VEBM945100

SHOP MANUAL

KOMATSU

WA250PZ-5

MACHINE MODEL	SERIAL NUMBER
WA250PZ-5	**H50051 and up**

CONTENTS

SAFETY
SAFETY NOTICE

IMPORTANT SAFETY NOTICE

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

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

GENERAL PRECAUTIONS

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

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, hand shield, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

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

PRECAUTIONS DURING WORK

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

FOREWORD
GENERAL

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

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

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.
In addition, this section may contain hydraulic circuit diagrams, electric circuit diagrams, and maintenance standards.

TESTING AND ADJUSTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs.
Troubleshooting charts correlating "Problems" with "Causes" are also included in this section.

DISASSEMBLY AND ASSEMBLY

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

MAINTENANCE STANDARD

This section gives the judgment standards for inspection of disassembled parts.
The contents of this section may be described in STRUCTURE AND FUNCTION.

OTHERS

This section mainly gives hydraulic circuit diagrams and electric circuit diagrams.
In addition, this section may give the specifications of attachments and options together.

NOTICE

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

HOW TO READ THE SHOP MANUAL

VOLUMES

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

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

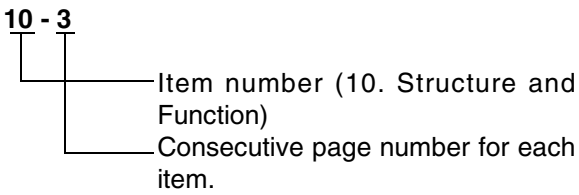
These various volumes are designed to avoid duplicating the same information. Therefore, to deal with all repairs for any model , it is necessary that chassis, engine, electrical and attachment volumes be available.

DISTRIBUTION AND UPDATING

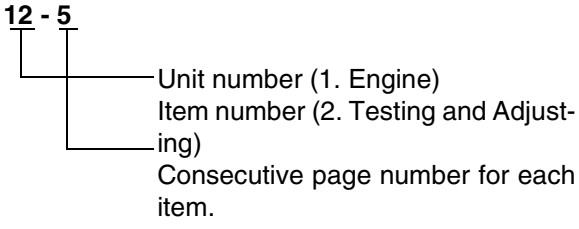
Any additions, amendments or other changes will be sent to KOMATSU distributors. Get the most up-to-date information before you start any work.

FILING METHOD

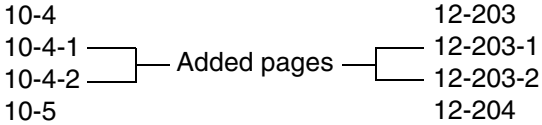
1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show how to read the page number.
   Example 1 (Chassis volume):



   Example 2 (Engine volume):



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



REVISED EDITION MARK

When a manual is revised, an edition mark ((1)(2)(3)....) is recorded on the bottom of the pages.

REVISIONS

Revised pages are shown in the LIST OF REVISED PAGES next to the CONTENTS page.

