2. TECHNICAL DATA

2. Technical Data

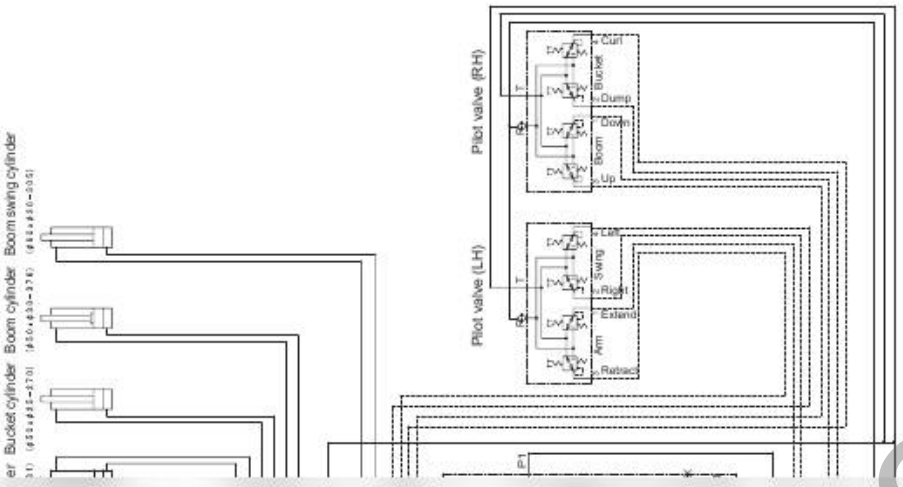
2-1 Specifications

Item	Unit	ViO10
Main specifications of machine		
Dimensions		
Overall length (Transportation position)	in. (mm)	118.5 (3010)

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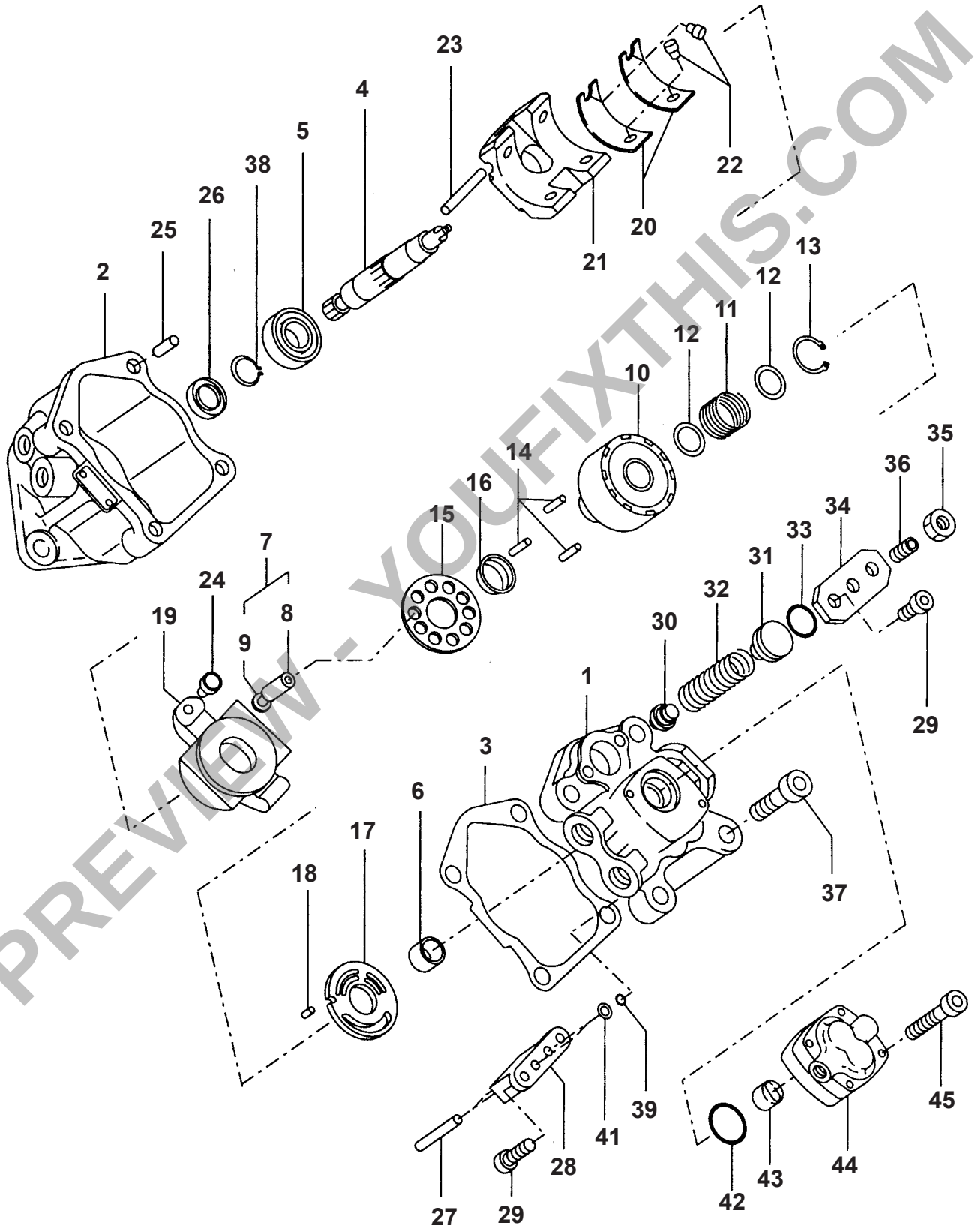
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3. Exploded view and component parts

