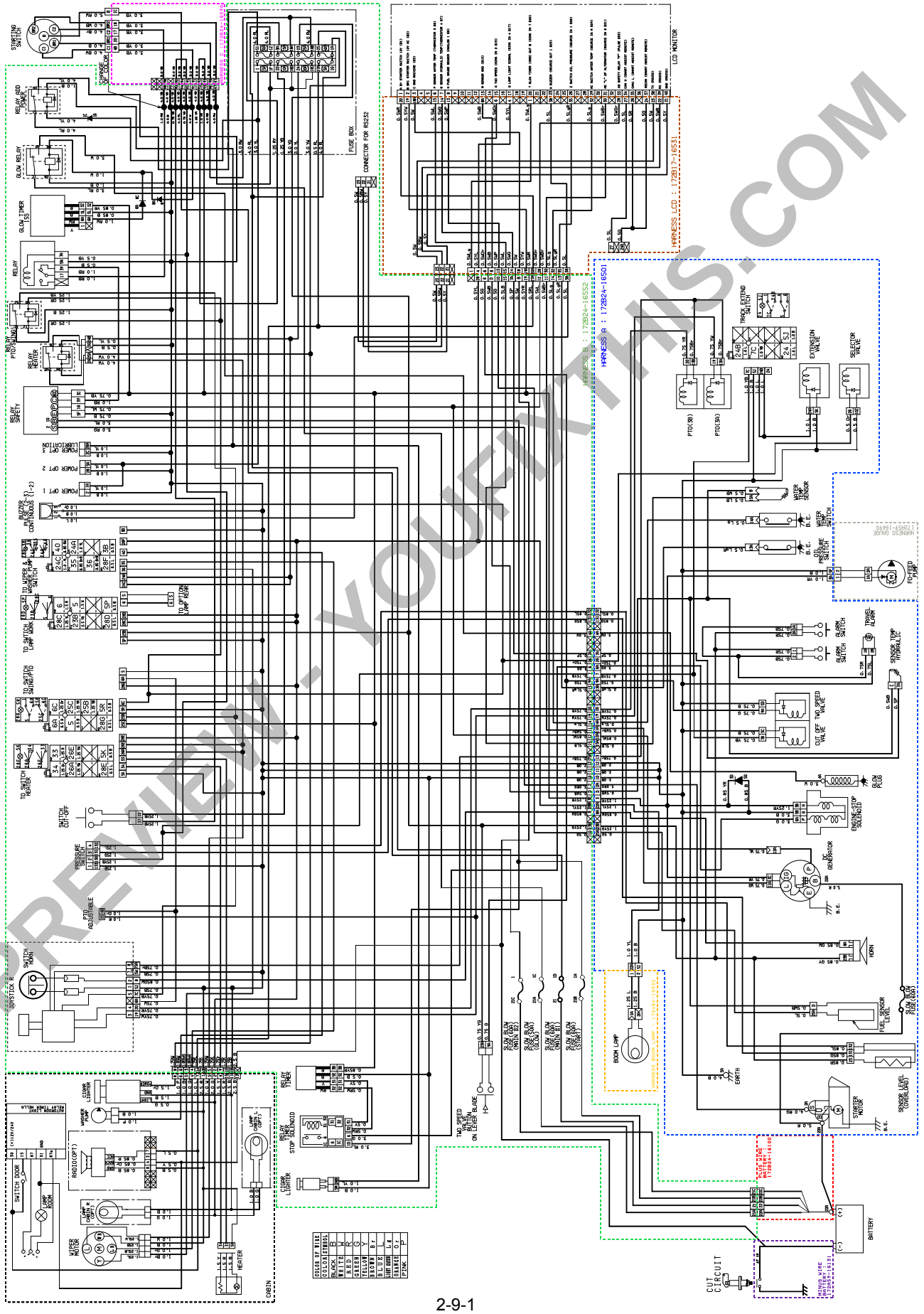
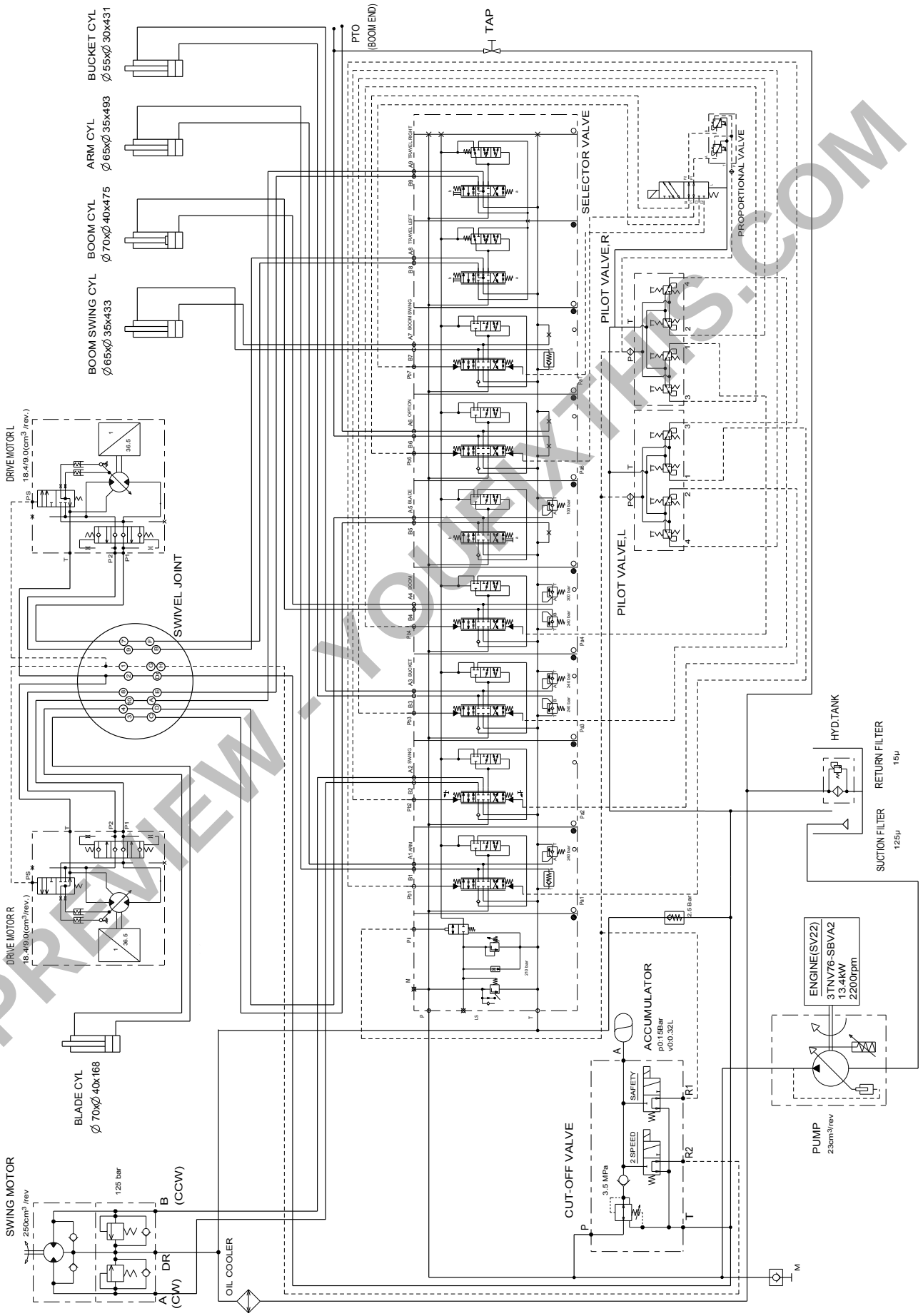
2-9 Wiring Diagram



