YANMAR

SERVICE MANUAL

EXCAVATOR

Vio17

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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 3-7-4
3-7-3 Tightening Torque for General Bolts and Nuts 3-7-4
3-7-4 Hydraulic Hose Joint 3-7-5

CHAPTER 4
ENGINE

4-1 Exploded View 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

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2. TECHNICAL DATA

2. Technical Data

2-1 Specifications

Item				Unit	ViO17
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				in. (mm)	135.8 (3450)
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)	90.6 (2300)
		Traveling position		in. (mm)	90.6 (2300)
	Overall width	Full machine width (Maximum/Minimum)		in. (mm)	50.4 (1280)/37.4 (950)
Tumbler center distance				in. (mm)	46.3 (1176)
Track gauge (Maximum/Minimum)				in. (mm)	41.3 (1050)/28.3 (720)
Minimum ground clearance				in. (mm)	6.9 (175)
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)	2.61(4.2)/2.61 (4.2)
Permissible water depth limit				in. (mm)	10.4 (265)
Work performance					
Bucket	Width (Standard)			in. (mm)	17.7 (450)
	(Standard. JIS heaped capacity)			cu.ft. (cu.m)	1.77 (0.05)
	Number of teeth / Installation method			pcs.	3 / rubber pin lock type
Maximum digging depth	With blade raised			in. (mm)	86.6 (2200)
	With blade on the ground			in. (mm)	90.9 (2310)
Maximum depth of vertically digging				in. (mm)	72.8 (1850)
Maximum dumping height				in. (mm)	103.5 (2630)
Minimum front swing radius (with boom in front)				in. (mm)	60.4 (1535)
Minimum front swing radius (at 75 degrees right boom swing)			Cabin	in. (mm)	-
			Canopy	in. (mm)	54.3 (1380)
Rear end swing radius				in. (mm)	25.2 (640)
Boom swing angle		Cabin	Left	degrees	-
			Right	degrees	-
		Canopy	Left	degrees	42
			Right	degrees	75
Maximum digging force		Bucket		lbs. (kN)	3418 (15.2)
		Arm		lbs. (kN)	1911 (8.5)
Maximum tractive force (Oil pressure force) (rubber)				lbs. (kN)	4183 (18.6)
Maximum swing inclination angle (with standard bucket)				degrees	23 (at loading)

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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 (class 1)	M9 × 1.25	39.8 to 42.7 (53.9 to 57.9)	Yes
2	Connecting rod bolt (class 1)	M7 × 1.0	16.6 to 20.3 (22.6 to 27.5)	Yes
3	Flywheel mounting bolt	M10 × 1.25	59.3 to 63.7 (80.4 to 86.4)	Yes
4	Metal cap bolt	M12 × 1.5	55.7 to 60.1 (75.5 to 81.5)	Yes
5	Crankshaft pulley fastening bolt	M12 × 1.25	61.5 to 68.7 (83.3 to 93.3)	Yes
6	Fuel injection nozzle retainer clamp nut	M20 × 1.5	36.2 to 39.1 (49.0 to 53.0)	No
7	Glow plug	M10 × 1.25	10.9 to 14.5 (14.7 to 19.6)	No
8	Governor weight support nut	M12 × 1.25	50.6 to 54.3 (68.7 to 73.7)	Yes
9	High pressure pipe nut	M12 × 1.25	21.7 to 25.3 (29.4 to 34.3)	No
10	Cam end nut (Fuel pump)	M12 × 1.75	43.4 to 50.7 (58.8 to 68.8)	Yes
11	Fop gear bolt	M8 × 1.0	2.43 to 2.73 (3.3 to 3.7)	No

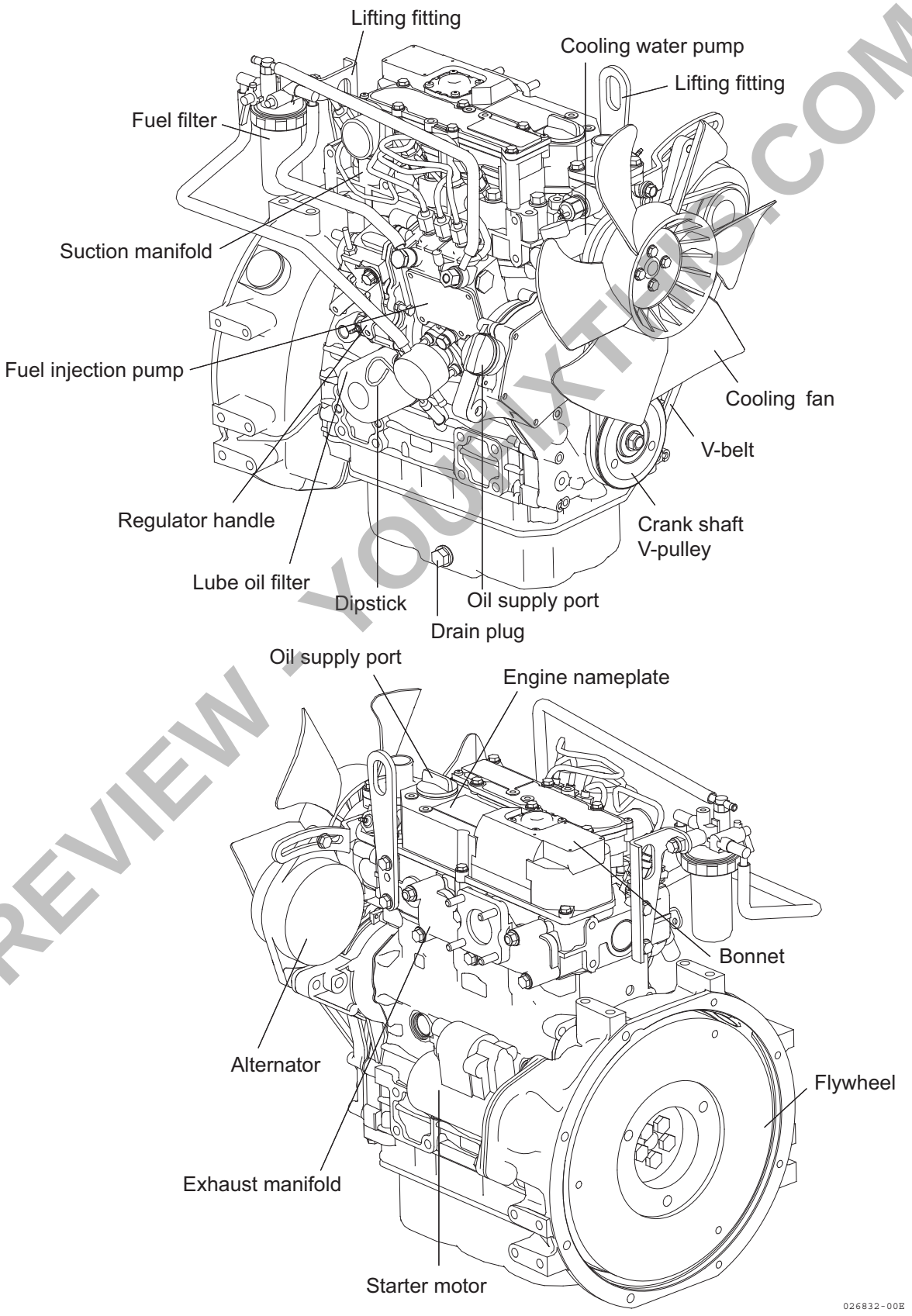
3-7-3 Tightening Torque for General Bolts and Nuts

