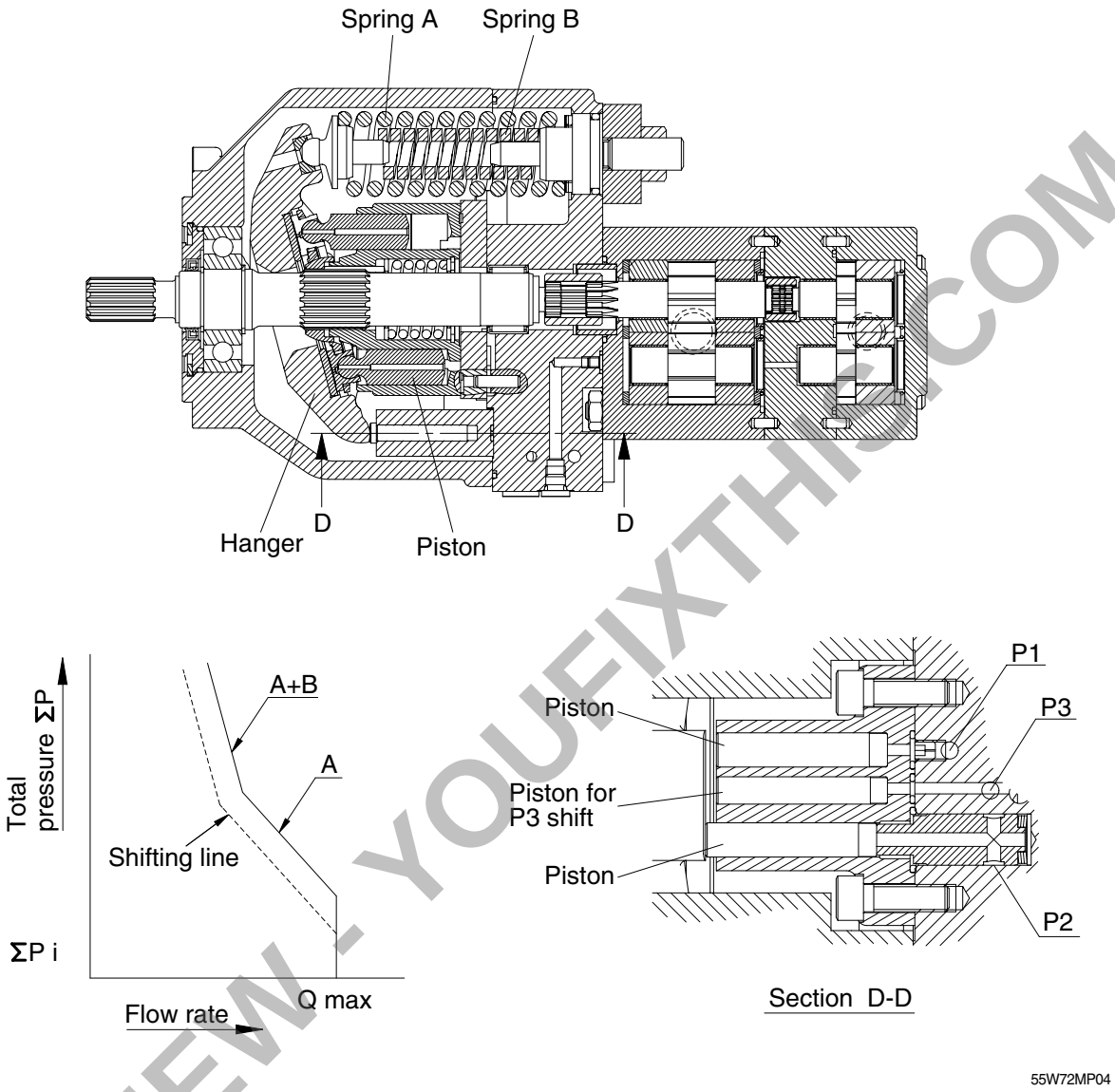
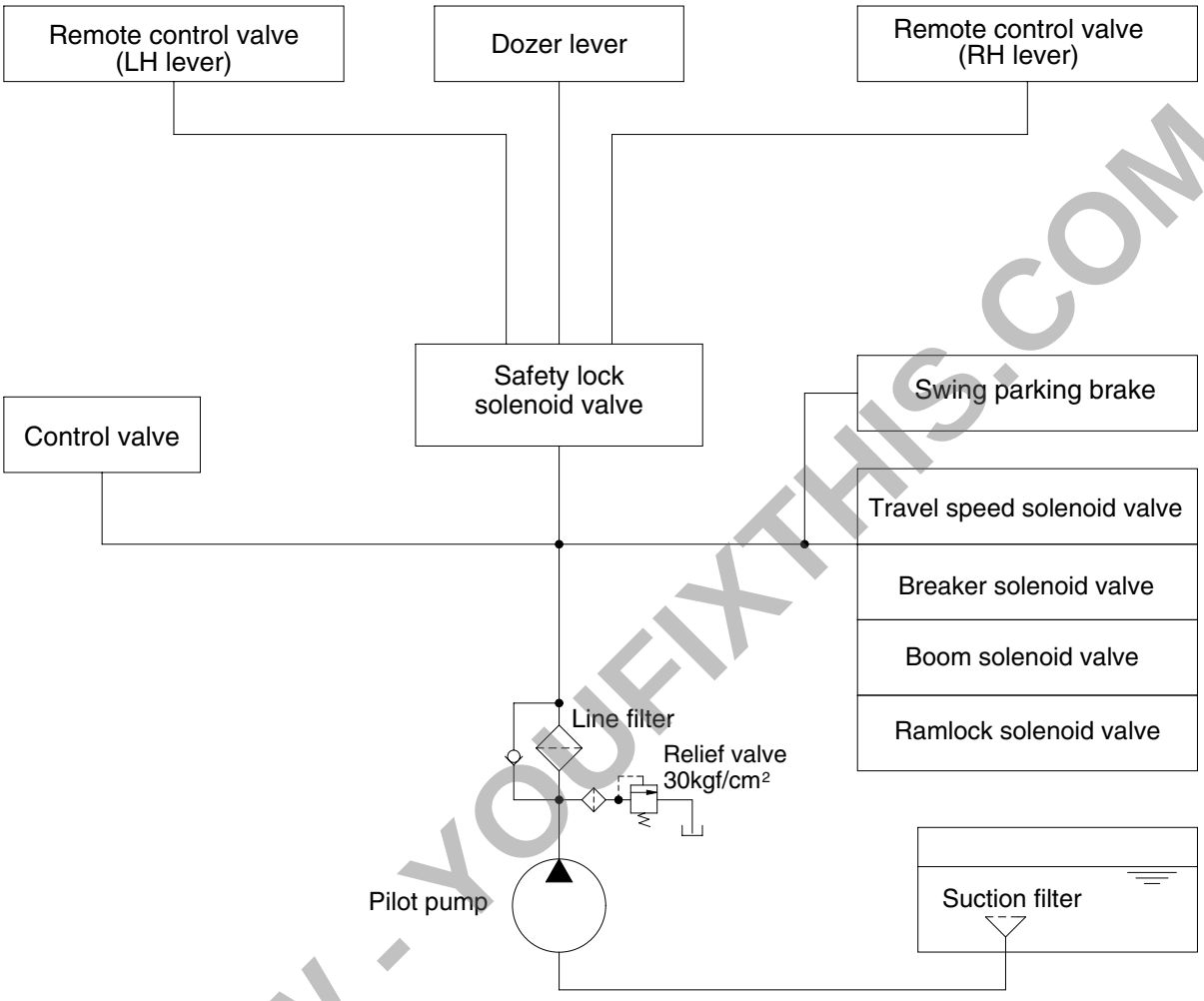
2) CONTROL FUNCTIONS



The discharge pressures P1 and P2 are directed to the pistons of equal area act on the hanger.
The spring is provided to act against the discharge pressure. When the oil pressure acting on the piston is less than the installation load of the spring A (outer spring), the hanger is fixed to the maximum tilting position. When the oil, pressure acting on the piston exceeds the installation load of the spring A the hanger is tilted and kept tilted at a position where the oil pressure is balanced with the spring force. (Region A in the middle of the figure above)
When the oil pressure acting on the piston rises further to reduce the tilting angle, the spring B which has been inactive up to now becomes active.
To overcome the spring force of two springs, the oil pressure must be higher and the shifting line becomes more steep. (Regions A + B in the middle of the figure above)
When the P3 oil pressure acts on the shift piston, the control shifting line is shifted.

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GROUP 3 PILOT CIRCUIT



The pilot circuit consists of suction circuit, delivery circuit and return circuit.
The pilot pump is provided with relief valve, receives the oil from the hydraulic tank through the suction filter.
The discharged oil from the pilot pump flows to the remote control valve through line filter, solenoid valve assemblies, swing parking brake, main control valve and safety lock solenoid valve.

