YANMAR

SERVICE MANUAL

EXCAVATOR

Vi012

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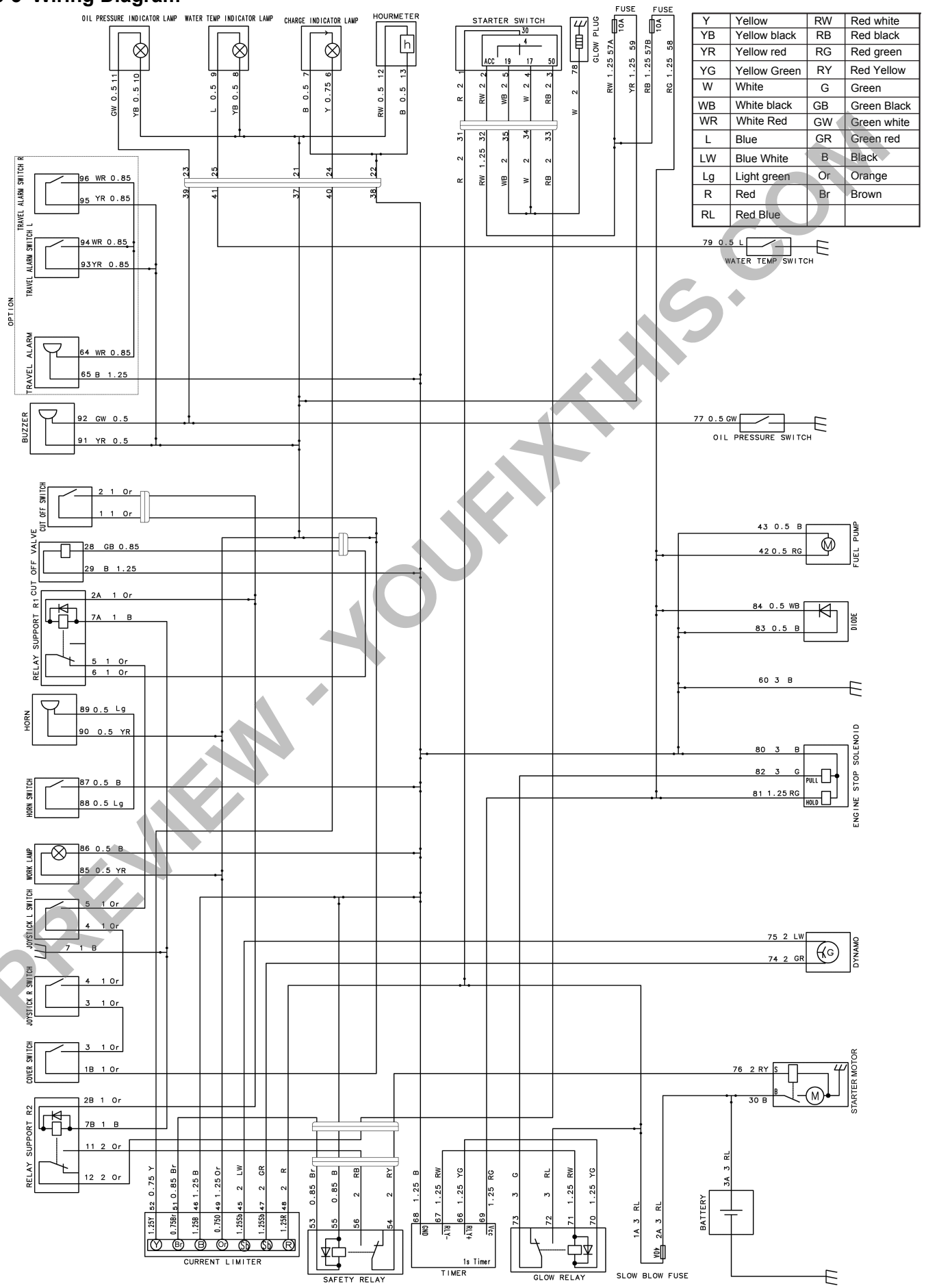
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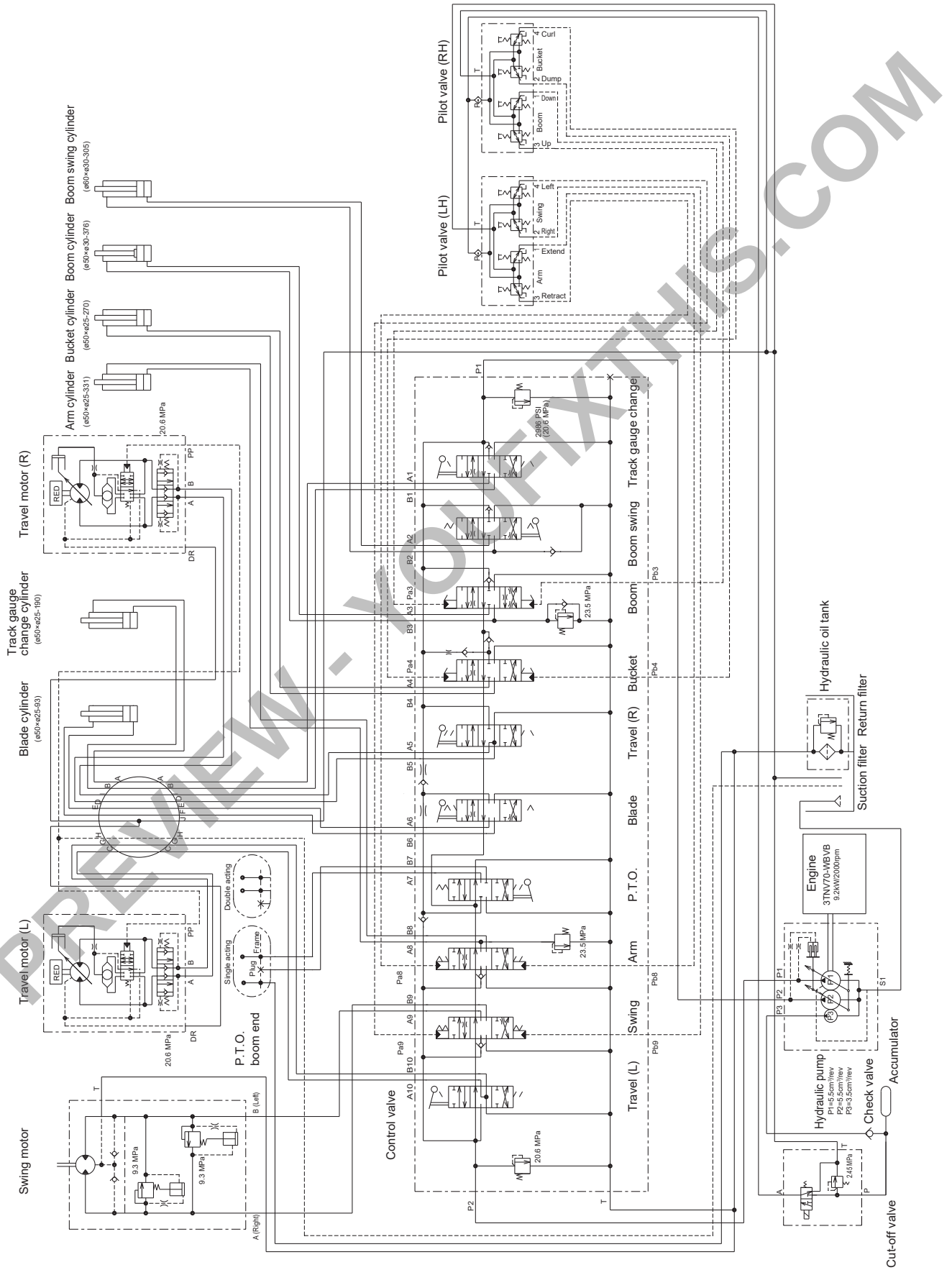
5-3 Wiring Diagram