Item		Thread size × Pitch	Tightening torque [Unit : ft•lbf (N•m)]	Remarks
Hexagon head bolt (7T) Nut	Coarse thread	M6 × 1	7.23 to 8.68 (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	16.6 to 21.0 (22.6 to 28.4)	
		M10 × 1.5	32.6 to 43.4 (44.1 to 58.8)	
		M12 × 1.75	57.9 to 72.3 (78.5 to 98.1)	
		M14 × 2	86.8 to 108.5 (117.7 to 147.1)	
		M16 × 2	123.0 to 151.9 (166.7 to 205.9)	
		M18 × 2.5	173.6 to 209.8 (235.4 to 284.4)	
		M20 × 2.5	238.7 to 296.6 (323.6 to 402.1)	
	Fine thread	M14 × 1.5	94.0 to 108.5 (127.5 to 147.1)	
		M16 × 1.5	155.5 to 177.2 (210.9 to 240.3)	
PT plug		1/8	7.23 (9.8)	
		1/4	14.5 (19.6)	
		3/8	21.7 (29.4)	
		1/2	43.4 (58.8)	
Pipe joint bolt		M8	9.4 to 12.3 (12.7 to 16.7)	
		M12	18.1 to 25.3 (24.5 to 34.3)	
		M14	28.9 to 36.2 (39.2 to 49.0)	
		M16	36.2 to 43.4 (49.0 to 58.8)	

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4. Engine

4-1 Exploded View



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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 :

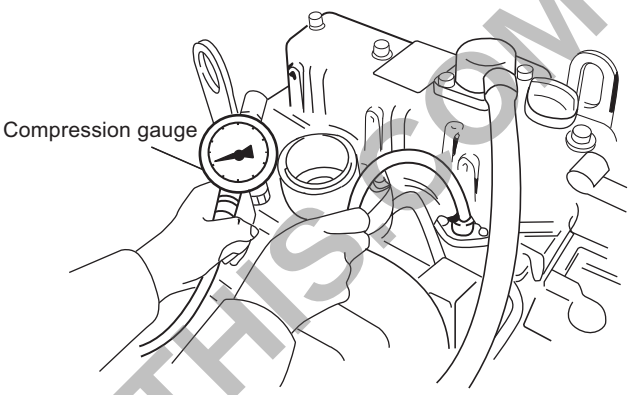
Crank the engine when the regulator handle has been turned to "STOP" position (no injection state).

(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	
455.4 to 484.4 (3.14 to 3.34)	369.8 (2.55)	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.

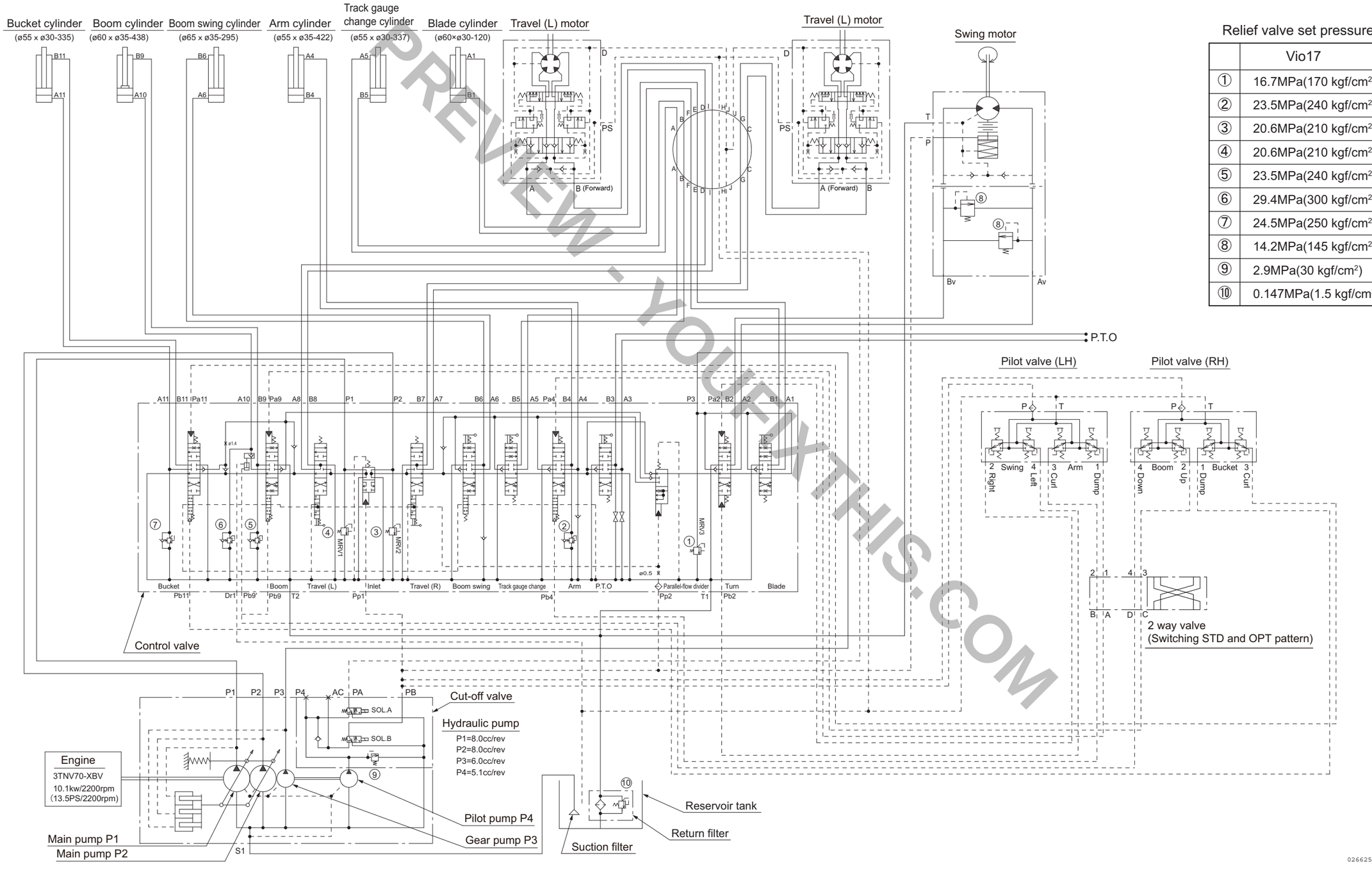
In addition, the compression pressure is also decreased by scratches on the cylinder or the piston which are caused by dust or other foreign matters drawn in through the soiled filter element of the air cleaner, and wear or breakage of any piston rings. Therefore, the condition of the engine should be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