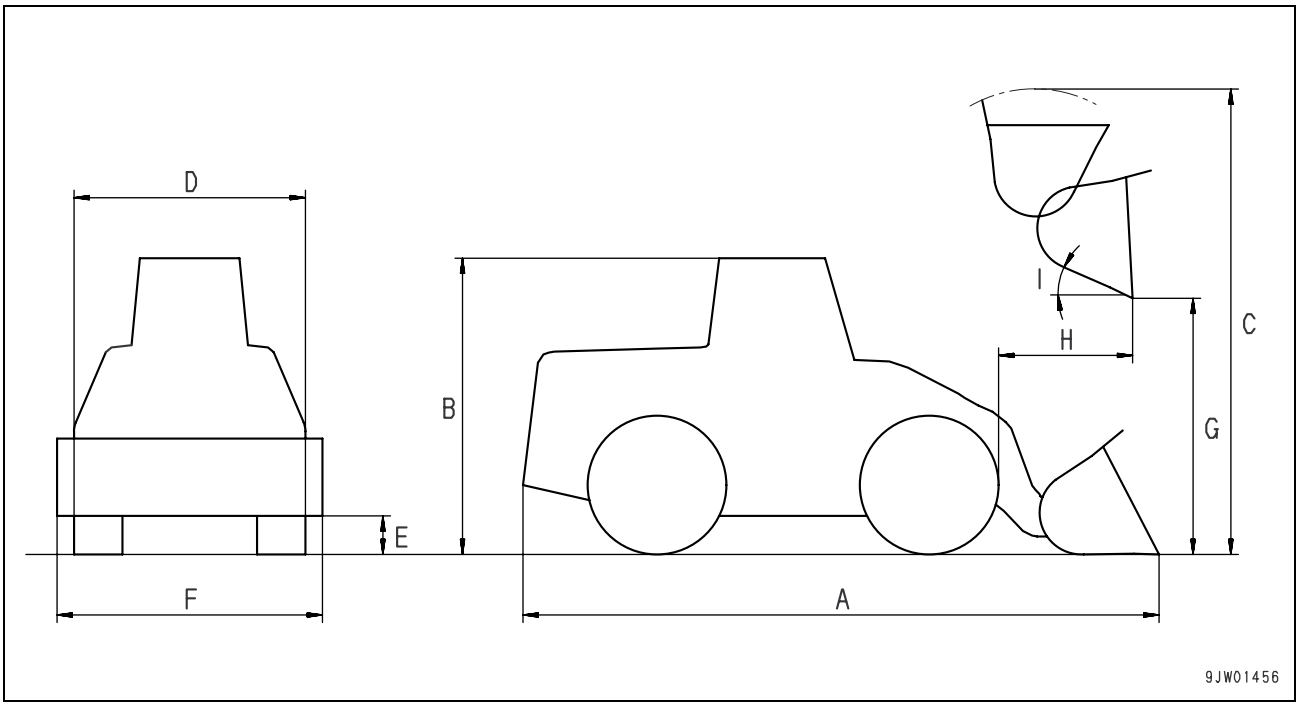
SYMBOLS

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

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

01 GENERAL

GENERAL ASSEMBLY DRAWINGS



	Item		Unit	WA250PZ-5
	Operating weight		kg	12,275
	Rated load		kg	3,680
	Bucket capacity (piled)		m^3	2.3
	Engine model		—	KOMATSU SAA6D102E-2-A-Diesel engine
	Flywheel horse power		kW {HP} / rpm	101{135} / 2,000
A	Overall length		mm	7,245
B	Overall height		mm	3,240
C	Overall height when bucket is raised		mm	5,230
D	Overall width		mm	2,470
E	Min. ground clearance		mm	460
F	Bucket width		mm	2,550
G	Dumping clearance	Tip of cutting edge/Tip of tooth	mm	2,840 / 2,730
H	Dumping reach	Tip of cutting edge/Tip of tooth	mm	1,075 / 1,230
I	Bucket dump angle		deg.	45
	Min. turning radius	Tip of cutting edge/Tip of tooth	mm	5,840 / 5,920
		Center of outside wheel	mm	4,950
	Travel speed	F1	km / h	4.0 – 13.0
		F2	km / h	13.0
		F3	km / h	18.0
		F4	km / h	38.0
		R1	km / h	4.0 – 13.0
		R2	km / h	13.0
		R3	km / h	18.0
		R4	km / h	38.0

SPECIFICATIONS

Machine model				WA250PZ-5
Serial No.				H50051 and up
Weight	Operating weight		kg	12,275
	Distribution (front) SAE travel posture		kg	5,350
	Distribution (rear) SAE travel posture		kg	7,270
Performance	Bucket capacity (piled)		m^3	2.3
	Rated load		kg	3,680
	Travel speed	FORWARD 1st	km / h	4.0 – 13.0
		FORWARD 2nd	km / h	13.0
		FORWARD 3rd	km / h	18.0
		FORWARD 4th	km / h	38.0
		REVERSE 1st	km / h	4.0 – 13.0
		REVERSE 2nd	km / h	13.0
		REVERSE 3rd	km / h	18.0
		REVERSE 4th	km / h	38.0
	Max. rimpull	FORWARD	kN {kg}	96 {9,800}
		REVERSE	kN {kg}	96 {9,800}
	Gradeability		deg.	25
	Min. turning radius	(Center of outside wheel)	mm	4,950
	Min. turning radius (Tip of cutting edge)	[SAE travel posture]	mm	5,800
Dimensions	Overall length (Tip of cutting edge)		mm	7,245
	Overall width (chassis)		mm	2,470
	Bucket width (Without tooth/With tooth)		mm	2,550
	Overall height (top of cab)		mm	3,240
	Overall height (Bucket approx. raised to max.)		mm	5,230
	Wheel base		mm	2,900
	Tread		mm	1,930
	Min. ground clearance		mm	460
	Max. height of bucket hinge pin		mm	3,965
	Dumping clearance (Tip of cutting edge/ Tip of tooth)		mm	2,840 / 2,730
	Dumping reach (Tip of cutting edge/Tip of tooth)		mm	1,075 / 1,230
	Steering angle		deg.	40
	Bucket tilt angle (travel posture)		deg.	48
	Bucket tilt angle (max. height)		deg.	55
	Bucket dump angle (max. height)		deg.	48
	Digging depth (10° dump) (Tip of cutting edge/Tip of tooth)		mm	305 / 385

Machine model				WA250PZ-5
Serial No.				H50051 and up
Engine	Model			SAA6D102E-2-A
	Type			4-cycle, water-cooled, in-line, 6-cylinder, direct injection with turbocharger, aftercooler
	No. of cylinders - bore x stroke		mm	6 – 102 x 120
	Piston displacement		ℓ {cc}	5.88 {5,880}
	Flywheel horsepower		kW / rpm	101 / 2,000
			{HP / rpm}	{135 / 2,000}
	Maximum torque		Nm / rpm	618 / 1,400
			{kgm / rpm}	{63 / 1,400}
	Min. fuel consumption ratio		g / kWh {g / HPh}	224 {167}
	High idling speed		rpm	2,225
	Low idling speed		rpm	825
	Starting motor			24 V 4.5 kW
	Alternator			24 V 60 A
	Battery			24 V 110 Ah x 2 pcs.
Power train	HST pump			Variable displacement swash plate-type piston pump
	HST motor 1			Variable displacement swash plate-type piston motor
	HST motor 2			Variable displacement swash plate-type piston motor
	Transfer			Multiple shaft planetary compound-type, spur gear constant mesh-type, 2 alternative power systems
	Reduction gear			Spiral bevel gear, splash lubrication type
	Differential			Straight bevel gear type, torque portioning
	Final drive			Planetary gear 1-stage, splash lubrication type
Axle	Drive type			Front and rear wheel drive
	Front axle			Fixed to frame, semi-floating type
	Rear axle			Center pin support, semi-floating type
Tire	Tire size			20.5–25–L3
	Rim size			25x17.00–1.7
	Inflation pressure	Front tire	kPa {kg / cm²}	274 {2.8}
		Rear tire	kPa {kg / cm²}	274 {2.8}
Brakes	Main brake	Braking system		4 wheel braking, Front and rear wheel independent system control
		Brake type		Enclosed wet multiple disc type
		Operation method		Hydraulically controlled
		Control method		Hydraulic power servo assisted brake
	Parking brake	Braking system		Speed change gear output shaft braking
		Brake type		Wet multiple disc type
		Operation method		Mechanical type
		Control method		Hand lever type