Y	Yellow	RW	Red white
YB	Yellow black	RB	Red black
YR	Yellow red	RG	Red green
YG	Yellow Green	RY	Red Yellow
W	White	G	Green
WB	White black	GB	Green Black
WR	White Red	GW	Green white
L	Blue	GR	Green red
LW	Blue White	B	Black
Lg	Light green	Or	Orange
R	Red	Br	Brown
RL	Red Blue		

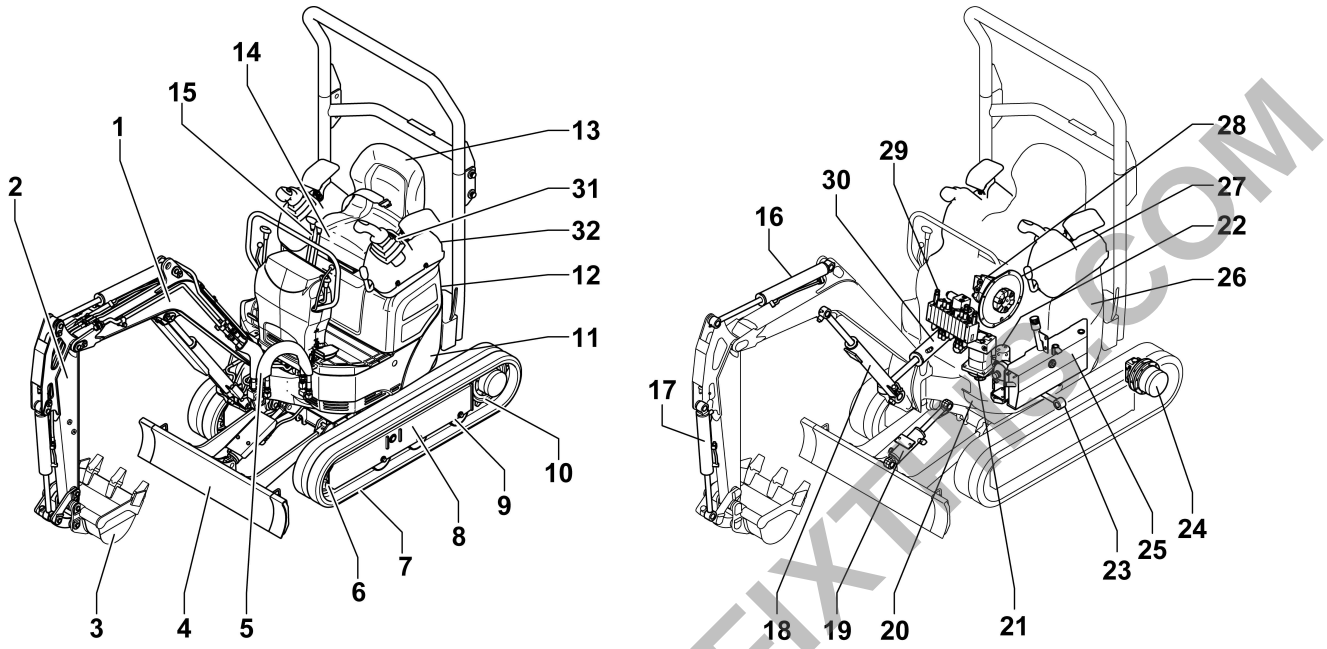
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6-2 Hydraulic Circuit Schematic