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5. HYDRAULIC SYSTEM

5-2 Hydraulic Circuit Schematic

5-2-1 For Standard Type Machines



Relief valve set pressure

	Vio17
①	16.7MPa(170 kgf/cm²)
②	23.5MPa(240 kgf/cm²)
③	20.6MPa(210 kgf/cm²)
④	20.6MPa(210 kgf/cm²)
⑤	23.5MPa(240 kgf/cm²)
⑥	29.4MPa(300 kgf/cm²)
⑦	24.5MPa(250 kgf/cm²)
⑧	14.2MPa(145 kgf/cm²)
⑨	2.9MPa(30 kgf/cm²)
⑩	0.147MPa(1.5 kgf/cm²)

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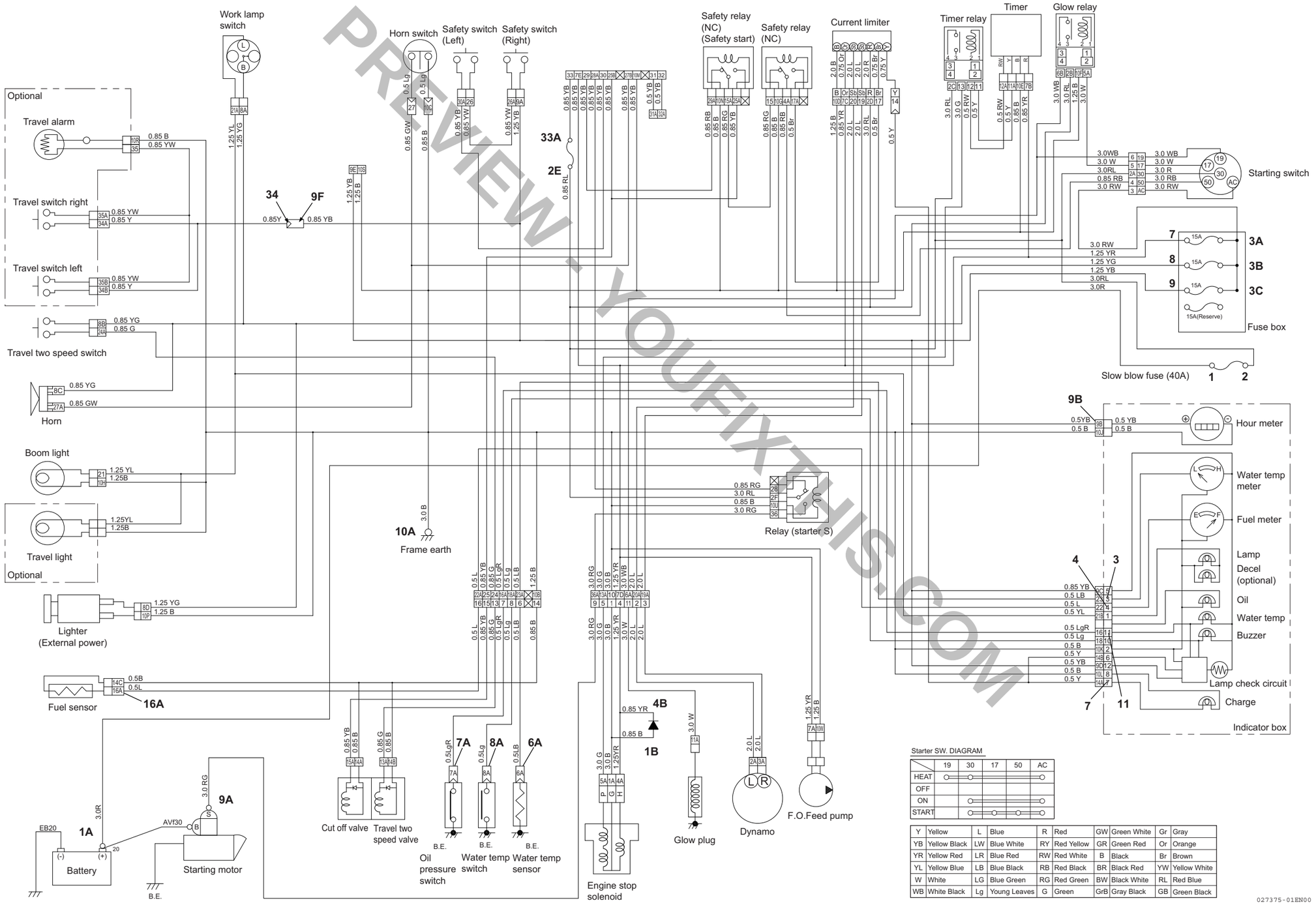
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7-1-3 Wiring Diagram

