SHOP MANUAL

model SK10SR

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KOBELCO

APPLICABLE No. SK10SR-3 PA04-10000～

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CONTENTS

CHAPTER 1
GENERAL CAUTIONS FOR MAINTENANCE WORK

1-1 Correct Work 1-1
1-2 Safety Precautions 1-1
1-3 Preparations 1-1
1-4 Cautions for Disassembly and Reassembly 1-1
1-5 Cautions for Removal and Installation of Hydraulic Equipment 1-2
1-6 Cautions for Removal and Installation of Hydraulic Piping 1-2
1-7 Cautions for Handling Seals 1-3
1-8 Correct Installation of Hydraulic Hose 1-3
1-9 Specifications of Hydraulic Hose 1-6
1-10 Air Release of Hydraulic Equipment 1-11

CHAPTER 2
TECHNICAL DATA

2-1 Specifications 2-1-1
2-2 Outline Drawing and Working Area 2-2-1
2-3 Weight List of Main Parts 2-3-1
2-4 Lifting Capacity List 2-4-1

CHAPTER 3
SERVICE STANDARDS

3-1 Machine Performance 3-1-1
3-2 Engine 3-2-1
3-3 Undercarriage 3-3-1
3-3-1 Rubber Crawler Specifications 3-3-1
3-4 Controls 3-4-1
3-5 Hydraulic Equipment 3-5-1
3-5-1 Hydraulic Cylinders 3-5-1
3-6 Implement 3-6-1
3-6-1 Front Attachments 3-6-1
3-6-2 Blade Moving Device 3-6-2
3-6-3 Bucket Teeth 3-6-2
3-7 List of Tightening Torque 3-7-1
3-7-1 Machine 3-7-1
3-7-2 Engine 3-7-3
3-7-3 Tightening Torque for General Bolts and Nuts 3-7-3

CHAPTER 4
ENGINE

4-1 Exploded View (General layouts of major engine components) 4-1-1
4-2 Measurement, Inspection and Adjustment 4-2-1
4-2-1 Measuring the Compression Pressure 4-2-1
4-2-2 Adjusting the Valve Clearance 4-2-2
4-2-3 Checking the V-belt Tension 4-2-3
4-2-4 Checking the Fuel Injection Valve 4-2-3
4-2-5 Checking and Adjusting Fuel Injection Timing 4-2-5

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CHAPTER 8
PERIODIC INSPECTION AND SERVICING

8-1 List of Periodic Inspection and Servicing....8-1

CHAPTER 9
FUEL, LUBE OIL AND GREASE RECOMMENDED

9-1 List of Fuel, Lube Oil and Grease Recommended....9-1

CHAPTER 10
TROUBLESHOOTING

10-1 Non-Breakdowns.... 10-1-1
10-1-1 Natural Release of Bucket.... 10-1-1
10-1-2 Discontinuous Arm Movement.... 10-1-1
10-1-3 Drifting of Upperstructure on Quick Travel Operation.... 10-1-2
10-1-4 Thermal Shock of Travel Motor.... 10-1-3
10-1-5 Change of Blade Speed in Loaded Condition.... 10-1-4
10-1-6 Time Lag on Travel Speed Switching.... 10-1-5
10-1-7 Fluctuation in Oil Level of Hydraulic Oil Tank Due to Temperature Change.... 10-1-6
10-2 Troubleshooting.... 10-2-1
10-2-1 Machine and Engine.... 10-2-1
10-2-2 Electrical Equipment on Panel.... 10-2-22

CHAPTER 11
REFERENCE DATA

11-1 Specifications for Attachment....11-1

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CHAPTER 1

GENERAL CAUTIONS FOR MAINTENANCE WORK

1-1 Correct Work....1-1
1-2 Safety Precautions....1-1
1-3 Preparations....1-1
1-4 Cautions for Disassembly and Reassembly....1-1
1-5 Cautions for Removal and Installation of Hydraulic Equipment....1-2
1-6 Cautions for Removal and Installation of Hydraulic Piping....1-2
1-7 Cautions for Handling Seals....1-3
1-8 Correct Installation of Hydraulic Hose....1-3
1-9 Specifications of Hydraulic Hose....1-6
1-10 Air Release of Hydraulic Equipment....1-11

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3-7 List of Tightening Torque

3-7-1 Machine

Unit : ft•lbf (N•m)

