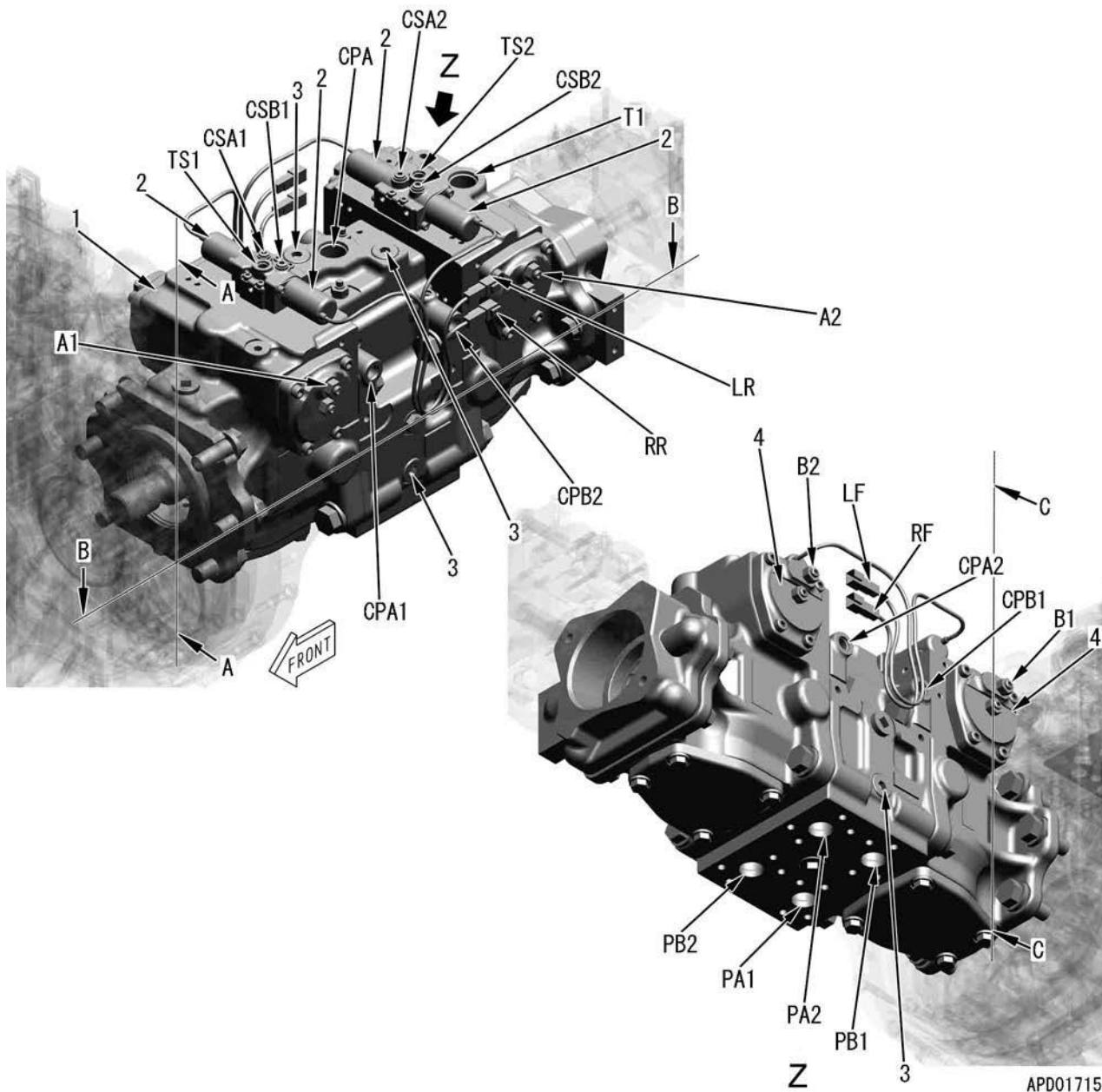
- Electric steering lever (6) sends electric signals according to the stroke of joystick (steering, directional and gear shift lever) (4) to HST controller (3). Upon receiving this signal, HST controller (3) sends the signals to the EPC valve of the HST pump to change the flow rate in the HST pump to control the HSS motor.
- If joystick (steering, directional and gear shift lever) (4) is tilted forward and leftward a little, the machine turns to the left gradually. If it is tilted leftward fully, the machine makes a left counter-rotation turn to the left.
- Decelerator/ Brake pedal potentiometer (10) sends electric signals according to the stroke of decelerator/ Brake pedal (1) to HST controller (3). Upon receiving this signal, HST controller (3) sends the signals to the EPC valve of the HST pump to decelerate both right and left tracks simultaneously.
- If brake pedal (1) is depressed fully when parking brake lever (9) is in "FREE" position, HST controller (3) receives electric signals from brake pedal potentiometer (10) and operates the right and left HST hydraulic brakes simultaneously. After the machine stops, HST controller (3) stops sending the signals to the parking brake solenoid valve. At the same time, brake limit switch (2) operates the relay to stop sending the signals to the slow brake solenoid valve. After sending the signals to the parking brake solenoid valve or the slow brake solenoid valve is stopped, the parking brakes built in the right and left HST motors operate.
- When parking brake lever (9) is set to "LOCK" position or joystick (steering, directional and gear shift lever) (4) is set in "NEUTRAL" position or fuel control dial (5) is set to "SLOW" position, the HST controller receives electric signals from parking brake limit switch 1 (7), electric steering lever (6), fuel control dial (5), and neutral brake and stops sending signals to the parking brake solenoid valve. At the same time, parking brake limit switch 2 (8) stops sending signals to the slow brake solenoid valve. After sending the signals to the parking brake solenoid valve or the slow brake solenoid valve is stopped, the parking brakes built in the right and left HST motors operate.

