WORKSHOP MANUAL

TB216

Serial No.216100002~

Book No. CC7E000

WETB216-BA



MINI EXCAVATOR

TAKEUCHI

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FOREWORD

This manual, which is written for engineers who service the machine, describes procedures for disassembly and assembly, inspection and maintenance, and troubleshooting, as well as maintenance reference values and an outline of the specifications. Refer to this manual during daily work to improve your services. Note that the information is subject to change without notice due to design modifications made to the machine from time to time by the manufacturer.

Directional terms: front, rear, left, right

In this manual, the “front” refers to the end of the machine where the dozer blade is mounted, while the “rear” refers to the other end where the travel motor is mounted. The “right” or “left” refers to the side viewed by a person sitting in the operator’s seat.

Machine serial number

The machine serial number is stamped on the identification plate. Be sure to include this number when sending a report or inquiry or when ordering parts.

Control of manual

Appoint a person in charge of keeping the manuals up to date in your company and inform us of the person’s name for our records. Any revisions or additions to this manual will be sent to the person.

Symbols used in this manual

The symbols used in this manual have the following meanings.

S/N Indicates the machine serial number.
☞ Means “Refer to the section quoted.”
kg Indicates the mass of the equipment or machine.
Means “Tighten to the torque specified here.”
Indicates the use of thread-locking compound.
Indicates the use of grease.

Manual structure

This manual consists of the following parts.

1. Safety
2. Service data
3. Function
4. Disassembly and assembly
5. Troubleshooting
6. Other

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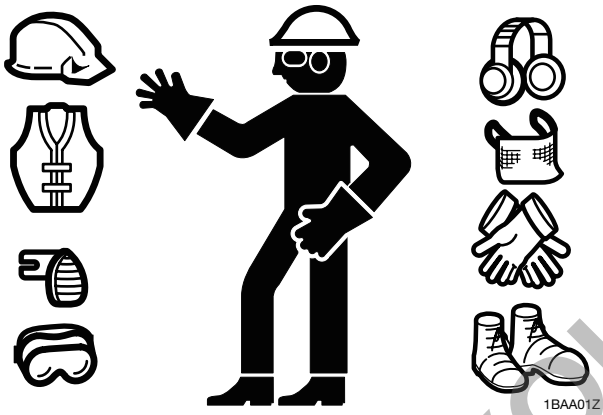
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SAFETY PRECAUTIONS

Observe all safety rules

- Operation, inspection and maintenance of this machine must be performed only by a trained and qualified person.
- All rules, regulations, precautions and safety procedures must be understood and followed when performing operation, inspection and maintenance of this machine.
- Do not perform any operation, inspection or maintenance of this machine when under the influence of alcohol, drugs, medication, fatigue or insufficient sleep.

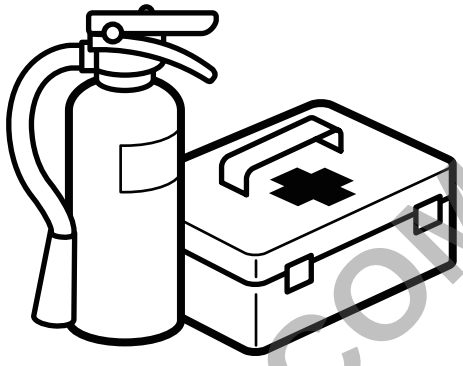
Wear safe clothing and protective gear



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- Do not wear loose clothing or any accessory that can catch on the controls or the moving parts of the machine.
- Do not wear clothing stained with oil or grease that can easily catch fire.
- Wear protective gear such as helmet, safety shoes, protective goggles, respirator, gloves and earmuffs, as appropriate, depending on the work involved. Especially make sure to wear protective eye-wear and mask when working with a grinding/polishing/sanding machine, hammer or compressed air, as metal fragments or other objects could scatter in such an environment.
- Wear hearing protectors when operating the machine. Loud and prolonged noise can damage or destroy your hearing.

Install an extinguisher and a first aid kit



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- Install an extinguisher to fight a fire, and learn how to use it.
- Prepare a first aid kit and keep it at a designated place.
- Decide on the procedures to be used in case of fire or other hazards.
- Decide on and take note of the contact(s) in case of emergency.

Place a “Do not operate” alert sign

Serious injury or death may result if an unauthorized person starts the engine or touches the controls during inspection or maintenance.

- Before performing maintenance, stop the engine, remove the key and store it in a safe place.
- Prominently display a “Do not operate” alert sign on places such as the starter switch and the control lever. Place another sign outside of the machine as necessary.

Use the correct tools



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Do not use damaged or weakened tools or tools designed for other purposes. Use only the correct tools for the work involved.