Machine model					WA250PZ-5
Serial No.					H50051 and up
Steering control	Type				Articulated steering
	Control				Hydraulic control
Hydraulic system	Hydraulic pump	Steering pump	• Type		Gear type
			• Delivery	ℓ / min	110
		Work equipment pump	• Type		Gear type
			• Delivery	ℓ / min	78
		Brake and cooling fan pump	• Type		Gear type
			• Delivery	ℓ / min	19
		Transfer lubrication pump	• Type		Gear type
			• Delivery	ℓ / min	22
	Cylinder	Steering cylinder	Type		Reciprocating piston type
			Cylinder inner diameter	mm	70
			Piston rod diameter	mm	40
			Stroke	mm	453
			Max. length between pins	mm	1,271
			Min. length between pins	mm	818
		Lift cylinder	Type		Reciprocating piston type
			Cylinder inner diameter	mm	130
			Piston rod diameter	mm	70
			Stroke	mm	717
			Max. length between pins	mm	1,950.5
			Min. length between pins	mm	1,233.5
		Bucket cylinder	Type		Reciprocating piston type
			Cylinder inner diameter	mm	170
			Piston rod diameter	mm	100
			Stroke	mm	491
			Max. length between pins	mm	1,815
			Min. length between pins	mm	1,335

Machine model				WA250PZ-5
Serial No.				H50051 and up
Hydraulic system	Control valve	Work equipment control valve • Type		2-spool type
		• Set pressure	MPa {kg / cm²}	20.6 {210}
		Steering valve • Type		Orbit-roll type
		• Set pressure	MPa {kg / cm²}	18.6 {190}
	Motor	Cooling fan motor • Type		Fixed displacement piston type
Work equipment	Link type			Z bar link
	Bucket edge type			Flat blade with top BOC

WEIGHT TABLE

★ This weight table is a guide for use when transporting or handling components.

Unit: kg

Machine model	WA250PZ-5
Serial Numbers	H50051 and up
Engine (without coolant and oil)	608
Cooling assembly (without coolant)	54
Cooling fan motor	6
Damper	3
HST pump	60
HST motor 1	59
HST motor 2	59
Transfer	211
Front drive shaft	18
Rear drive shaft	4
Front axle	555
Rear axle	492
Axle pivot (rear axle)	79
Wheel (each)	130
Tire (each)	147
Orbit-roll valve	7
Priority valve	6
Steering cylinder assembly (each)	18
Brake valve	10
Hydraulic tank (without hydraulic oil)	59
4-gear pump unit	40
Work equipment PPC valve	3
Attachment PPC valve	1
Work equipment control valve	26
Lift cylinder assembly (each)	104
Bucket cylinder assembly	220
Engine hood (with side panel)	164
Front frame	1,015
Rear frame	704

Unit: kg

Machine model	WA250PZ-5
Serial Numbers	H50051 and up
Lift arm (including bushing)	906
Bucket (2.1m^2, excluding BOC)	—
Bucket (2.0m^2, including tooth)	840
Tilt lever	232
Quick coupler	383
Coupler plunger Ass'y	4
Bucket link	68
Counterweight	1,770
Additional counterweight (1 piece)	50/125
Fuel tank (without fuel)	79
Battery (each)	33
Operator's Cab (including air conditioner and interior parts)	755
Operator's seat	41