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2-8 Hydraulic Circuit Schematic



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4-2-4 Cylinder Head

Cylinder Head Components

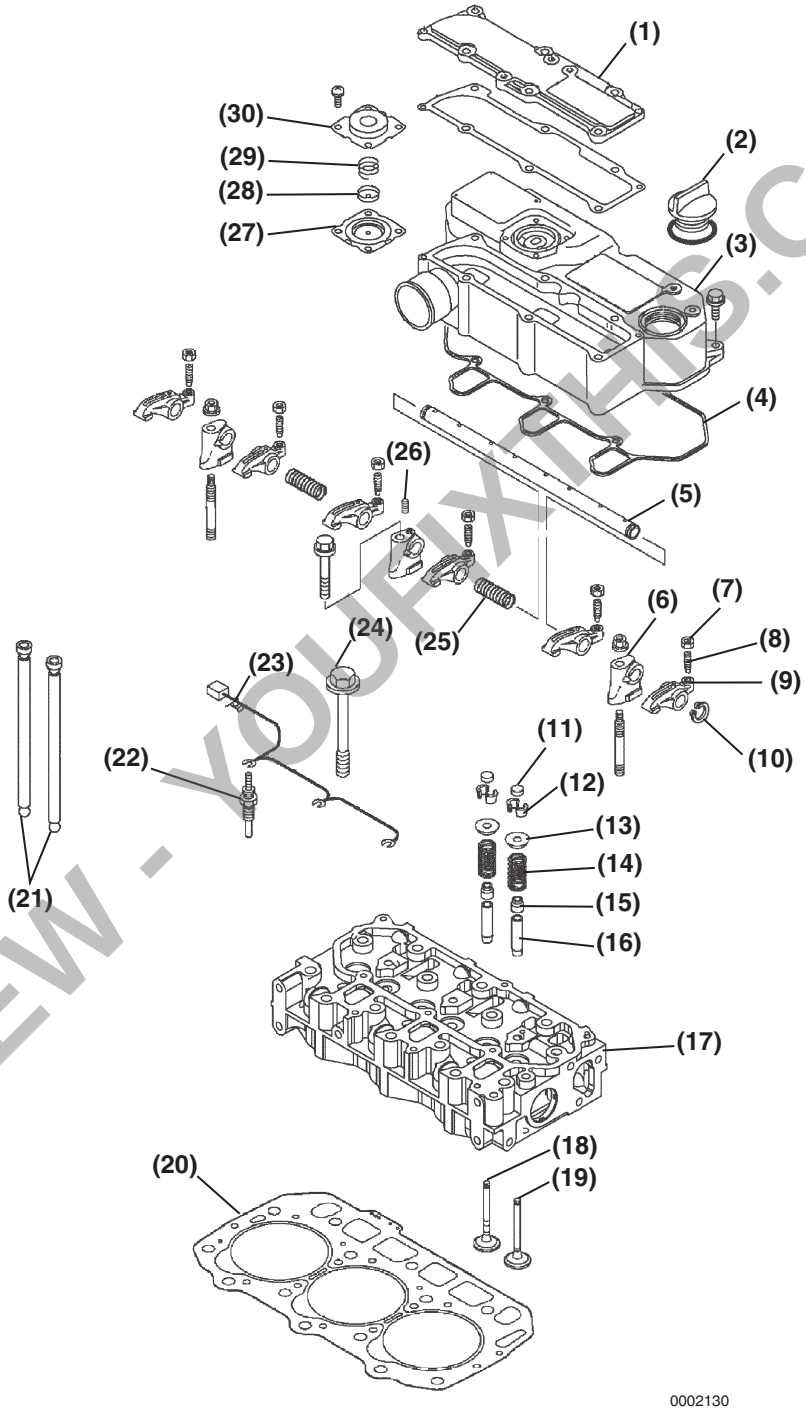


Figure 4-2-1

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

Item		Thread size × Pitch	Tightening torque [Unit : N•m]	Remarks
Nut		M5	5,5 to 6,5	
		M6	9,5 to 11,5	
		M8	23 to 27	
		M10	46 to 54	
		M12	79 to 93	
		M14	127 to 149	
		M16	198 to 230	
		M18	283 to 329	
		M20	402 to 464	
		M22	552 to 634	
		M24	691 to 798	
Hexagon head bolt	8.8T	M5	5,5 to 6,5	
		M6	9,5 to 11,5	
		M8	23 to 27	
		M10	46 to 54	
		M12	79 to 93	
		M14	127 to 149	
		M16	198 to 230	
		M18	283 to 329	
		M20	402 to 464	
		M22	552 to 634	
		M24	691 to 798	
Hexagon head bolt	10.9T	M5	8 to 9	
		M6	14 to 16	
		M8	34 to 40	
		M10	67 to 79	
		M12	116 to 138	
		M14	187 to 219	
		M16	291 to 339	
		M18	402 to 470	
		M20	570 to 662	
		M22	783 to 905	
		M24	981 to 1137	
		M27	1452 to 1674	

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NOTICE

When the battery indicator goes out, it should not come on again. The battery indicator only comes on during operation if the alternator fails. However, if an LED is used in the battery indicator, the LED will shine faintly during normal operation.

NOTICE

Using a non-specified V-belt will cause inadequate charging and shorten the belt life. Use the specified belt.

NOTICE

Agricultural or other chemicals, especially those with a high sulfur content, can adhere to the IC regulator. This will corrode the conductor and result in battery over-charging (boiling) and charging malfunctions. Consult Yanmar before using the equipment in such an environment or the warranty is voided.

NOTICE

Make sure that the combined total resistance of the battery cable in both directions between the starter motor and the battery is within the value indicated on the wiring diagram. The starter motor will malfunction or break down if the resistance is higher than the specified value.

NOTICE

The starter motor is water-proofed according to JIS D 0203, R2 which protects the motor from rain or general cleaning. Do not use high-pressure wash or submerse the starter motor in water.

NOTICE

Use a specialized battery charger to recharge a battery with a voltage of 8 volts or less. Booster starting a battery with a voltage of 8 volts or less will generate an abnormally high voltage and destroy electrical equipment.

NOTICE