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SPECIFICATION TABLES

Operating mass	Rubber crawler	Canopy	kg (lb)	1770 (3900)
		Cab	kg (lb)	–
	Steel crawler	Canopy	kg (lb)	1820 (4010)
		Cab	kg (lb)	–
Rated horse power*	NET (IOS 14396)		kW (hp)	11.2 (15)
			min^{-1} (rpm)	2400 (2400)
	NET (IOS 9249/ SAEJ1349)		kW (hp)	10.8 (14.5)
			min^{-1} (rpm)	2400 (2400)
Bucket capacity	Heaped capacity		m^3 ($ft.^3$)	0.038 (1.34)
	Struck capacity		m^3 ($ft.^3$)	0.028 (0.99)

Performance

Standard loading mass			kg (lb)	70 (150)
Slew speed			min^{-1} (rpm)	9.2 (9.2)
Travel speed	Rubber crawler	1st	km/h (mph)	2.2 (1.37)
		2nd	km/h (mph)	4.2 (2.61)
	Steel crawler	1st	km/h (mph)	2.1 (1.30)
		2nd	km/h (mph)	4.0 (2.49)
Maximum tractive force			kN (lbf)	19.4 (4360)
Gradeability			%	58
			deg.	30
Ground pressure	Rubber crawler	Canopy	kPa (psi)	29.4 (4.26)
		Cab	kPa (psi)	–
	Steel crawler	Canopy	kPa (psi)	32.8 (4.76)
		Cab	kPa (psi)	–
Noise level	Sound-power level		dB (A)	L_{WA} 93
	Sound-pressure level*		dB (A)	–

*: At the operator location as stipulated by ISO 6396: 2008.

Dimensions of completed machine

Overall length	Standard arm		mm (in.)	–
	Middle arm		mm (in.)	–
	Long arm		mm (in.)	3870 (152.3)
Overall width	During normal operation		mm (in.)	1300 (51.2)
	Track retracted		mm (in.)	985 (38.8)
Overall height	Rubber crawler	Canopy	mm (in.)	2305 (90.7)
		Cab	mm (in.)	–
	Steel crawler	Canopy	mm (in.)	–
		Cab	mm (in.)	–

Dimensions of base machine

Overall length of base machine		mm (in.)	1910 (75.2)
Overall width of base machine	During normal operation	mm (in.)	1300 (51.2)
	Track retracted	mm (in.)	985 (38.8)
Upper structure overall width		mm (in.)	985 (38.8)
Upper structure overall width	Left	mm (in.)	495 (19.5)
	Right	mm (in.)	490 (19.3)

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PERFORMANCE CRITERIA

Standard values table

Item				Standard value	Allowable value
Engine speed	Idling		min^{-1} (rpm)	1060 $^{+100}_{-100}$ (1060 $^{+100}_{-100}$)	
	Maximum R.P.M.		min^{-1} (rpm)	2530 $^{+50}_{-50}$ (2530 $^{+50}_{-50}$)	
Hydraulic oil pressure	Boom		MPa (psi)	21.0 $^{+1.0}_{-0.3}$ (3046 $^{+145}_{-44}$)	
	Arm		MPa (psi)	21.0 $^{+1.0}_{-0.3}$ (3046 $^{+145}_{-44}$)	
	Dozer blade		MPa (psi)	20.0 $^{+1.0}_{-0.3}$ (2901 $^{+145}_{-44}$)	
	Slew		MPa (psi)	13.4 $^{+2.0}_{0}$ (1944 $^{+290}_{0}$)	
	Pilot pressure		MPa (psi)	3.4 $^{+0.4}_{-0.3}$ (493 $^{+58}_{-44}$)	
Cylinder speed	Boom cylinder	Retracted	s	2.2 $^{+0.4}_{-0.4}$	2.8
		Extended	s	2.2 $^{+0.4}_{-0.4}$	2.8
	Arm cylinder	Retracted	s	2.4 $^{+0.4}_{-0.4}$	3.0
		Extended	s	2.5 $^{+0.4}_{-0.4}$	3.2
	Bucket cylinder	Retracted	s	1.6 $^{+0.4}_{-0.4}$	2.2
		Extended	s	2.4 $^{+0.4}_{-0.4}$	3.0
	Swing cylinder	Retracted	s	5.5 $^{+0.7}_{-0.7}$	6.8
		Extended	s	5.5 $^{+0.7}_{-0.7}$	6.8
	Dozer blade cylinder	Retracted	s	2.6 $^{+0.4}_{-0.4}$	3.3
		Extended	s	2.7 $^{+0.4}_{-0.4}$	3.4
	Spanner cylinder	Retracted	s	3.4 $^{+0.7}_{-0.7}$	4.4
		Extended	s	3.7 $^{+0.7}_{-0.7}$	4.8
Slew time		Normal speed	s	13.0 $^{+0.8}_{-0.8}$	15.1
Overrun when slewing stops			mm (in.)	33 $^{+20}_{-20}$ (4.7 $^{+0.8}_{-0.8}$)	67 (2.6)
Natural travel drop			mm (in.)	0 (0)	
Natural slew drop	Slew bearing		mm (in.)	0 (0)	
	Swing cylinder		mm (in.)	5.0 $^{+0.0}_{-5.0}$ (0.2 $^{+0.0}_{-0.2}$)	10.0 (0.4)
Travel speed 10 m (32.8 ft.)	1st	Rubber	s	15.9 $^{+1.2}_{-1.2}$	18.7
		Steel	s	18.3 $^{+1.5}_{-1.5}$	21.6
	2nd	Rubber	s	9.2 $^{+1.0}_{-1.0}$	11.5
		Steel	s	9.6 $^{+1.2}_{-1.2}$	12.1
Travel speed (5 revs.)	1st	Rubber	s	27.4 $^{+1.2}_{-1.2}$	31.3
		Steel	s	27.9 $^{+1.5}_{-1.5}$	32.2
	2nd	Rubber	s	14.8 $^{+0.8}_{-0.8}$	17.7
		Steel	s	14.8 $^{+1.3}_{-1.3}$	18.2
Straight-ahead traveling			mm (in.)	0 $^{+125}_{0}$ (0 $^{+4.9}_{0}$)	
Straight travel function check	Bucket			To be moved forward using simultaneous operation	
	Arm				
	Boom				
	Dozer blade				
Bucket cylinder speed		Retracted	s	2.7 $^{+0.8}_{-0.8}$	3.8