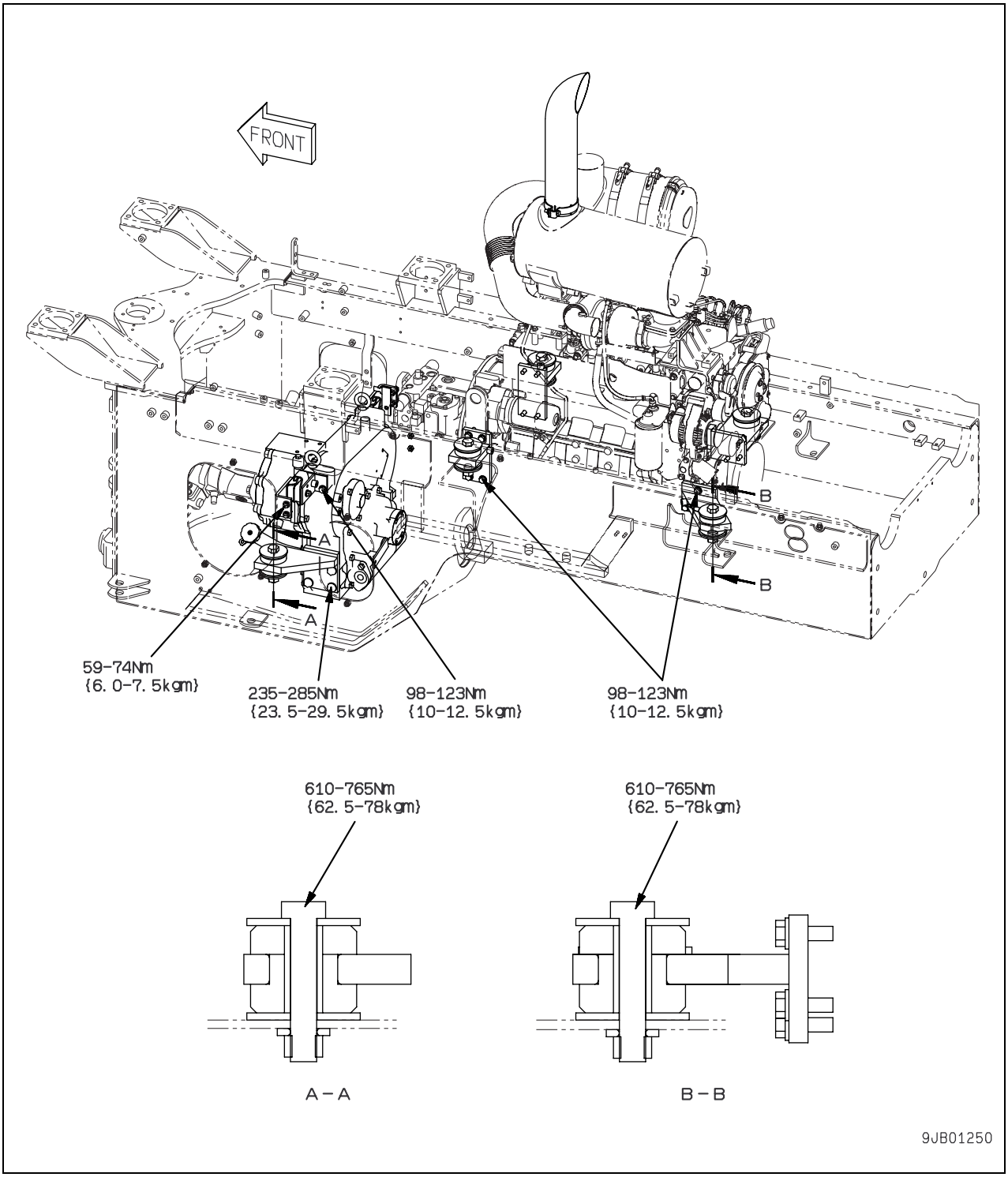
LIST OF LUBRICANT AND COOLANT

WA250PZ-5	LUBRICANTS, FUELS AND FILLING CAPACITIES					
	Lubricant and operating medium	Short code / cask lettering	Quality grade	Temperature range	Viscosity range	Filling capacitiy in litres
Engine	Engine oil	EO 0030A EO 0540A EO 10 EO 30 EO 1030A EO 1540A	ACEA E5 or, if not available: API CD or API CE or API CF -4	-30° up to 40° C -25° up to 40° C -20° up to 10° C 0° up to 40° C -20° up to 40° C - 15° up to 50° C	SAE 0W-30 SAE 5W-40 SAE 10 SAE 30 SAE 10W-30 SAE 15W-40 *)	20 (19,5 **)
Transfer case	Transmission oil	TO 10	ACEA E5 or, if not available: API CD or API CE or API CF -4	-30° up to 40° C	SAE 10W*)	7,7 (6,9 **)
Hydraulic system	Hydraulic oil	HYD 0530 HYD 1030	HVLP, HVLP D	-30° up to 40° C -20° up to 30°C	ISO VG46 *) ISO VG68	135 (67**)
	or Engine oil	EO 1030A	ACEA E5 or, if not available: API CD or API CE or API CF -4	-30° up to 40° C	SAE 10W-30	
Axle with standard differential	Axle oil	AXO 80 (*2) AXO	Shell: DONAX TD5W-30 ***)		80W SAE 5W-30 *)	each 18 (each 18**)
	or Engine oil	EO 30	ACEA E5 or, if not available: API CD or API CE or API CF -4	0° up to 40° C	SAE 30	
Axle with limited-slip differential (*3)	Axle oil(*4)	AXO	Shell: DONAX TD5W-30 ***) Esso: TORQUE FLUID56****) Mobil: MOBILFLUID 424 Fuchs: TITAN HYDRA ZF 20W-40		SAE 5W-30*) SAE 20W-40	
Fuel tank	Diesel fuel	ASTM D975 No.1 ASTM D975 No.2 DIN-EN 590	 CFPP class B CFPP class D CFPP class F	-30° up to -10° C -10° up to 40° C 0° up to 40° C -10° up to 40° C -20° up to 40° C	-----	184
Grease nippels	Multi purpose grease on a lithium base	MPG-A	KP2N-20	-30° up to 40° C	NLGI-No. 2	---
Grease box of central lubrication unit	Multi purpose grease on a lithium base	MPG-A	KP2N-20	-30° up to 40° C	NLGI-No. 2	---
Cooling system	Water and coolant	AF-NAC	TEXACO: Havoline XLC *) *****) Tanigawa Oil: NA2001 CCI: L246 TOTAL FINA ELF: GILACELF CHP SUPRA Showa: MCR20			19
Air conditioner	Coolant	NRS	R134a (CFC-free)			860 g