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2-3 Weight List of Main Parts



Unit : kg

No.	Part	Weight ViO12	No.	Part	Weight ViO12
1	Boom Ass'y	35.2	17	Bucket cylinder Ass'y	6.1
2	Arm Ass'y	18.1	18	Boom cylinder Ass'y	11.5
3	Bucket Ass'y	20.4	19	Blade cylinder Ass'y	5.6
4	Blade Ass'y	41.1	20	Swing bearing Ass'y	18.0
5	Boom bracket Ass'y	18.0	21	Swing motor + Swing pinion Ass'y	16.0
6	Front idler Ass'y	6.0	22	Swivel joint + Fitting	16.0
7	Rubber crawler Ass'y	31.6	23	Track gauge change cylinder Ass'y	6.2
8	Track frame crawler Ass'y	153.0	24	Travel motor	17.0
9	Track roller Ass'y	2.9	25	Hydraulic oil tank (Excluding oil)	8.5
10	Sprocket	5.6	26	Radiator	1.7
11	Turning frame	201.5	27	Engine + Hydraulic pump mount	124.3
12	Engine hood	25.5	28	Hydraulic pump	7.5
13	Operator's seat	7.4	29	Control valve	27.0
14	Battery + Battery cable	11.2	30	Swing cylinder Ass'y	10.7
15	Fuel oil tank + Piping	2.2	31	Joystick (pilot valve)	7.2
16	Arm cylinder Ass'y	7.5	32	Lever stand	1.9

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3-7-2 Engine

Tightening torque for major bolts and nuts

No.	Item	Thread size × Pitch	Tightening torque [Unit :N•m]	Lubricating oil
1	Cylinder head bolt	M9 × 1.25	53,9 to 57,9	Yes
2	Connecting rod bolt	M7 × 1.0	22,6 to 27,5	Yes
3	Flywheel mounting bolt	M10 × 1.25	80,4 to 86,4	Yes
4	Metal cap bolt	M10 × 1.25	75,5 to 81,5	Yes
5	Crankshaft pulley fastening bolt	M12 × 1.25	83,3 to 93,3	Yes
6	Fuel injection nozzle retainer clamp nut	M20 × 1.5	49 to 53	No
7	Glow plug	M10 × 1.25	14,7 to 19,6	No
8	Governor weight support nut	M12 × 1.25	68,7 to 73,7	Yes
9	Fuel pipe sleeve fastening nut	M12 × 1.25	29,4 to 34,3	No
10	Fuel injection pump cam end nut	M12 × 1.75	58,8 to 68,8	Yes
11	Fuel injection pump drive gear bolt	M8 × 1.0	32,3 to 36,3	No

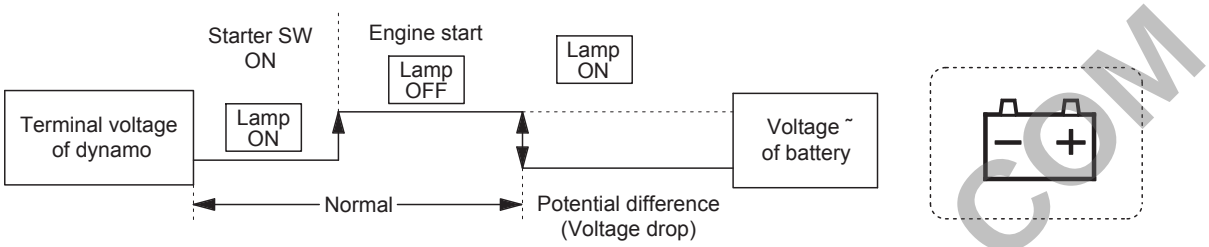
3-7-3 Tightening Torque for General Bolts and Nuts

Item		Thread size × Pitch	Tightening torque [Unit :N•m]	Remarks
Hexagon head bolt (7T) Nut	Coarse thread	M6 × 1	9,8 to 11,8	1) Apply 80% of tightening torque when tightened to aluminum. 2) Apply 60% of tightening torque for 4T bolts and lock nuts. 3) Use fine screw threads for engine only.
		M8 × 1.25	22,6 to 28,4	
		M10 × 1.5	44,1 to 58,9	
		M12 × 1.75	78,5 to 98,1	
		M14 × 2	112,8 to 142,2	
		M16 × 2	166,8 to 206	
		M18 × 2.5	235,5 to 284,5	
		M20 × 2.5	323,8 to 402,2	
	Fine thread	M14 × 1.5	127,5 to 147,1	
		M16 × 1.5	210,9 to 240,3	
R (PT) plug		1/8	9,8	
		1/4	19,6	
		3/8	29,4	
		1/2	58,8	
Pipe joint bolt		M8	12,7 to 16,7	
		M12	24,5 to 34,3	
		M14	39,2 to 49	
		M16	49,1 to 58,9	

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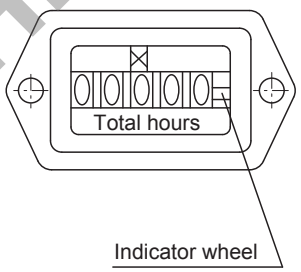
(3) State of charge monitoring (service hours accumulation)

When there occurs a potential difference between the output voltage of the dynamo and the voltage of the battery, the lamp lights.



