Table of Isuzu standard tightening torque

The tightening torque values in the table below apply to all situations unless a special tightening torque is specified.

Isuzu standard bolts, nuts

N·m {kgf·m}

Strength classification	4.8 4T		7T	
Shape of bolt head	Hexagon head bolt	Flange bolt	Hexagon head bolt	Flange bolt
*M10 × 1.5	19.6 — 33.3 {2.0 — 3.4}	22.3 — 37.2 {2.3 — 3.8}	27.5 — 45.1 {2.8 — 4.6}	30.3 — 50.4 {3.1 — 5.1}
M12 × 1.25	49.0 — 73.5 {5.0 — 7.5}	54.9 — 82.3 {5.6 — 8.4}	60.8 — 91.2 {6.2 — 9.3}	68.1 — 102.1 {6.9 — 10.4}
*M12 × 1.75	45.1 — 68.6 {4.6 — 7.0}	51.0 — 76.5 {5.2 — 7.8}	56.9 — 84.3 {5.8 — 8.6}	62.7 — 94.0 {6.4 — 9.6}
M14 × 1.5	76.5 — 114.7 {7.8 — 11.7}	83.0 — 124.5 {8.5 — 12.7}	93.2 — 139.3 {9.5 — 14.2}	100.8 — 151.1 {10.3 — 15.4}
*M14 × 2	71.6 — 106.9 {7.3 — 10.9}	77.2 — 115.8 {7.9 — 11.8}	88.3 — 131.4 {9.0 — 13.4}	94.9 — 142.3 {9.7 — 14.5}
M16 × 1.5	104.0 — 157.0 {10.6 — 16.0}	115.6 — 173.3 {11.8 — 17.7}	135.3 — 204.0 {13.8 — 20.8}	150.1 — 225.2 {15.3 — 23.0}
*M16 × 2	100.0 — 149.1 {10.2 — 15.2}	109.4 — 164.2 {11.2 — 16.7}	129.4 — 194.2 {13.2 — 19.8}	142.5 — 213.8 {14.5 — 21.8}
M18 × 1.5	151.0 — 225.6 {15.4 — 23.0}	—	195.2 — 293.2 {19.9 — 29.9}	—
*M18 × 2.5	151.0 — 225.6 {15.4 — 23.0}	—	196.1 — 294.2 {20.0 — 30.0}	—
M20 × 1.5	206.0 — 310.0 {21.0 — 31.6}	—	269.7 — 405.0 {27.5 — 41.3}	—
*M20 × 2.5	190.2 — 286.4 {19.4 — 29.2}	—	249.1 — 374.6 {25.4 — 38.2}	—
M22 × 1.5	251.1 — 413.8 {25.6 — 42.2}	—	362.8 — 544.3 {37.0 — 55.5}	—
*M22 × 2.5	217.7 — 327.5 {22.2 — 33.4}	—	338.3 — 507.0 {34.5 — 51.7}	—
M24 × 2	358.9 — 539.4 {36.6 — 55.0}	—	430.5 — 711.0 {43.9 — 72.5}	—
*M24 × 3	338.3 — 507.0 {34.5 — 51.7}	—	406.0 — 608.0 {41.4 — 62.0}	—

The * mark indicates where soft materials have been used for internal thread sections, such as castings.

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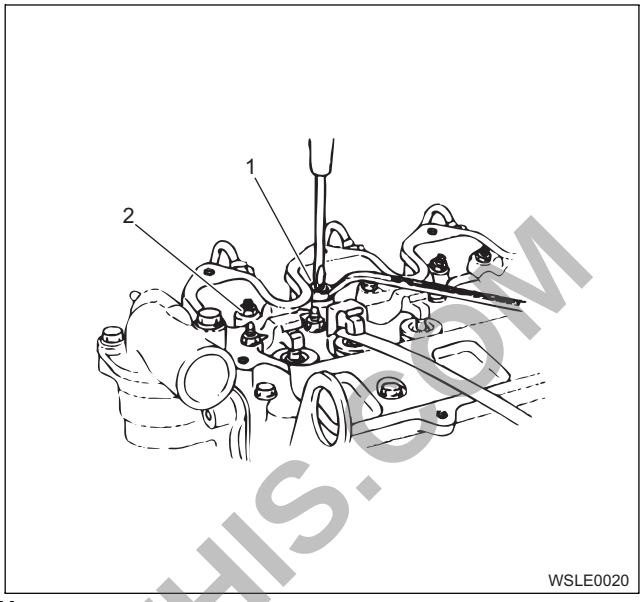
2. Remove the cylinder head cover and check whether the No.1 cylinder is in the compression top dead center position or in the exhaust top dead center position.
   The cylinder is in the compression top dead center position if both intake and exhaust valves are closed. The cylinder is in the exhaust top dead center position if both intake and exhaust valves are open.