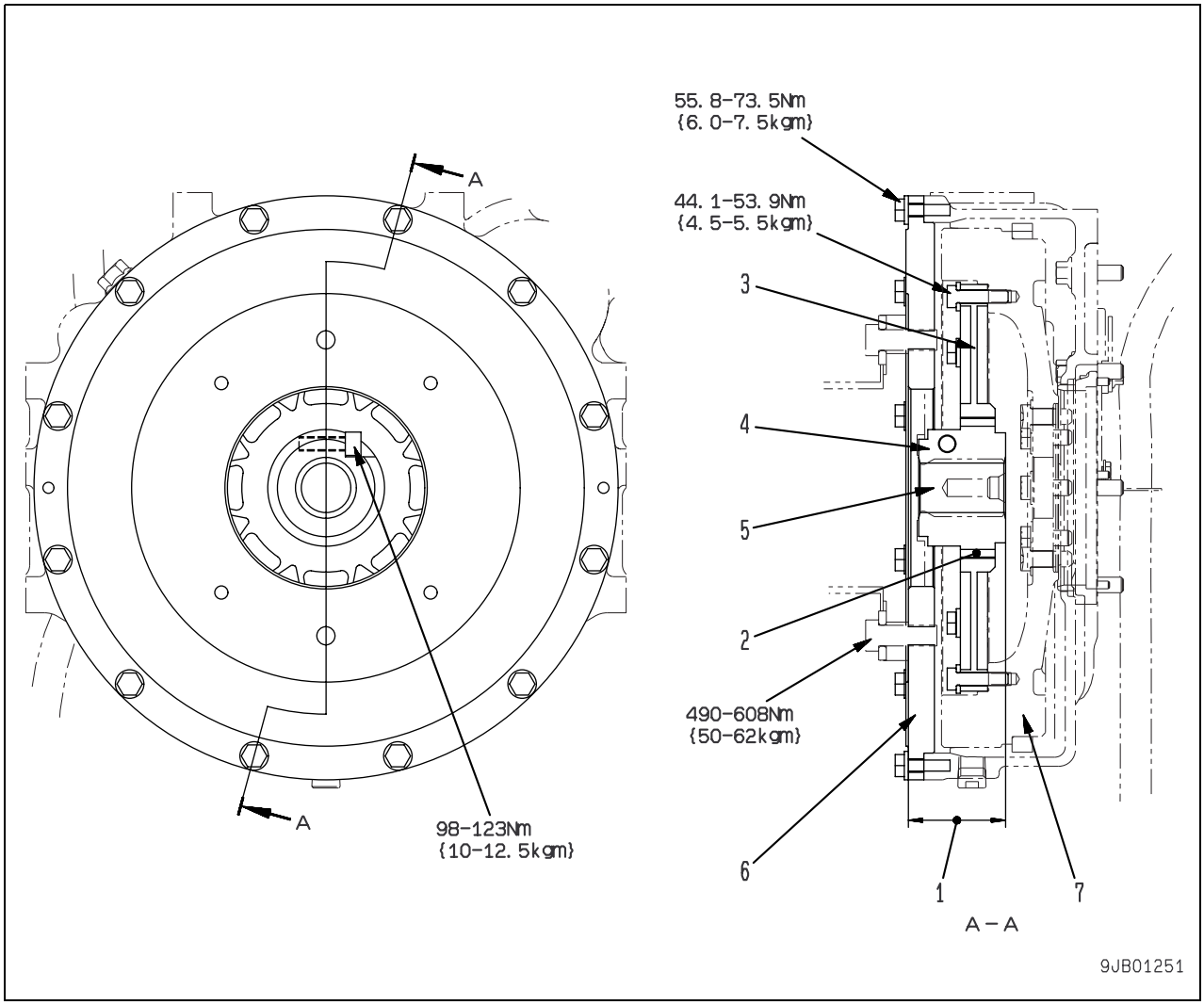
* Work filling
** Top-up quantity
*** North American manufacted DONAX TD 20W-40 must not be used.
**** North American manufacted TORQUE FLUID 56 must not be used.
***** Proportion of mixture: 50% coolant : 50% water, Min. freeze proofing: -35°C

10 STRUCTURE, FUNCTION AND MAINTENANCE STANDARD

ENGINE MOUNT AND TRANSFER MOUNT



DAMPER



Unit: mm

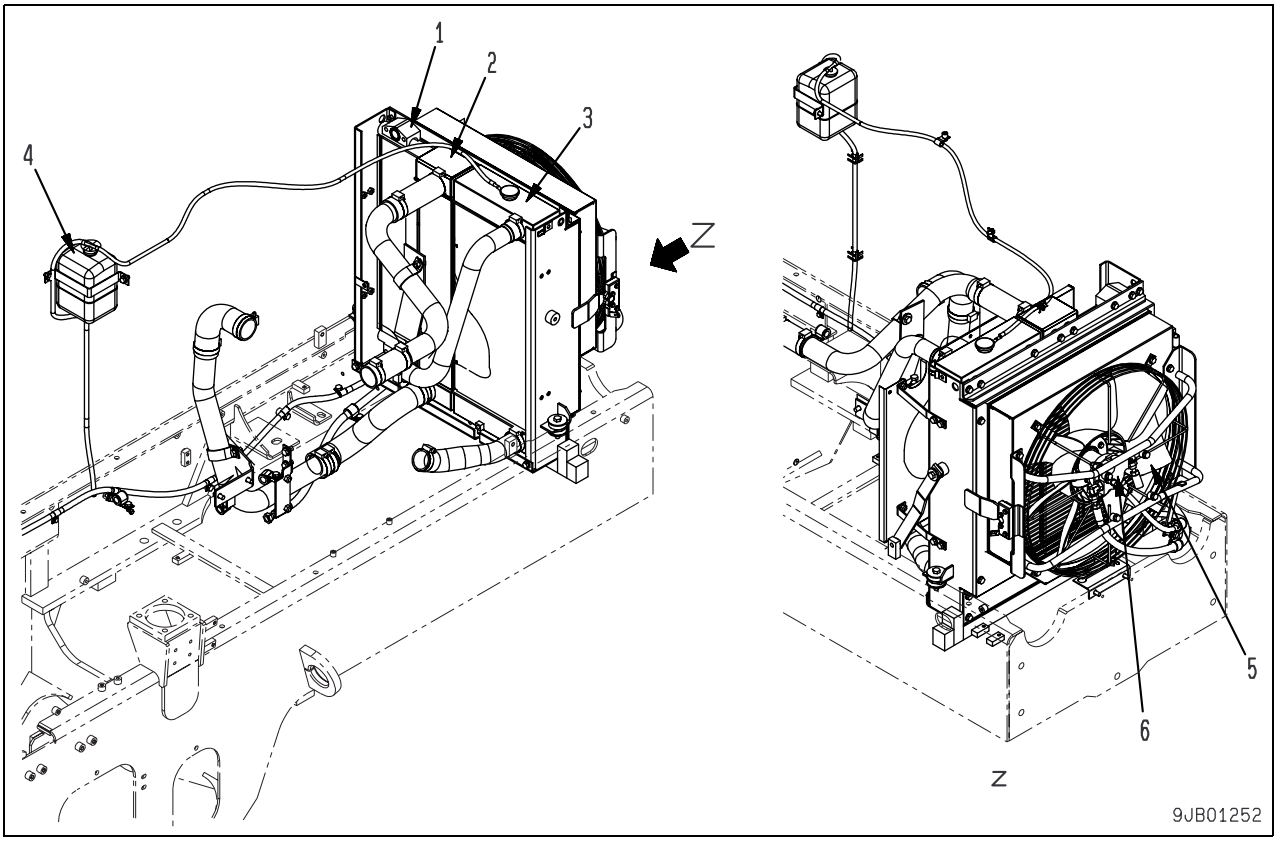
No.	Check item	Criteria		Remedy
1	Distance between HST pump mounting face and tip of boss	Standard size	Repair limit	Adjust
		75.1	± 0.8	
2	Wear of internal teeth of coupling (plastic)	Repair limit: 1.0		Replace