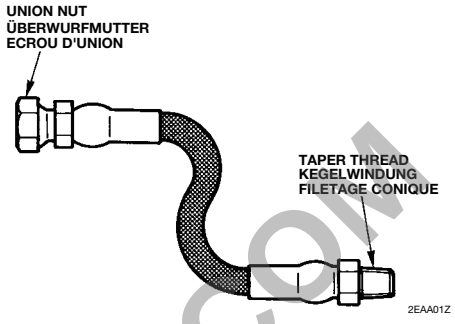
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TIGHTENING TORQUE

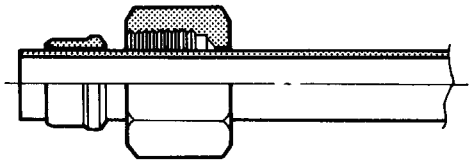
Hydraulic hose

Hose fitting size	Tightening torque			
	Union nut (G)		Taper thread (R)	
	N·m	ft.-lb	N·m	ft.-lb
1/8	$9.8^{+4.9}_{0}$	$7.3^{+3.5}_{0}$	11.8 ± 1.2	8.7 ± 0.8
1/4	$24.5^{+4.9}_{0}$	$18.1^{+3.5}_{0}$	29.4 ± 2.9	21.7 ± 2.1
3/8	$49.0^{+4.9}_{0}$	$36.2^{+3.5}_{0}$	53.9 ± 5.4	39.8 ± 3.9
1/2	$58.8^{+4.9}_{0}$	$43.4^{+3.5}_{0}$	88.3 ± 8.8	65.1 ± 6.4
3/4	$117.7^{+4.9}_{0}$	$86.8^{+3.5}_{0}$	147.1 ± 14.7	108.5 ± 10.7
1	$137.3^{+4.9}_{0}$	$101.3^{+3.5}_{0}$	196.1 ± 19.6	144.7 ± 14.3