1) Exploded view



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3-7-2 Engine

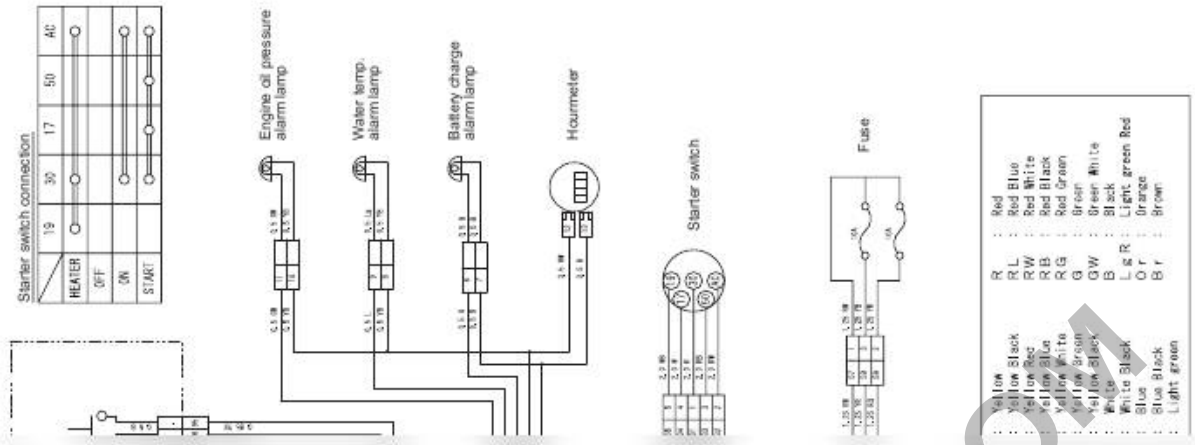
Tightening torque for major bolts and nuts

No.	Item	Thread size × Pitch	Tightening torque [Unit : ft•lbf (N•m)]	Lubricating oil
1	Cylinder head bolt	M8 × 1.25	27.5 to 30.4 (37.2 to 41.2)	Yes
2	Connecting rod bolt	M7 × 1.0	16.7 to 20.3 (22.6 to 27.5)	Yes
3	Flywheel mounting bolt	M10 × 1.25	59.3 to 63.7 (80.4 to 86.3)	Yes