Applicable model:			SK10SR-3			
Equipment			Thread size	Tightening torque	Adhesive	Remarks
	No.	Tightening part				
Engine / Electrical equipment						
	1	Engine bracket	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	Fan side
	2	Engine mount vibroisolating rubber	Nut M10	18.1 to 23.9 (24.5 to 32.3)		Radiator side
	3	Engine mount vibroisolating rubber	M14 (fine)	50.6 to 61.5 (68.6 to 83.3)		Flywheel side
	4	Engine stopper	M10	32.6 to 42.8 (44.1 to 58.0)	Three Bond 1324 or its equivalent	2 places
	5	Radiator vibroisolating rubber	Nut M8	9.4 to 12.3 (12.7 to 16.7)		
	6	Radiator hose band	32, 38	2.2 (2.9)		
	7	Air cleaner hose	Hose clip 60	1.4 to 2.2 (2.0 to 2.9)		
	8	Fuel tank band (Upper side)	Flanged nut M10	2.2 (2.9)		
Travel device						
	1	Track roller	M12	57.9 to 72.3 (78.4 to 98.0)	Three Bond 1324 or its equivalent	
	2	Sprocket	Hexagon socket head bolt M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
	3	Idler	M12	57.9 to 72.3 (78.4 to 98.0)	Three Bond 1324 or its equivalent	
	4	Idler fork	Plug R1/8	6.5 to 7.2 (8.8 to 9.8)	Loctite 262 or its equivalent	
	5	Nipple valve	M16	36.2 (49.0)		
	6	Nut (Stopper)	M16	123.0 to 151.9 (166.6 to 205.8)	Three Bond 1324 or its equivalent	
	7	Blade	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
Controls						
	1	Control lever grip	Binding head screw M4	1.4 to 2.2 (2.0 to 2.9)	Three Bond 1324 or its equivalent	
	2	Blade lever fulcrum	M8	16.6 to 21.0 (22.5 to 28.4)	Three Bond 1324 or its equivalent	
	3	Boss in blade lever shaft section	M8	16.6 to 21.0 (22.5 to 28.4)	Three Bond 1324 or its equivalent	
	4	Lock lever R	M6	8.7 to 12.3 (11.8 to 16.7)	Three Bond 1324 or its equivalent	
	5	L-ball, link-ball 8 (male screw)	M8	9.4 to 12.3 (12.7 to 16.7)		
	6	L-ball, link-ball 8 (female screw)	M8	5.8 to 7.2 (7.8 to 9.8)		
	7	L-ball, link-ball 6 (male screw)	M6	5.8 to 7.2 (7.8 to 9.8)		
	8	L-ball, link-ball 6 (female screw)	M6	3.6 to 5.1 (4.9 to 6.9)		
	9	Support	M12	79.6 to 94.0 (108 to 127)	Three Bond 1324 or its equivalent	

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CHAPTER 5

HYDRAULIC SYSTEM

5-1 Outline 5-1-1
5-1-1 Control Valve Operation 5-1-4
5-2 Hydraulic Circuit Schematic 5-2-1
5-2-1 For Standard Type Machines 5-2-1
5-3 Circuit Operation 5-3-1
5-3-1 Boom 5-3-1
5-3-2 Arm 5-3-3
5-3-3 Bucket 5-3-5
5-3-4 Swing 5-3-7
5-3-5 Boom Swing 5-3-9
5-3-6 Blade 5-3-11
5-3-7 Travel 5-3-13
5-3-8 Track Gauge Change 5-3-15
5-3-9 Simultaneous Operation of Travel and Blade 5-3-17
5-3-10 Simultaneous Operation of Boom Up and Bucket 5-3-19
5-3-11 Hydraulic P.T.O. 5-3-21
5-4 Pressure Adjustment 5-4-1
5-4-1 System Relief Valves 5-4-1
5-4-2 Circuit Relief Valves 5-4-2
5-4-3 Swing Brake Valve 5-4-3
5-4-4 Cut-Off Valve 5-4-4