10 Structure and function

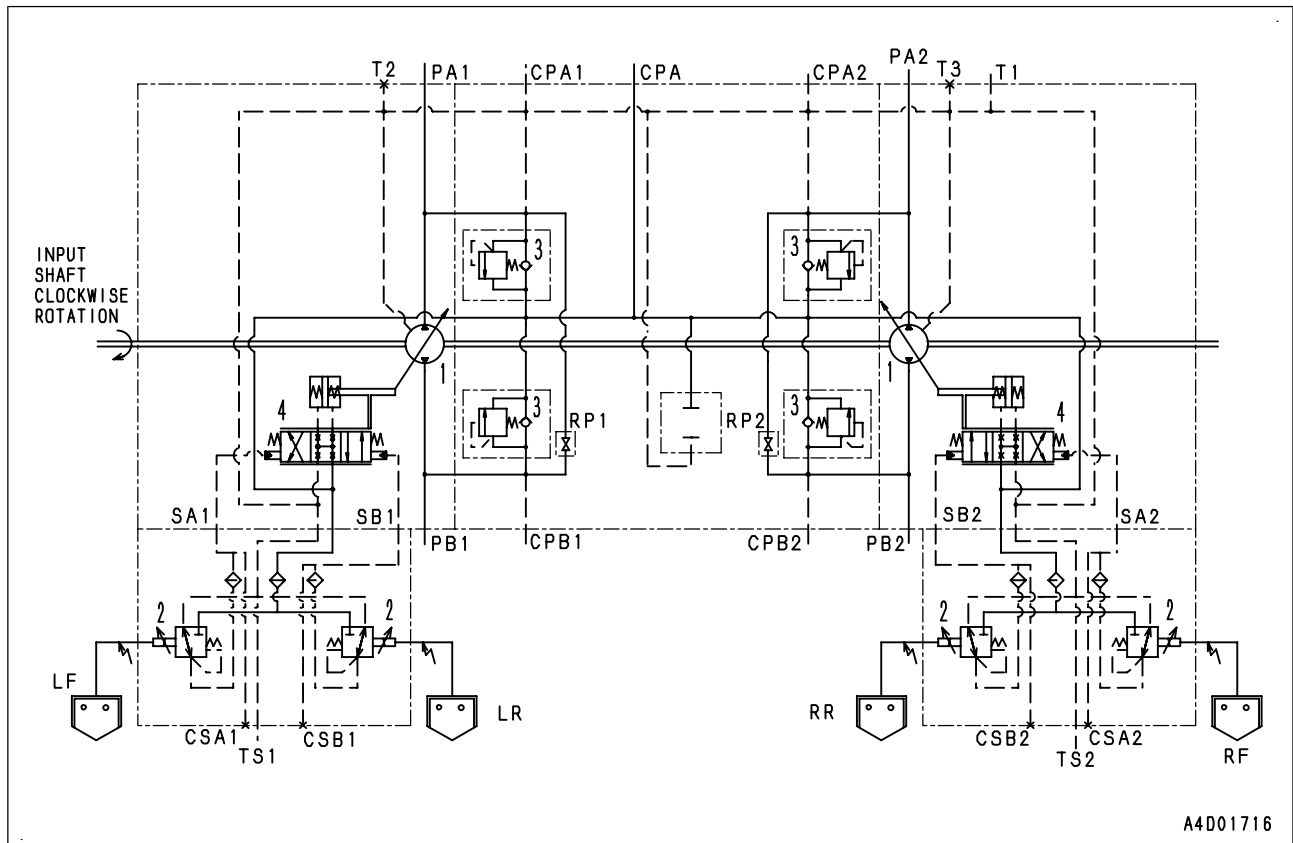
HST pump

HST pump (D61-C172-041-K-00-A)