1) Standard Specifications

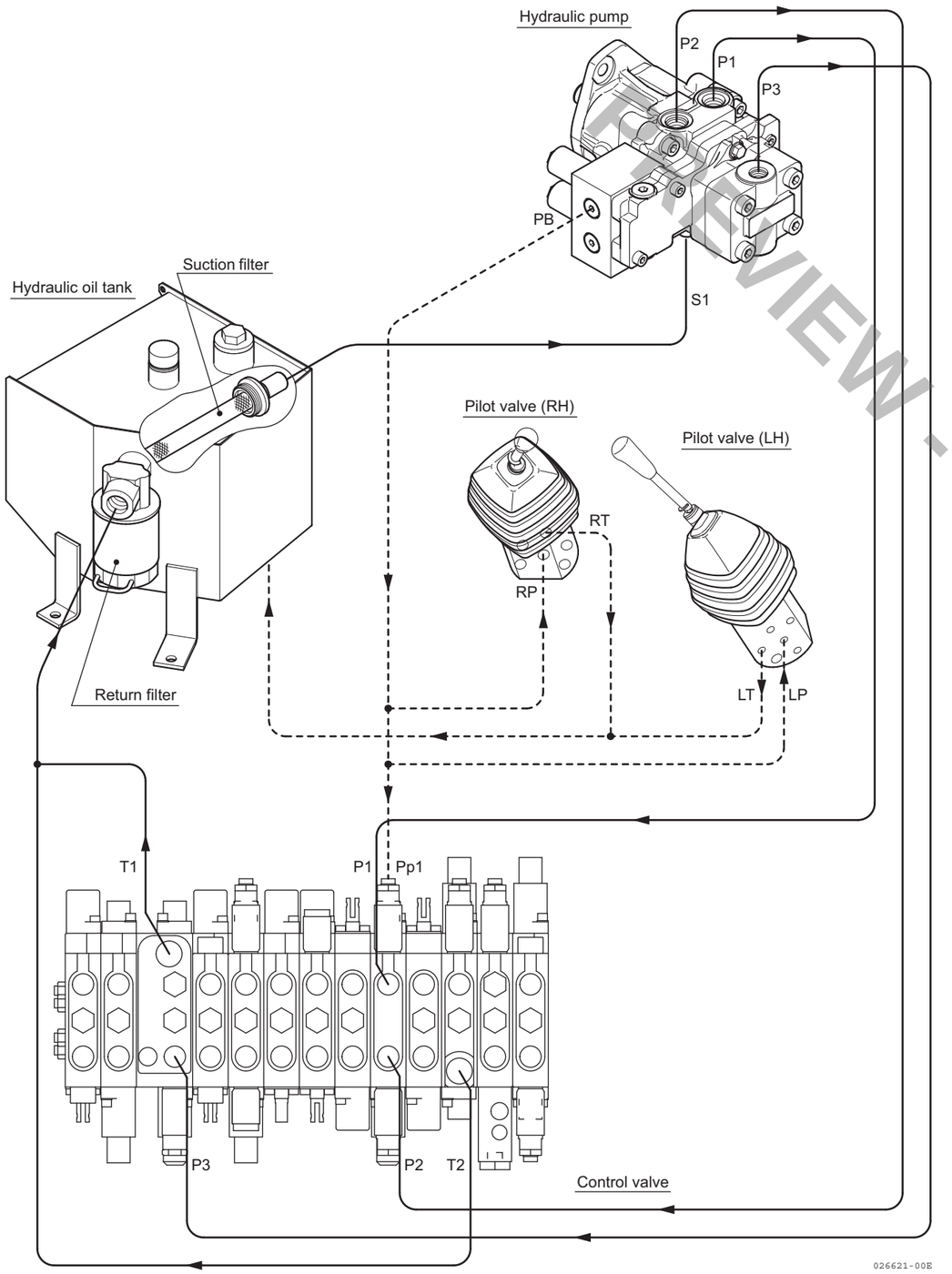
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5. HYDRAULIC SYSTEM



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4-3-8 Gears

1) Checking the Gears

Check the teeth surfaces of each gear and replace the gear if the teeth are damaged, worn, or flaked.

2) Measuring the Backlashes

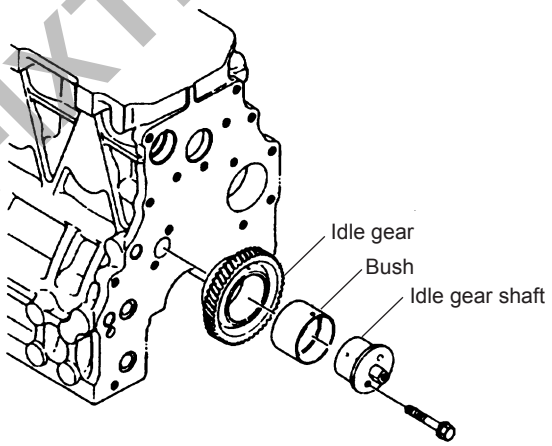
Apply a dial gauge onto the pitch circle of the gear, and measure the backlash.

		Standard	Wear limit
Backlash	Crank gear, cam gear, idle gear and fuel injection pump drive gear	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Lubricating oil pump gear		

3) Checking and Measuring the Idle Gear Shaft and the Idle Gear

(1) Measure the idle gear bush inside diameter and the idle gear shaft outside diameter, and replace the bush or the idle gear shaft if the oil clearance exceeds the wear limit.

(2) Check that the oil holes in the idle gear shaft and the bush are aligned.

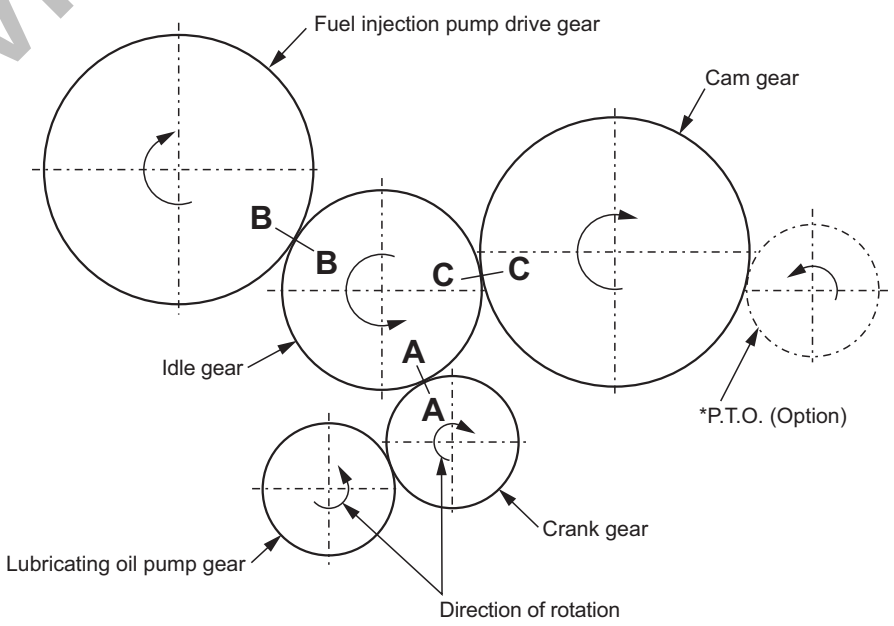


		Standard	Wear limit
Idle gear	Shaft outside dia.	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Bush inside dia.		
	Oil clearance		

4) Gear Train

After installing all the gears, check that the matchmarkes A, B and C on the idle gear are aligned with those on the crank gear the fuel injection pump drive gear and the cam gear respectively.