(4) Hour meter

When the starter switch is turned to ON, the hourmeter starts to work. While the hourmeter is working, the indicator wheel at the right end of the indicator rotates; otherwise, the hourmeter or the lead wire for the hourmeter can be defective.



5-2-4 Inspection of Electrical Equipment

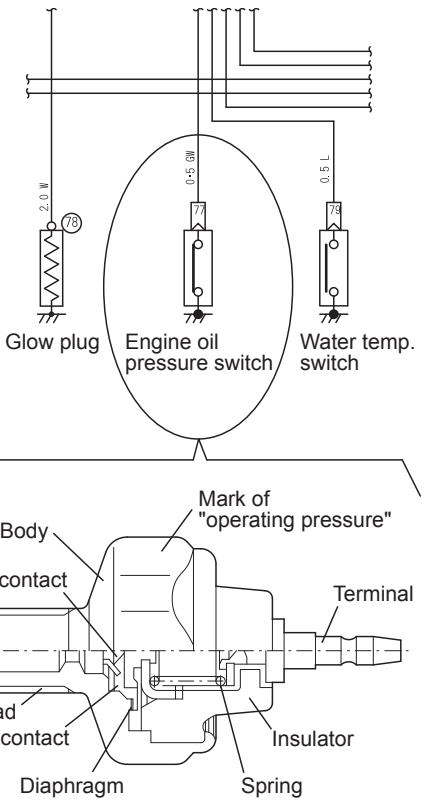
(1) Inspection of engine oil pressure switch

Check the engine oil pressure switch operation and the insulation/continuity resistance.

[1] Check the continuity resistance of the engine oil pressure switch.

Note :

First, check that the continuity resistance R_1 is proper, because the engine oil pressure switch body also serves for grounding. If not, clean the thread part or replace the engine oil pressure switch.



Standard value for continuity resistance R_1 (reference value)

-	Continuity resistance (MΩ)
R_1	25 or less

[2] Start the engine, and then check the insulation/continuity resistance R_2 between the body and the terminal with a circuit tester.

Standard value for insulation/continuity resistance R_2

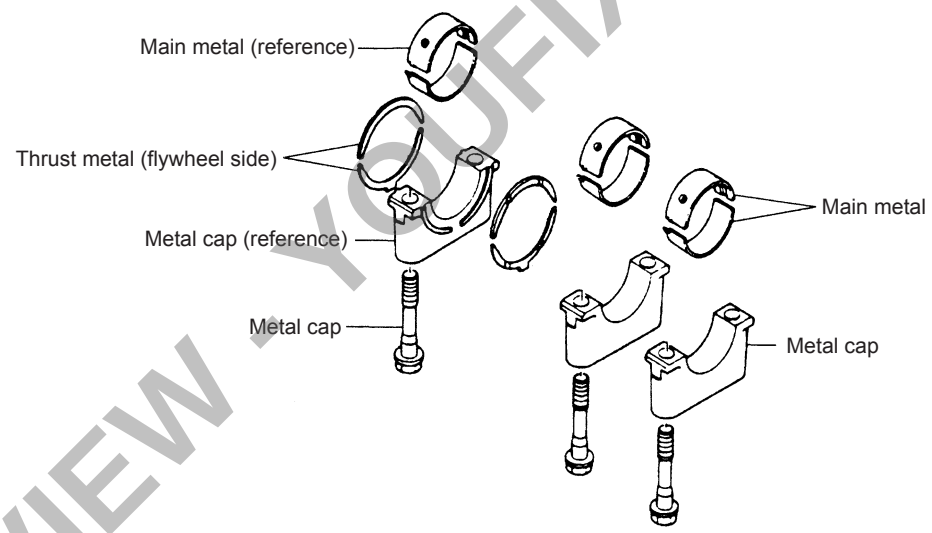
	Inspection condition	Operating limit	
		Insulation resistance	Continuity resistance
R_2	Engine stop	-	25 Ω or less (reference value)
	Engine running	1 mΩ	-

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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 0.25 mm and Oversized Thrust Metal by 0.25 mm

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

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2. TECHNICAL DATA

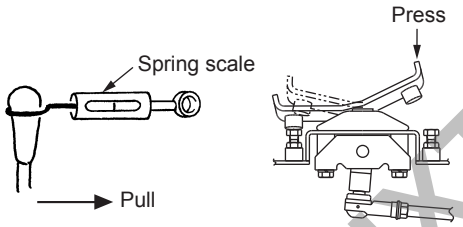
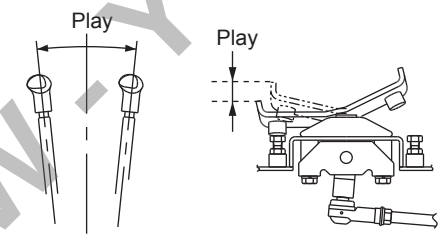
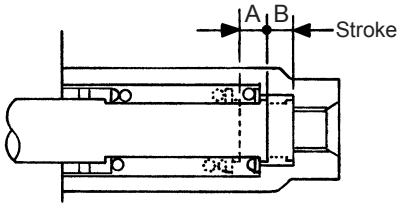
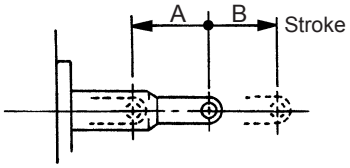
2. Technical Data