Removing the battery cables or the battery while the engine is operating may cause damage to the current limiter depending on the electrical equipment being used. This situation could cause loss of control of output voltage. The continuous high voltage of 23-24 volts (for 5000 rpm dynamo) will damage the current limiter and other electrical equipment.

NOTICE

Reversing the battery cable connections at the battery or on the engine will destroy the SCR diode in the current limiter. This will cause the charging system to malfunction and may cause damage to the electrical harnesses.

NOTICE

- NEVER attempt to modify the engine's design or safety features such as defeating the engine speed limit control or the diesel fuel injection quantity control.
- Modifications may impair the engine's safety and performance characteristics and shorten the engine's life. Any alterations to this engine may void its warranty. Be sure to use Yanmar genuine replacement parts.

NOTICE

Identify all parts and their location using an appropriate method. It is important that all parts are returned to the same position during the reassembly process.

NOTICE

Do not rotate the crankshaft with the injection pump removed.

NOTICE

Keep the piston pin parts, piston assemblies, and connecting rod assemblies together to be returned to the same position during the reassembly process. Label the parts using an appropriate method.

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1 – Baffle Plate
2 – Oil Fill Cap
3 – Valve Cover / Intake Manifold
4 – Gasket
5 – Rocker Arm Shaft
6 – Rocker Arm Shaft Support
7 – Adjuster Lock Nut
8 – Valve Adjuster Screw
9 – Rocker Arm
10 – Circlip
11 – Valve Cap
12 – Keeper
13 – Valve Spring Retainer
14 – Valve Spring
15 – Valve Stem Seal
16 – Valve Guide
17 – Cylinder Head
18 – Exhaust Valve
19 – Intake Valve
20 – Cylinder Head Gasket
21 – Push Rod (2 per cylinder)
22 – Glow Plug
23 – Glow Plug Wiring Harness
24 – Cylinder Head Bolt

Disassembly of Cylinder Head

Prepare a clean, flat working surface on a workbench large enough to accommodate the cylinder head assembly. Discard all gaskets, O-rings and seals. Use new gaskets, O-rings and seals on reassembly of cylinder head.

IMPORTANT

Mark all valve train components so they can be installed in their original locations.

Note: Record all measurements taken during disassembly.

1. Drain coolant from engine into a suitable container.

NOTICE

Identify all parts and their location using an appropriate method. It is important that all parts are returned to the same position during the reassembly process.