Bite-type pipe fitting for steel pipe

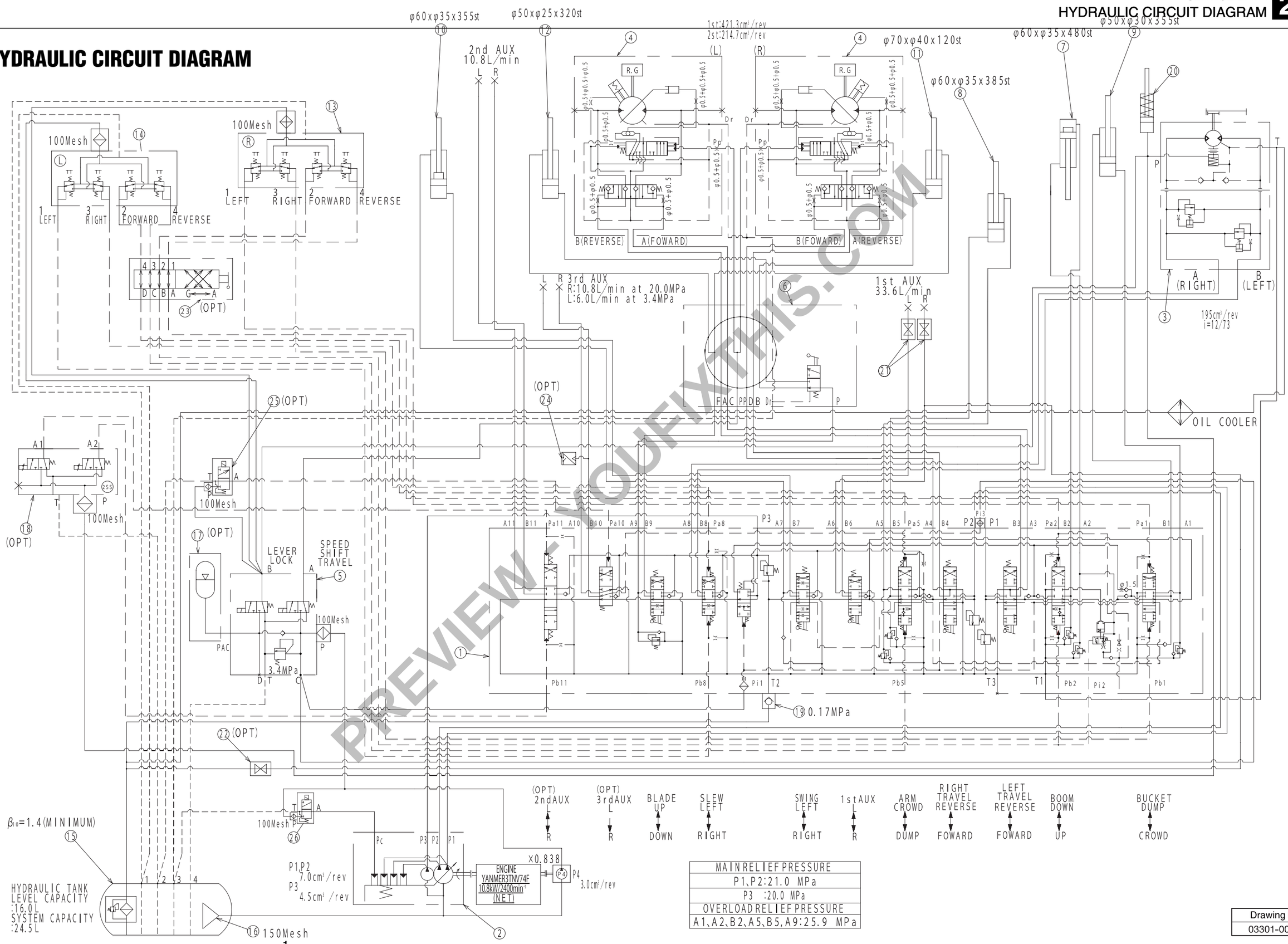
Outer diameter of pipe (mm)	Tightening torque	
	N·m	ft.-lb
8	34.3 ± 4.9	23.5 ± 3.5
10	41.7 ± 2.5	30.7 ± 1.7
12	58.8 ± 4.9	43.4 ± 3.5
15	88.3 ± 4.9	65.1 ± 3.5
16	93.2 ± 4.9	68.7 ± 3.5
18	132.4 ± 4.9	97.6 ± 3.5
22	205.9 ± 9.8	151.8 ± 7.2
27.2	245.2 ± 9.8	181.0 ± 7.2
28	313.8 ± 19.6	231.4 ± 14.3
32	313.8 ± 19.6	231.4 ± 14.3
35	411.9 ± 19.6	303.7 ± 14.3



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HYDRAULIC CIRCUIT DIAGRAM



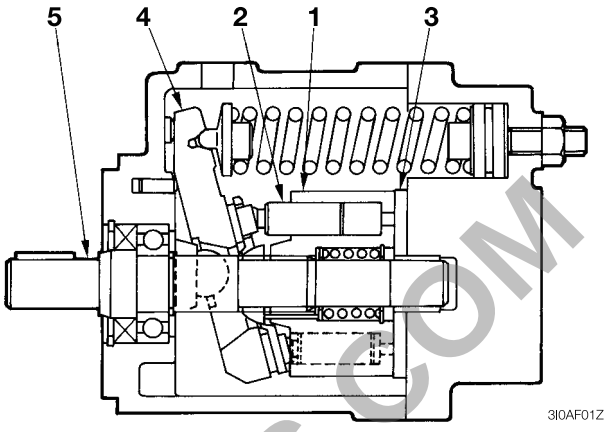
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Drawing No.
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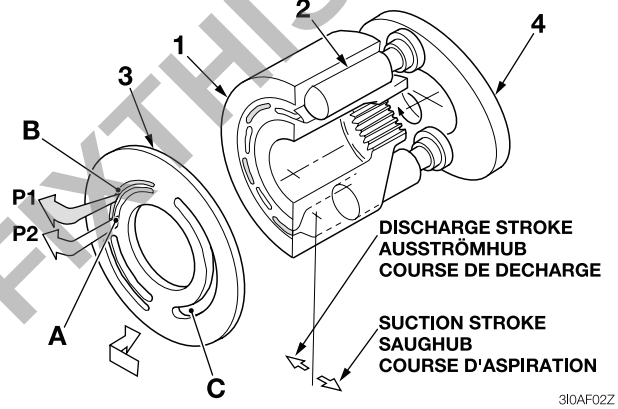
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HYDRAULIC PUMP (PISTON)

This pump is a variable displacement piston pump with a single cylinder block that discharges two separate but equal volumes of fluid.
The pistons (2) are installed in the cylinder block (1), and the end surface of which is in contact with the valve plate (3). The discharge port A of the pump P1 along with the discharge port B and the suction port C of the pump P2 are located in the valve plate (3). The swash plate (4), on the other hand, is fixed at an angle to the housing, and the pistons (2) are designed to rotate along with the swash plate (4).
Here, the cylinder block (1) rotates as the shaft (5) is rotated, and the pistons (2) mounted in the cylinder block (1) follow and move back and forth with the motion of the swash plate (4), which activates the suction and discharge pumps. At this time, the piston in contact with the discharge port A in the valve plate (3) operates as the pump P1, while the piston in contact with the discharge port B operates as the pump P2.
As thus described, the pistons (2) complete one stroke of intake and exhaust for every stroke of the cylinder block (1). The continuous rotation of the shaft (5) allows the pistons to continue the intake and exhaust process.
The displacement of the pistons (2) can be varied through modification of the angle of inclination of the swash plate (4) as the degree of displacement depends on the inclination of the swash plate (4).