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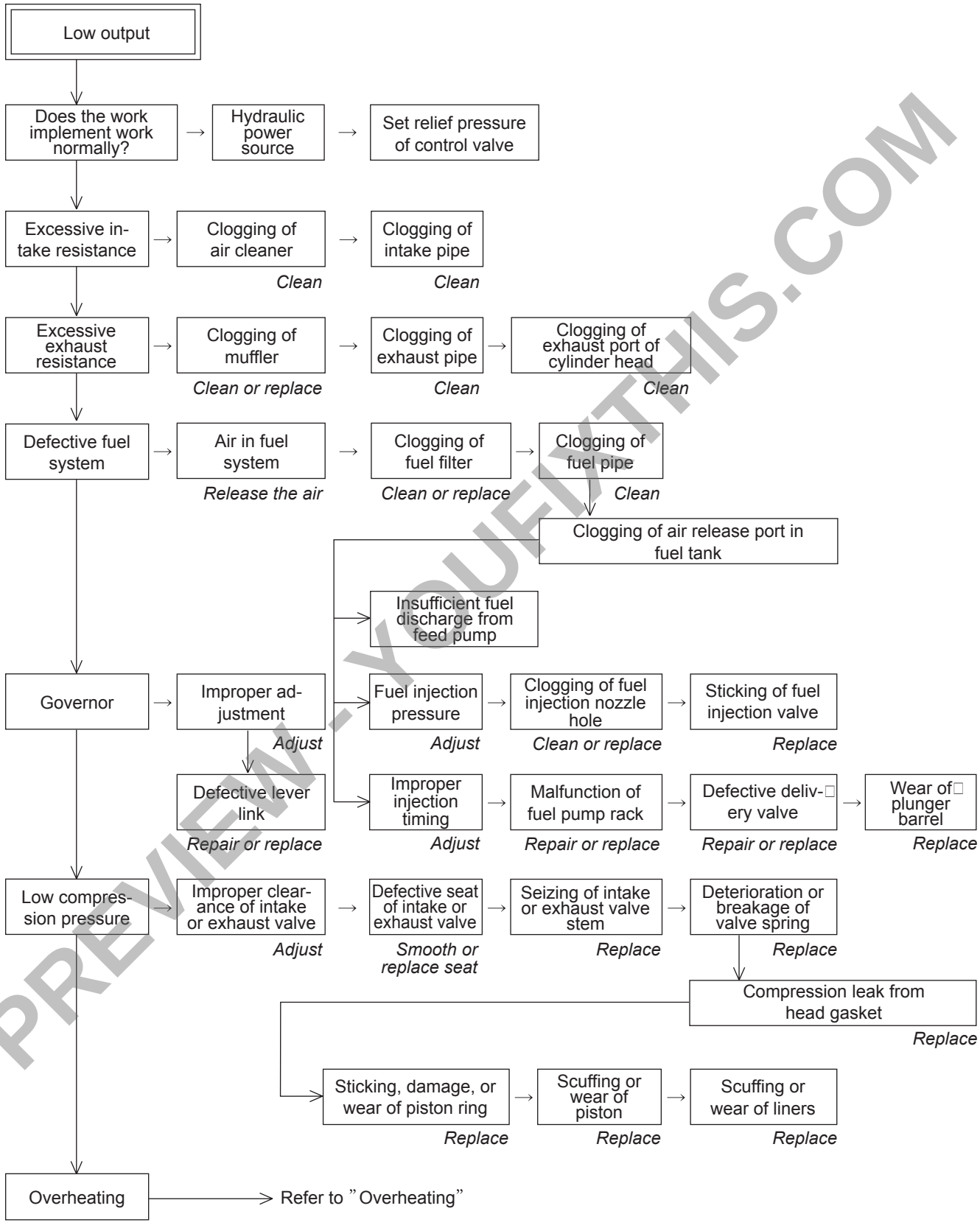
8. Periodic Inspection and Servicing

8-1 List of Periodic Inspection and Servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items			Daily	Every 50	Every 100	Every 250	Every 500	Every 1000 hrs
General	Check falling off, breakage of parts		◇					
	Check loose bolts & nuts, retighten		◇					
	Check engine condition		◇					
	Clean		□					
Lube oil	*Swing gear case oil	Check, resupply				◇/○		
		Replace				●1st time		●
	Travel reduction gear oil	Check, resupply				◇/○		
		Replace				●1st time		●
	*Transmission oil	Check, resupply	◇/○					
		Replace				●1st time		●
	*Differential gear oil	Check, resupply			◇/○			
		Replace				●1st time		●
Hydraulic system	Hydraulic oil	Check, resupply	◇/○					
		Replace						●
	Clean suction filter					□1st time		□
	Replace return filter					● 1st time	●	
	Check for abnormality of hydraulic pump		◇					
Grease	Check grease-up positions, grease		■					
	Greasing swing gears and swing bearings			■				
	*Greasing track gauge change cylinder and link fulcrum			■				
Undercar-riage	Check, adjust crawler tension		◇/□					
	*Check air pressure, wear, flaw in tyres		◇					
Steering equipment	*Check performance, play of steering levers		◇					
	Check performance, play of travel levers		◇					
	*Check performance of speed change lever		◇					
	*Check performance of forward/reverse pedal		◇					
	*Check performance, play of steering wheel		◇					
	*Brake pedal	Stroke	◇					
		Performance	◇					
	*Parking brake	Stroke	◇					
		Performance	◇					
	Check performance of accel. lever		◇					
Electric equipment	Check working lamp, horn		◇					
	Check hourmeter function		◇					
	Check function of charge, oil and pilot lamps		◇					
	Check wire breakage, short-circuits, loose terminals, retighten		◇					
	Check, resupply battery electrolyte		◇/○					
	Check specific gravity of electrolyte						□As required	
	Check function of monitor		◇					

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4. Engine

4-1 Measurement, Inspection and Adjustment

4-1-1 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 :

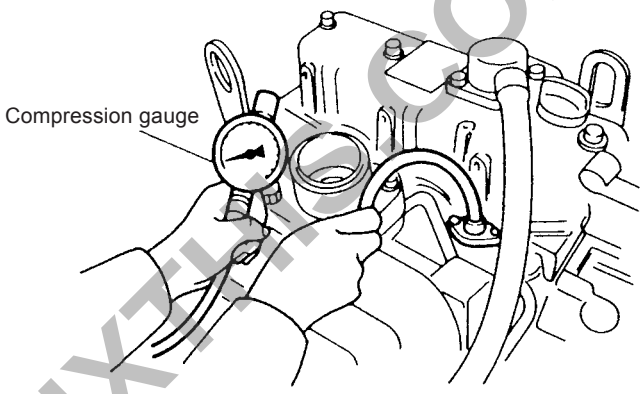
Crank the engine when the regulator handle has been turned to "STOP" position (no injection state).