---

2. Remove the coolant pump. *See Disassembly of Engine Coolant Pump on page 4-4-4.*
3. Remove the high-pressure fuel lines and fuel injectors from the cylinder head. *See Removal of Fuel Injectors on page 4-3-18.*

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3-7-2 Engine

1) Tightening torque of major components fasteners

Unit: N•m

No.	Item	Thread size × Pitch	Tightening torque	Lubricating oil
1	Cylinder head bolt	M9×1.25	53,9 to 57,9	Applied
2	Connecting rod bolt	M7×1.0	22,6 to 27,5	Applied
3	Flywheel bolt	M10×1.25	80,4 to 86,4	Applied
5	Crankshaft pulley bolt	M12×1.25	83,3 to 93,3	Applied
6	Glow plug	M10×1.25	14,7 to 19,6	Not applied

2) Tightening torque of major fuel system components fasteners

Unit: N•m

No.	Item	Tightening torque	Lubricating oil
1	Fuel injector	49 to 59	Not applied
2	Fuel pump drive gear nut	59 to 69	Not applied
3	High-pressure fuel piping nuts	29 to 34	Not applied
4	Fuel return line nuts	24 to 33	Not applied
5	Fuel injection pump mounting nuts	23 to 28	Not applied
6	Fuel injection nozzle case nut	29 to 49	Not applied

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2. TECHNICAL DATA

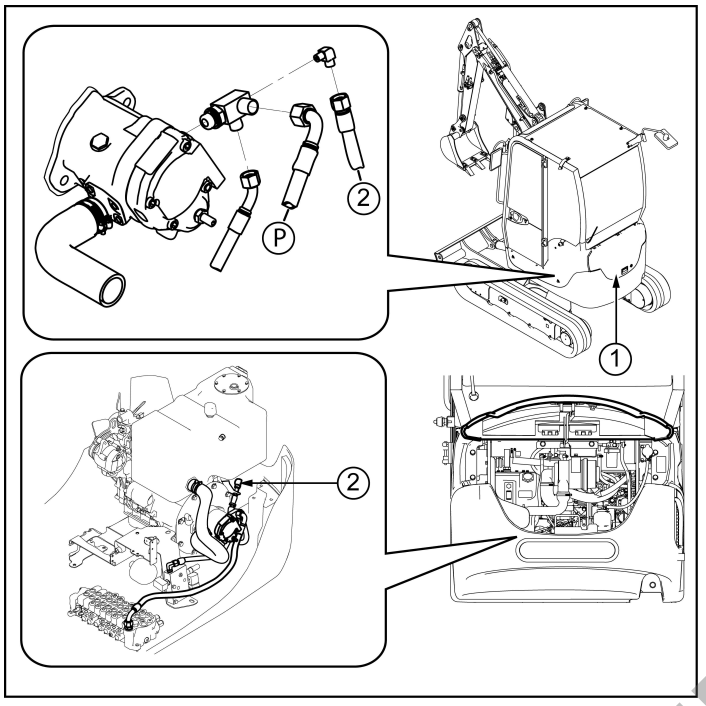
2. Technical Data

2-1 Specifications

Item				Unit	SV22
Main specifications of machine					
Dimensions					
Overall length (Transportation position)			Standard	mm	3775
			W/ long arm		-
Cabin		Overall height	Transportation position		2360
			Traveling position		2360
		Overall width	Full machine width		1380
Canopy		Overall height	Transportation position		2320
			Traveling position		2320
		Overall width	Full machine width		1380
Tumbler center distance (Steel track / rubber track)					1467
Track gauge					1160
Minimum ground clearance					280
Traveling performance					
Travel speed		Rubber track	Low speed (Forward/Reverse)	km/hr	2,4
			High speed (Forward/Reverse)	km/hr	4,1
Permissible water depth limit				mm	360
Work performance					
Bucket		Width (Standard)		mm	400
		[Standard. JIS heaped capacity]		m^3	0,067
		Number of teeth / Installation method		pcs.	3 / Bolt
Work range					
	Maximum digging depth	With blade raised		mm	2480
		With blade on the ground)		mm	2645
	Maximum depth of vertically digging			mm	2085
	Maximum dumping height			mm	2760
	Minimum front swing radius (with boom in front center)		Cabin	mm	1700
			Canopy	mm	1700
	Minimum front swing radius (with boom in full swing)		Cabin	mm	1460
			Canopy	mm	1460

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3) Measuring points on the primary relief valve



(1) Open rear bonnet 1.

(2) Remove the plug from the pressure port 2 and install the oil pressure gauge.

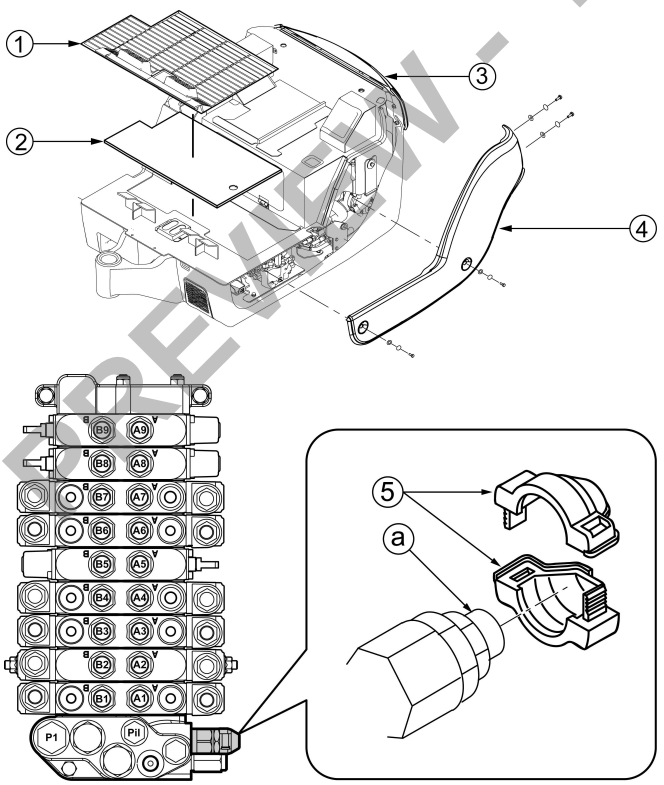
(3) To check the pressure of the system relief valve (P) in the control valve, retract the bucket cylinder to its stroke end, hold the lever and read the gauge.