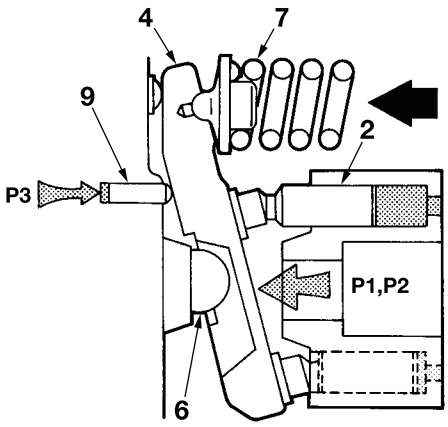
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Discharge volume control mechanism

The swash plate (4) is equipped with the swing pins (6) and is mounted on the housing at an angle of inclination that can be changed. The swash plate (4) has arranged on it the pistons (2) of the cylinder block and the piston (9), which lie in opposition to the spring (7). The discharge pressures from the pumps P1 and P2 work on the pistons (2), and the discharge pressure from the pump P3 works on the piston (9). If the discharge pressure falls below the preset value for the spring (7), the angle of inclination of the swash plate (4) will be set to its maximum value by the spring (7).



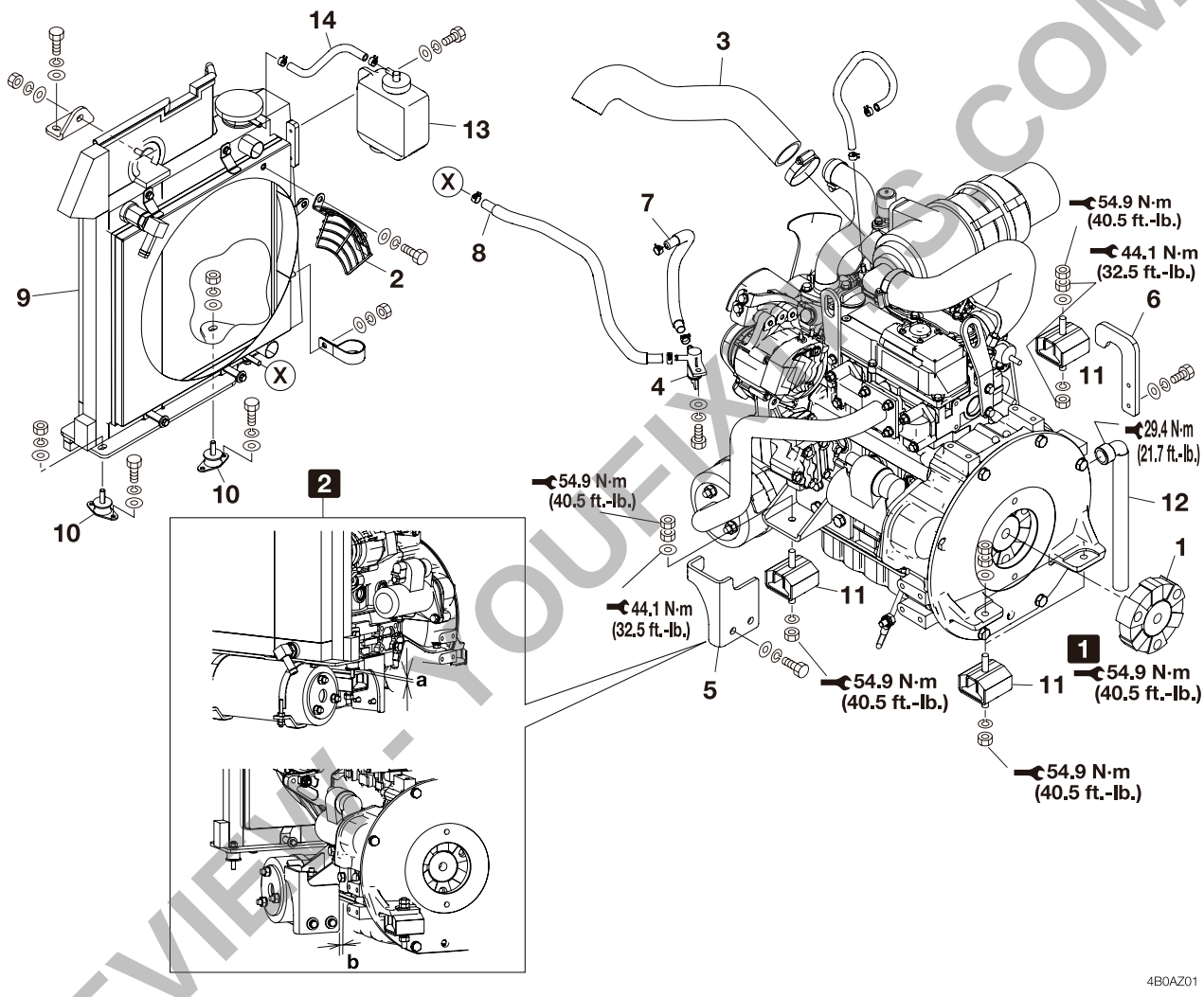
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DRIVE SYSTEM