★ HST: Abbreviation for Hydrostatic Transmission



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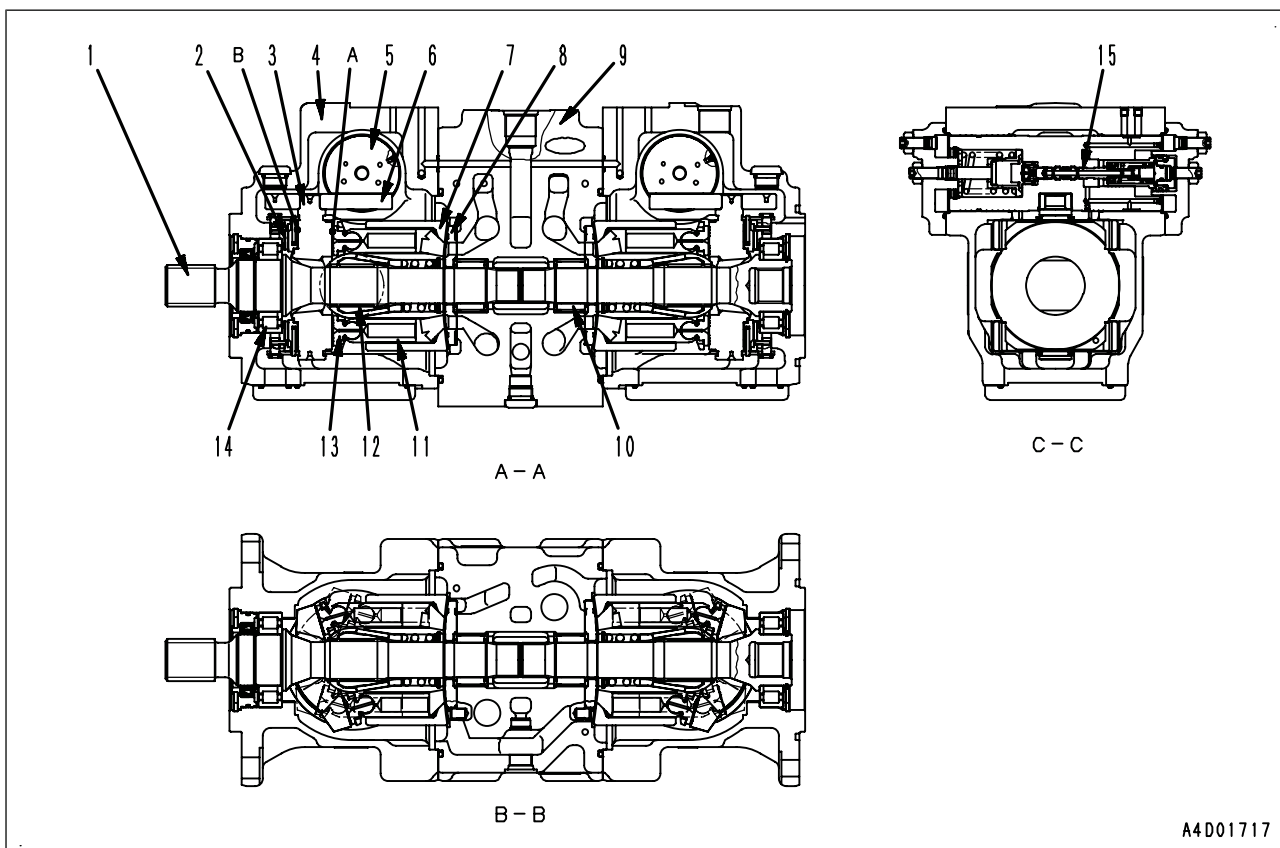
- A1: Max. capacity adjustment screw (left FORWARD)
- A2: Max. capacity adjustment screw (right FORWARD)
- B1: Max. capacity adjustment screw (left REVERSE)
- B2: Max. capacity adjustment screw (right REVERSE)
- CPA: Charge pressure input port
- CPA1: Pressure pickup port (left FORWARD)
- CPA2: Pressure pickup port (right FORWARD)
- CPB1: Pressure pickup port (left REVERSE)
- CPB2: Pressure pickup port (right REVERSE)
- CSA1: Pressure pickup port (left FORWARD EPC pressure)
- CSA2: Pressure pickup port (right FORWARD EPC pressure)
- CSB1: Pressure pickup port (left REVERSE EPC pressure)
- CSB2: Pressure pickup port (right REVERSE EPC pressure)
- LF: Pilot current (left FORWARD)
- LR: Pilot current (left REVERSE)
- PA1: Pump discharge port (left FORWARD)
- PA2: Pump discharge port (right FORWARD)
- PB1: Pump discharge port (left REVERSE)
- PB2: Pump discharge port (right REVERSE)
- RF: Pilot current (right FORWARD)
- RP1: Tow receiving plug
- RP2: Tow receiving plug
- RR: Pilot current (right REVERSE)
- T1: Drain port
- TS1: Drain port

10 Structure and function

HST pump

TS2: Drain port

1. Piston pump
2. EPC valve
3. Suction safety valve
4. Servo valve
- The pump consists of the variable displacement swash-plate type tandem piston pump, servo valve, EPC valve, and suction safety valve.



1. Shaft
2. Cradle bearing
3. Rocker cam
4. Case
5. Servo piston
6. Slider
7. Cylinder block
8. Valve plate
9. End cap
10. Bearing
11. Piston
12. Spline
13. Shoe
14. Bearing
15. Servo spool

Structure

- Cylinder block (7) is supported on shaft (1) through spline (12). Shaft (1) is supported on the front and rear bearings (14) and (10).

- The tip of piston (11) has a spherical hollow in which shoe (13) is being held by crimping. Piston (11) and shoe (13) forms a spherical bearing.
- Rocker cam (3) has flat surface (A) and shoe (13) is always pressed against this surface while sliding in a circular pattern. Rocker cam (3) rocks on cradle bearing (2) between case (4) and cylindrical surface (B).
- Piston (11) moves relatively in the axial direction in each cylinder chamber of cylinder block (7).
- Cylinder block (7) rotates relatively to valve plate (8) while sealing the pressurized oil and the oil pressure is balanced properly on this plane. The oil is sucked in and discharged from each cylinder chamber in cylinder block (7) through valve plate (8).