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POWER CIRCUIT

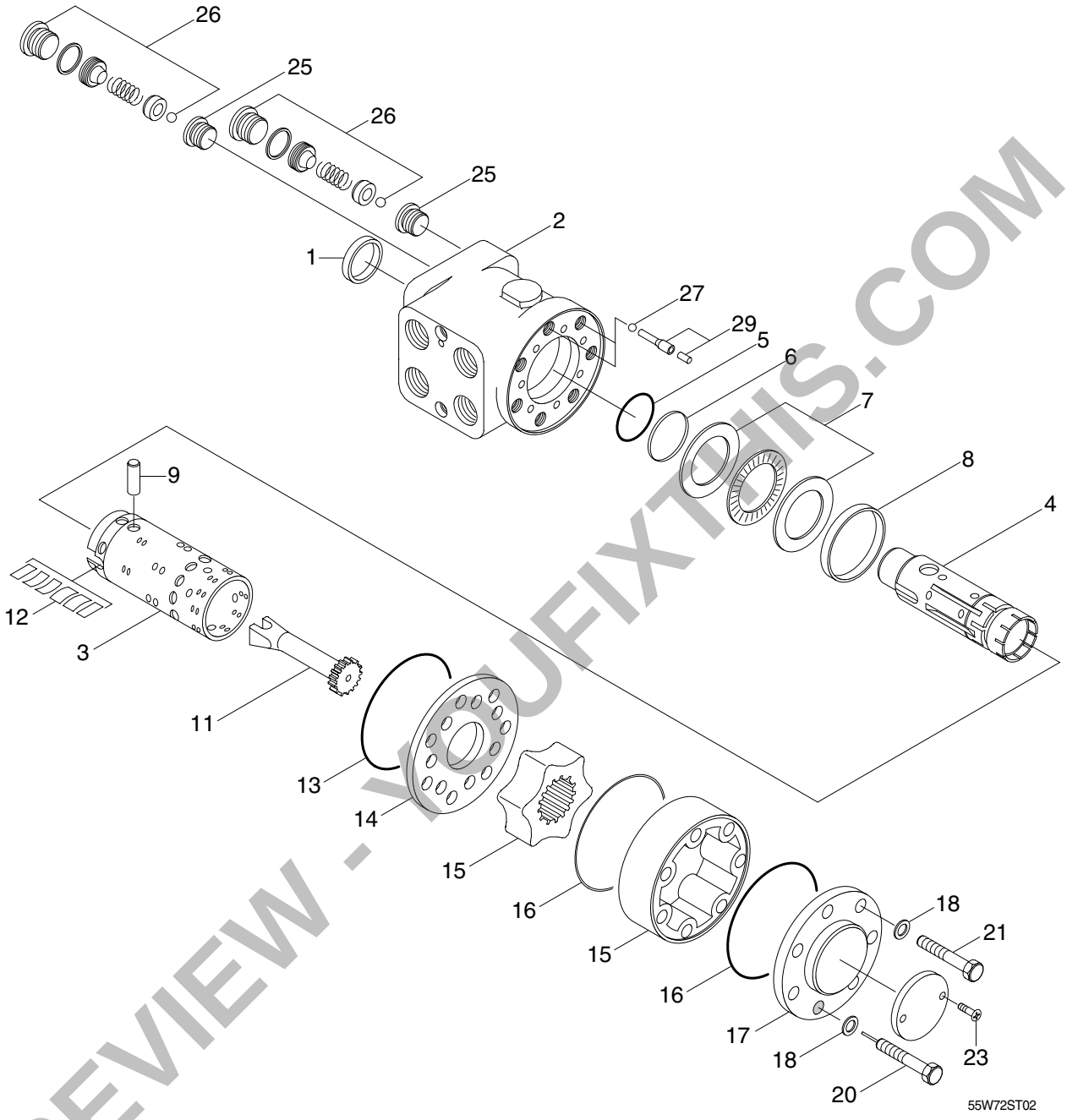


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2. COMPONENTS



1	Dust seal ring	11	Shaft	21	Screw
2	Housing	12	Spring set	22	Name plate
3	Sleeve	13	O-ring	23	Drive screw
4	Spool	14	Distributor plate	25	Plug
5	O-ring	15	Gear wheel set	26	Shock valve
6	Kin-ring	16	O-ring	27	Ball
7	Bearing assy	17	End cover	29	Suction valve pin
8	Ring	18	Washer		
9	Cross pin	20	Pin screw		

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7) POWER TRAIN

Item	Description		Specification
Gear box	Type		2 speed hydrostatic
	Gear ratio	1st	6.357
		2nd	1.961
Parking brake	Type		Multi disc brake integrated in rear axle
	Maximum braking power		714kgf · m(5164lbf · ft)
Axle	Type		4 wheel drive with differential
	Gear ratio		8.639
	Brake		Multi disc brake

8) REMOTE CONTROL VALVE

Item		Specification
Type		Pressure reducing type
Operating pressure	Minimum	5kgf/cm²(71psi)
	Maximum	20kgf/cm²(284psi)
Pushrod stroke		6.5/8.5mm(0.26/0.33in)

9) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	Ø110×Ø65×715mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	Ø90×Ø55×850mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	Ø80×Ø50×660mm
	Cushion	Extend only
Dozer cylinder	Bore dia × Rod dia × Stroke	Ø100×Ø50×159mm
	Cushion	-
Boom swing cylinder	Bore dia × Rod dia × Stroke	Ø95×Ø50×535mm
	Cushion	-

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

10) BUCKET

Item		Capacity		Tooth quantity	Width	
		SAE heaped	CECE heaped		Without side cutter	With side cutter
R55W-7	STD	0.18m³(0.24yd³)	0.15m³(0.20yd³)	5	705mm(27.8")	770mm(30.3")
	OPT	0.07m³(0.09yd³)	0.06m³(0.08yd³)	3	315mm(12.4")	360mm(14.2")

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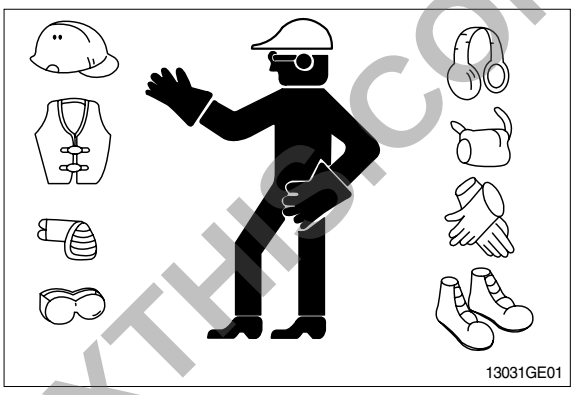
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; do not attempt shortcuts.

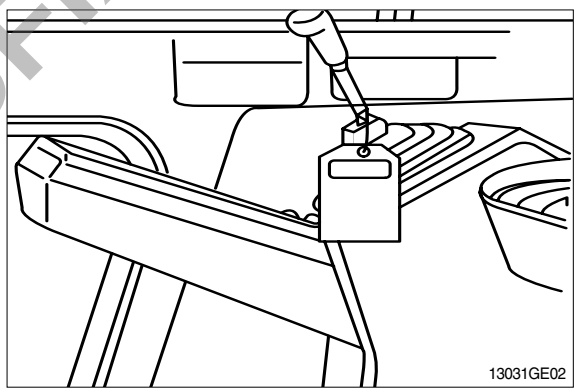
WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.



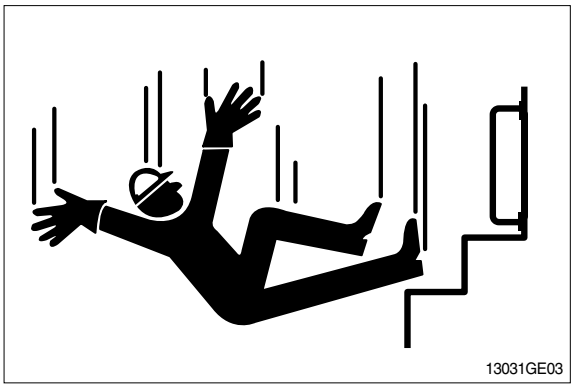
WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a 「**Do Not Operate**」 tag on the right side control lever.