3. Coupling
4. Boss
5. HST pump input shaft
6. Cover
7. Flywheel

Outline

- The damper reduces the 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 (7) to coupling (3), which absorbs the torsional vibration, and then transmitted through boss (4) to the HST pump.

COOLING SYSTEM

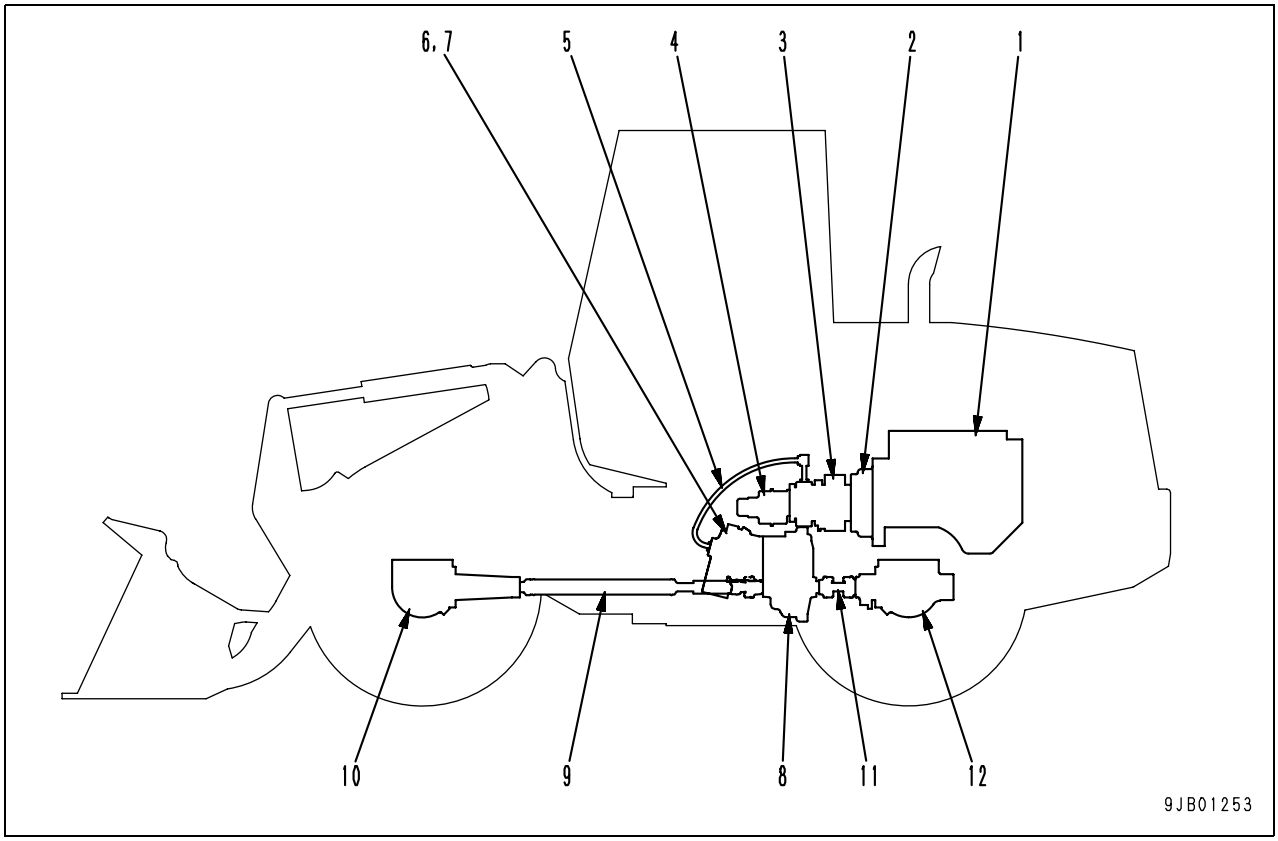


25. Oil cooler
26. Charge air cooler
27. Radiator
28. Reservoir tank
29. Cooling fan
30. Cooling fan motor

Specification

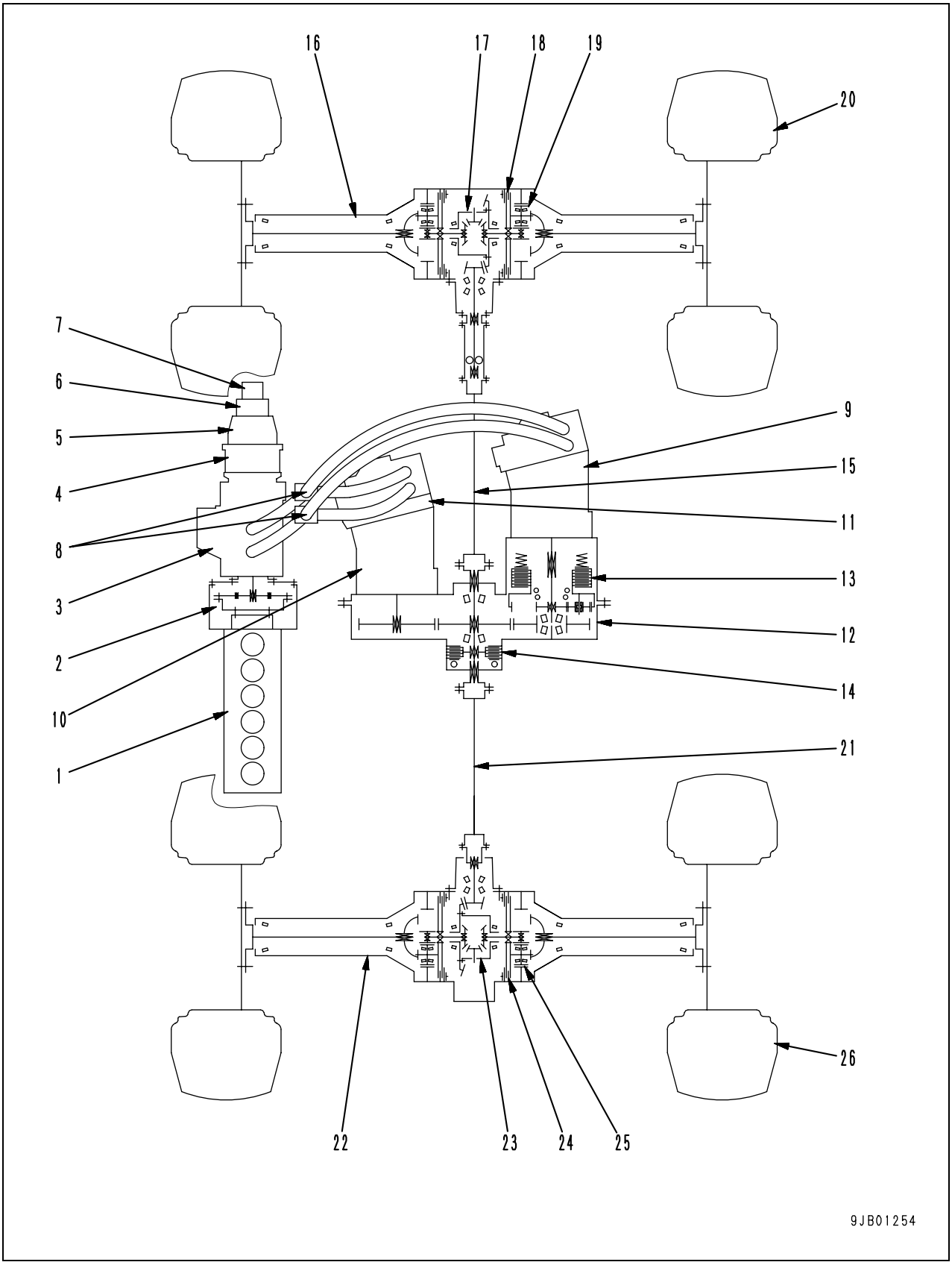
	Radiator	Oil cooler	Charge air cooler
Core type	AL WAVE–4	CF40–1	
Fin pitch (mm)	3.5 / 2	3.5 / 2	4.0 / 2
Total heat radiating area (m^2)	27.9	4.67	7.23
Pressure valve opening pressure (kPa {kg/cm^2})	68.6 {0.7}	—	—
Vacuum valve opening pressure (kPa {kg/cm^2})	0 – 4.9 {0 – 0.05}	—	—

POWER TRAIN



1. Engine
2. Damper
3. HST pump
4. 4-gear pump unit
5. High-pressure hose
6. HST motor 1
7. HST motor 2
8. Transfer
9. Front drive shaft
10. Front axle
11. Rear drive shaft
12. Rear axle