4) Adjustment Procedure on the primary relief valve

The pressure of the hydraulic circuit sets through the primary relief valve of the control valve.

WARNING

The pressure is factory setting, all necessary adjustment must be done by YANMAR dealer.



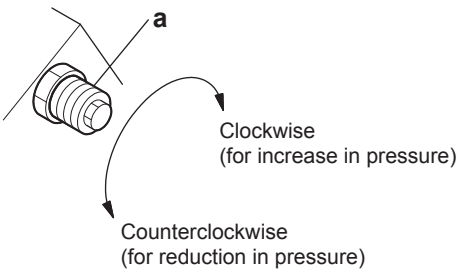
(1) Remove floor mat **1** and step **2**.

(2) Open the rear bonnet **3**.

(3) Remove the left cover of the machine **4**.

(4) To adjust the pressure of the hydraulic circuit, it is necessary to break the plastic cap **5** on the control valve.

(5) Adjust the pressure if necessary by turning the adjusting screw **a** on the hydraulic control valve until you reach the correct pressure.



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4. Engine

4-1 Safety

4-1-1 Safety Statements

Yanmar is concerned for your safety and your machine's condition. Safety statements are one of the primary ways to call your attention to the potential hazards associated with Yanmar TNV engine operation. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your engine. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.



This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER

Danger (the word "DANGER" is in white letters with a red rectangle behind it) - indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Danger is limited to the most extreme situations.

⚠ WARNING

Warning (the word "WARNING" is in black letters with an orange rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Caution (the word "CAUTION" is in black letters with a yellow rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Caution without the safety alert symbol indicates a potentially hazardous situation that can cause damage to the machine, personal property and / or the environment or cause the machine to operate improperly.

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CHAPTER 1

GENERAL CAUTIONS FOR MAINTENANCE WORK

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

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3-7-4 Hydraulic Fitting

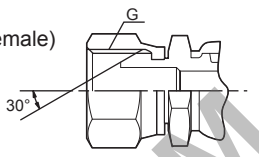
(1) Tightening torque of parallel pipe thread

For 30° sheet type joint and the O-ring sheet type joint.

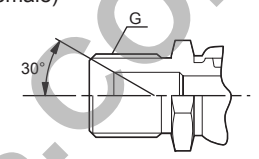
Unit : N•m

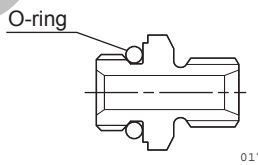
Nominal designation of screw thread G (PF)	Tightening torque
	Material : Steel, Cast iron
1/8	13,7 to 16,7
1/4	22,6 to 27,5
3/8	44,1 to 53,9
1/2	53,0 to 64,7
3/4	106 to 129
1	124 to 151
1 1/4	150 to 183
1 1/2	186 to 226

Example
Parallel pipe thread (female)
(male 30° sheet)



Parallel pipe thread (female)





017498-00E

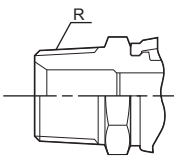
(2) Tightening torque of taper pipe thread

Apply seal tape

Unit : N•m

Nominal designation of screw thread G (PF)	Tightening torque
	Material : Steel, Cast iron
1/8	6,9 to 8,8
1/4	9,8 to 14,7
3/8	29,4 to 39,2
1/2	39,2 to 49,0
3/4	49,0 to 63,7
1	68,6 to 88,3
1 1/4	98,1 to 118

Example
Parallel pipe thread (female)



017501-00E

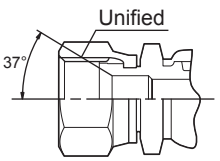
(3) Tightening torque of unified screw thread

For 30° sheet type joint and the O-ring sheet type joint.

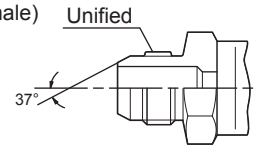
Unit : N•m

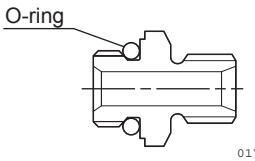
Nominal designation of screw thread G (PF)	Tightening torque
	Material : Steel, Cast iron
7/16-20UNF	17,7 to 21,6
9/16-18UNF	35,3 to 43,1
3/4-16UNF	44,1 to 53,9
7/8-14UNF	53 to 64,7
1 1-16-12UN	106 to 129
1 5/16-12UN	124 to 151
1 5/8-12UN	150 to 183

Example
Unified screw thread (female)
(male 37° sheet)



Example
Unified screw thread (female)
(male 37° sheet)





017502-00E

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Honing and Boring

Pistons must move freely in the cylinders while maintaining adequate compression and oil sealing. If the cylinder walls are scuffed, scored, out-of-round, or tapered beyond specifications, rebore and hone to restore cylinders to usable condition. Slight imperfections can be corrected by honing alone.

1. **Boring** - Significant cylinder damage may be corrected by boring the cylinder to an oversize dimension. Refer to the appropriate parts catalog for available oversize pistons and piston rings.
   - Boring a cylinder should always be done in a properly equipped machine shop.
   - A bored cylinder should always be finished with a hone to properly prepare the cylinder surface so the new piston rings will seat properly.
   - After the cylinder has been bored and honed, install the appropriate oversize pistons and piston rings.
2. **Honing** - Minor cylinder imperfections may be corrected by using a rigid cylinder hone **(Figure 4-2-82, (1))**. Be sure not to exceed the maximum cylinder bore specification.

   Deglazing - A used cylinder that did not require boring or honing, should always be deglazed with a ball hone **(Figure 4-2-82, (2))** before installing new piston rings. This will properly prepare the cylinder surface to allow new piston rings to seat properly.