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2. TECHNICAL DATA

2. Technical Data

2-1 Specifications

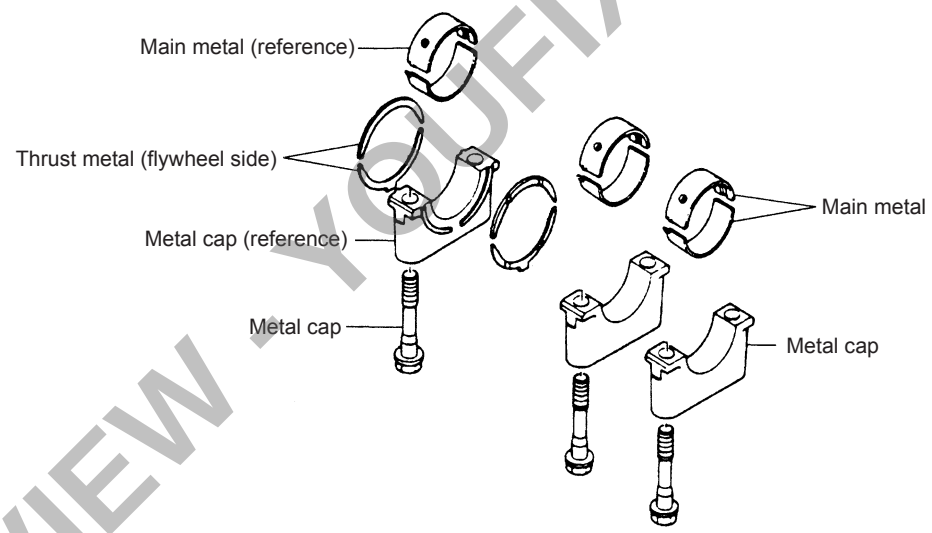
Item				Unit	SK10SR-3
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				in. (mm)	118.5 (3010)
Cabin	Overall height	Transportation position		in. (mm)	-
		Traveling position		in. (mm)	-
	Overall width	Full machine width		in. (mm)	-
Canopy	Overall height	Transportation position		in. (mm)	55.9 (1420)
		Traveling position		in. (mm)	55.9 (1420)
	Overall width	Full machine width (Maximum/Minimum)		in. (mm)	39.4 (1000) / 32.7 (830)
Tumbler center distance				in. (mm)	44.1 (1120)
Track gauge (Maximum/Minimum)				in. (mm)	32.3 (820) / 25.6 (650)
Minimum ground clearance				in. (mm)	5.5 (140)
Traveling performance					
Travel speed	Steel crawler	Low speed (Forward/Reverse)		MPH (km/hr)	-
		High speed (Forward/Reverse)		MPH (km/hr)	-
	Rubber crawler	Low speed (Forward/Reverse)		MPH (km/hr)	1.30 (2.1) / 1.30 (2.1)
		High speed (Forward/Reverse)		MPH (km/hr)	2.49 (4.0) / 2.49 (4.0)
Theoretical climbing ability				degrees	30
Permissible water depth limit				in. (mm)	11.4 (290)
Work performance					
Bucket	Width (Standard)			in. (mm)	15.7 (400)
	(Standard. JIS heaped capacity)			cu.ft. (cu.m)	0.99 (0.03)
	Number of teeth / Installation method			pcs.	3 / rubber pin lock type
Maximum digging depth	With blade raised			in. (mm)	70.9 (1800)
	With blade on the ground			in. (mm)	74.8 (1900)
Maximum depth of vertically digging				in. (mm)	59.1 (1500)
Maximum dumping height				in. (mm)	89.0 (2260)
Minimum front swing radius (with boom in front)				in. (mm)	51.2 (1300)
Minimum front swing radius (at 75 degrees right boom swing)			Cabin	in. (mm)	-
			Canopy	in. (mm)	40.9 (1040)
Rear end swing radius				in. (mm)	19.7 (500)
Boom swing angle		Cabin	Left	degrees	-
			Right	degrees	-
		Canopy	Left	degrees	50
			Right	degrees	90
Maximum digging force		Bucket		lbs. (kN)	3087 (13.7)
		Arm		lbs. (kN)	1477 (6.6)
Maximum tractive force (Oil pressure force) (rubber)				lbs. (kN)	2712 (12.1)
Maximum swing inclination angle (with standard bucket)				degrees	20 (at loading)

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		Standard	Wear limit
Crank pin	Crank pin outside dia.	Refer to Section "3-2 1) Nominal and Allowable Values".	
Crank journal	Outside dia.		
	Main metal thickness		
	Oil clearance		

6) Precautions for Installation of the Metal Caps

(1) The lower half of the metal on the cap side has no oil groove.
(2) The upper half of the metal on the cylinder block side has an oil groove.
(3) Check the cylinder block alignment No.
(4) Place the arrow mark of the cap on the flywheel side.
(5) Place the main metal as a reference one on the flywheel side.



7) Undersized Main Metal by 0.0098 in. (0.25 mm) and Oversized Thrust Metal by 0.0098 in. (0.25 mm)

		Parts code No.
Main metal	Under size	719717-02911
Thrust metal	Over size	119810-02941

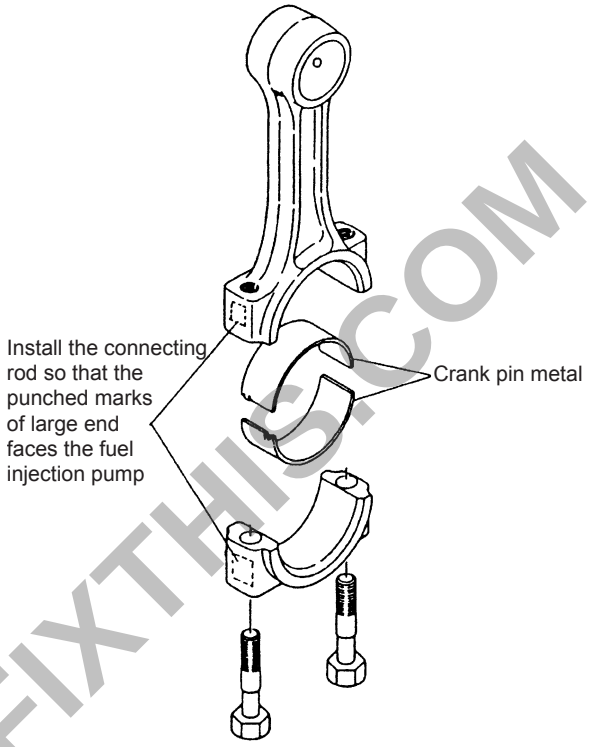
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5) Checking the Contact of the Crank Pin Metal

Apply a blue ink or a minium to the inside surface of the crank pin metal. Install the crank pin metal to the crank shaft, and tighten the rod bolts at a specified tightening torque (refer to the above 3 of this section) to check the contact of the metal. If the contacted surface of the metal occupies 75 % or more of the total surface, the crank pin metal is good in terms of contact.