Specifications (D61-C172-030-K-00-A)

Model	HPV125+125
Type	Variable displacement swash plate type tandem piston pump
Theoretical discharge (cm ³ /rev)	125 x 2
Rated discharge pressure (MPa {kg/cm ² })	41.2 {420}
Rated speed (rpm)	2,280

Function (D61-C172-042-K-00-A)

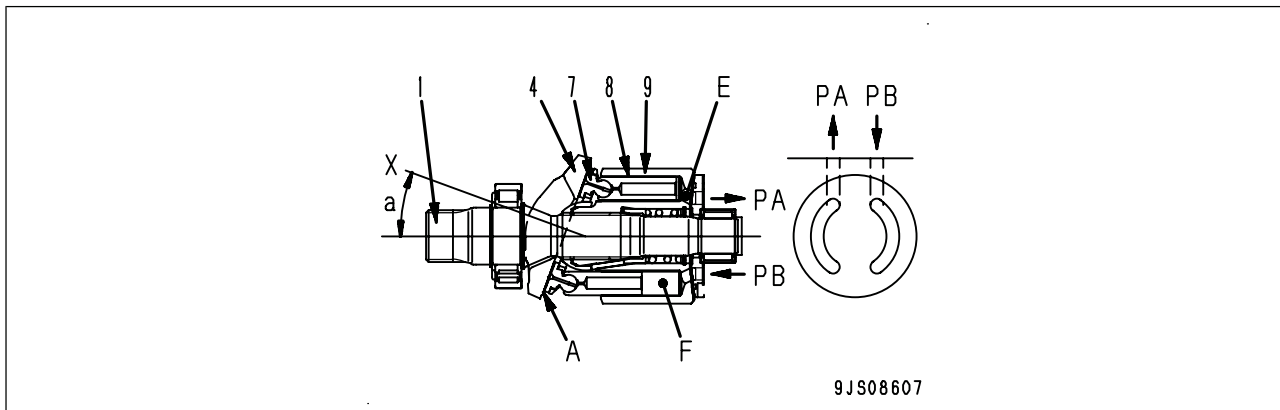
- Torque transmitted to the shaft is converted into hydraulic energy and discharges pressurized oil according to the load.
- It is possible to change the discharge by changing the swash plate angle. (Forward discharge <=> Zero <=> Reverse discharge)

10 Structure and function

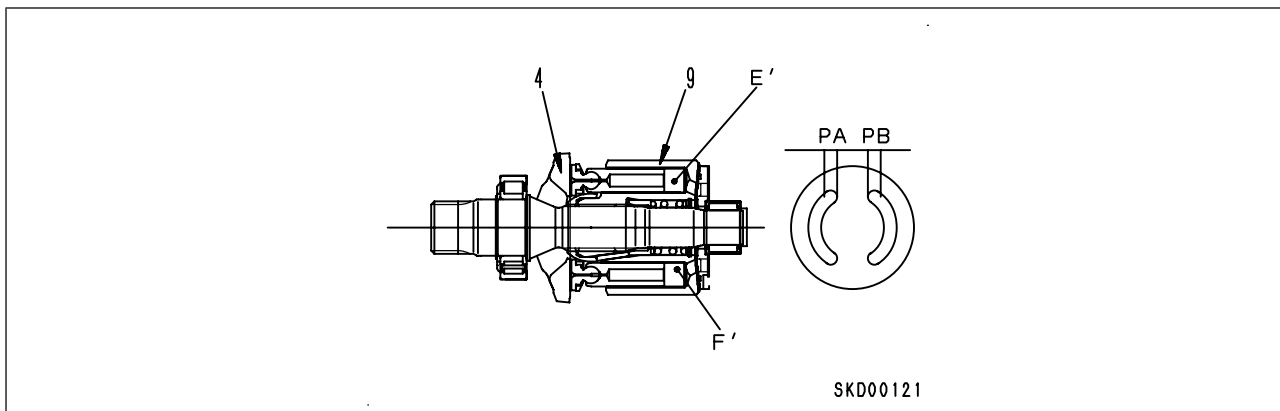
HST pump

Operation of pump (D61-C172-044-K-01-A)

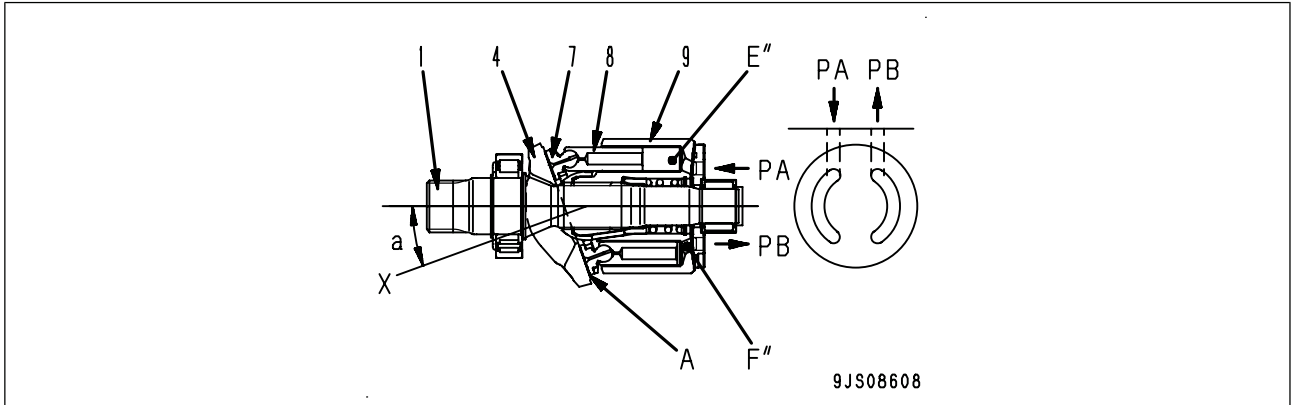
- Cylinder block (9) rotates together with shaft (1) and shoe (7) slides on plane (A). At this time, angle (a) between center line (X) of rocker cam (4) and the axis of cylinder block (9) changes. Angle (a) is called the swash plate angle.
- While angle (a) is made between center line (X) of rocker cam (4) and the axis of cylinder block (9), plane (A) works as a cam for shoe (7).
- Piston (8) reciprocates inside cylinder block (9) and a difference is made between volumes (E) and (F) in cylinder block (9) and oil is sucked in and discharged by (F) - (E).
- Oil is discharged while cylinder block (9) rotates and the volume of chamber (F) decreases. On the other hand, oil is sucked in when the volume of chamber (E) increases.