Note: When honing a cylinder, with either a ridged hone or a ball hone **(Figure 4- 2-81, (1))**, move the rotating hone up and down in the cylinder bore to accomplish a 30° to 40° crosshatch pattern **(Figure 4-2-81)**. This will provide the ideal surface for the proper seating of new piston rings.

NOTICE

Do not allow the honing tool to operate in one position for any length of time. Damage to the cylinder wall will occur. Keep the tool in constant up-and-down motion.

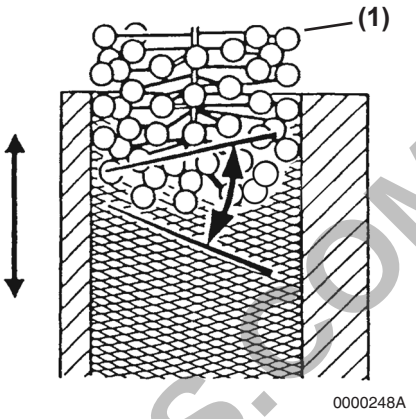


Figure 4-2-81

- Use a 50:50 mixture of diesel fuel and engine oil as a honing fluid.
- Use a 300-grit hone at 300 - 1200 rpm **(Figure 4-2-82)**.

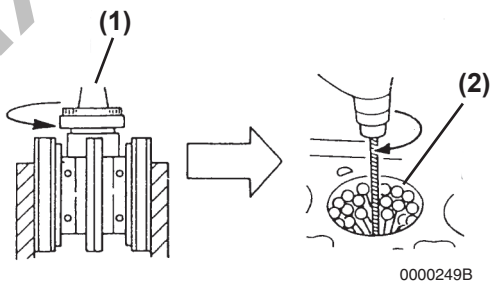


Figure 4-2-82

IMPORTANT

Solvents will not adequately remove honing residue, resulting in premature piston and ring wear. Always wash cylinders using hot, soapy water.

- When honing is completed, wash the cylinder block with hot water and soap. The cylinder wall is adequately cleaned when a white rag wiped in cylinder comes out clean. Use brushes to clean all passages and crevices. Rinse with hot water and dry with compressed air. Apply clean engine oil to all steel surfaces to prevent rusting.

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Pinion Clutch Assembly

Pinion Clutch Assembly Inspection

Manually rotate the pinion clutch assembly in the drive direction. It should rotate freely in the drive direction and is locked by turning it in the opposite direction **(Figure 4-6-26)**. Replace the pinion clutch assembly if the results are different.

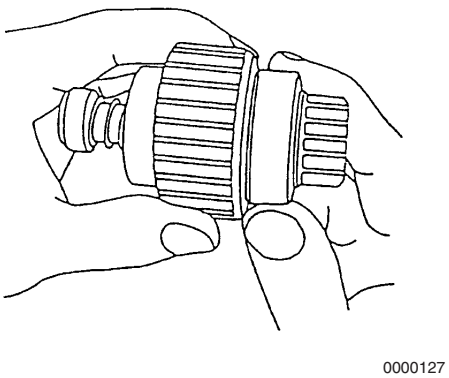


Figure 4-6-26

Slide the pinion clutch assembly on the shaft **(Figure 4-6-27)**. It should slide smoothly on the shaft. Rust, too much grease, or damage could prevent the pinion clutch from sliding smoothly. If the pinion clutch assembly does not slide smoothly, clean the shaft and pinion clutch assembly or replace the damaged component.

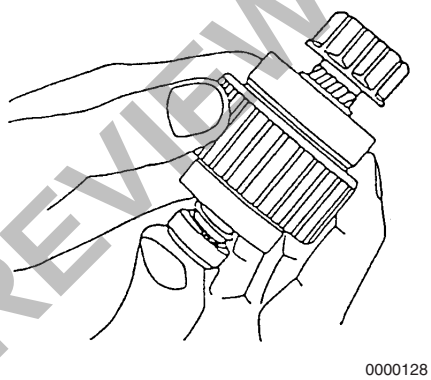


Figure 4-6-27

Reassembly of Starter Motor

1. Apply a appropriate starter bendix grease (obtain locally) to the pinion shaft.
2. Reassemble the reduction gear **(Figure 4-6-28, (4))**, pinion shaft **(Figure 4-6-28, (5))**, planetary gears **(Figure 4-6-28, (6))**, and washers into the intermediate housing **(Figure 4-6-28, (3))**. Reinstall snap ring **(Figure 4-6-28, (1))**.