6) Installing the Piston and the Connecting Rod

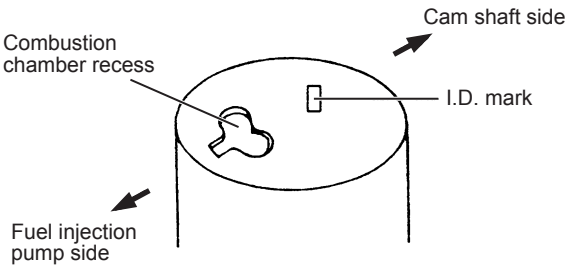
Install the piston with the connecting rod, with the marks at the large end of the connecting rod facing the fuel injection pump. Also, install the piston so that the recess of the combustion chamber is on the fuel injection pump side as seen from the top.



7) Side Gap of the Connecting Rod

After installing the connecting rod to the crank shaft, tighten the rod bolts at a specified tightening torque (refer to the above 3 of this section). Measure the side gap by inserting a thickness gauge between the connecting rod and the crank arm. If the measured value exceeds the wear limit, replace the crank pin metal or the connecting rod.

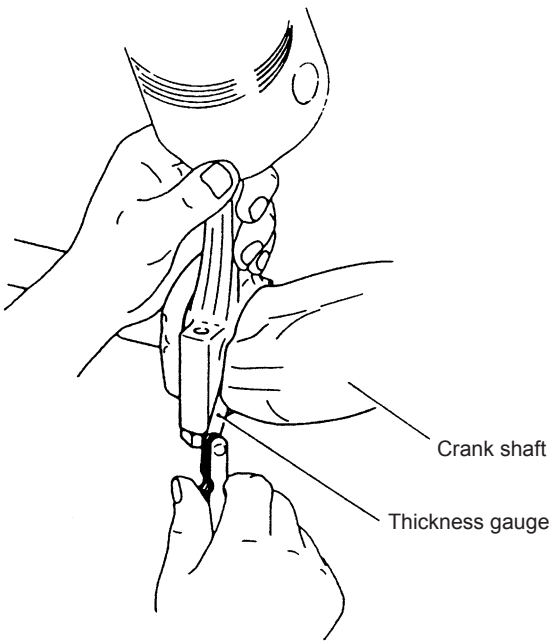
Side gap	Refer to Section "3-2 1) Nominal and Allowable Values".



8) Undersized Crank Pin Metal

Undersized by 0.0098 in. (0.25 mm)

Part code No.	119717-23610
Machining diameter of crank pin	φ41.702 to 41.712



(Measuring the connecting rod side gap)

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4-2 Measurement, Inspection and Adjustment

4-2-1 Measuring the Compression Pressure

1) Measurement Procedure

(1) Warm up the engine. Remove the fuel injection pipe and the fuel injection valve from the cylinder to be measured.

(2) Crank the engine before attaching the compression gauge adapter.

Note :

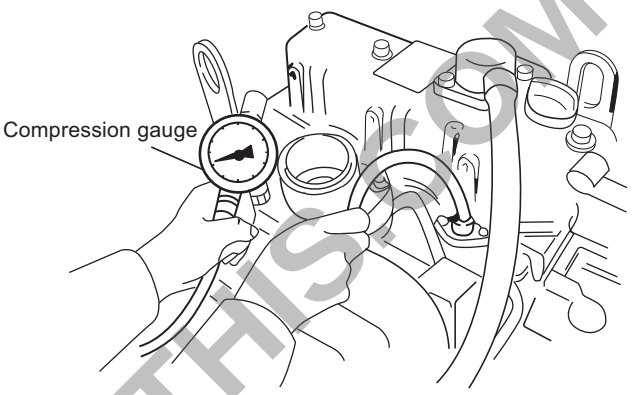
Crank the engine when the regulator handle has been turned to "STOP" position (no injection state).

(3) Attach the compression gauge adapter and the compression gauge to the cylinder to be measured.

Note :

Never fail to attach the gasket to the tip of the adapter.

(4) Crank the engine with the starter motor until the reading of the compression gauge is stabilized, according to the above step (2) and Note.



Measuring the compression pressure

[Engine compression pressure (Reference values)]

Compression pressure at 250 rpm PSI (MPa)		Variations of compression pressure among cylinders PSI (MPa)
Standard	Limit	
455 to 485 (3.14 to 3.34)	370 (2.55)	29 to 43 (0.2 to 0.3)

2) Trouble Diagnosis Through Measurement of Compression Pressure

Reduction in the compression pressure of the cylinder is one of the major causes of the increase in blow-by gas (which causes contamination and increased consumption of lubricating oil, and other trouble) and the engine starting failure. The compression pressure is influenced by the following factors :

(1) Degree of the clearance between the piston and the cylinder ;

(2) Degree of the clearance around the intake / exhaust valve seats ; and

(3) Gas leak through the nozzle gasket or the cylinder head gasket.