2-1 Specifications

Item				Unit	ViO12
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				mm	3040
Cabin	Overall height	Transportation position		mm	-
		Traveling position		mm	-
	Overall width	Full machine width		mm	-
Canopy	Overall height	Transportation position		mm	1580
		Traveling position		mm	2250
	Overall width	Full machine width (Maximum/Minimum)		mm	1000 / 830
Tumbler center distance				mm	1120
Track gauge (Maximum/Minimum)				mm	820 / 650
Minimum ground clearance				mm	140
Traveling performance					
Travel speed	Steel crawler	Low speed (Forward/Reverse)		km/hr	-
		High speed (Forward/Reverse)		km/hr	-
	Rubber crawler	Low speed (Forward/Reverse)		km/hr	2.1 / 2.1
		High speed (Forward/Reverse)		km/hr	4.0 / 4.0
Theoretical climbing ability				degrees	30
Permissible water depth limit				mm	290
Work performance					
Bucket	Width (Standard)			mm	400
	(Standard. JIS heaped capacity)			m^3	0.02
	Number of teeth / Installation method			pcs.	3 / rubber pin lock type
Maximum digging depth	With blade raised			mm	1800
	With blade on the ground			mm	1900
Maximum depth of vertically digging				mm	1500
Maximum dumping height				mm	2260
Minimum front swing radius (with boom in front)				mm	1300
Minimum front swing radius (at 75 degrees right boom swing)			Cabin	mm	-
			Canopy	mm	1040
Rear end swing radius				mm	500
Boom swing angle		Cabin	Left	degrees	-
			Right	degrees	-
		Canopy	Left	degrees	50
			Right	degrees	90
Maximum digging force		Bucket		kN	13.7
		Arm		kN	6.6
Maximum tractive force (Oil pressure force) (rubber)				kN	12.1
Maximum swing inclination angle (with standard bucket)				degrees	20 (at loading)

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3-4 Controls

Applicable model			ViO12		
Item		Measuring conditions	Unit	Standard	Allowable limit
Controls					
Operating force					
	Right control lever (Boom)	• Engine : stopped • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Lever operating force : Measure the force by hanging the spring scale on the lever grip. • Pedal operating force : Measure the force by applying load as shown below. 	N	9,8	12,7
	Right control lever (Bucket)				
	Left control lever (Arm & Swing)				
	Blade lever			19,7	24,5
	Travel levers			14,7	19,6
	Track gauge change lever			24,5	34,3
	Boom swing pedal			29,4	39,2
	P.T.O. pedal			29,4	39,2
Play of control lever & pedal					
	Right control lever (Front & rear / left & right)	• Engine : stopped • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Play of each control lever and pedal : Measure the total play (front & rear and left & right) at the lever grip end or the pedal end. 	mm	20	–
	Left control lever (Front & rear / left & right)			20	–
	Blade lever			10	–
	Travel levers			10	–
	Boom swing pedal			5	–
	P.T.O. pedal			5	–
	Track gauge change lever			5	–
Control valve					
Spool stroke					
	Boom		mm	6	–
	Bucket				
	Arm				
	Swing				
	Right travel		mm	6	–
	Left travel				
	Blade				
	Boom swing				
	P.T.O.				
	Track gauge change				

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5) Where to Use Liquid Packing

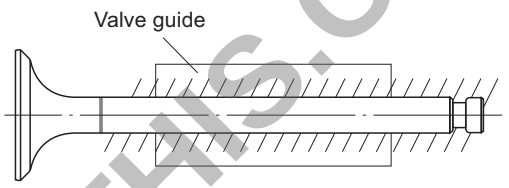
(1) Between the cylinder block and the gear case flange
(2) Between the gear case flange and the gear case cover
(3) Oil pan mounting surface

Notes :

1. *Use Three Bond No. 1212 (Yanmar part code : 97777-01212) as the liquid packing.*
2. *Apply the liquid packing so that there should no break halfway. Otherwise, oil leakage or other trouble may be caused.*

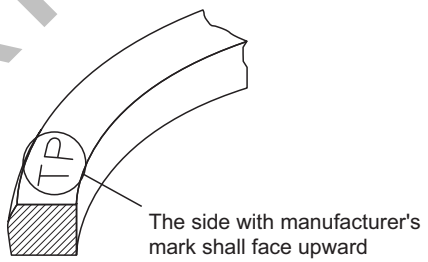
6) Applying Lubricating Oil to the Intake / Exhaust Valve Stem

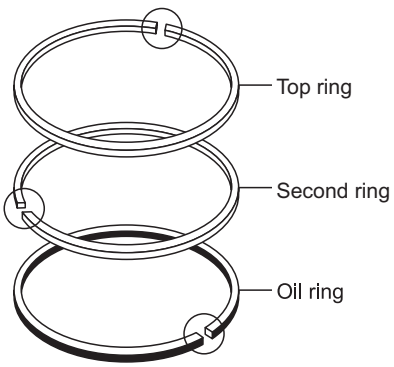
Apply lubricating oil to the valve stem so that the oil spreads over the lower surface (hatched portion in the figure) of the valve guide, before reinstalling the valve stem.