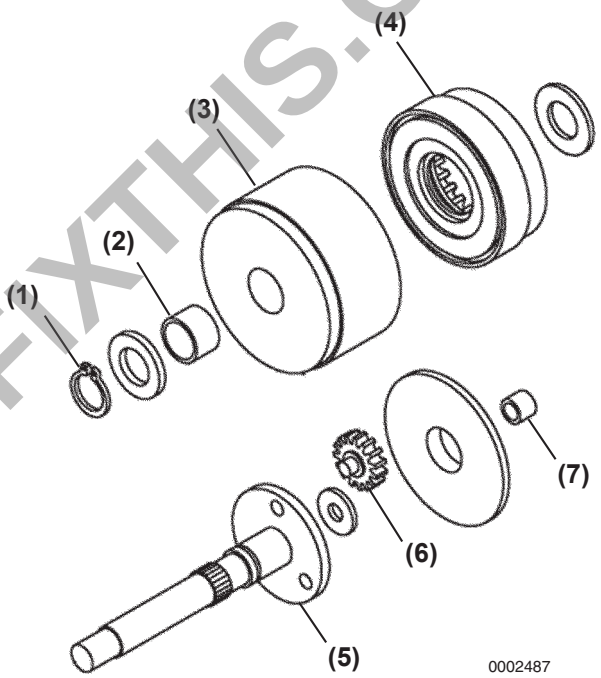
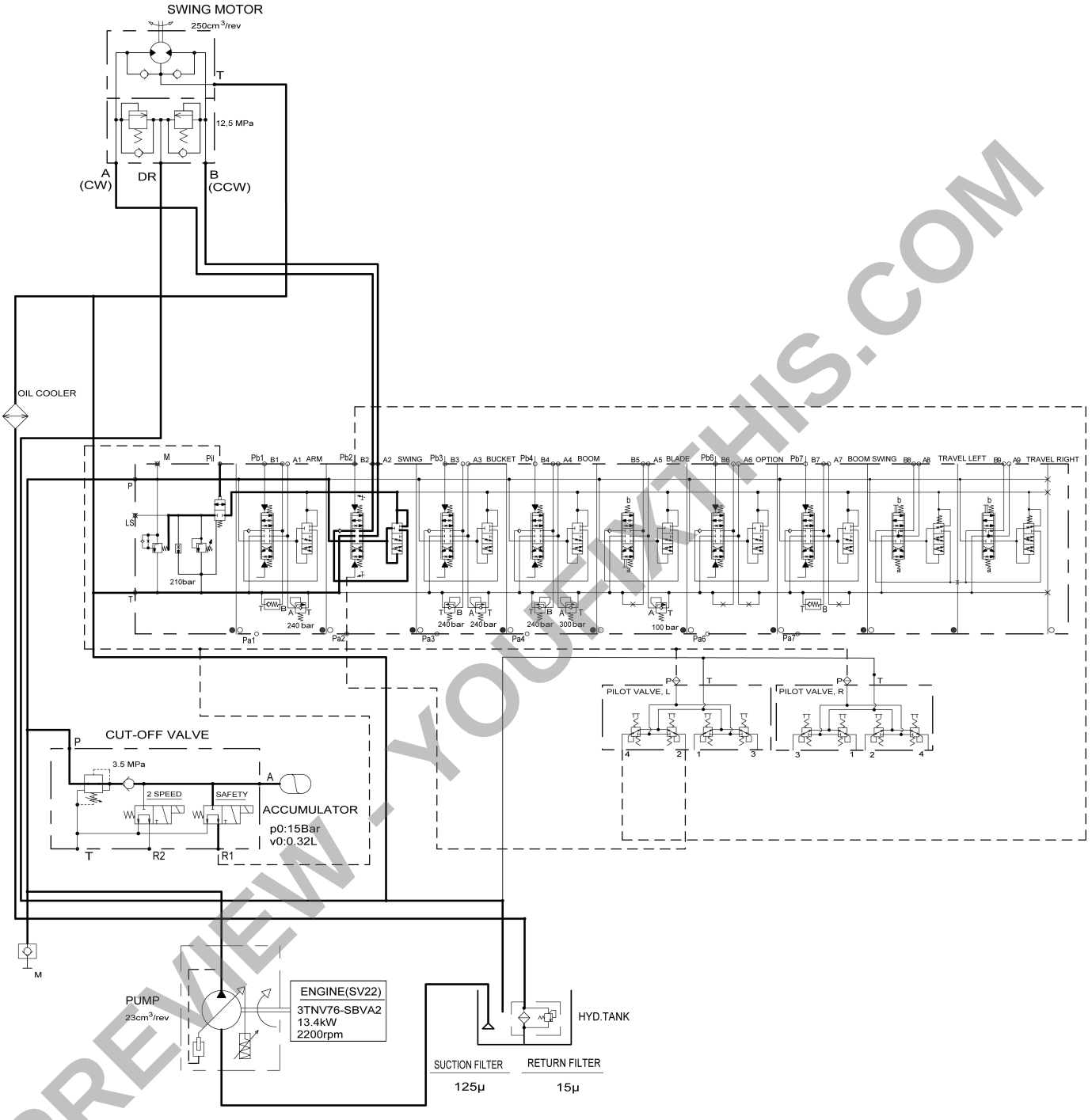


Figure 4-6-28

3. Reinstall the pinion clutch assembly **(Figure 4-6-29, (2))**, return spring (if equipped) and pinion stop **(Figure 4-6-29, (3))** onto the pinion shaft **(Figure 4-6-29, (1))**. Reinstall the retaining ring **(Figure 4-6-29, (4))** in the groove in the pinion shaft. Slide the pinion stop over the retaining ring.