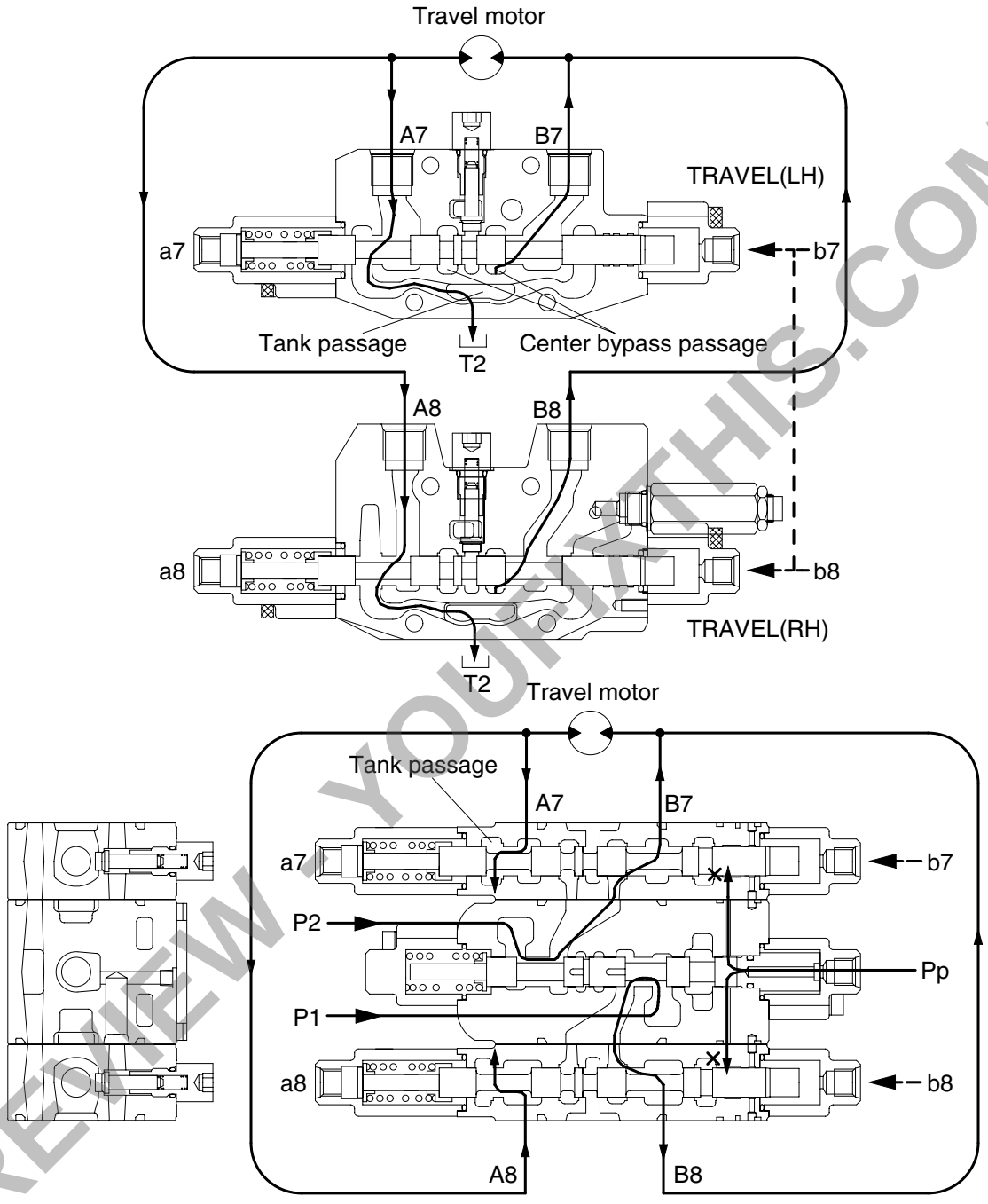
USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury.
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.
Never jump on or off the machine. Never mount or dismount a moving machine.
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



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② **Travel backward operation**



55W72MC09

During the travel operation, the hydraulic fluid of the pump P1, P2 is supplied to the travel motor.
The pilot pressure from the solenoid valve is supplied to the right side of pilot ports(b7, b8).
And it shifts travel spools in the left direction against springs. Hydraulic fluid from the pump P1, P2 flow into the travel spools through the bypass passage.
Then they are dlirected to the travel motor through port B7 and B8. As a result, the travel motor turn and hydraulic fluid retums to the tank passage through the travel spools.

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3. TECHNICAL DATA

1) GENERAL DATA

(1) Max. input power : 33kW

(2) Max. input torque : 24.6kg · m

(3) Max. input speed : 3114rpm

(4) Hydraulic motor : 80cc/rev

(5) Gear ration
- · 1st speed : 6,357
- · 2nd speed : 1,961

(6) Output flange
- · Bolt for propshaft connection : M10 × 1.25
- · Gear box weight : 63kg(140lb)

2) GEAR BOX CONTROL

(1) Control pressure

① At connection P1 and P2 at Low/High speed : 30kg/cm^2

② Definition of lubricants : SAE 80W-90

3) HOW TO CHANGE THE TRAVEL SPEED

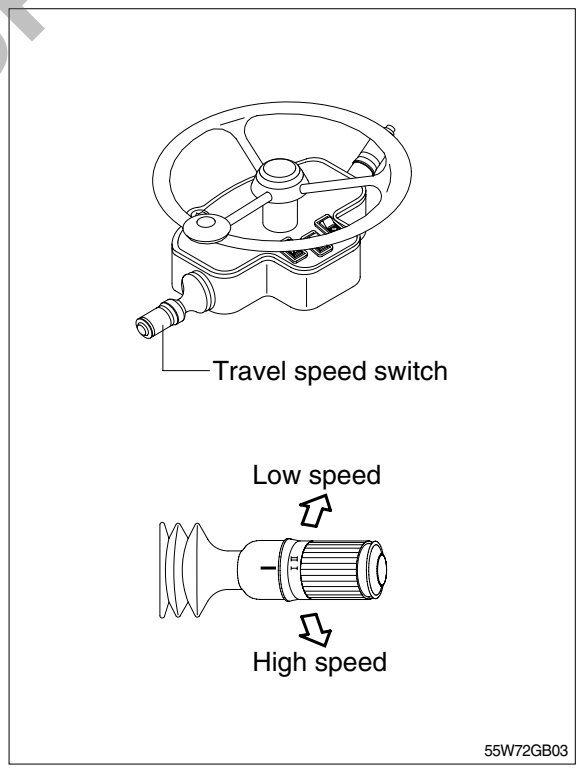
If you want to change the speed, be sure to operate according to the following procedure. Otherwise, unreasonable operation may cause fatal impact and failure to the transfer box(Gear box).

- In case of changing the travel speed, be sure to stop the machine completely.
- Keep the machine on the stationary state and stepping the brake pedal to full stroke. Trereafter, select the speed switch to the desired position.

When operating the travel speed switch without stepping brake pedal and stopping the machine completely, the operation of gear box can not be worked actualy even though the position of speed switch is left to the desired position.

- When turning the key switch to "OFF" position to stop the machine, be sure to transfer the travel speed switch to the low speed position.

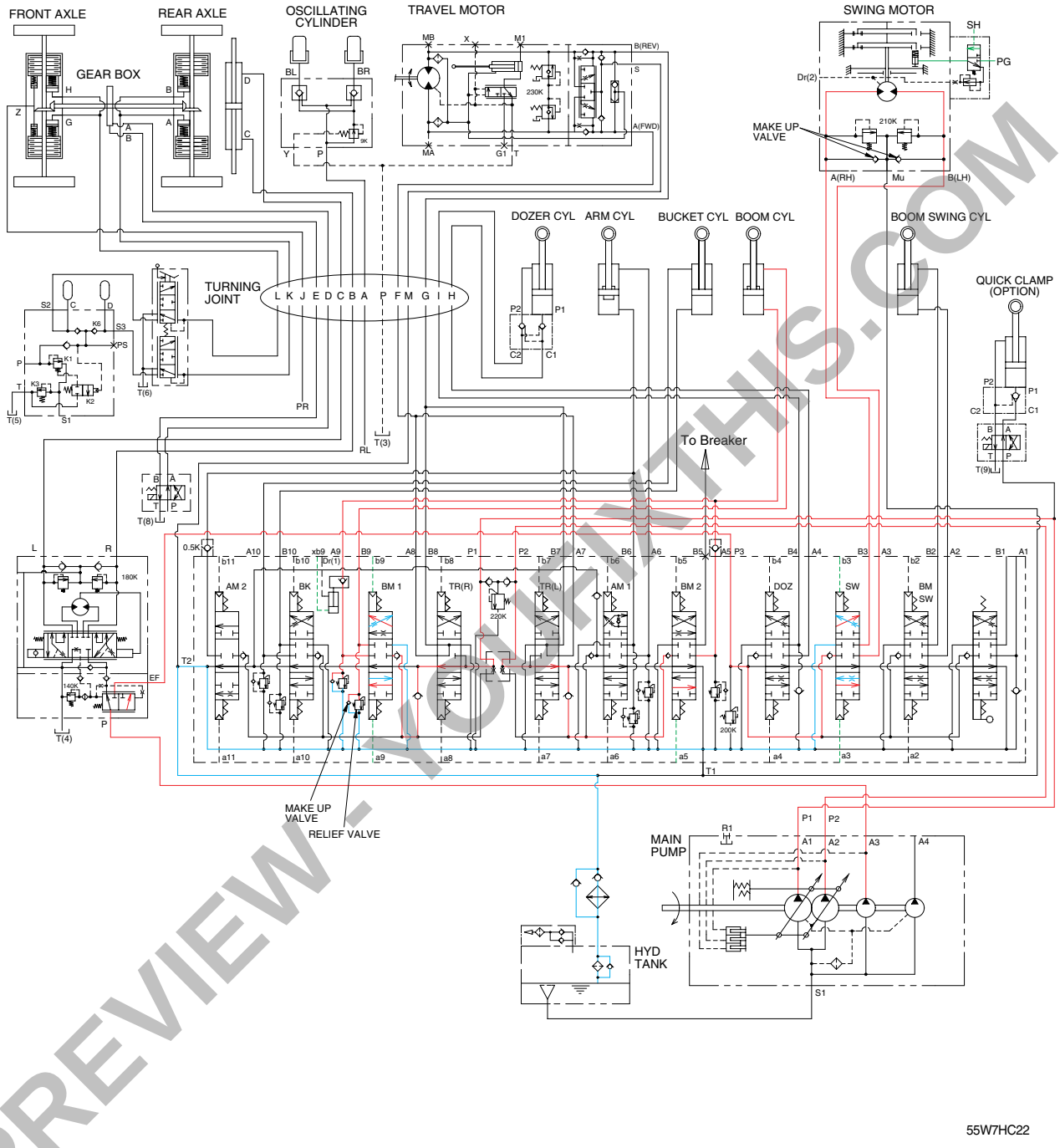
Because the position of solenoid valve for travel is automatically transfered to the low speed position when turning the key switch to "OFF"position.