This means that the compression pressure decreases as the engine parts are worn and lose durability through the use of the engine over a long period of time.

In addition, the compression pressure is also decreased by scratches on the cylinder or the piston which are caused by dust or other foreign matters drawn in through the soiled filter element of the air cleaner, and wear or breakage of any piston rings. Therefore, the condition of the engine should be diagnosed by measuring the compression pressure.

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4-2-6 Adjusting the Maximum (or Minimum) Idling Speed 4-2-10
4-2-7 Checking the Cooling Water System and Radiator for Water Leakage 4-2-10
4-2-8 Checking the Sensors 4-2-11
4-3 Measurement Procedure, Service Data and Corrective Action 4-3-1
4-3-1 Cylinder Head 4-3-1
4-3-2 Cylinder Block 4-3-6
4-3-3 Valve Rocker Arm 4-3-8
4-3-4 Piston and Piston Rings 4-3-10
4-3-5 Connecting Rod 4-3-13
4-3-6 Cam shaft 4-3-16
4-3-7 Crank shaft 4-3-17
4-3-8 Gears 4-3-20
4-3-9 Trochoid Pump 4-3-21
4-4 Precautions for Reassembly 4-4-1
4-5 Electrical Equipment 4-5-1
4-5-1 Starter Motor 4-5-1
4-5-2 Alternator 4-5-2

CHAPTER 5
HYDRAULIC SYSTEM

5-1 Outline 5-1-1
5-1-1 Control Valve Operation 5-1-4
5-2 Hydraulic Circuit Schematic 5-2-1
5-2-1 For Standard Type Machines 5-2-1
5-3 Circuit Operation 5-3-1
5-3-1 Boom 5-3-1
5-3-2 Arm 5-3-3
5-3-3 Bucket 5-3-5
5-3-4 Swing 5-3-7
5-3-5 Boom Swing 5-3-9
5-3-6 Blade 5-3-11
5-3-7 Travel 5-3-13
5-3-8 Track Gauge Change 5-3-15
5-3-9 Simultaneous Operation of Travel and Blade 5-3-17
5-3-10 Simultaneous Operation of Boom Up and Bucket 5-3-19
5-3-11 Hydraulic P.T.O. 5-3-21
5-4 Pressure Adjustment 5-4-1
5-4-1 System Relief Valves 5-4-1
5-4-2 Circuit Relief Valves 5-4-2
5-4-3 Swing Brake Valve 5-4-3
5-4-4 Cut-Off Valve 5-4-4

CHAPTER 6
HYDRAULIC EQUIPMENT

6-1 Hydraulic Pump 6-1-1
6-2 Control Valve 6-2-1
6-3 Pilot Valve 6-3-1

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3. SERVICE STANDARDS

Unit : ft•lbf (N•m)

Applicable model:			SK10SR-3			
Equipment			Thread size	Tightening torque	Adhesive	Remarks
	No.	Tightening part				
Frame						
	1	Inner race of swing bearing	M12	57.9 to 72.3 (78.4 to 98.0)	Loctite 262 or its equivalent	
	2	Outer race of swing bearing	M12	57.9 to 72.3 (78.4 to 98.0)	Loctite 262 or its equivalent	
Rigging						
	1	Canopy	M16	123.0 to 151.9 (166.6 to 205.8)		
	2	Counter weight	M20	238.7 to 296.6 (323.4 to 401.8)	Three Bond 1324 or its equivalent	Option
Hydraulic equipment						
	1	Swing motor	M12	57.9 to 72.3 (78.4 to 98.0)	Three Bond 1324 or its equivalent	
	2	Travel motor	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
	3	Swivel joint	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
	4	Boom tube	M8	9.4 to 12.3 (12.7 to 16.7)	Three Bond 1324 or its equivalent	
	5	Hydraulic oil tank drain	M14	86.8 to 108.5 (117.6 to 147.0)		
	6	Oil level gauge	M10	10.9 to 12.3 (14.7 to 16.7)		Hydraulic oil tank
	7	Hose clip	13 to 19	1.4 to 2.2 (2.0 to 2.9)		
	8	Hose clip	22 or larger	2.2 to 2.9 (2.9 to 3.9)		
Work implements						
	1	Implement fulcrum pin lock plate	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	Boom, Arm and Blade
	2	Cylinder fulcrum pin lock plate	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	Boom, Arm and Bucket blade
	3	Boom bracket vertical pin	M12	18.1 to 23.9 (24.5 to 32.3)		
	4	Boom cylinder slide cover	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	
	5	Swing cylinder bottom fulcrum pin	M10	32.6 to 43.4 (44.1 to 58.8)	Three Bond 1324 or its equivalent	

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5. HYDRAULIC SYSTEM

1) Hydraulic Pump

The variable displacement piston pumps and the pilot pump are linked to the flywheel of the engine through the coupling. The number of revolutions of each hydraulic pump is identical to the engine speed.