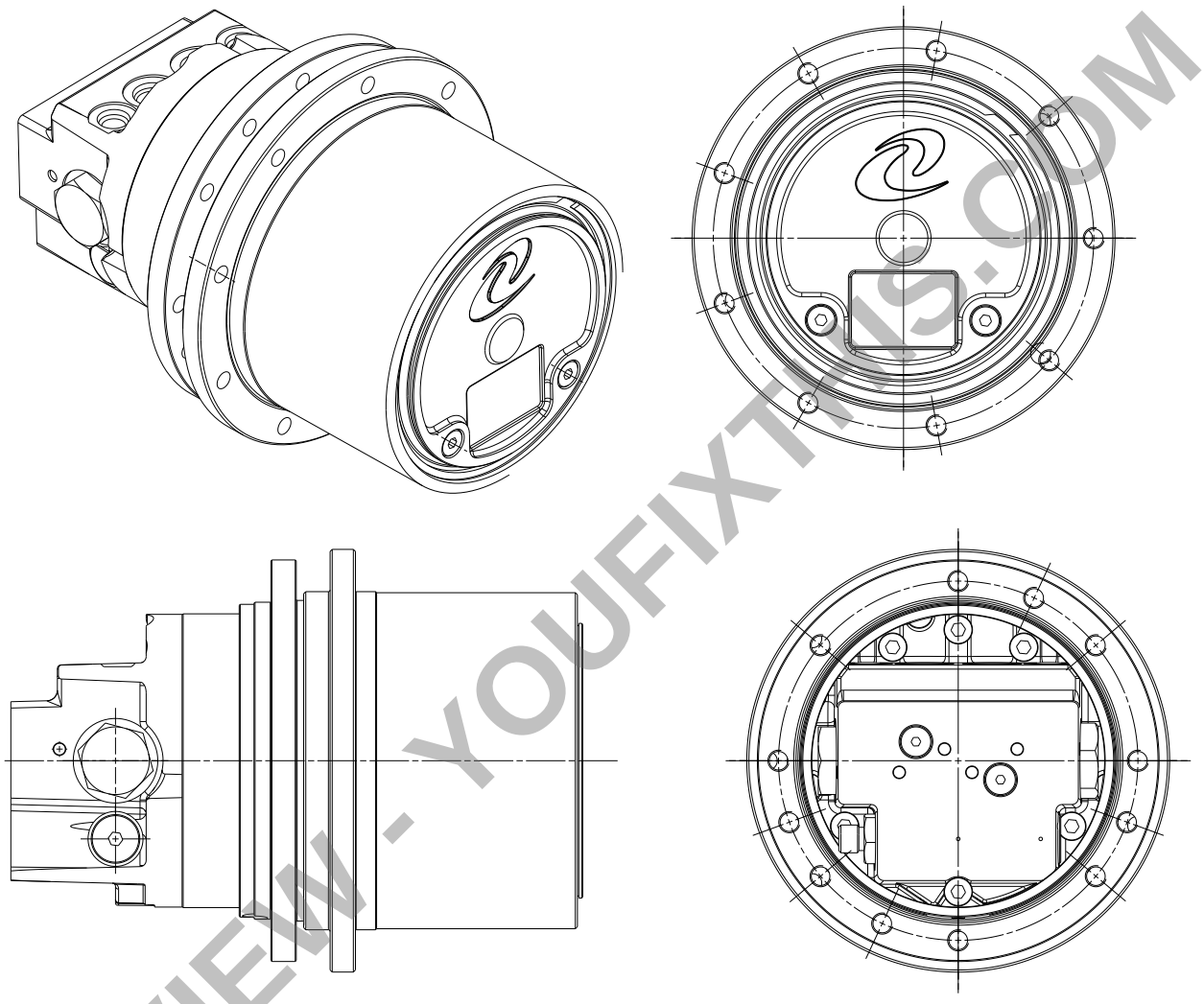
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6-7 Travel Motor

6-7-1 External Drawing



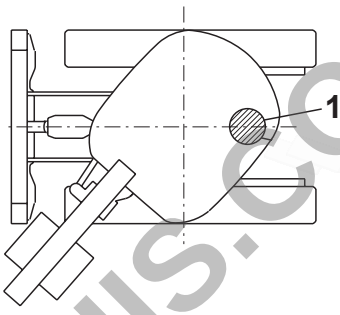
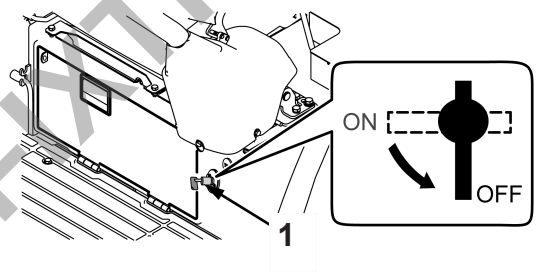
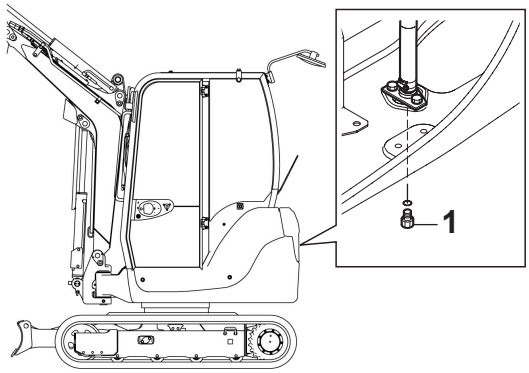
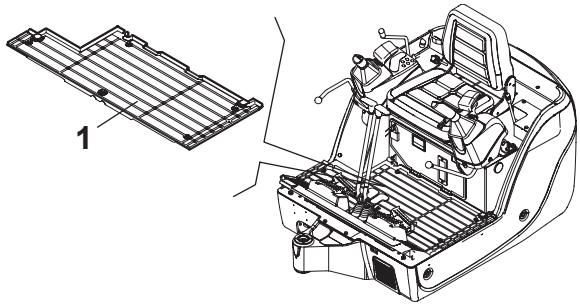
Motor displacement (cc/rev)	high speed:18,4 / low speed: 9
Maximal pressure (bar)	206
Maximal oil flow (L)	21,8
Gearbox oil quantity (L)	0,37
Total mass (kg)	17

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7-5-3 Removal and Reinstallation of Swing Motor

1) Removal

Procedure	
(1) Swing the upperstructure so that the drain plug **1** of the hydraulic oil tank is positioned halfway between the right and left crawlers. Then, lower the bucket to the ground and stop the engine.	
(2) Cut the main switch 1 to the OFF position to disconnect the battery of the machine. Note : Place a MAINTENANCE IN PROGRESS label on the machine.	
(3) Remove the drain plug **1** from the hydraulic oil tank and drain the hydraulic oil. Hydraulic oil quantity: 20 L (in tank) **Warning :** Put a container under the hydraulic oil plug.	
(4) Remove the step **1**.	

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