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2. COMBINED SWING AND BOOM OPERATION



When the swing and boom functions are operated, simultaneously the swing spool and boom spools in the main control valve are moved to the functional position by the pilot oil pressure from the remote control valve.

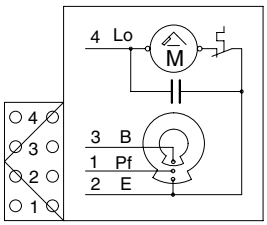
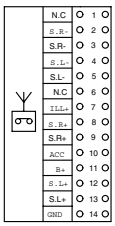
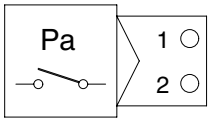
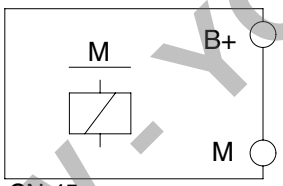
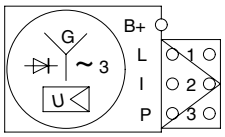
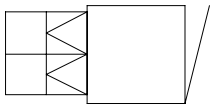
The oil from the P1 and P2 pump flows into the boom cylinder through boom 1 and boom 2 spool.

The oil from the P3 pump flows into the swing motor through the swing spool.

The superstructure swings and the boom is operated.

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Part name	Symbol	Specification	Check
Wiper motor	 CN-21	12V 3A	※ Check contact Normal : 6 Ω (For terminal 2-6)
Cassette radio	 CN-27	12V 3A	※ Check voltage 10 ~ 12.5V (For terminal 10-14,11-14)
Receiver dryer	 CN-29 CD-4 CD-38	12V	※ Check contact Normal : 0 Ω
Starter	 CN-45	12V	※ Check contact Normal : 0.1 Ω
Alternator	 CN-74	12V 55A	※ Check contact Normal : 0 Ω (For terminal B+-1) Normal : 10 ~ 12.5V
Travel buzzer	 CN-81	12V	-

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5) IT IS NOT POSSIBLE TO REDUCE THE MOTOR SMOOTHLY

It is not possible to reduce the motor smoothly

Cause	Remedy
The orifice for closing the counterbalance is clogged. The opening of the neutral position of the spool is clogged.	Remove the foreign matter by disassembling and cleaning.
Wrong setting of pressure of the relief valve.	Adjust at the correct value. If the relief valve turns out to be out of order, the new one should be used.

6) EXTRAORDINARY NOISE IS HEARD WHEN SUDDENLY REDUCING THE SPEED FROM THE HIGH-SPEED MODE

It takes time to accelerate the motor

Cause	Remedy
The anti-cavitation valve does not not work properly.	Screw the fitting bolts one more time with correct tightening torque. If the valve turns out to be damaged, is should be repaired.

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11) PILOT PRIMARY PRESSURE

(1) Preparation

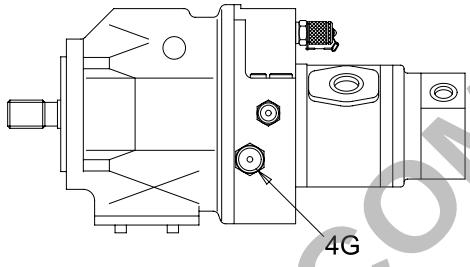
① Stop the engine.

② Push the pressure release button to bleed air.

③ Loosen and remove plug on the pilot pump delivery port(4G) and connect pressure gauge.

④ Start the engine and check for oil leakage from the port.

⑤ Keep the hydraulic oil temperature at 50±5°C.



R55NN7MA14

(2) Measurement

① Measure the primary pilot pressure at rated rpm.

(3) Evaluation

The average measured pressure should meet the following specifications:

Unit : kgf / cm^2

Model	Standard	Remarks
R55W-7	30±5	

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(9) Disassembly of the shaft

① Remove the bearing.
Remove the C-type stop ring.
Snap ring pliers for shaft.



R55NM7HP34

② Remove it while knocking the rear end of shaft lightly with a plastic hammer.



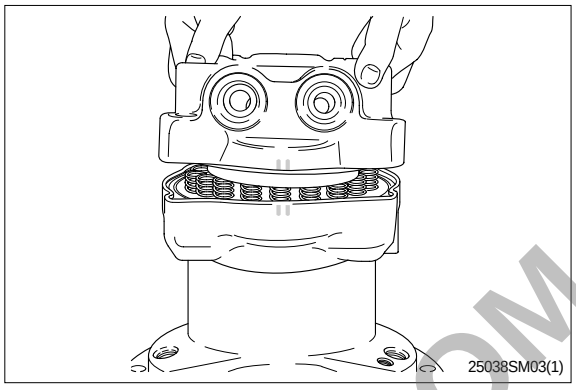
R55NM7HP35

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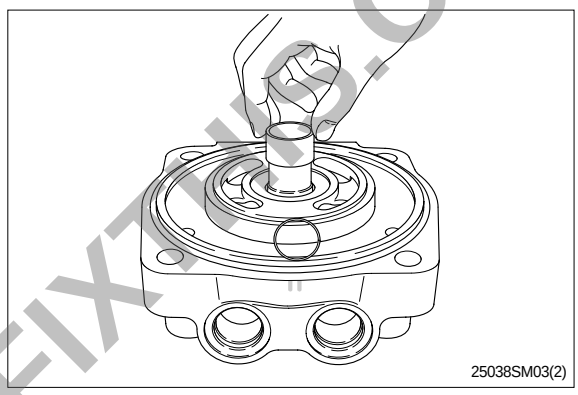
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(5) Removal of cover assembly

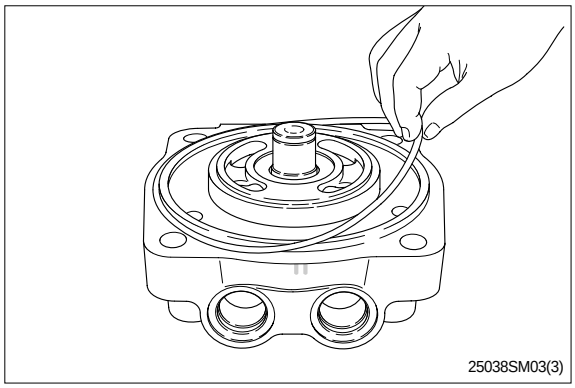
Place shaft of motor assembly to downward and take cover(12) out.



(6) Remove shim(22) remove inner race of needle bearing(15) by bearing puller.



(7) Remove O-ring(29) from cover.