Discharge volume of each pump

cu. in. (cu. cm) / rev

No.	Pump		Discharge volume
1	Piston pump	P1	0.336 (5.5)
2	Piston pump	P2	0.336 (5.5)
3	Pilot pump	P3	0.214 (3.5)

2) Oil Flow

(when the lock lever is in the unlock position)

(1) Piston pumps P1 and P2

(when the lock levers are in the unlock position)

The pumps take in oil through the suction filter from the hydraulic oil tank and discharge it. The discharged oil flows to the ports P1 and P2 of the control valve and returns from the port T to the hydraulic oil tank through the return filter. This circulation is repeated.

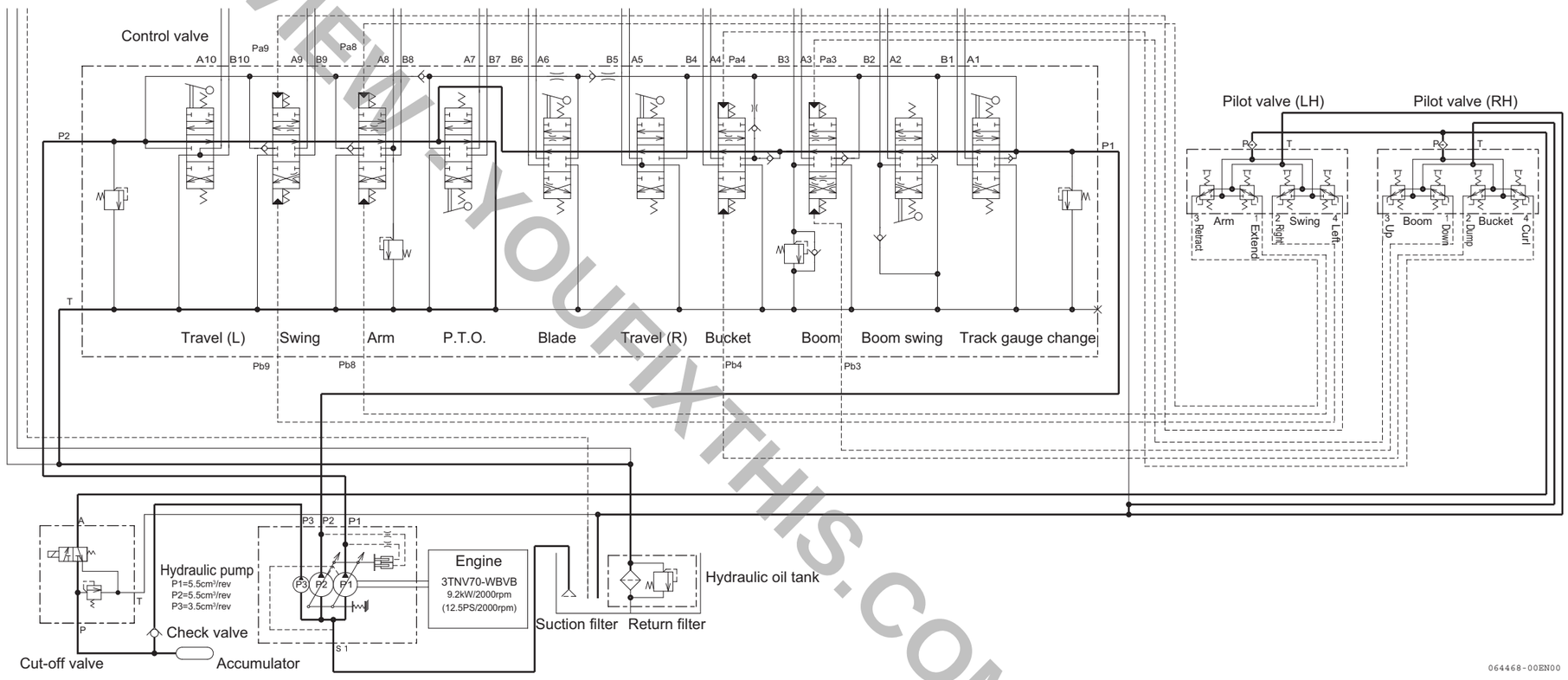
The bypass valve in the return filter opens at a differential pressure of 21.3 PSI (0.147 MPa).

(2) Pilot pump P3

The oil from the pilot pump P3 flows back to the hydraulic oil tank through the port A of the cut-off valve and the pilot valves.

3) System Relief Valve

The system relief valves R1 and R2 of the control valve control the discharge pressure of the pumps.