Engine



1 Use the included bolts which have been coated to prevent them from becoming loose.
Press-fit the three included spring pins into the assembly to insert them.
54.9 N·m (40.5 ft-lb)
ThreeBond #1324
2 Use a shim to adjust the clearance between the engine hood and stopper.
- Clearance “a”: 5 mm (0.2 in.)
- Clearance “b”: 6 mm (0.24 in.)

1. Coupling assembly
2. Fan guard
3. Hose
4. Drain valve
5. Stopper
6. Stopper
7. Hose
8. Hose
9. Radiator assembly
10. Cushion rubber
11. Cushion rubber
12. Plug
13. Tank
14. Hose

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Removing the engine

1. Remove the battery ground cable from the battery terminal.
2. Remove the covers.
   ☞ "Removing the covers"
3. Disconnect the hoses, and take out the air cleaner assembly (18).
4. Loosen the radiator cap, and bleed out the engine coolant from the drain valve (4).
   • Engine coolant volume: 3.8 L (4.0 USqt)
5. Disconnect the hoses (26) and (27) from the radiator assembly (1).
6. Disconnect the hose from the drain valve (4).
7. Disconnect the hose from the sub-tank (13), and remove the sub-tank.
8. Drain the hydraulic oil from the tank.
   ☞ "Removing the hydraulic tank"
9. Disconnect the hydraulic hoses from the radiator assembly (9).
10. Remove the fan guard (2).
11. Take out the fixing nuts holding the cushion rubber in place, and remove the radiator assembly (1).
    • Slowly hoist up the radiator assembly while slowly pulling it forward so that the shroud does not strike the cooling fan.
    kg : 13 kg (28 lbs)
12. Remove the hydraulic pump.
    ☞ "Removing the hydraulic pump"
13. Disconnect the fuel hoses on the engine side.
    ☞ "Removing the hydraulic tank"
14. Disconnect the battery cable and the engine electrical wiring on the engine side.
    • Attach an identification label to each wiring.
    ☞ "2. Wire harness diagram"
    ☞ "Removing the battery"
15. Disconnect the engine ground cable (20).
16. Take out the nuts, and suspend the engine.
    • Adjust the clearance between the engine hood and the stopper (6).
    Upper side of the nut: 54.9 N·m (40.5 ft-lb)
    Lower side of the nut: 44.1 N·m (32.5 ft-lb)
    ☞ Refer to the construction diagram
    kg : 98 kg (216 lb)