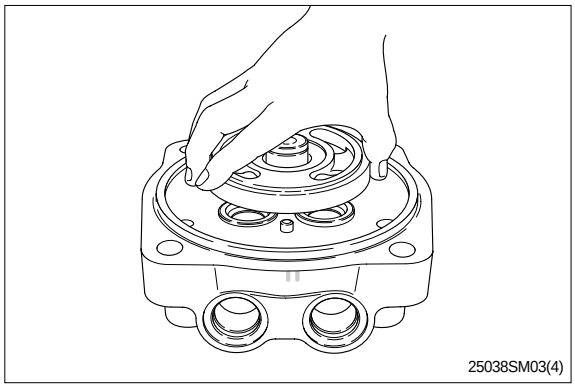
(8) Remove balance plate

Valve plate(16) is adhered on end surface of cylinder(3) by oil viscosity. Take off balance plate(16) with hands.

Assembling method of balance plate(16) depends on cover(12).

(Band groove and round groove of high · low pressure transmission area)

Before removing, check and record location of balance plate(16) to prevent misassembling.



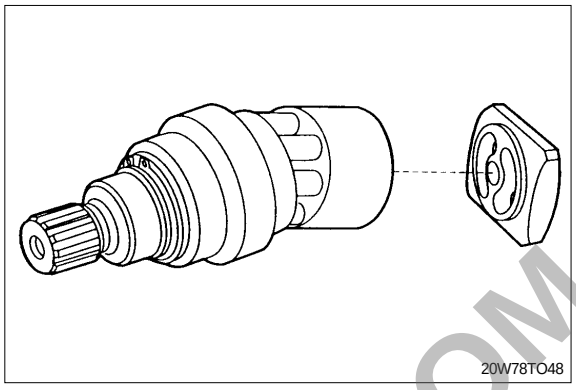
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10) EXCHANGING OF THE ROTARY GROUP

Complete rotary group

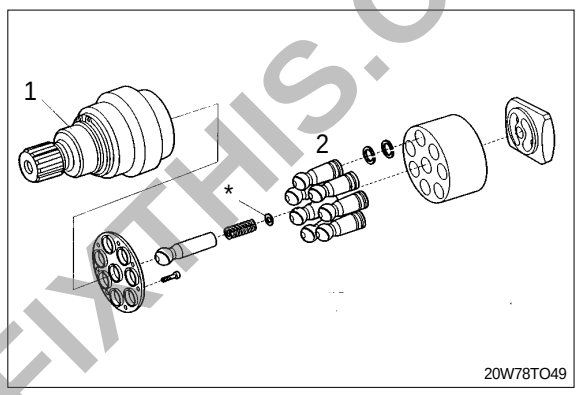
※ Setting of hydraulic part necessary.



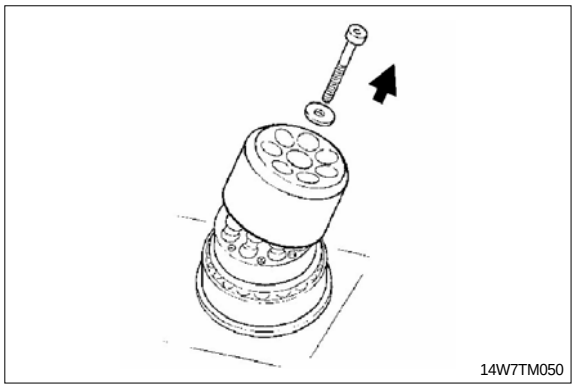
Rotary group

1 Mechanical part : Adjust drive shaft with bearing

2 Hydraulic part : Adjustment necessary

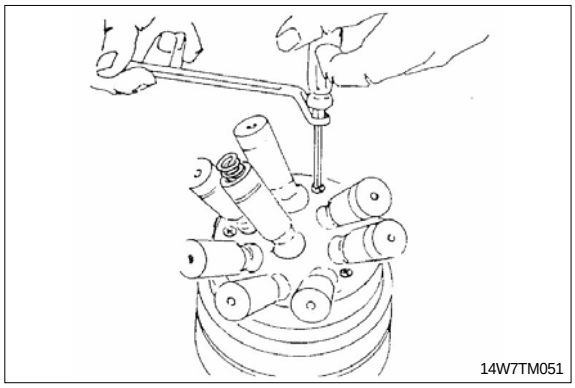


(1) Remove fixing screw(Cylinder).
Remove cylinder.



(2) Disassemble retaining plate.

※ Screws are glued.
Use Torx tools.

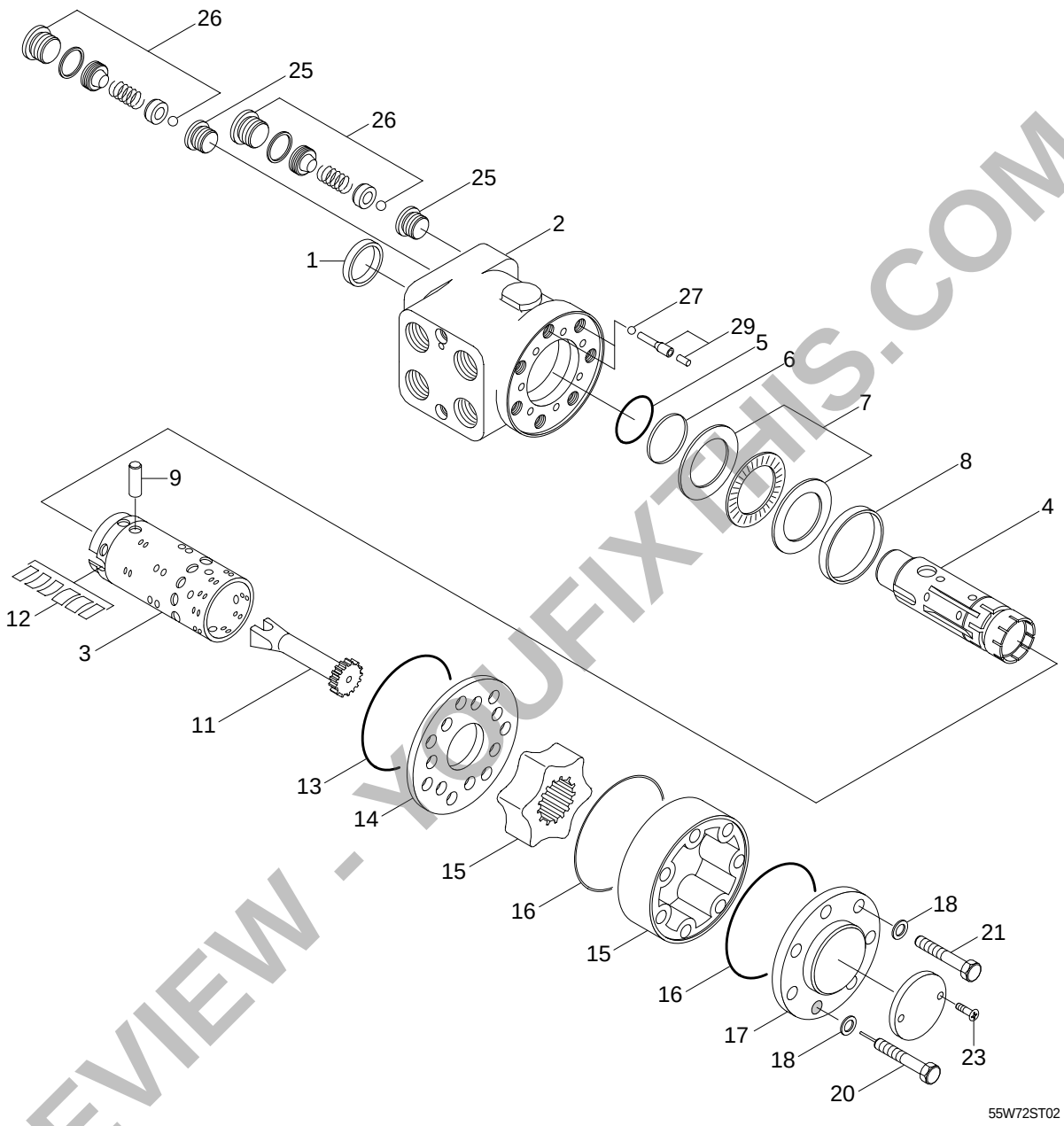


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2. STEERING VALVE

1) STRUCTURE



1	Dust seal ring	11	Shaft	20	Pin screw
2	Housing	12	Spring set	21	Screw
3	Sleeve	13	O-ring	22	Name plate
4	Spool	14	Distributor plate	23	Drive screw
5	O-ring	15	Gear wheel set	25	Plug
6	Kin ring	16	O-ring	26	Shock valve
7	Bearing assy	17	End cover	27	Ball
8	Ring	18	Washer	29	Suction valve pin
9	Cross pin				