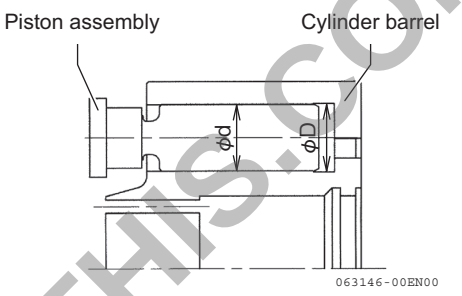
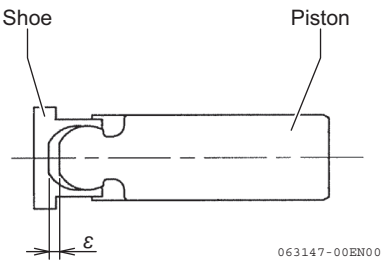
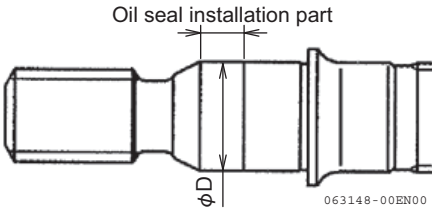


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6. Service standards

Clean the parts to be checked and completely dry them. Check the major parts carefully and replace them with new ones if they are excessively worn or damaged and may cause malfunction. Replace any obviously deformed or damaged seal with new one.

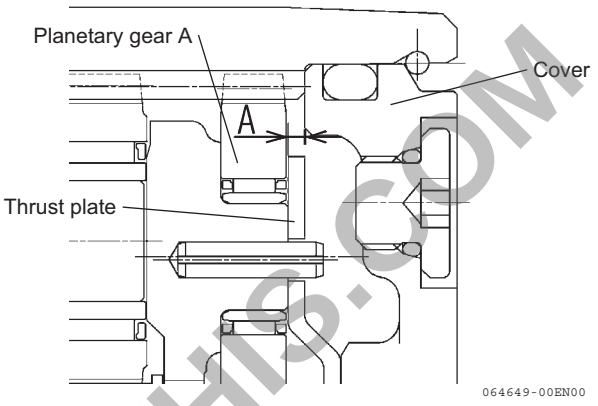
Procedure	
(1) Piston assembly and cylinder barrel • Check them with eyes for flaws, scuffing or excessive wear. (Especially check the sliding parts.) • Check the clearance between the outer surface d of each piston and the inner surface of the cylinder barrel D. D-d ≤ 0.0012 in (0.030 mm)	
(2)Piston shoe and piston • Check the axial play between the piston and the piston shoe. ε ≤ 0.0079 in. (0.2 mm)	
(3) Shaft • Check the oil seal installation part for wear.. Wear ≤ 0.00098 in (0.025 mm)	

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6. Troubleshooting

Trouble	Check	Result	Cause	Remedy
1. Malfunction of valve (Oil does not flow properly.) (Pressure is not stable.)	(1) Check the relief valve.	• Set pressure is low.	• Pressure is not set correctly.	• Set to the specified valve.
		• Spool does not work properly.	• Damaged or worn spool	• Replace the valve.
	(2) Check the solenoid-operated directional control valve.	• Voltage does not flow through solenoid.	• Damaged solenoid	• Replace the solenoid.
			• Loose connector	• Connect the connector.
		• Spool does not work properly.	• Clogged spool	• Disassemble and wash the spool, and replace hydraulic oil.
			• Damaged or worn spool	• Replace the valve.
	(3) Check the manual directional control valve.	• Spool does not work properly.	• Clogged spool	• Disassemble and wash the spool, and replace hydraulic oil.
			• Damaged or worn spool	• Replace the valve.
2. Leakage	(1) Check the torque of the bolt.	• Bolt is loosened.	• Improper installation	• Retighten the bolt to the specified torque.
	(2) Check the O-ring and packing.	• O-ring or packing is faulty.	• Damaged O-ring or packing	• Replace the O-ring and packing.
	(3) Check the clamp face of the O-ring and packing.	• Clamp face is faulty.	• Damaged clamp face	• Replace the valve.

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Procedure	
Thrust plate selection According to table below, select thickness of thrust plate **21** to install appropriate one after measurement of distance A. Unit: mm 	Distance A	1.4 to 1.8	1.9 to 2.4	2.5 to 2.9	3.0 to 3.5
---	---	---	---	---
Thickness	1.4t	1.8t	2.3t	2.8t		

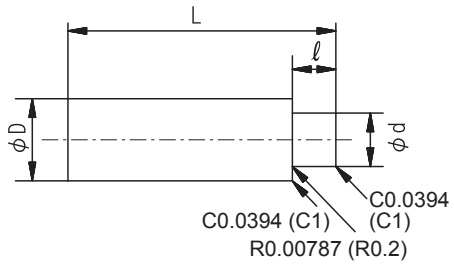
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7-3-2 Mechanical Control Linkage

1) Points of Assembly

(1) Use a jig to install the bushing into the link.