(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 300 rpm PSI (MPa)		Variations of compression pressure among cylinders PSI (MPa)
Standard	Limit	
469.3 (3.2)	369.7 (2.5)	28.4 to 42.7 (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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CHAPTER 4
Engine

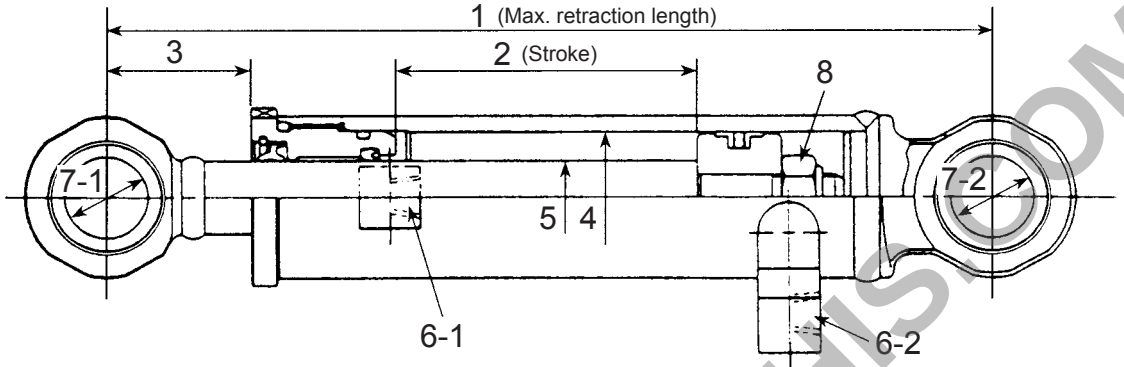
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3-5 Hydraulic Equipment

3-5-1 Hydraulic Cylinders



Unit : in. (mm)

No. / Cylinder	1	2	3	4	5	6-1 / 6-2	7-1 / 7-2		8	
							Standard	Allowable limit	Nut size	Tightening torque ft•lbf (N•m)
Boom	25.08 (637)	14.80 (376)	2.36 (60)	Ø1.97 (Ø50)	Ø1.18 (Ø30)	G1/4	Ø0.98 (Ø25) / Ø1.18 (Ø30)	Ø1.00 (Ø25.5) / Ø1.20 (Ø30.5)	M20	217.0 to 253.2 (294 to 343)
Arm	21.02 (534)	13.03 (331)	2.09 (53)	Ø1.97 (Ø50)	Ø0.98 (Ø25)	G1/4 / Rc1/4	Ø0.98 (Ø25)	Ø1.00 (Ø25.5)	M18	151.9 to 173.6 (206 to 235)
Bucket	18.15 (461)	10.63 (270)	1.77 (45)	Ø1.97 (Ø50)	Ø0.98 (Ø25)	G1/4	Ø0.98 (Ø25)	Ø1.00 (Ø25.5)	M18	151.9 to 173.6 (206 to 235)
Boom swing	21.34 (542)	12.01 (305)	2.70 (68.5)	Ø2.36 (Ø60)	Ø1.18 (Ø30)	G1/4	Ø1.18 (Ø30)	Ø1.20 (Ø30.5)	M20	217.0 to 253.2 (294 to 343)
Blade	15.31 (389)	3.66 (93)	5.91 (150)	Ø1.97 (Ø50)	Ø0.98 (Ø25)	Rc1/4	Ø0.98 (Ø25)	Ø1.00 (Ø25.5)	M18	151.9 to 173.6 (206 to 235)
Track gauge change	15.31 (389)	7.48 (190)	2.09 (53)	Ø1.97 (Ø50)	Ø0.98 (Ø25)	G1/4	Ø1.30 (Ø33)	Ø1.32 (Ø33.5)	M18	151.9 to 173.6 (206 to 235)

Nut for pipe

Symbol	Name
G (PF)	Straight pipe thread
R (PT)	Taper pipe thread (male)
Rc (PT)	Taper pipe thread (female)

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1. Adjustment of governor
(by using a pump tester and referring to the adjustment service data for the standard values)