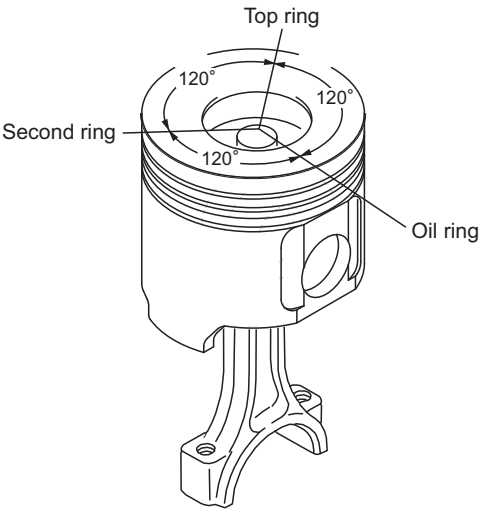


7) Reinstalling the Piston Rings

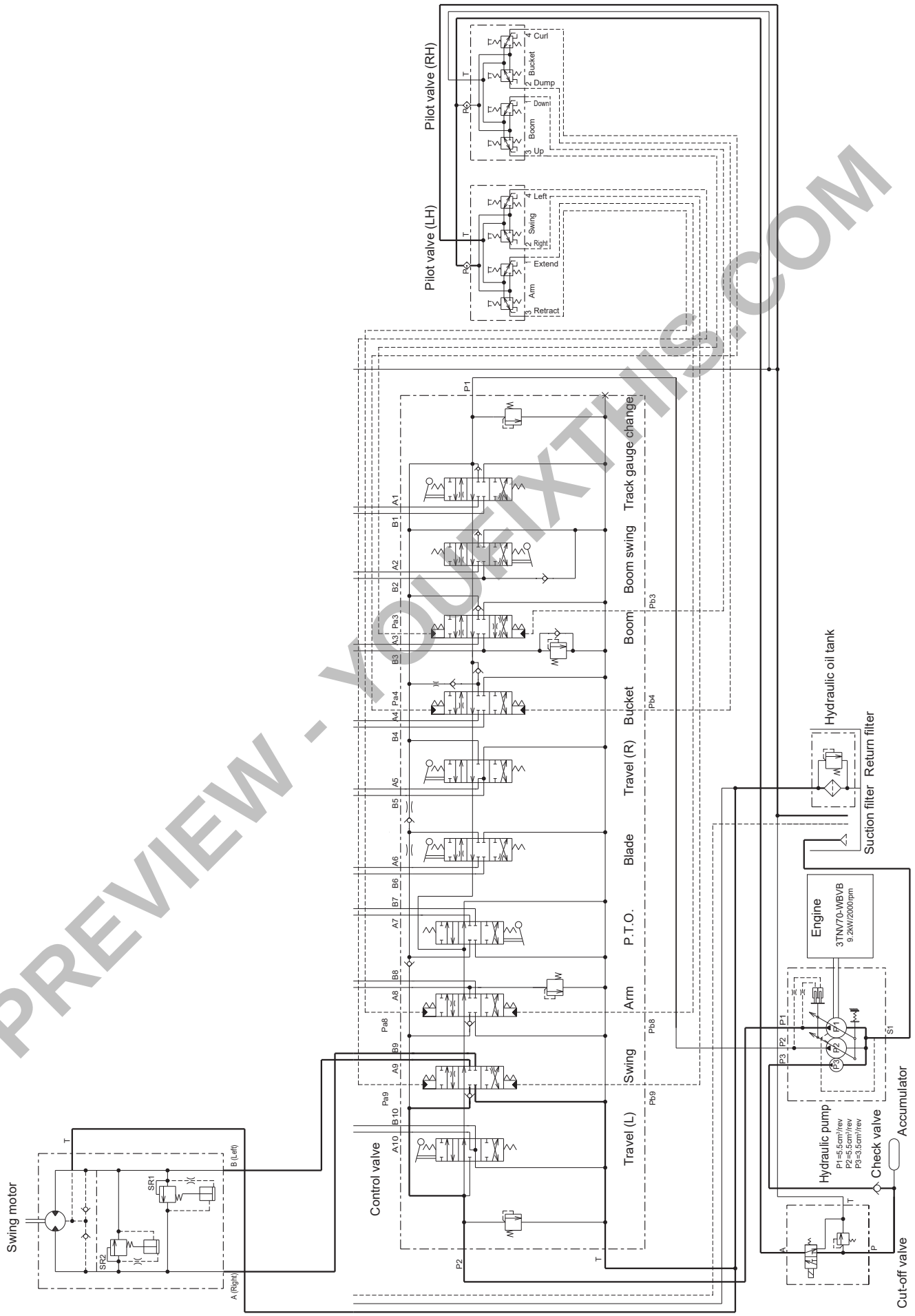
(1) Fit the piston ring into the ring groove, with the manufacturer's mark near the end of the piston ring facing upward (to the combustion chamber side), using a piston ring replacer. After fitting the piston ring, check that it moves smoothly.
(2) Install the piston their end gaps rings into their respective ring grooves so that their end gaps are shifted at 120 degrees intervals, making sure that they are not aligned along the piston. Be sure to place the end gaps of the top rings in the position not at right angle to the piston pin. Apply lubricating oil to the outside surface of the piston.