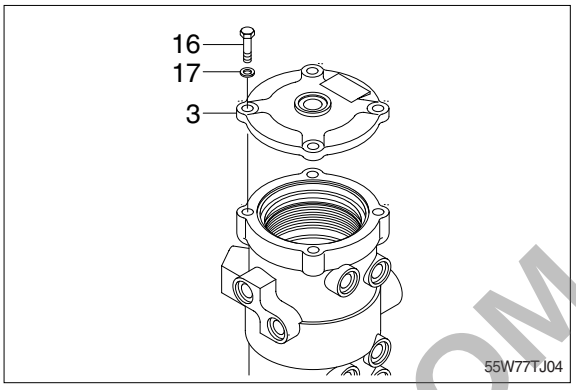
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2) DISASSEMBLY

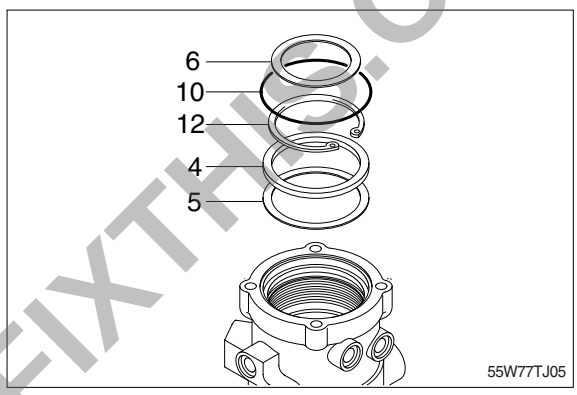
※ Before the disassembly, clean the turning joint.

(1) Loosen the bolts(16), washer(17) and remove cover(3).



(2) Remove shim(6) and O-ring(7).

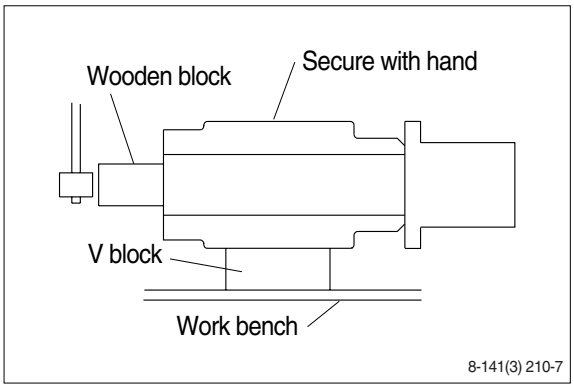
(3) Remove retainer ring(12), spacer(4) and shim(5).



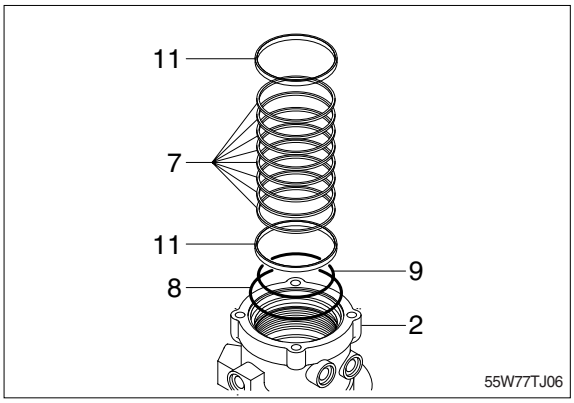
(4) Place hub(2) on a V-block and by using a wood buffer at the shaft end, hit out shaft(2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft(1) when remove hub(2) or rest it sideway.

※ Put a fitting mark on hub(2) and shaft(1).



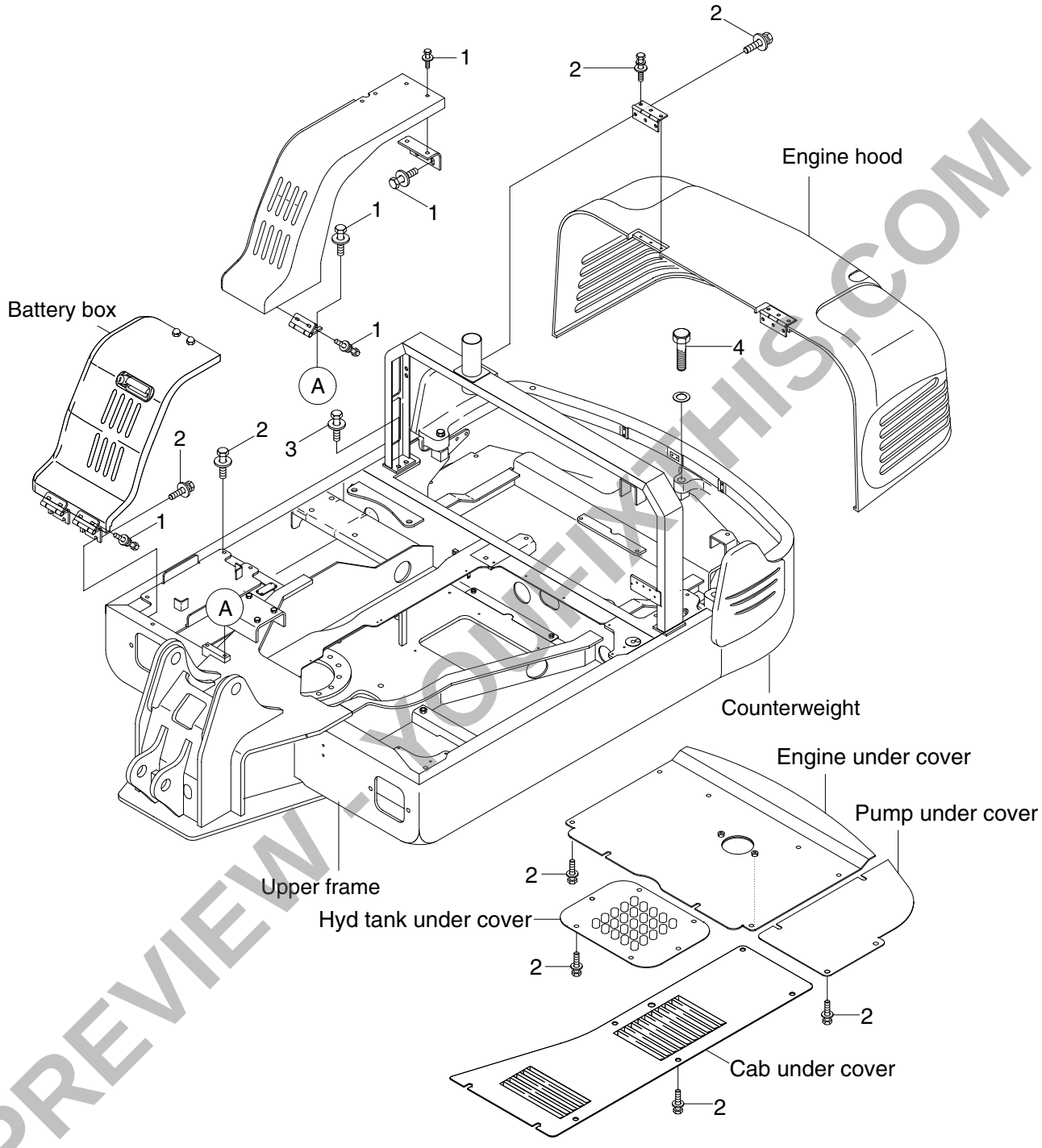
(5) Remove wear rings(11), thirteen slipper seals(7) and O-rings(8, 9) from hub(2).



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2. COWLING MOUNTING



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· Tightening torque

Item	Size	kgf · m	lbf · ft
1	M 8×1.25	2.5±0.5	18.1±3.6
2	M10×1.5	6.9±1.4	49.9±10.1

Item	Size	kgf · m	lbf · ft
3	M12×1.75	12.8±3.0	92.6±21.7
4	M20×2.5	57.8±6.4	418±46.3

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(10) 4TNV98T

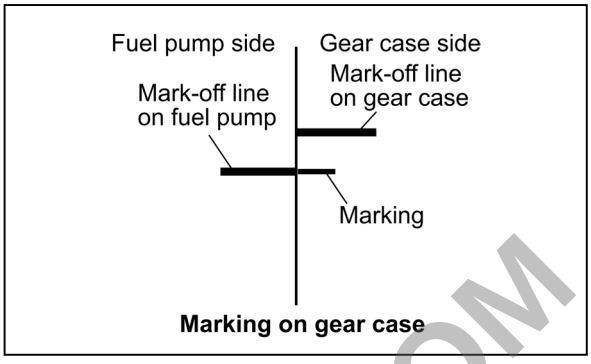
Engine name		Unit	4TNV98T						
Engine specification class		-	CL		VM				
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine						
Combustion chamber		-	Direct injection						
Number of cylinders		-	4						
Cylinder bore×stroke		mm×mm	88×110						
Displacement		L	3.318						
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-				
	Output	kW (hp)	37.9 (51.5)	45.6 (62.0)	-				
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600
	Output	kW (hp)	41.9 (57.0)	50.4 (68.5)	50.7 (69.0)	55.5 (75.5)	60.3 (82.0)	62.5 (85.0)	64.0 (87.0)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)						
Power take off		-	Flywheel						
Direction of rotation		-	Counterclockwise (viewed from flywheel)						
Cooling system		-	Radiator						
Lubrication system		-	Forced lubrication with trochoid pump						
Starting system		-	Electric						
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (cetane No.45 min.)						
Applicable lubricant		-	API grade class CD or CF						
Lubricant capacity (oil pan) *	Total	L	10.2						
	Effective	L	4.5						
Coolant water capacity (engine only)		L	4.2						
Engine dimensions ** (with flywheel housing)	Overall length	mm	715						
	Overall width	mm	575						
	Overall height	mm	779						
Engine mass (dry) ** (with flywheel housing)		kg	258 (equivalent to SAE#3)		245 (equivalent to SAE#4)				
Cooling fan (std.)		mm	430 mm O/D, 8 blades suction type						
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	130×130						