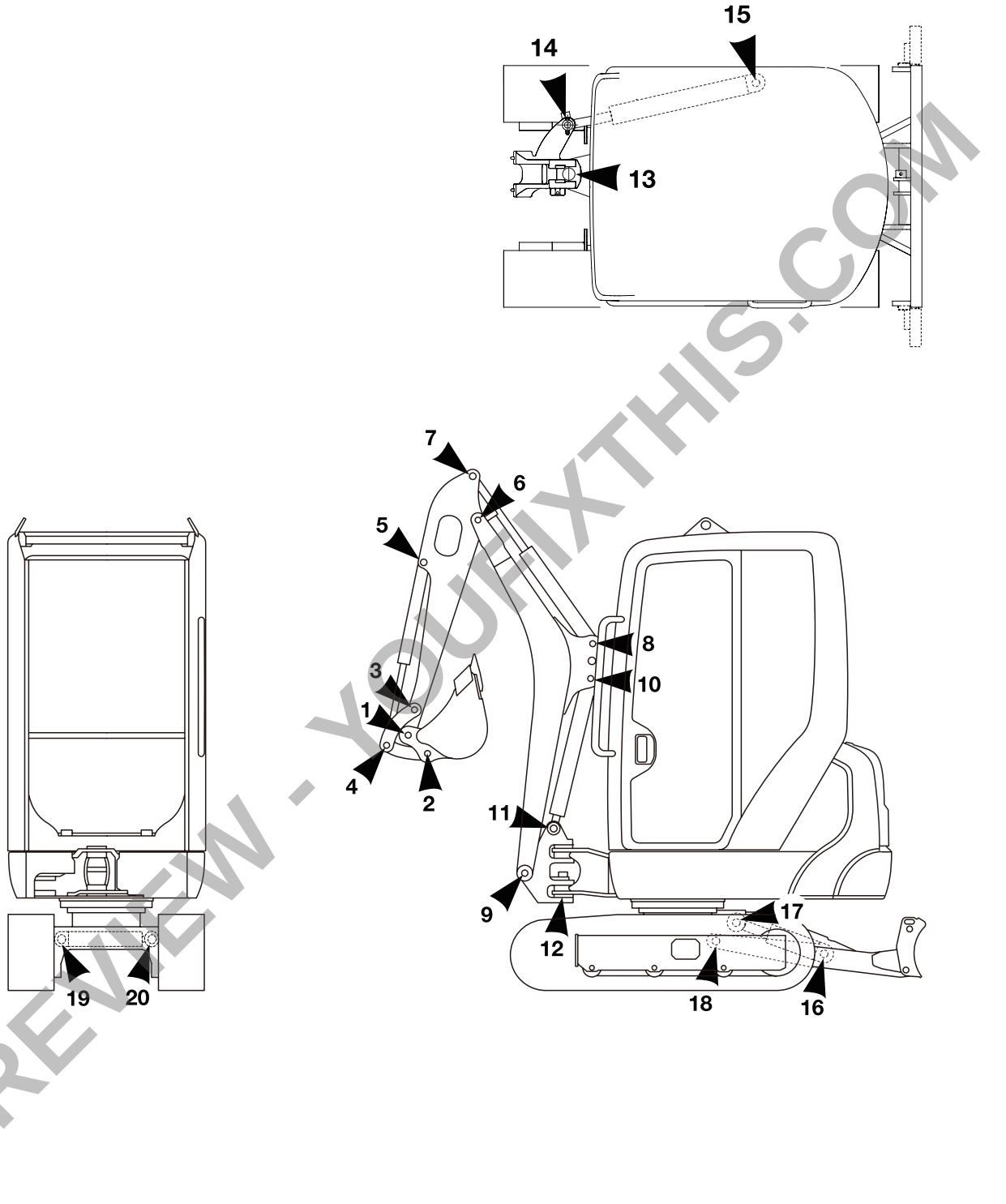
Installing the engine

For installation of the engine, follow the same procedures as for removal but in the reverse order.
The radiator must be mounted at a right angle to the frame and parallel to the cooling fan.

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Clearance for pin and bushing