- As center line (X) of rocker cam (4) matches the axis of cylinder block (9) (swash plate angle = zero), the difference between volumes (E') and (F') inside cylinder block (9) is 0. The pump does not carry out any suction or discharge of oil.



- Piston (8) reciprocates inside cylinder block (9) and a difference is made between volumes (E'') and (F'') in cylinder block (9) and oil is sucked in and discharged by (F'') - (E'').
- That is, oil is discharged while cylinder block (9) rotates and the volume of chamber (E'') decreases. On the other hand, oil is sucked in when the volume of chamber (F'') increases. When the swash plate angle is reversed, suction and discharge through ports (PA) and (PB) are reversed.

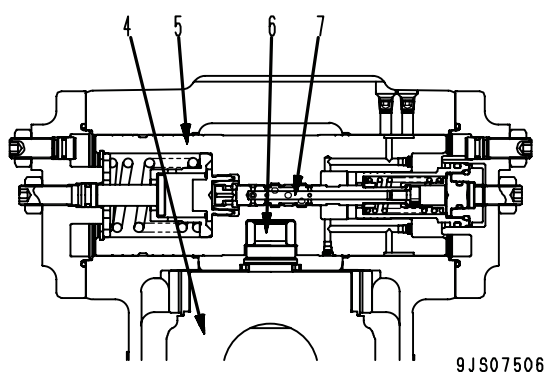
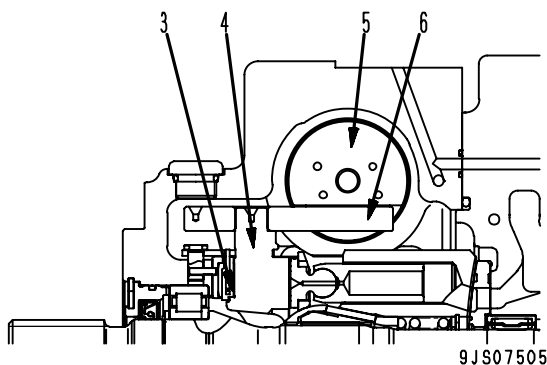
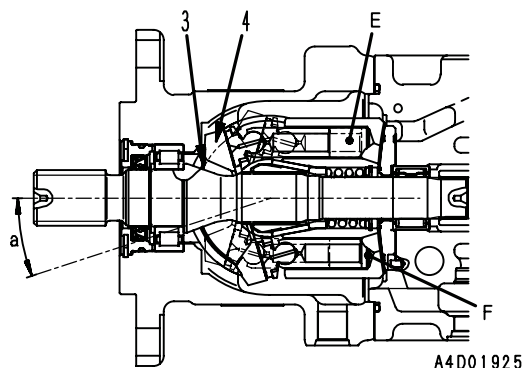