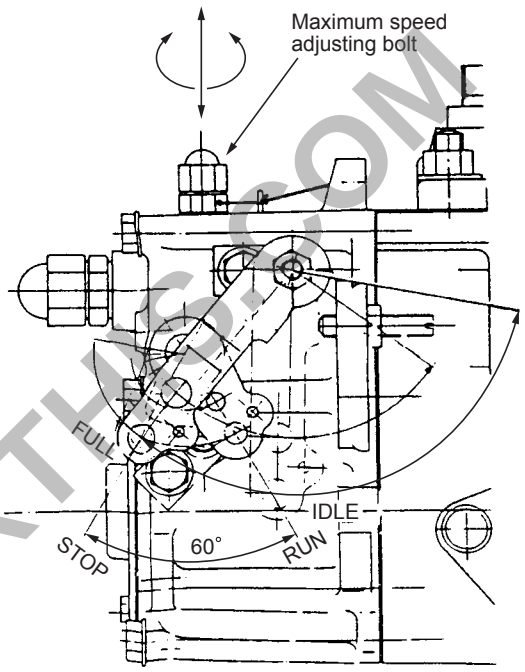
1) Adjusting the maximum idling speed

(1) Set the governor control lever to the fuel increase position end.

(2) Adjust the tightening volume of the maximum speed adjusting bolt.
Increase the idling speed. Check that the maximum idling speed is within the specified range.

Maximum idling speed

ViO10	Refer to Section "2-1 Specifications".



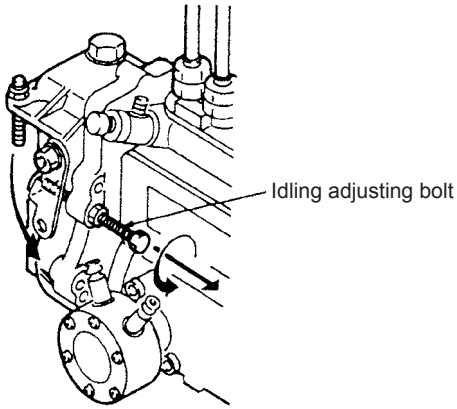
Note :
Adjustment after mounting the engine to the machine:
Refer to Section "7-3-10 Adjustment of Accelerator Lever".

2) Adjusting the minimum idling speed
(Adjusting the idling)

(1) Measure the idling speed while lowering the governor control lever to the idling position and adjust the position of the control lever to the position where the specified minimum idling speed is attained, with the idling adjusting bolt.

Maximum idling speed

ViO10	Refer to Section "2-1 Specifications".



Note :
Adjustment after mounting the engine to the machine:
Refer to Section "7-3-10 Adjustment of Accelerator Lever".

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6. Hydraulic Equipment

6-1 Hydraulic Pump

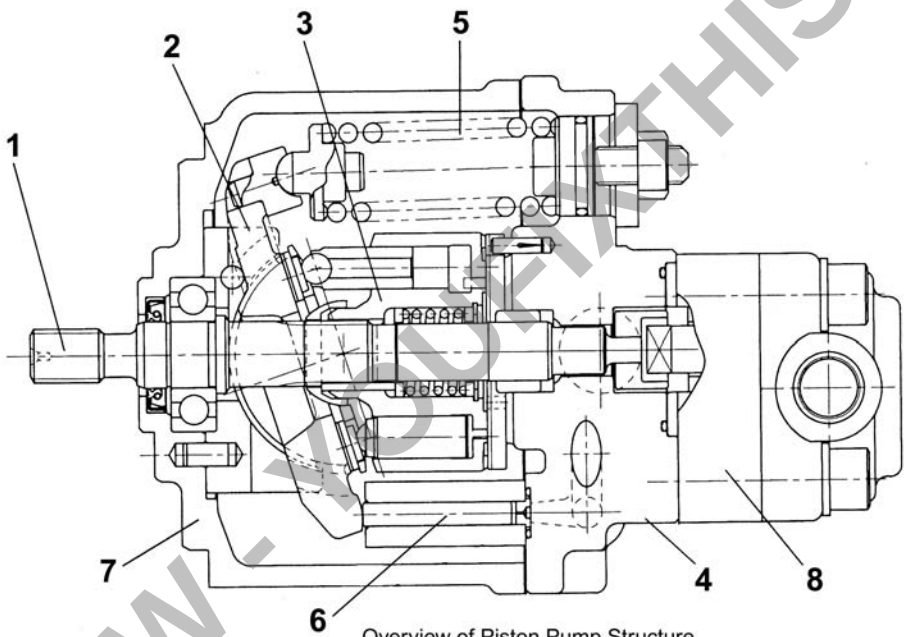
1. Outline

This piston pump consists of a drive shaft, a cradle, a rotary group, an oil port block, a control spring, a control piston, a pilot pump (a gear pump), a housing and other components. It is a variable displacement piston pump that discharges two equivalent volumes by means of a single rotary group.

The one rotary group is divided into one intake port and two discharge ports.