Bushing press-fitting jig

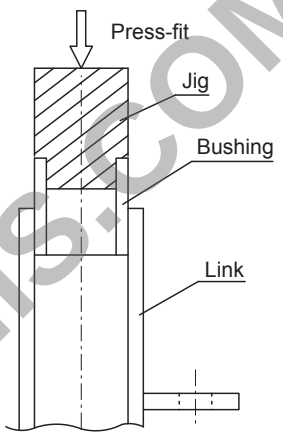


Unit : in. (mm)

	Jig No.	
	F-001	F-002
ϕ D	1.18 (30)	←
ϕ d	0.55 (14)	0.79 (20)
L	4.72 (120)	←
ℓ	0.55 (14)	←

Notes : *F-001 : Valve support*
: Track gauge change lever
F-002 : Valve support
: Travel levers
: Others

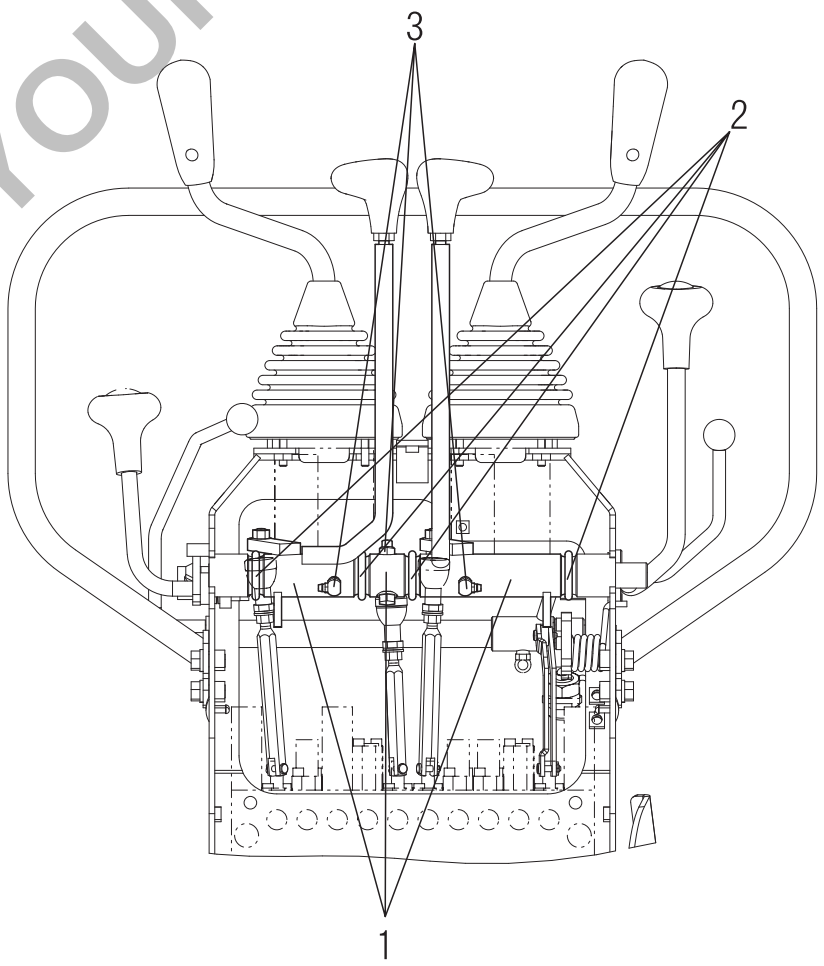
Bushing installation



(2) Apply grease to the links **1** and install them.

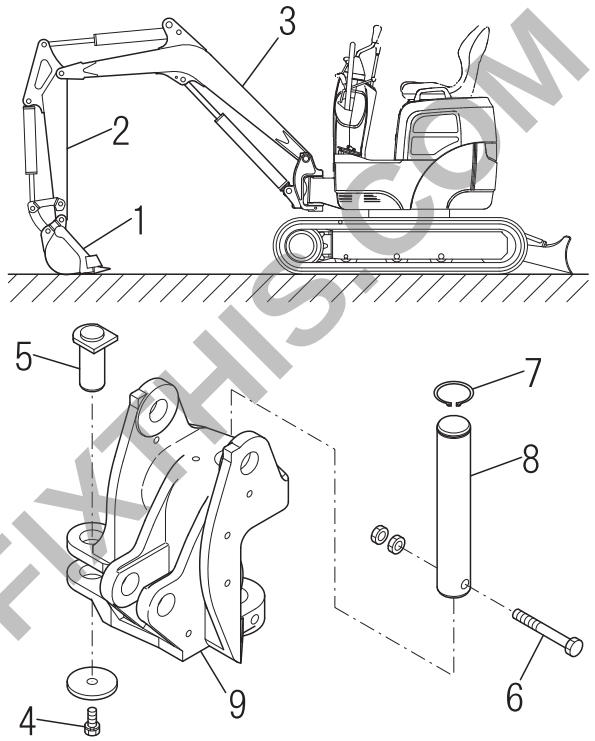
Note :
*Take care not to damage the O-rings **2** when installing the links.*

(3) Add grease to the grease nipples **3** after installation.



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5) Removal of Boom Bracket

Procedure	
(1) Remove the bucket **1**. Refer to Section "7-6-1 1) Removal of Bucket". (2) Remove the arm **2**. Refer to Section "7-6-1 2) Removal of Arm". (3) Remove the boom **3**. Refer to Section "7-6-1 3) Removal of Boom". (4) Remove the bolt **4** (M12) and pull out the pin **5** (for the boom swing cylinder). (5) Remove the bolt **6** (M12) and the snap ring C **7**, and pull out the pin **8**. Then remove the boom bracket **9**. ***Note :*** *Rope the boom bracket and remove it using a lifting device.*	

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