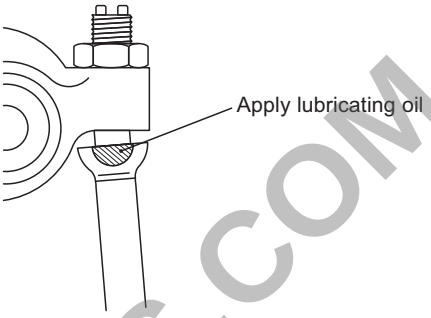
(From the gear case side)



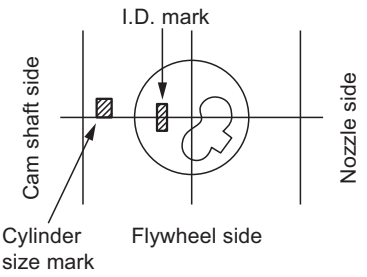
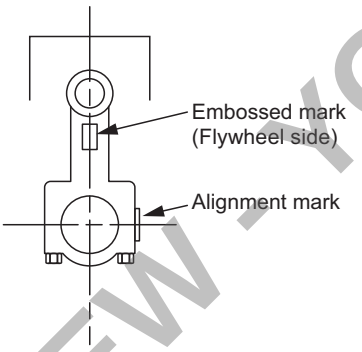
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8) Applying Lubricating Oil to the Push Rod Adjust Screw Contact Portion

Apply lubricating oil to the hatched portion of the push rod as shown in the figure, before reassembly.

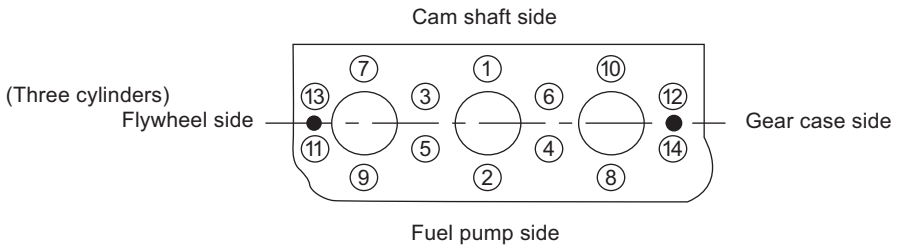


9) Installation Direction of the Piston and the Connecting Rod

Piston	
Connecting rod	

10) Tightening Order and Tightening Torque of the Cylinder Head Bolts

Tighten the cylinder head bolts at a specified tightening torque in the numerical order as shown below.



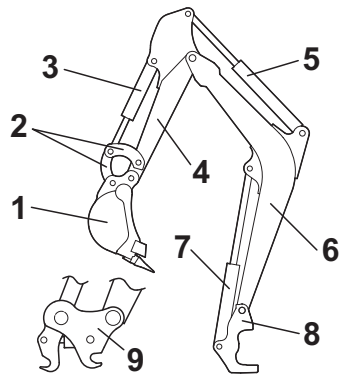
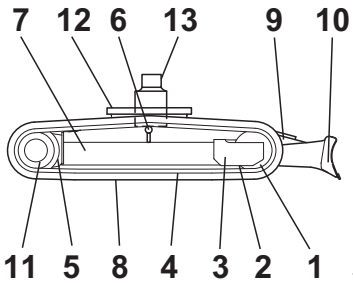
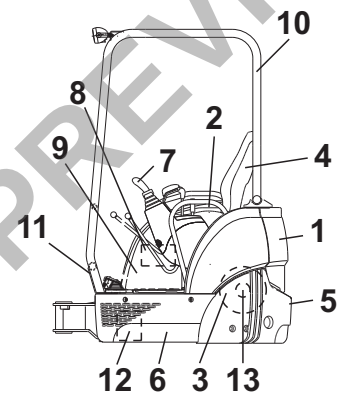
Tightening torque	Refer to Section "3-7-2 Engine Tightening torque for major bolts and nuts".

11) After Completing the Reassembly, Carry Out a Verification Run of the Engine to Check That There is No Water or Oil Leakage.

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2-3 Weight List of Main Parts

[Unit : lbs. (kg)]

Equipment	No.	Part		ViO17 Canopy Rubber crawler
Front implement				
	1	Bucket	Ass'y	73.9 (33.5)
	2	Bucket arm & link	Ass'y	24.3 (11)
	3	Bucket cylinder	Ass'y	24.3 (11)
	4	Arm	Ass'y	59.5 (27)
	5	Arm cylinder	Ass'y	30.9 (14)
	6	Boom	Ass'y	116.8 (53)
	7	Boom cylinder	Ass'y	35.3 (16)
	8	Boom bracket	Ass'y	72.8 (33)
	9	Quick coupler	Ass'y	–
Undercarriage				
	1	Idler	Ass'y	30.9 (14) × 2
	2	Crawler guard	Ass'y	–
	3	Crawler adjuster	Ass'y	12.1 (5.5) × 2
	4	Track roller	Ass'y	8.2 (3.7) × 2
	5	Sprocket	Ass'y	11.0 (5.0) × 2
	6	Carrier roller	Ass'y	4.6 (2.1) × 2
	7	Track frame	Ass'y	480.6 (218)
	8	Steel crawler & Rubber crawler	Ass'y	127.9 (58) × 2
	9	Blade cylinder	Ass'y	18.7 (8.5)
	10	Blade	Ass'y	149.9 (68)
	11	Travel motor	Ass'y	52.9 (24) × 2
	12	Swing bearing	Ass'y	43.0 (19.5)
	13	Swivel & hose or fitting	Ass'y	30.9 (14)
Upperstructure				
	1	Engine hood	Ass'y	8.8 (4)
	2	Hydraulic oil tank & filters	Ass'y	30.9 (14)
	3	Engine		253.5 (115)
	4	Operator's seat & mount	Ass'y	88.2 (40)
	5	Counter weight	Ass'y	242.5 (110)
	6	Turning frame	Ass'y	529.1 (240)
	7	Controls (4 cables)	Ass'y	55.1 (25)
	8	Battery	Ass'y	30.9 (14)
	9	Fuel tank & piping	Ass'y	24.3 (11)
	10	Canopy & mount	Ass'y	154.3 (70)
	11	Swing lock, covers, steps and panels		66.1 (30)
	12	Swing motor	Ass'y	50.7 (23)
	13	Pump & mount and hoses	Ass'y	77.2 (35)
	14	Control valve & fitting and hoses	Ass'y	110.2 (50)
	15	Boom swing cylinder	Ass'y	32.0 (14.5)

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(4) Last, lap the valve using only oil.