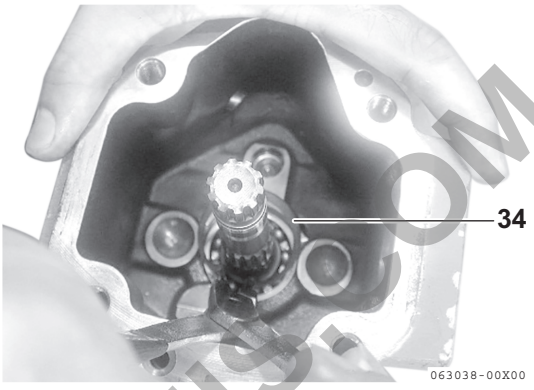
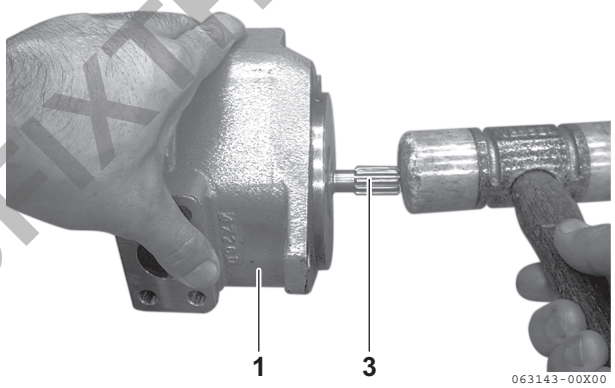
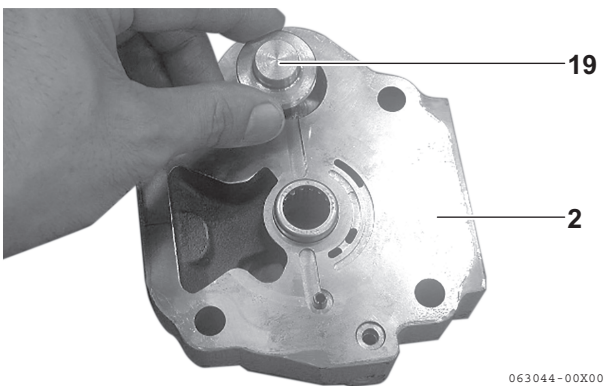
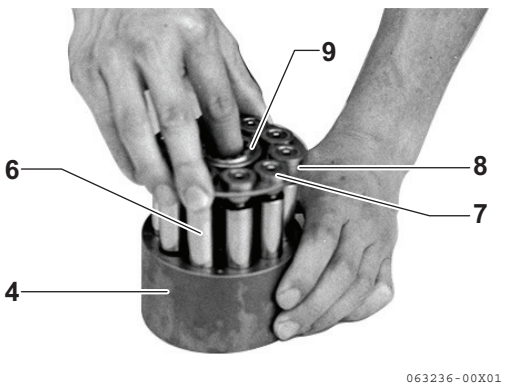




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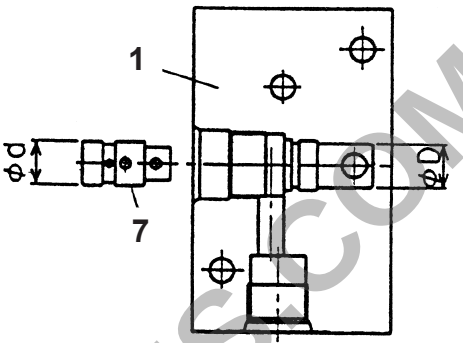
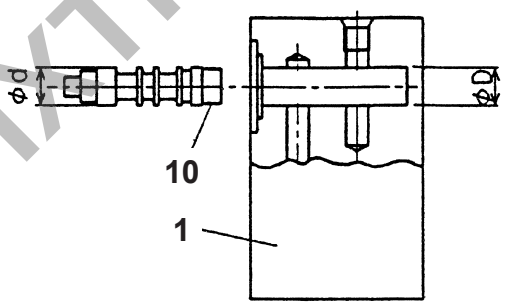
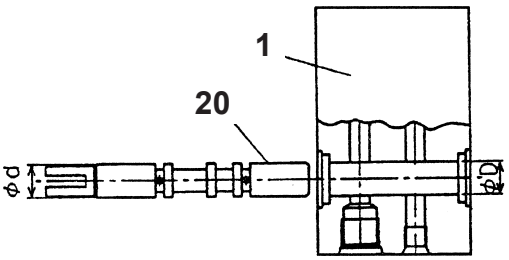
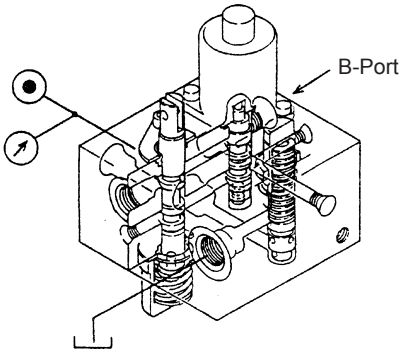


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Procedure	
(9) Remove snap ring 42 **34**.	
(10) Lightly strike shaft **3** with elastic hammer to remove it with ball bearing **30** from body S **1**.	
(11) Take off spring guide **19** from body H **2**.	
(12) Remove barrel holder **9** and needles **11** as well as shoe holder **8** with assemblies of pistons **6** and shoes **7** from cylinder barrel **4**.	

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5. Service standard

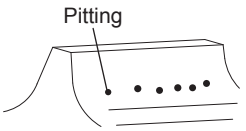
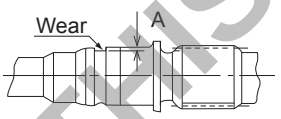
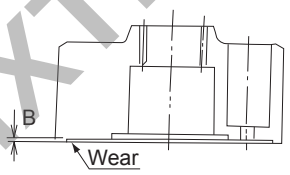
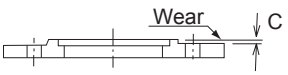
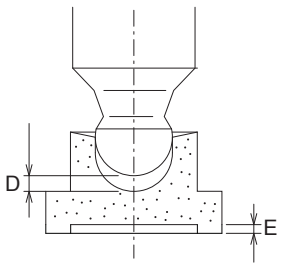
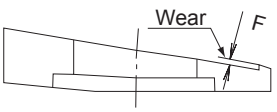
Procedure	
(1) Relief valve Measure the clearance between the body **1** and the spool **7**. Clearance = ØD – Ød Standard : Approx. 0.015 mm	
(2) Solenoid-operated directional control valve Measure the clearance between the body **1** and the spool **10**. Clearance = ØD – Ød Standard : Approx. 0.015 mm	
(3) Manual directional control valve Measure the clearance between the body **1** and the spool **20**. Clearance = ØD – Ød Standard : Approx. 0.015 mm	
(4) Check the set pressure of the relief valve Standard : Original set pressure $2.9^{+0.2}_{0}$ MPa at 1.7 L / min (30^{+2}_{0} kgf/cm^2) ***Note :*** *a. The tank pressure must be 0 MPa when checking the set pressure.* *b. The B-port must be shut.*	