POWER TRAIN SYSTEM DIAGRAM

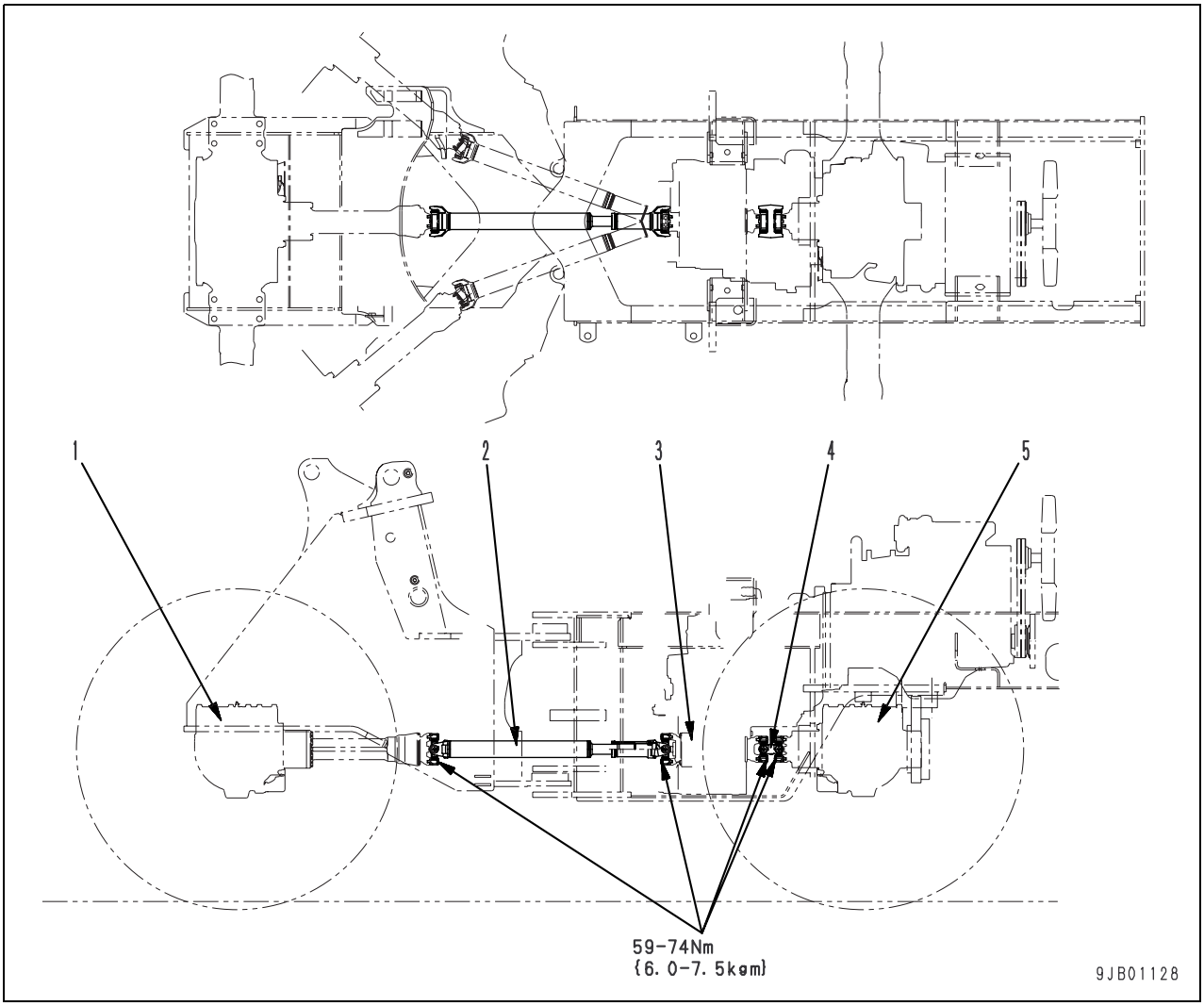


1. Engine
2. Damper
3. HST pump
4. Steering pump
5. Work equipment pump
6. Brake and cooling fan pump
7. Transfer lubricating oil pump
8. High-pressure hose
9. HST motor 1
10. HST motor 2
11. Emergency steering valve
12. Transfer
13. Transfer clutch
14. Parking brake
15. Front drive shaft
16. Front axle
17. Differential
18. Wet multiple disc brake
19. Final drive
20. Front tire
21. Rear drive shaft
22. Rear axle
23. Differential
24. Wet multiple disc brake
25. Final drive
26. Rear tire

Outline

- The power of engine (1) is transmitted to HST pump (3) through damper (2) which is installed to the flywheel and which absorbs the torsional vibration of the power,
- The power of engine (1) is also transmitted to HST pump (3), HST charge pump built in HST pump (3), steering pump (4) connected to HST pump (3), work equipment pump (5), brake and cooling fan pump (6), and transfer lubricating oil pump (7).
- HST pump (3) is equipped with the forward-reverse shifting valve and servo piston, which changes the discharge direction and discharge rate of HST pump (3) continuously by changing the swash plate angle.
- HST motors (9) and (10) are installed to transfer (12) and connected to HST pump (3) by high-pressure hose (8).
- The turning direction and speed of HST motors (9) and (10) are changed by the hydraulic power of HST pump (3) to control the travel direction and travel speed of the machine.
- The power of HST motor 1 (9) is transmitted through transfer clutch (13) in transfer (12) to the output shaft.
  The power of HST motor 2 (10) is transmitted through the gear in transfer (12) to the output shaft.
- Parking brake (14) is installed on the rear side in transfer (12). It operates the wet multiple disc brake to stop the machine according to the operation of the parking brake lever.
- The power for the front side is transmitted through front drive shaft (15) to front axle (16).
  The power for the rear side is transmitted through rear drive shaft (21) to rear axle (22).
- The power transmitted to axles (16) and (22) is reduced in speed by the pinion gears of differentials (17) and (23), and then transmitted through the sun gear shaft to the sun gear.
- The power of the sun gear is reduced in speed by the planetary mechanisms of final drives (19) and (25), and then transmitted through the axle shaft and wheels to tires (20) and (26).

DRIVE SHAFT (PROPELLER SHAFT)



1. Front axle
2. Front drive shaft
3. Transfer
4. Rear drive shaft
5. Rear axle

Outline

- The power from the output shaft of the transfer is transmitted through front drive shaft (2) and rear drive shaft (4) to front axle (1) and rear axle (5).
- When the machine is articulated or it receives an impact from the road during travel or a working impact, the positions of the transfer and front and rear axles change. The drive shafts can change their angles and lengths by means of the universal joints and sliding joints so that the power will be transmitted without damaging any part even when the positions of the components change because of the impacts.