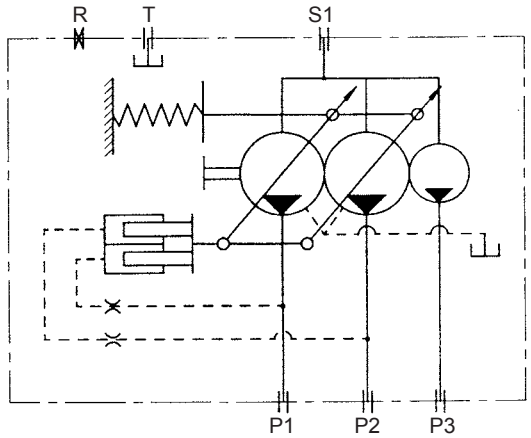
The gear pump is connected to this piston pump via a coupling.

The control system is a simultaneous incline angle full horsepower control.



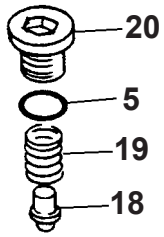
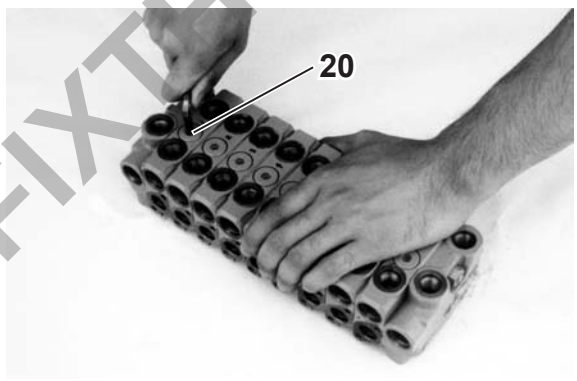
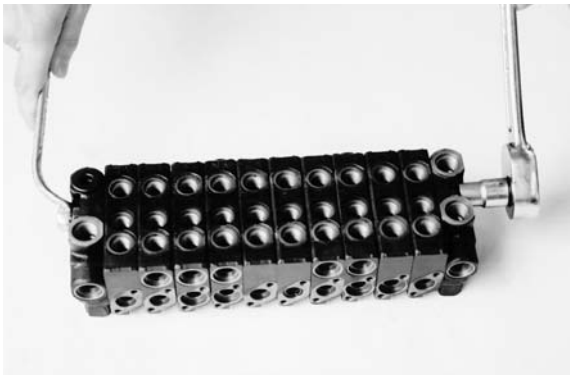
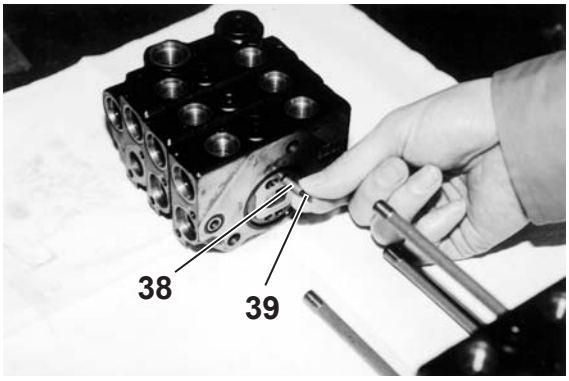
Overview of Piston Pump Structure

No.	Part	No.	Part
1	Drive shaft	5	Control spring
2	Cradle	6	Control piston
3	Rotary group	7	Housing
4	Oil port block	8	Gear pump



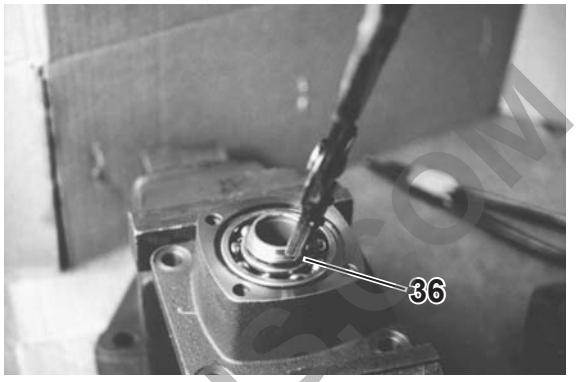
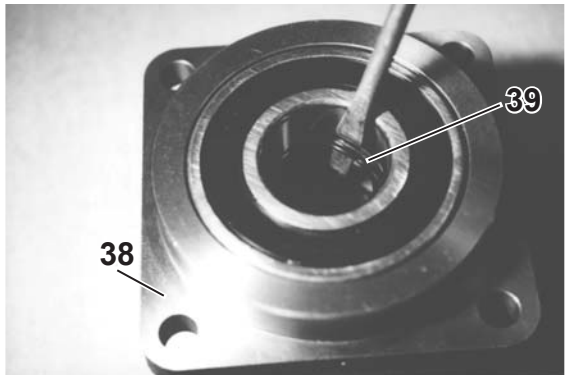
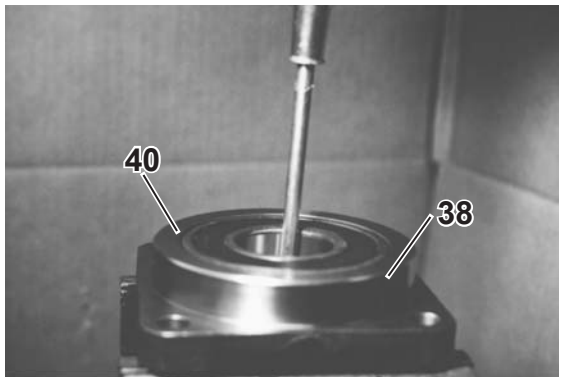
Hydraulic Circuit Diagram