10 Structure and function

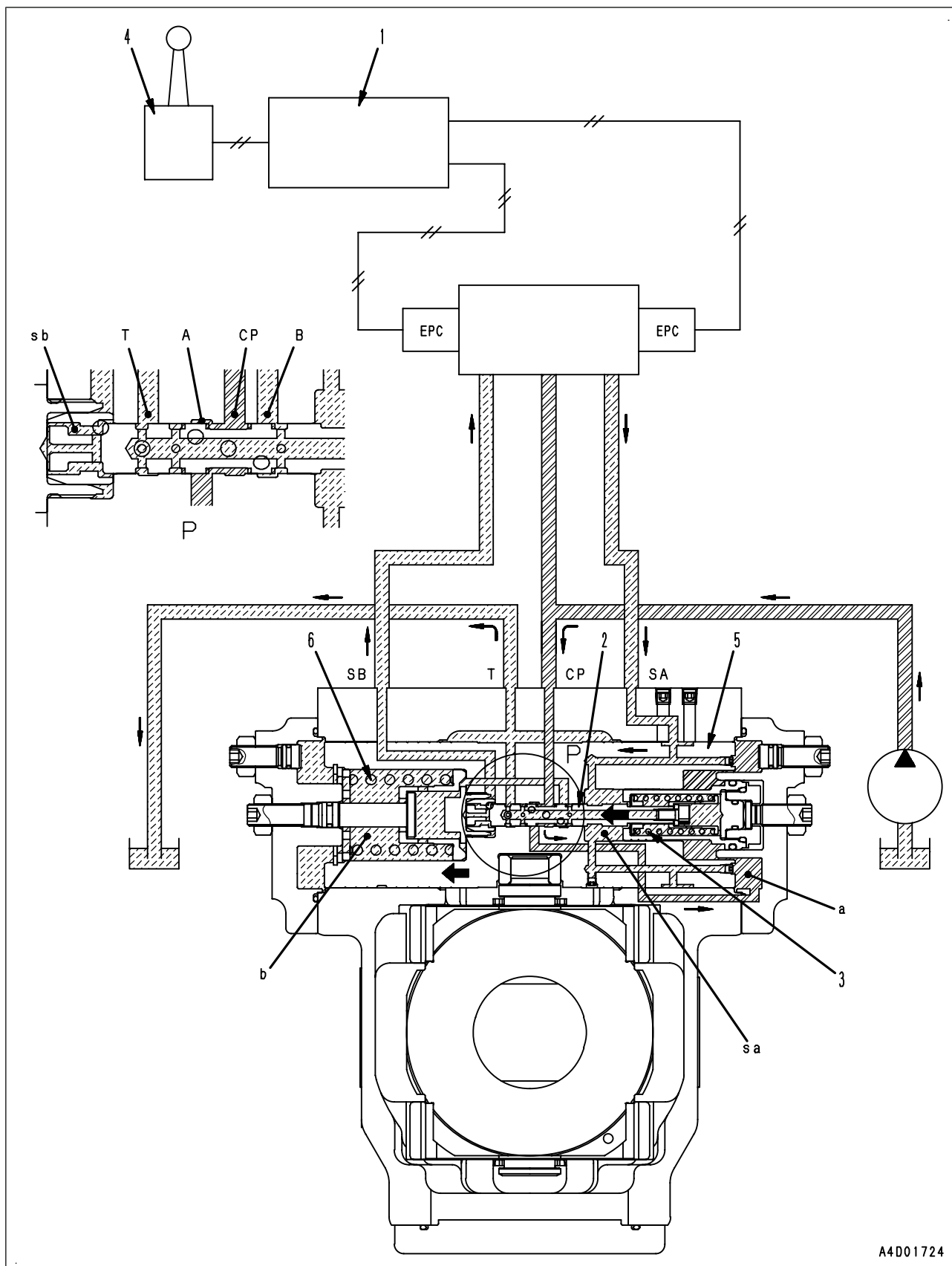
HST pump

Control of discharge (D61-C172-044-K-02-A)

- If swash plate angle (a) increases, the difference between volumes (E) and (F) increases, and consequently discharge (Q) increases. Servo piston (5) changes swash plate angle (a).
- Servo spool (7) moves according to the command from the EPC valve. Servo piston (5) reciprocates linearly according to the command pressure output from servo spool (7).
- This linear reciprocating motion is transmitted through slider (6) to rocker cam (4). Rocker cam (4) supported on the cylindrical surface of cradle bearing (3) rocks around the cylindrical surface.
- The maximum swash plate angle (a) of this pump is ± 16.7 degrees.



Operation of servo valve (D61-C2B0-044-K-00-A)



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10 Structure and function

HST pump

When lever is operated

Operation of servo spool

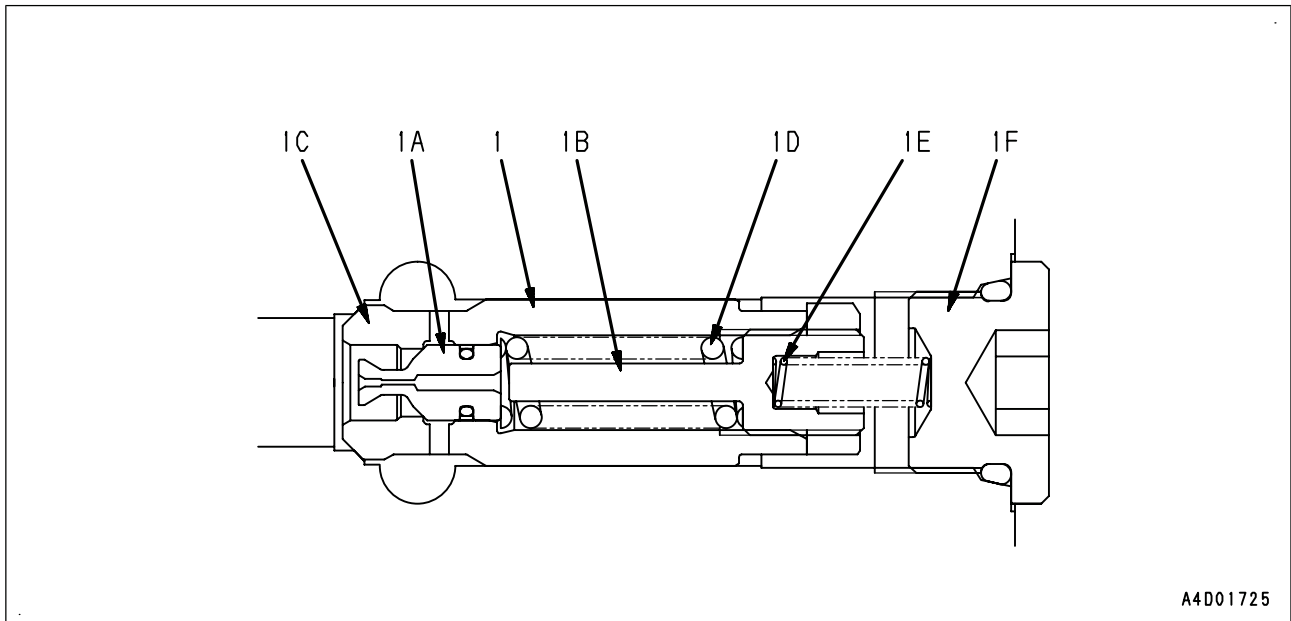
- The command current from pump controller (1) flows to the EPC valve solenoid.
- This command current acts on the EPC valve and outputs signal pressure. This signal pressure is led into chambers (sa) and (sb) through ports (SA) and (SB). The force pushing servo spool (2) is changed by the signal pressure.
- Servo spool (2) stops at a position where the force pushing servo spool (2) is balanced with the force of spring (3).
- The command current value is decided by the software of pump controller (1) on the basis of the information of the operation distance of joystick (steering, directional and gear shift lever) (4), pump pressure, etc.