Notes :

1. *After correcting the valve seat, thoroughly clean the valve and the cylinder head using light oil or the like. Thoroughly remove the valve compound or the grindstone powder.*
2. *For slightly poor contact, take the steps (3) and (4) only.*

3) Intake / Exhaust Valve

(1) Wear and bend of the valve stem

Replace the valve stem if bent or worn excessively. In this case, replace the valve guide together with the valve stem.

(2) Valve stem and valve guide

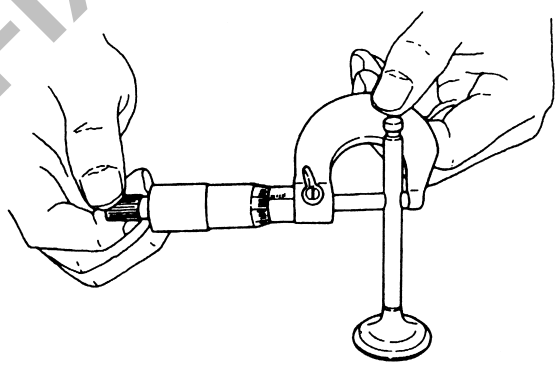
Oil clearance is the difference between the valve guide inside diameter measured with a three-point micrometer or a cylinder gauge and the stem outside diameter measured with a micrometer. If the oil clearance is near the wear limit, replace both the intake / exhaust valve and the valve guide with new ones.

Note :

Three-point micrometer : Used for an inside diameter of 0.157 to 0.315 in. (4 to 8 mm).

Cylinder gauge : Used for an inside diameter of 0.236 in. (6 mm) or more.

		Standard	Wear limit
Intake valve	Stem outside dia.	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Guide inside dia.		
	Oil clearance		
Exhaust valve	Stem outside dia.		
	Guide inside dia.		
	Oil clearance		

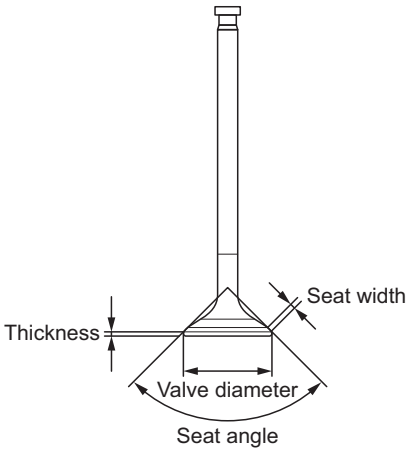


(Measuring the valve stem outside diameter)

(3) Thickness of valve head

Measure the thickness of the valve head with a micrometer. If the measured value is near the wear limit, replace the valve with a new one.

		Standard	Wear limit
Thickness of valve head	Intake valve	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Exhaust valve		

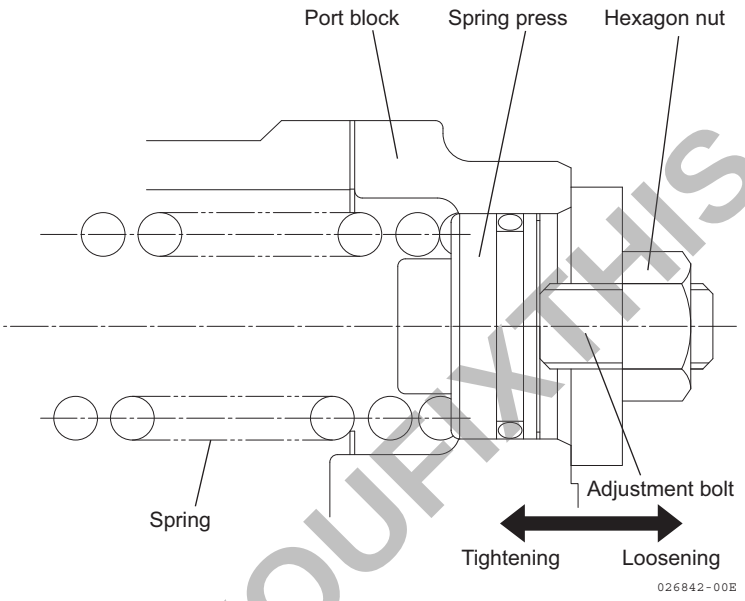


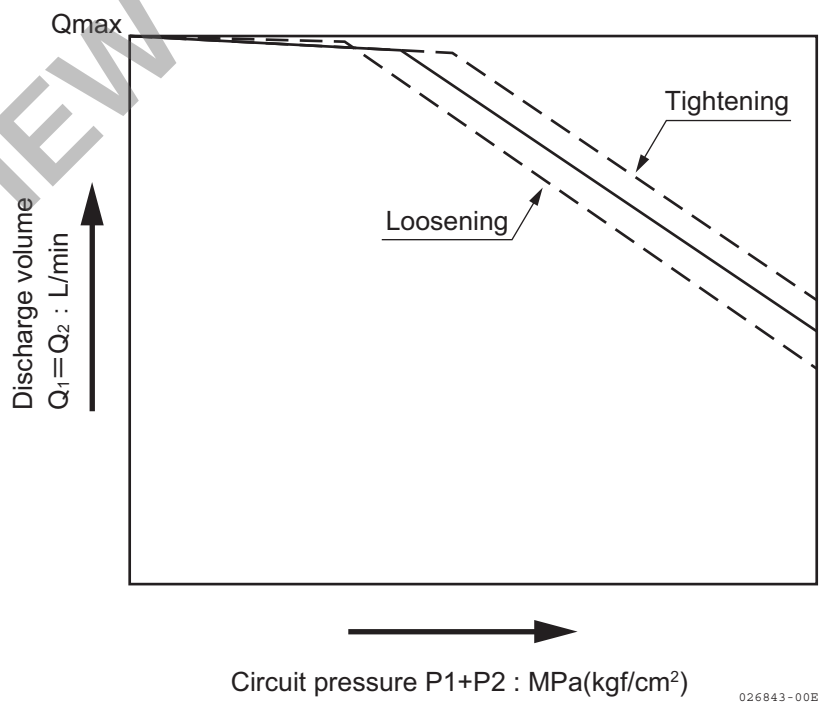
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3) Torque Adjustment Procedure

(1) Loosen the hexagon nut.