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Procedure	
(8) Remove the plug G3 / 8 **21** on the side of each section.	
(9) Remove the check valve holder **20** (with the O-ring **5**), the check valve spring **19** and the check valve **18** of each section. 	
(10) While holding the nut on one inlet section side, loosen the nut on the other inlet section side to separate the sections from each other.	
(11) Remove the check valve **38** and the check valve spring **39** of the bucket section.	

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Procedure	
(13) Remove retaining ring **36.**	
(14) Remove pinion gear **42** with a press or a plastic hammer.	
(15) Remove X-ring **39** from bearing housing **38.**	
(16) Remove ball bearing **40** from bearing housing **38.** ***Notes :*** *a) Remove the bearing by tapping the inner race of it with a punch or the like.* *b) Do not remove the bearing unless required.*	

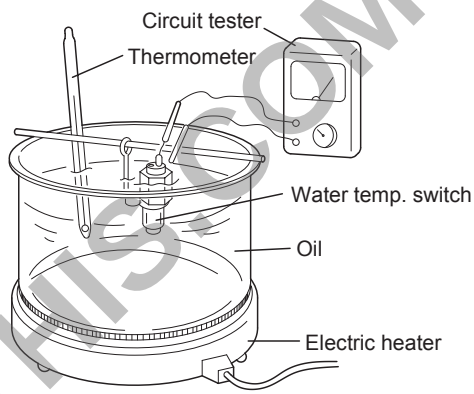
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Standard values for oil temperature T and continuity resistance R_2

-	Oil temperature	Operating limit
T	224.6 to 235.4°F (107 to 113°C)	-
R_2	-	25 Ω or less (reference value)

Check the insulation resistance R between the body and the terminal when the oil temperature is below 104°F (40°C). Clean the insulator or replace the water temp. switch if the insulation resistance R is not the standard value.

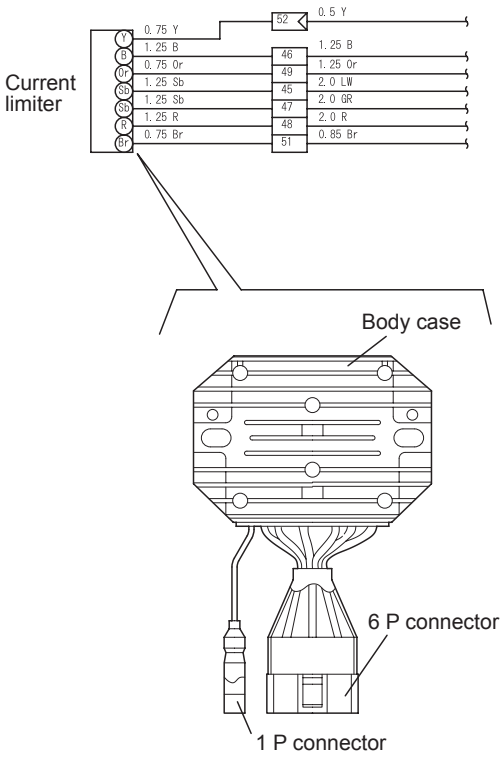


Standard value for insulation resistance R

-	Insulation resistance (MΩ)
R	Approx. 10

(3) Inspection of current limiter

[1] Measure the electric current when DC 100 V is applied between the point at which all the input/output lead wire terminals have been short-circuited together and the body case. (Measure it on the current limiter only.)



Insulation performance

0.001 A or less / DC 100 V

[2] Check the continuity between the terminals on the 1 P and 6 P connectors.

Continuity check

		Measuring point [Wire color, Tester (+)]						
		Sb	Sb	R	B	Or	Br	Y
Measuring point [Wire color, Tester (-)]	Sb	-	×	○	×	×	×	×
	Sb	×	-	○	×	×	×	×
	R	×	×	-	×	×	×	×
	B	×	×	×	-	×	○	×
	Or	○	○	○	○	-	○	○
	Br	×	×	×	×	×	-	×
	Y	○	○	○	○	○	○	-