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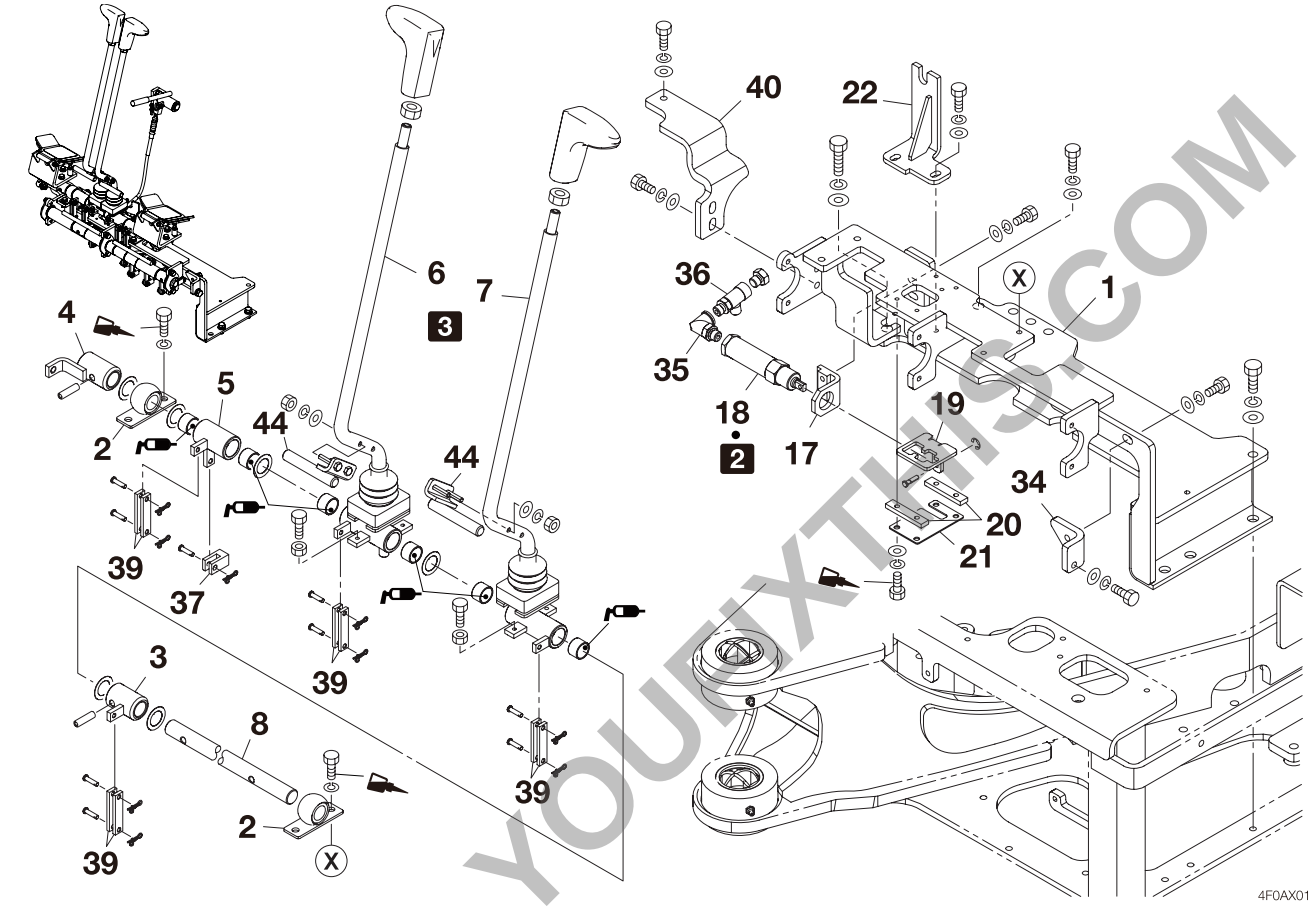
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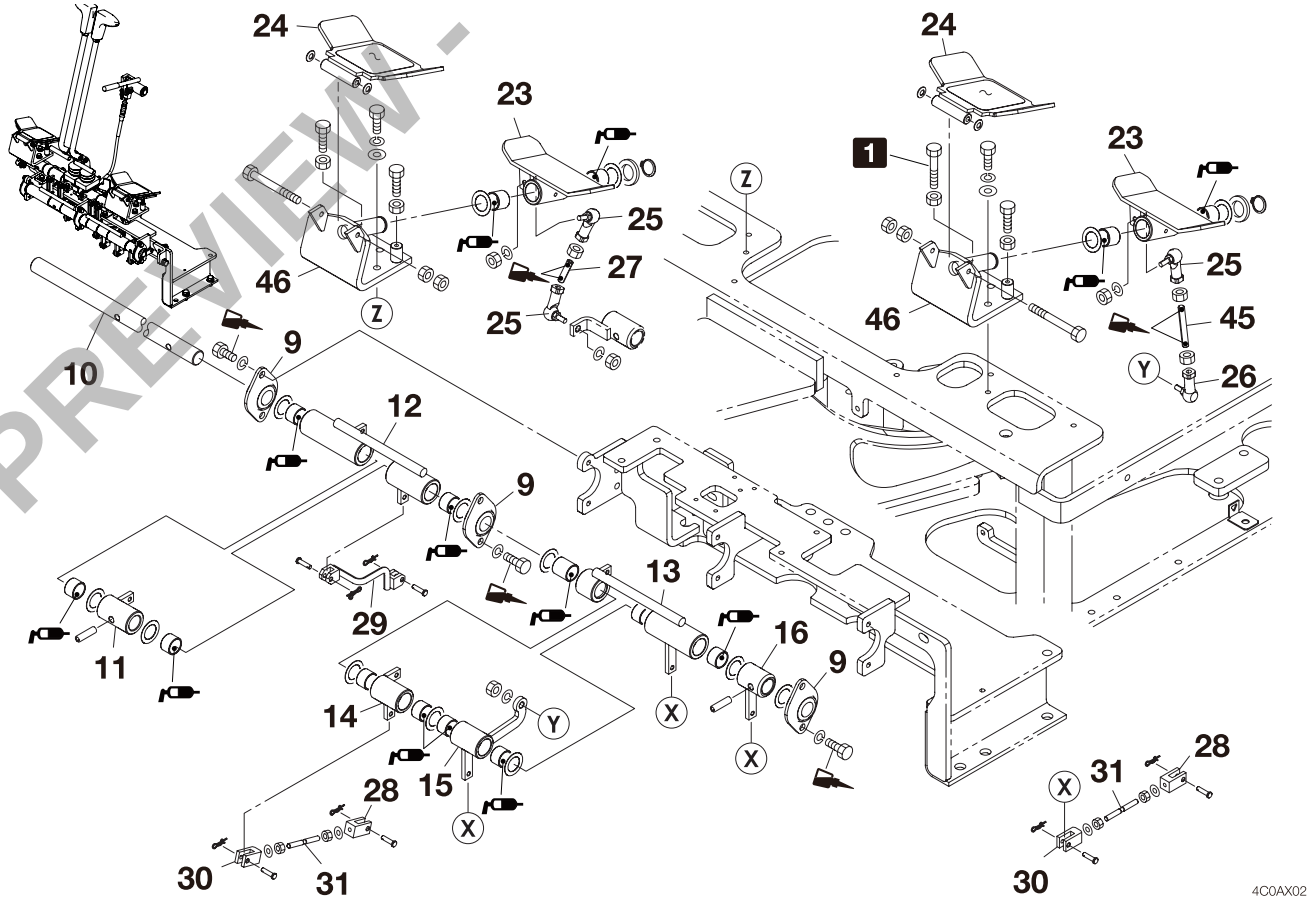
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OPERATING DEVICE

Control levers

Construction





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