Name
1. Intake of No.1 Cylinder
2. Exhaust of No.1 Cylinder

3. Measure the clearance of the valve with m mark or × mark in the table, depending on the status of the No.1 cylinder. If the clearance is not the standard value, adjust it to the standard value using the adjusting screw.

CAUTION:
To measure the clearance, use the thickness gauge when the engine is cold.

Valve clearance standard value	mm {in}
Inlet valve	0.40 ± 0.05 {0.016 ± 0.002} (at cold condition)
Exhaust valve	



Name
1. Adjusting Screw
2. Lock Nut

4. Rotate the crankshaft again into a proper direction, and set the mark in the same way as 1. after 3. is completed. Then measure and adjust the clearances of the remaining valves.

CAUTION:
- **Rocker arm is die-cast aluminum. So do not over-tighten the rocker arm when tightening the adjusting screw.**
- **The load of the used valve spring is low. So do not push down the spring when measuring or adjusting the clearance.**

Adjustment table

Cylinder No.	1		2		3		4	
Valve arrangement	IN	EX	IN	EX	IN	EX	IN	EX
No.1 cylinder compression top dead center position	m	m	m			m		
No.1 cylinder exhaust top dead center position				×	×		×	×

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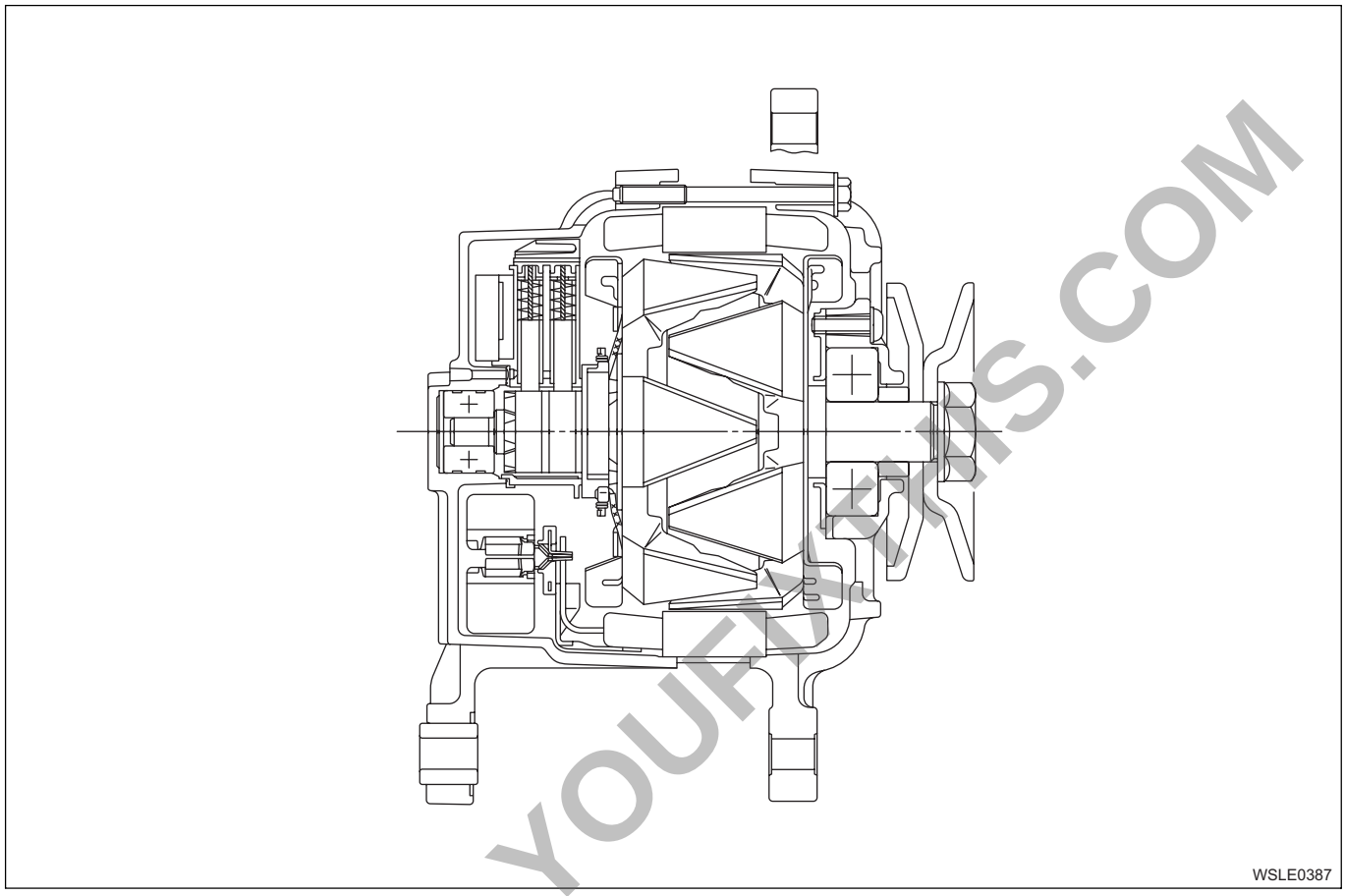
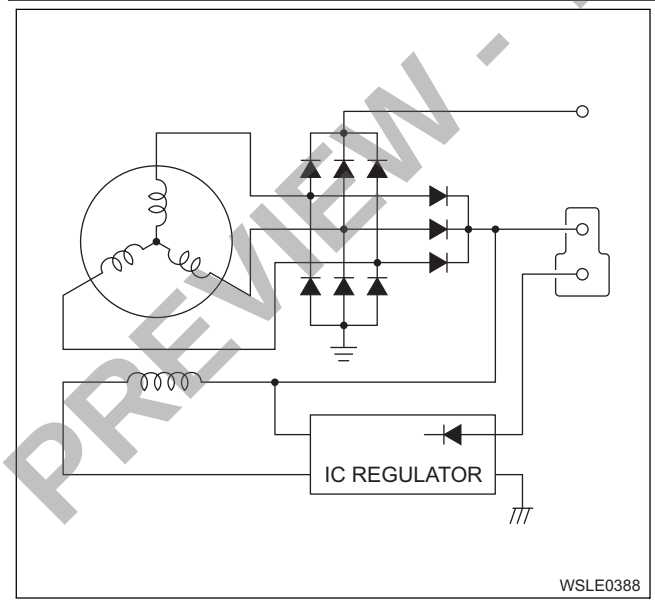
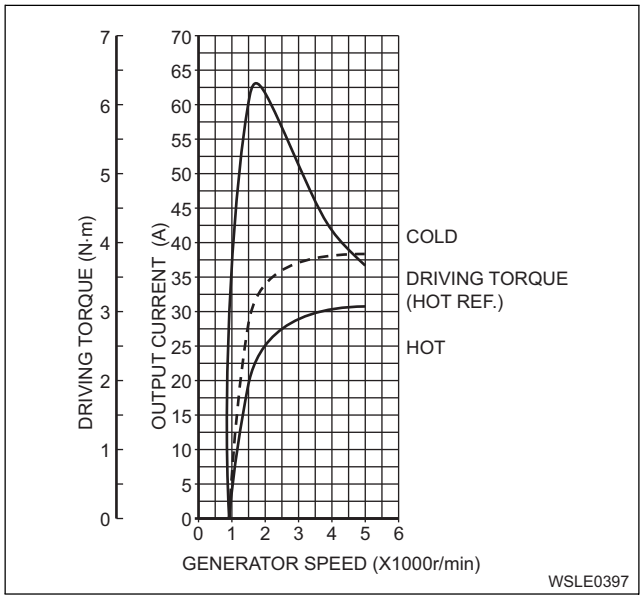
Generator (24V-30A)