Operation of servo piston

- When servo spool (2) moves to the left, ports (CP) and (A) are connected, and chamber (a) is pressurized. At the same time, ports (B) and (T) are connected and chamber (b) is drained, thus servo piston (5) moves to the left.
- When servo piston (5) moves to the left and ports (CP) and (A) are disconnected, servo piston (5) stops moving.
- That is, servo piston (5) moves by the moving distance of servo spool (2).
- Similarly, when servo spool (2) moves to the right, ports (CP) and (B) are connected, and chamber (b) is pressurized. At the same time, ports (A) and (T) are connected, and chamber (a) is drained, and servo piston (5) moves to the right until ports (CP) and (B) are disconnected.

When lever is in neutral

- When pressurized oil does not enter from the EPC valve, servo spool (2) does not operate. Servo piston (5) is held at the neutral position by the force of spring (6) and the main pump is kept in the neutral state.

Suction-safety valve (D61-C2VE-041-K-00-A)

1. Suction safety valve

1A. Valve

1B. Rod

1C. Sleeve

1D. Spring

1E. Spring

1F. Plug

Function (D61-C2VE-042-K-00-A)

In high-pressure safety valve mode

- This valve limits the maximum pressure in HST circuit to protect the circuit.

In suction valve mode

- It secures the amount of oil flow in the HST closed circuit. It prevents charge flow from flowing into pump high-pressure side (discharge side).

Operation (D61-C2VE-044-K-00-A)

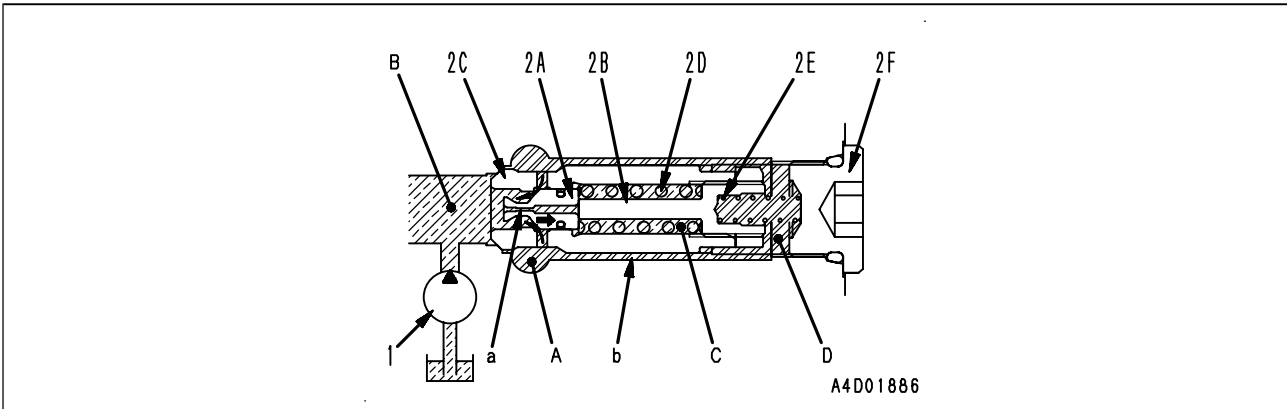
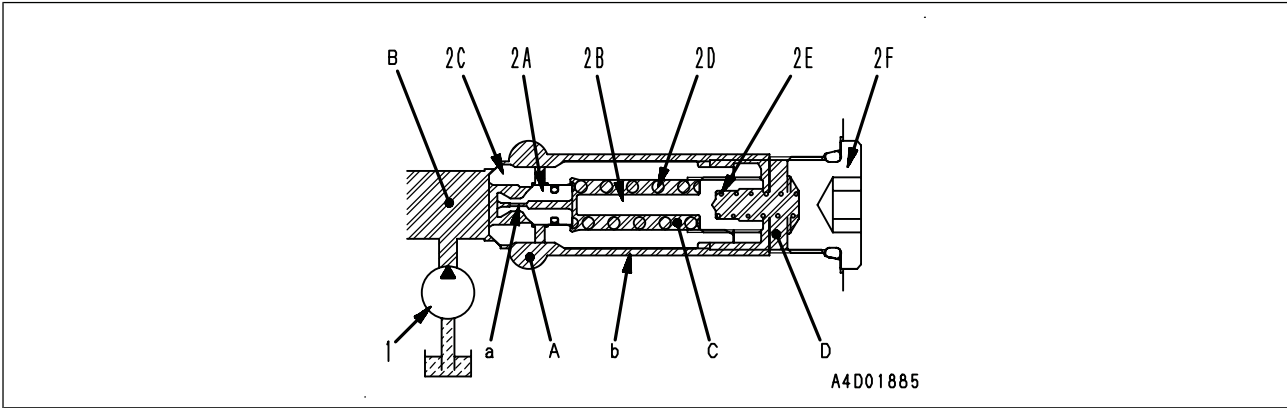
In high-pressure safety valve mode