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4. Service Standards

(Hydraulic Motor Section)

If any of the parts of the hydraulic motor is defective, replace the whole hydraulic motor assembly with a new assembly in principle.

Part	Inspection item	Inspection standard		Measure
Shaft	Excessive wear of gear and damage to teeth	Pitting area rate : 5 % or more		Replace the hydraulic motor assembly.
	Shear droop or damage of splined portion	Visible dents		
	Wear of oil seal portion (A)	Wear : 0.0010 in. (0.025 mm) or more		
Cylinder barrel	Wear of surface contacted with valve plate (B)	Wear : 0.020 mm or more		Replace the cylinder barrel kit.
Valve plate	Wear of sliding surface contacted with cylinder barrel (C)	Wear : 0.020 mm or more		
Pistons and shoes	Looseness in caulked portion of shoe (D)	Play : 0.3 mm or more		Replace the cylinder barrel kit.
	Wear of surface contacted with swash plate (E)	Wear : 0.02 mm or more		
Swash plate	Wear of sliding surface contacted with shoes (F)	Wear : 0.020 mm or more		Replace the swash plate kit.

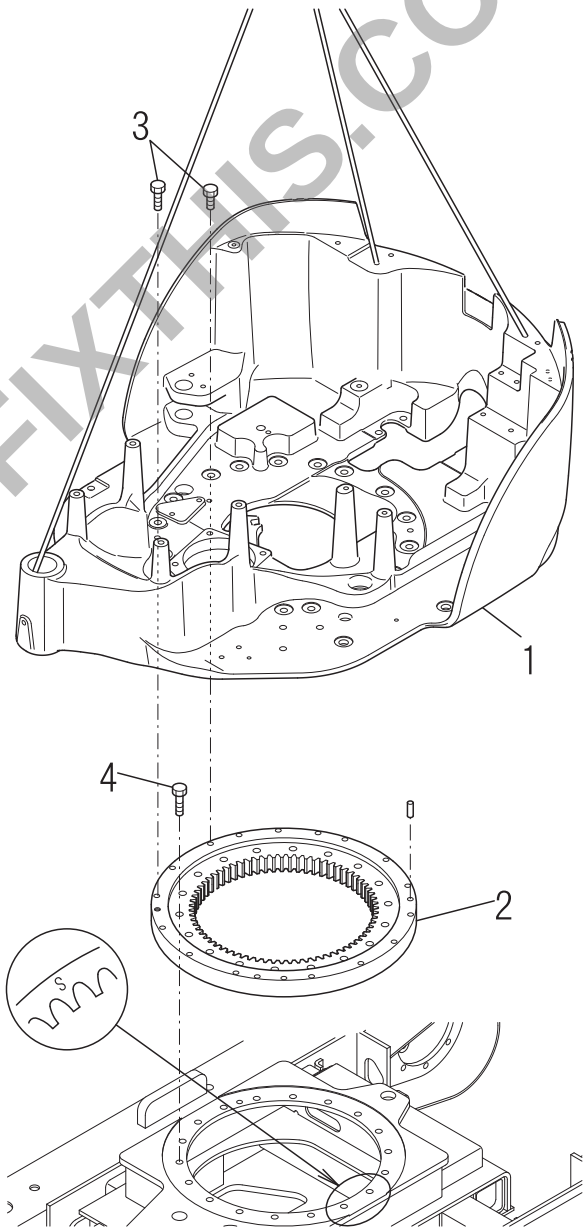
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7-4 Swing Bearing

7-4-1 Removal and Reinstallation of Swing Bearing

1) Removal

(1) Remove the implement.
Refer to Section "7-6-1 Removal and Reinstallation of Implement".
(2) Remove the engine.
Refer to Section "7-1-1 Removal and Reinstallation of Engine".
(3) Remove the swing motor.
Refer to Section "7-5-3 Removal and Reinstallation of Swing Motor".
(4) Remove the hydraulic hoses from the shaft of the swivel joint.
Refer to Section "7-5-4 Removal and Reinstallation of Swivel Joint".
(5) Rope the turning frame **1** at three points and suspend it temporarily.
(6) Remove the seventeen mounting bolts **3** with which the turning frame **1** is mounted on the outer race of the swing bearing.
(7) Lift up the turning frame **1**.
(8) Remove the eighteen mounting bolts **4** with which the inner race of the swing bearing is mounted on the track frame.
(9) Remove the swing bearing **2**.



2) Reinstallation

Reinstall the swing bearing in the reverse order of the removal procedure.

(1) Points of installation

The inner and outer races of the swing bearing have a soft zone, and the soft zone of the inner race is marked with "S".

The soft zone of the outer race is located at the steel ball insertion port.

To reduce the load to be applied to the soft zones, as shown in the figure at the right, install the swing bearing with the "S" mark on the left side of the track frame and the steel ball insertion port on the left side of the upperstructure.

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