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

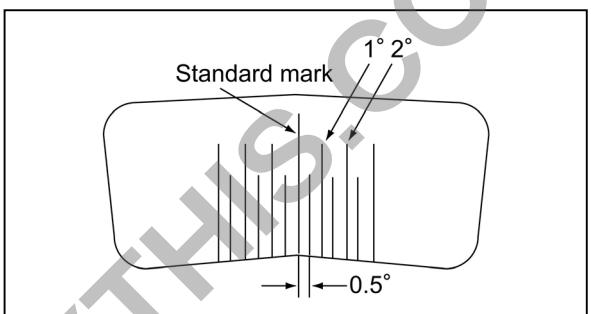
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1) Before removing a fuel pump drive gear, make ID marks on the gearing part of the pump drive gear and the idle gear with paint and so on.
2) Make the mark-off line to the gear case precisely in accordance with the position of mark-off line of the fuel pump.
3) Before removing a fuel pump, put the standard mark of a sticker for fuel injection angle adjustment in accordance with the mark-off line of the fuel pump and paste it on the gear case.

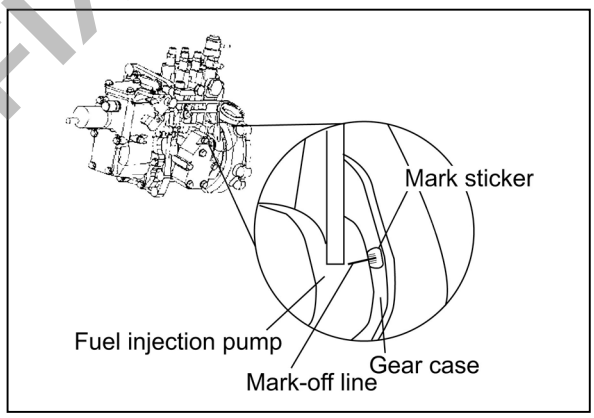


Marking on gear case



Sticker for adjusting injection angle

4) Remove a fuel pump, and read the fuel injection angle recorded in that fuel pump.



5) Read the injection angle recorded on a reassembled fuel pump and calculate the difference from the injection angle of the disassembled fuel pump. (When re-installation does the same fuel pump, the angular difference is zero.)

Fuel injection angle difference (cam angle) = (the fuel injection angle of a reassembled fuel pump) - (the fuel injection angle of a disassembled previous fuel pump)

[NOTICE]
Tell the fuel pump number to Yanmar, and inquire the injection angle of the pump when it is hard to find out.

6) Put the fuel pump on the gear case temporarily and install the drive gear on the cam shaft with checking the ID marks, which were put on the fuel pump drive gear and the idle gear at the time of the disassembling.

Tighten the installation nut of a pump drive gear.

Model	Tightening torque Nm(kgf·m)	Lubricating oil application (thread portion, and seat surface)
3TNV82A～TNV88	78～88 (8～9)	Not applied
4TNV94L/98/106(T)	113～123 (11.5～12.5)	

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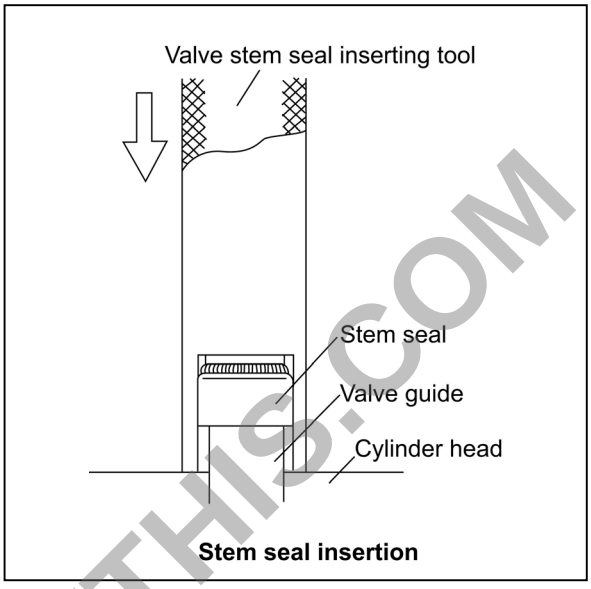
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4.2.8 Valve stem seal replacement

Always use a new seal after the intake/exhaust valve is disassembled. Since the one for the exhaust valve is marked with yellow paint, do not confuse the intake and exhaust valves.

1) Apply engine oil to the lip.

2) Push with the inserting tool (Refer to No.5 of 4.1.2 in Chapter 4) for installation.

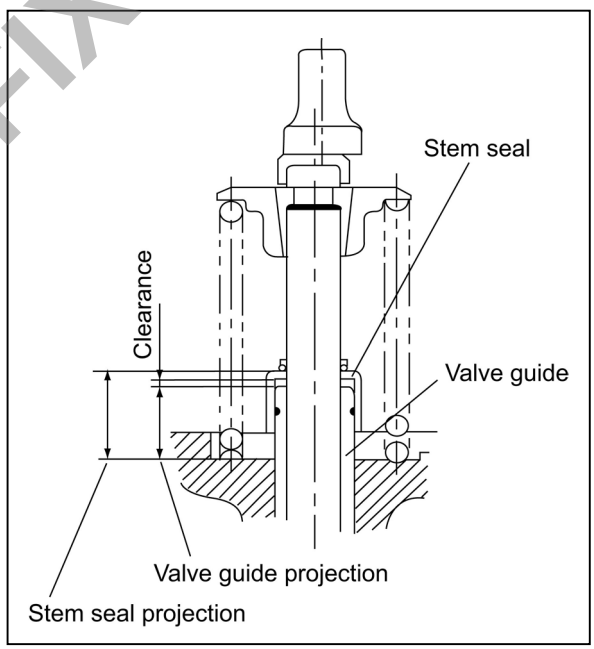


Stem seal insertion

3) Measure and check the projection of valve stem seal to keep proper clearance between valve guide and stem seal.

mm

Model	Number of valves	Projection
3TNV82A	2 valves	15.7∼16.0
4TNV84 3TNV84(T) 4TNV88		18.7∼19.0
4TNV84T	4 valves	9.9∼10.2
4TNV94L 4TNV98(T)		11.7∼12.0
4TNE106(T)		15.4∼15.6



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8. TURBOCHAGER: Disassembly, inspection and reassembly