(Valve on discharge side of piston pump)

- Port (A) is connected to the pump circuit and port (B) is connected to the charge circuit. The pressurized oil also fills port (C) through hole (a) of valve (2A).
- High-pressure port (A) is also connected to port (D) through passage groove (b) of the body.
- Valve (2A) is in firm contact with sleeve (2C).
- When abnormal pressure is generated in the circuit, if the oil pressure in ports (A) and (D) increases to the pressure set by spring (2D), valve (2A) is pushed to the right to relieve the oil in port (A) into port (B) and the oil pressure in port (A) decreases.

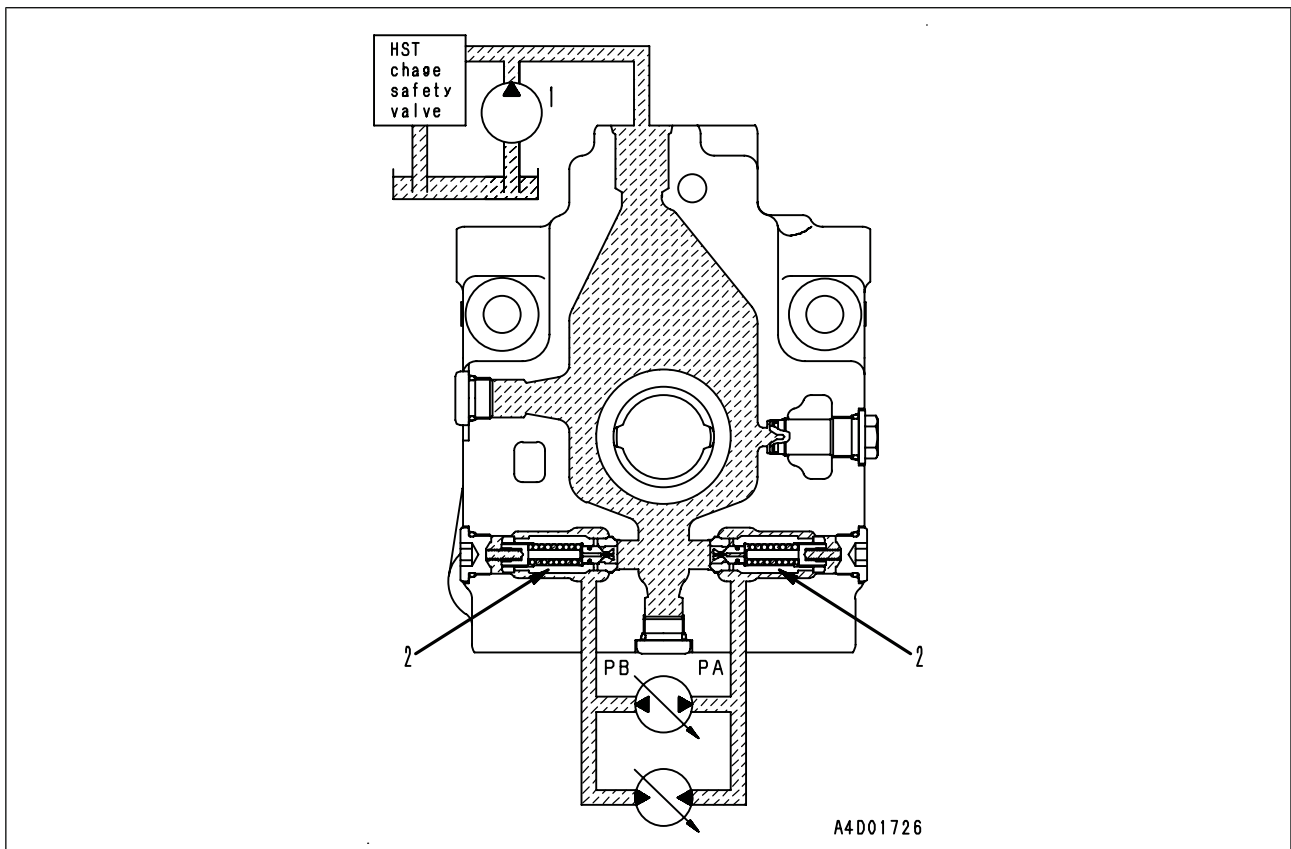
10 Structure and function

HST pump



In suction valve mode**When HST pump discharge is 0**

- The HST closed circuit is sealed and the charge pressurized oil does not flow into the HST circuit.



10 Structure and function

HST pump

When HST pump discharges oil from port (PA)

Valve on discharge side of piston pump

- When pressurized oil is discharged from port (PA) side of HST pump (3), port (PA) becomes the high-pressure side.
- The pressurized oil in port (PA) flows into port (D) through passage (b) of the body.
- At this time, sleeve (2C) is pushed to the left because of the area difference ($A1 > A2$).
- As a result, the pressurized oil from charge lamp (1) does not flow in.