(2) Set the horsepower diagram by either tightening or loosening the adjustment bolt.



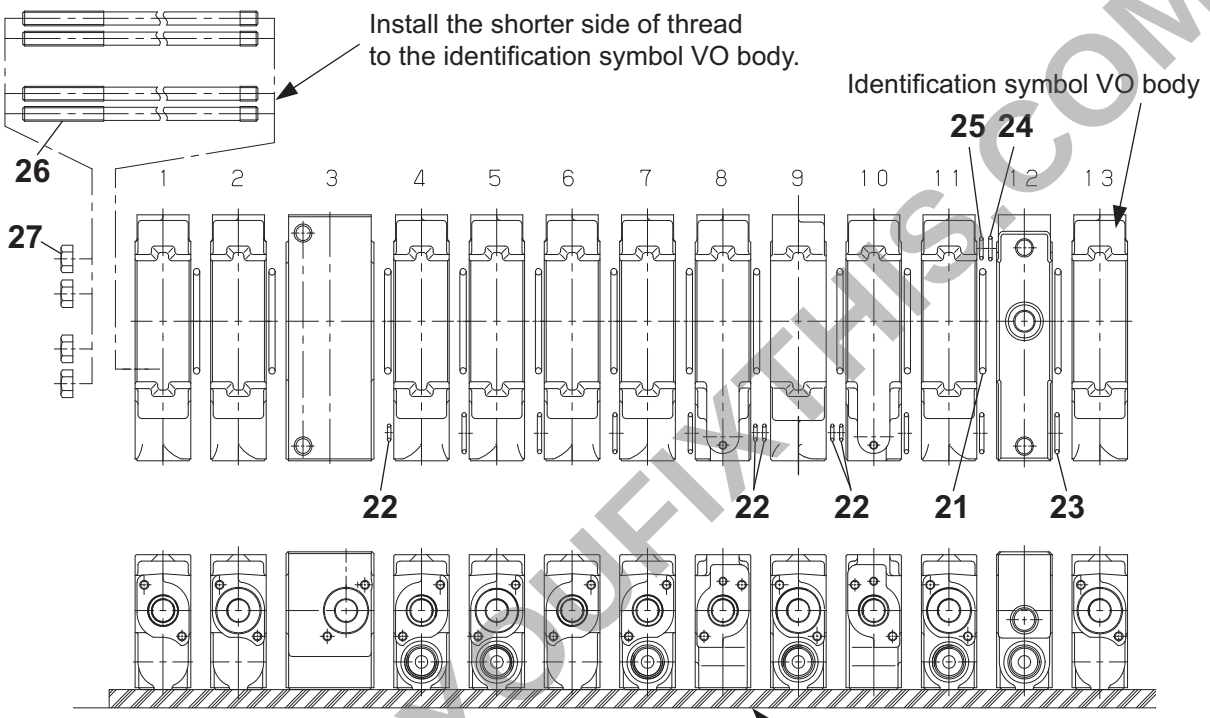


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Body Reassembly Order

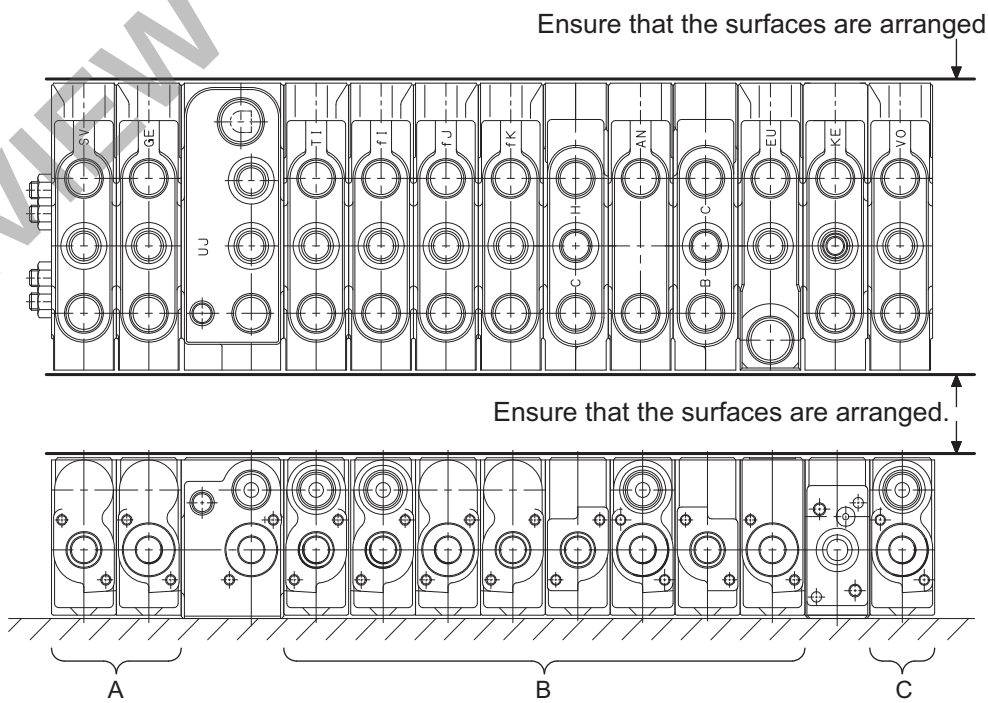
No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Identification	SV	GE	UJ	T1	f1	fJ	fK	CH	AN	BC	BU	KE	VO

[Note] The identification symbols are carved on the upper surface of the unit (actuator port surface).



The condition prior to the body reassembly

Prevent the actuator port surface from damage by a clean rubber board or the like.



Note: When the actuator port surface is placed upward, the clearance of 1.5mm appears between A, B, C and the ground plane.

Body assembly (after reassembly)

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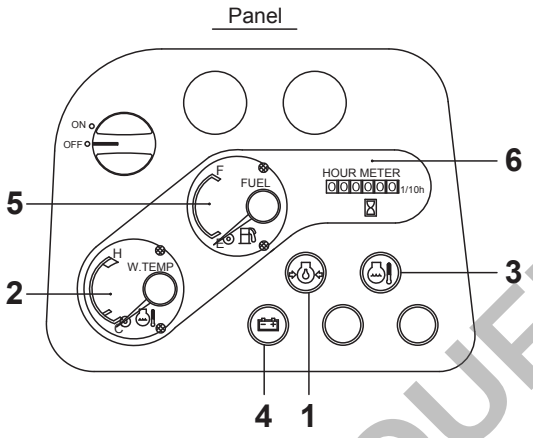
7-1-2 Monitor and Alarm Systems

For safer machine operation, the operator needs to have a clear understanding of the machine's condition. However, it is difficult for the operator to keep an eye on every aspect of the machine he/she operating.
Therefore, gauges and alarms are installed to warn the operator of any trouble of the machine at the early stage.