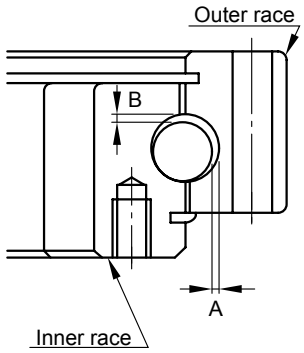
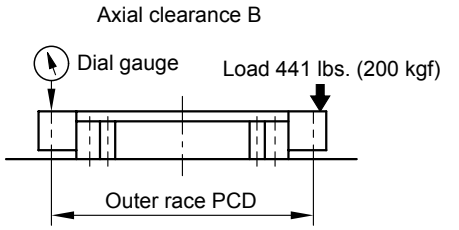
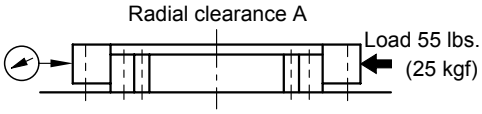
○: Continuity exists. ×: No continuity

Notes :

- *Do not reverse the polarity of the cable connection to the battery. Reversing the polarity of the connection will trigger the reverse-blocking triode thyristor, causing the main rectifier device to be damaged or burned out.*
- *Before checking the insulation performance, be sure to short-circuit all the lead wire terminals. Failure to do so will cause damage to the internal devices.*

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(2) Service standards

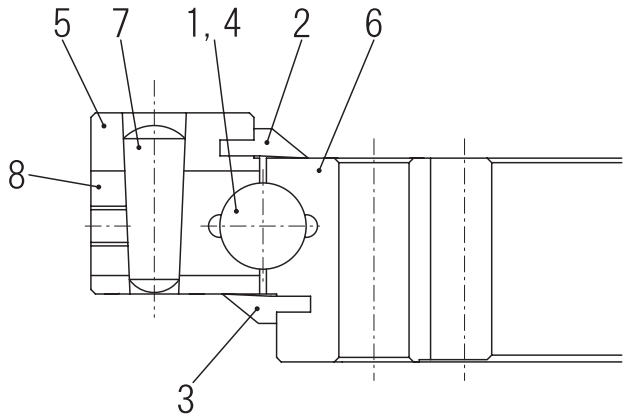
			Standard	Wear limit
			0.0012 to 0.0059 in. (0.03 to 0.15 mm)	0.0157 in. (0.4 mm)
			0.0012 to 0.0098 in. (0.03 to 0.25 mm)	0.0197 in. (0.5 mm)
Steel ball diameter			Ø0.6946 in. (Ø17.6425 mm)	∝
Tightening torque (10.9 T)	Tuning frame×outer race Track frame×inner race	M12×30 M12×40 M12×45	79.6 to 94.0 ft·lbf (107.9 to 128.5 N·m)	Apply Loctite 262 or its equivalent.

Note :

Put multipurpose grease into the swing bearing.

(3) Parts of swing bearing

No.	Part	Q'ty
1	Steel ball	60
2	Seal A	1
3	Seal B	1
4	Support	60
5	Outer race	1
6	Inner race	1
7	Taper pin	1
8	Plug	1



(4) Inspection

[1] Check the gear teeth surfaces for nicks, flaws, cracks, wear and breakage. Replace the swing bearing if the damage is excessive.

[2] Check for abnormal sound. Clean, grease or replace the swing bearing if necessary.

[3] Check the inner and outer races for play and irregular rotation. Refer to the service standards for repair or replacement.

[4] Check for grease leak from the swing bearing seal. Replace the swing bearing if the leakage is excessive.

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8. PERIODIC INSPECTION AND SERVICING

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items		Daily	Every 50	Every 200	Every 400	Every 1000	Every 2000 hrs
Fuel	Check & supply fuel to the tank	◇/○					
	Drain water and deposits in fuel tank		□				
	Clean water separator		□				
	Replace fuel filter element, pre-filter				●		
Lube oil	Check quantity of engine oil	◇/○					
	Replace engine oil		● 1st time	●within 6 months			
	Replace engine oil filter		● 1st time	●within 6 months			
Cooling water	Check & supply cooling water	◇/○					
	Clean radiator fin			□			
	Check fan belt tension	◇/□					
	Replace cooling water					●	
	Clean & check cooling system					●within one year	
Rubber hose	Check & replace fuel pipe, cooling water pipe						●
Operation system	Check & adjust governor lever, accelerator	◇		□			
Intake system	Clean air cleaner & replace element			□	●		
	*Check turbocharger, adjust					□	
Cylinder head	Adjust intake and exhaust valve clearances					□	
	Lap intake and exhaust valves						□
Fuel injection pump & injection valve	Check fuel injection valve nozzle, clean					□	
	Check & adjust fuel injection pressure & atomizing condition					□	
	Check fuel injection pump, adjust						□

*Applicable to models with the relevant equipment

Notes :

- *When the machine is used at dusty worksites, clean and replace the filter elements twice as often as specified in the table.*
- *Execution of periodic inspection and servicing is indispensable to assuring conformance to EPA emission control regulations.*
  Keep a record of the results.

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