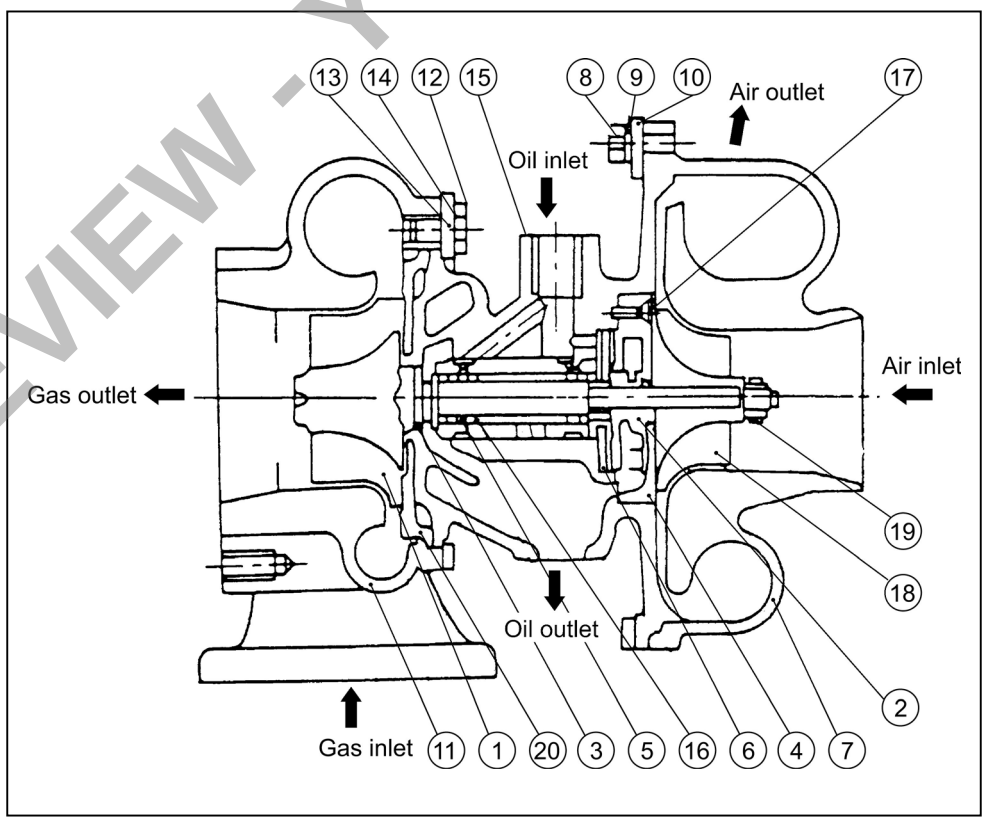
8.1 Structure and Functions

8.1.1 Main specifications

Applicable engine model (application)	3TNV84T(CL, VM) 4TNV84T(CL)	3TNV84T(VM)	4TNV106T(CL, VM)
Turbocharger model	RHB31	RHB51	RHF5
Turbocharger specification	Standard (w/waste gate)		
Turbine type	Radial flow		
Blower (compressor) type	Centrifugal		
Lubrication method	External lubrication		
Max. continuous allowable speed	250,000	180,000	
Max. continuous allowable gas inlet temperature	750		
Dry weight N(kgf)	24(2.4)	41(4.2)	46(4.7)

Note) VM application is provided with the waste gate.

8.1.2 Construction



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(3) Pinion projection length

Connect the positive (+) lead from the battery to terminal S and negative (-) lead to terminal M. Turn the switch ON and measure the pinion moving distance L in the thrust direction.
Perform this test within 10 seconds.

mm

	Standard
L	0.3～1.5

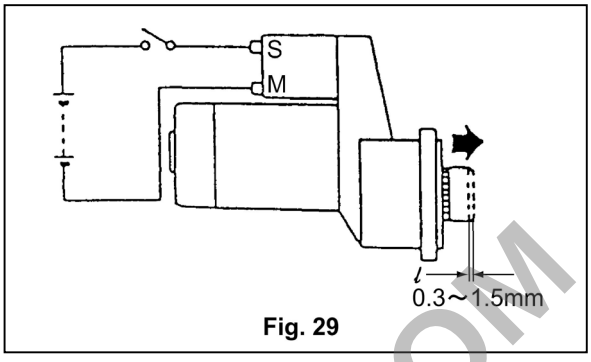


Fig. 29

Note: Before measuring the dimension, pull the pinion out lightly in the direction of the arrow.

If the measured L dimension is outside the standard range, either insert or remove the dust cover (adjusting shim 0.5 mm, 0.8 mm) for adjustment.

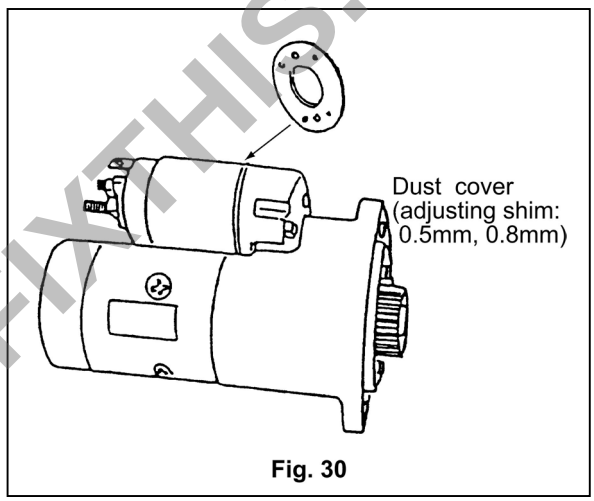


Fig. 30

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12.2.2 Gear train and camshaft

(1) Camshaft

mm

Inspection item			Standard	Limit	Reference page
Side gap			0.05～0.20	0.30	4.3.4
Bending (1/2 the dial gage reading)			0～0.02	0.05	4.3.5(1)
Cam height		3TNV82A-TNV88	38.600～38.800	38.350	
		4TNV94L･98	43.400～43.600	43.150	
		4TNV106(T)	50.900～51.100	50.650	
Shaft outside diameter / Metal inside diameter					
TNV82A～TNV88	Gear side	Bushing inside diameter	44.990～45.055	45.130	4.3.5(1)
		Camshaft outside diameter	44.925～44.950	44.890	
		Clearance	0.040～0.130	0.240	
	Intermediate	Bushing inside diameter	45.000～45.025	45.100	
		Camshaft outside diameter	44.910～44.935	44.875	
		Clearance	0.065～0.115	0.225	
	Wheel side	Bushing inside diameter	45.000～45.025	45.100	
		Camshaft outside diameter	44.925～44.950	44.890	
		Clearance	0.050～0.100	0.210	
4TNV94L/98(T)	Gear side	Bushing inside diameter	49.990～50.055	50.130	
		Camshaft outside diameter	49.925～49.950	49.890	
		Clearance	0.040～0.130	0.240	
	Intermediate	Bushing inside diameter	50.000～50.025	50.100	
		Camshaft outside diameter	49.910～49.935	49.875	
		Clearance	0.065～0.115	0.225	
	Wheel side	Bushing inside diameter	50.000～50.025	50.100	
		Camshaft outside diameter	49.925～49.950	49.890	
		Clearance	0.05～0.100	0.210	
4TNV106(T)	Gear side	Bushing inside diameter	57.980～58.050	58.105	
		Camshaft outside diameter	57.910～57.940	57.875	
		Clearance	0.040～0.140	0.250	
	Intermediate	Bushing inside diameter	58.000～58.030	58.105	
		Camshaft outside diameter	57.895～57.925	57.860	
		Clearance	0.075～0.135	0.245	
	Wheel side	Bushing inside diameter	58.000～58.030	58.105	
		Camshaft outside diameter	57.910～57.940	57.875	
		Clearance	0.050～0.120	0.230	

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3. Disassembly ,Reassembly and Inspection

3.1. Disassembly

Disassembled parts must be put aside in order.

Wash them before reassembly.

3.1.1. Separating the pump body from the governor body



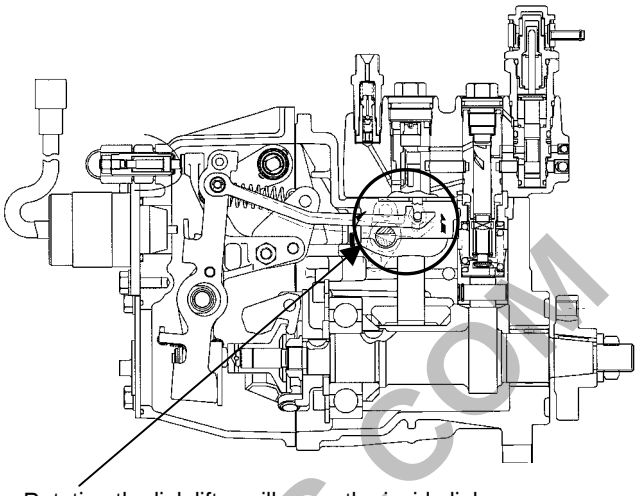
Install the pump body to the disassembly table.



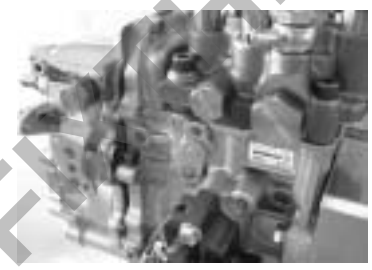
Remove the link lifter fix bolt.



Turn the link lifter plate counterclockwise.



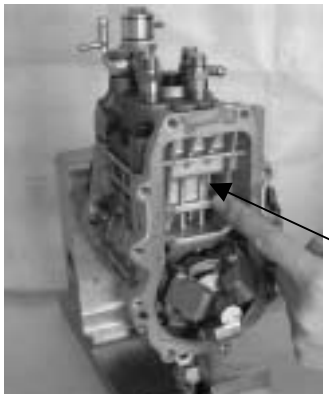
Rotating the link lifter will move the inside link upward/downward, so the control rack may be engaged/disengaged.



Remove the bolt fixing the pump and governor bodies.



Separate the governor from the pump body.



The pump body separated from t he governor body

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