Note :

The monitors do not give a full assurance of the machine's condition. The indications shown on them should be used as a guide for daily check and periodic maintenance according to the operation and maintenance manual.

1) Part Name



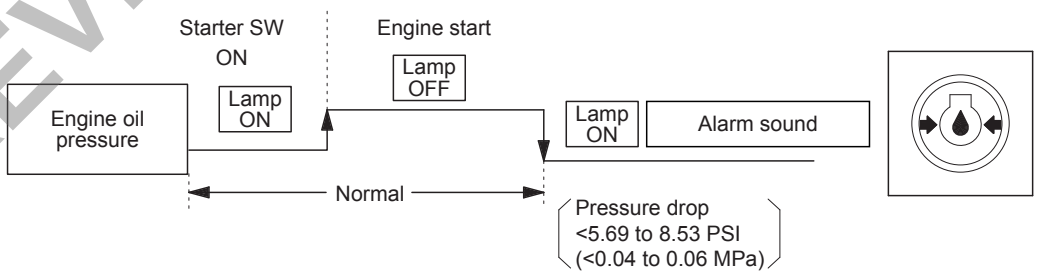
1 Engine oil pressure alarm lamp
2 Water temp. meter
3 Water temp. alarm lamp
4 Battery charge alarm lamp
5 Fuel gauge
6 Hour meter

2) Function of Alarm Sensor

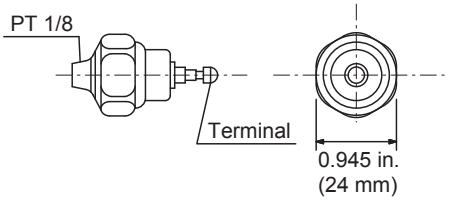
- All the lamps should go on for a few seconds when the starter switch is turned on.
- All the lamps should go off when the engine is running.
- The engine oil pressure and battery charge alarm lamps should go on when the engine is stopped.
- The buzzer should sound when a lamp goes on while the engine is running.

3) Alarm Sensor Operation

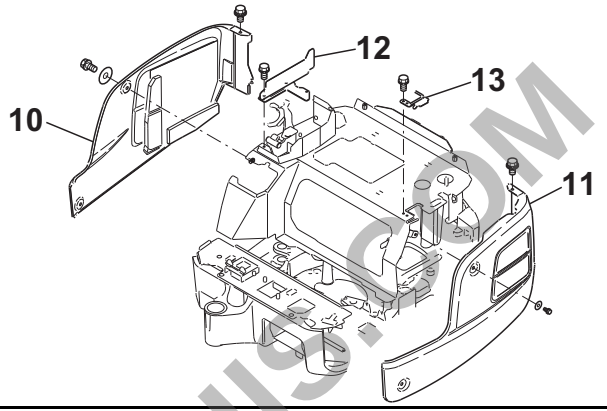
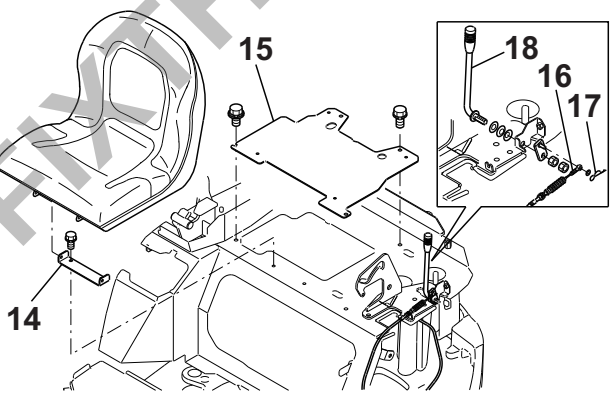
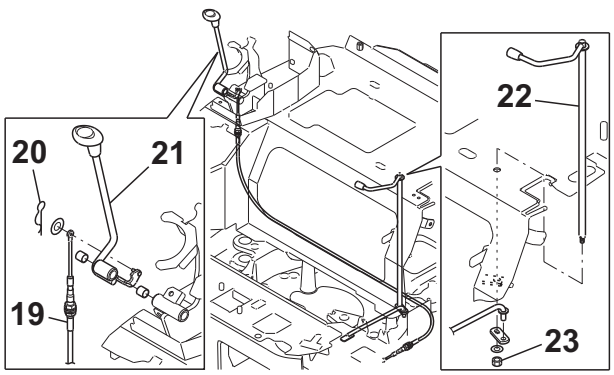
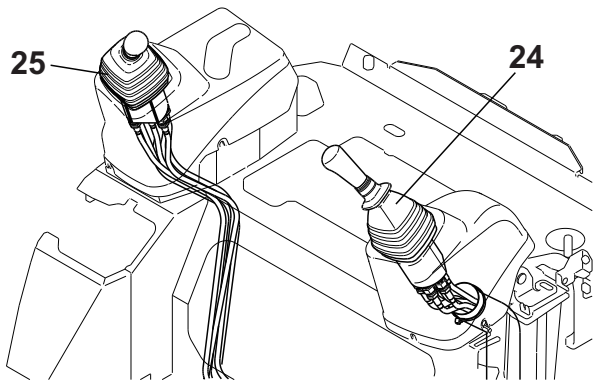
(1) Lube oil pressure drop monitoring (engine oil pressure switch)
When the engine oil pressure falls, the lamp goes on and the buzzer sounds.



The switch monitors the lube oil pressure drop of the engine and causes the engine oil pressure alarm lamp to go on and the alarm buzzer to sound.
Working pressure : 5.69 to 8.53 PSI (0.04 to 0.06 MPa)
Installation position : Engine block



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Procedure	
(6) Remove the cover R **10** and the cover L **11**. (7) Remove the plates in the left and right (the cover **12** and **13**).	
(8) Remove the operator's seat bracket **14** (with the operator's seat), and then remove the operator's seat plate **15**. (9) Remove the snap pin **17** and disconnect the accelerator cable **16** from the accelerator lever **18**.	
(10) Remove the snap pin **20** and disconnect the blade cable **19** from the blade lever **21**. (11)Remove the nut **23** and disconnect the adjustable leg lever **22** from the link.	
(12) Remove the pilot valve **24** and **25** in the left and right with the hydraulic hose attached.	

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