Structure







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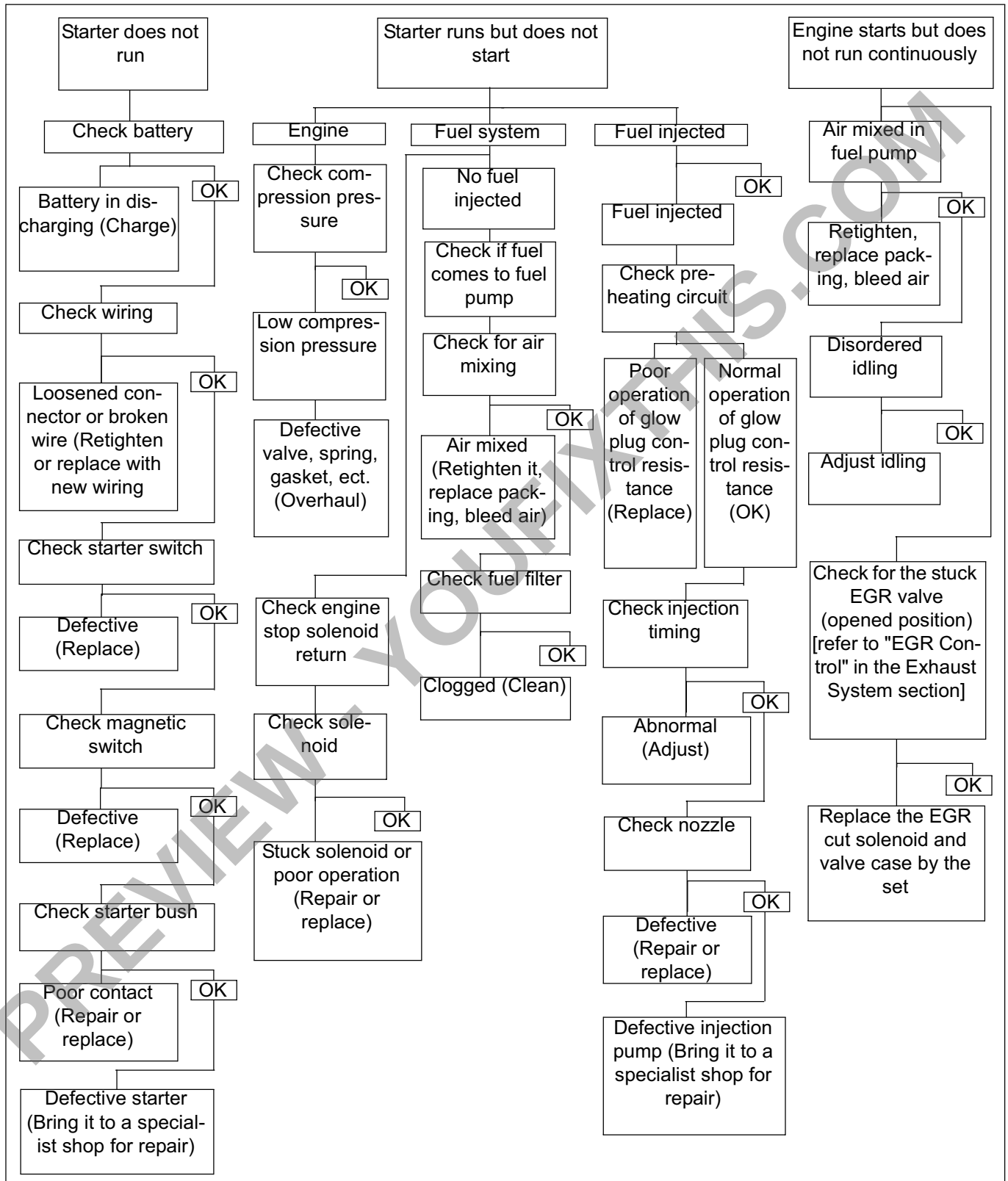
List of Trouble Symptom

Engine does not start



Note: "Bring it to a specialty shop" means that defective parts of the injection pump and electricals must be brought to a specialty shop for repair. (This note is applicable to all the following procedures.)

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Specifications

Item \ Engine name			4LE2X
Engine structure type			4-cycle, water cooled-type, inline four-cylinder, OHV type
Cylinder number – bore × stroke (mm {in})			4 – 85{3.35} × 96{3.78}
Total displacement (L {cu·in})			2.179 {133}
Compression ratio			18.3:1
Combustion chamber type			Direct injection
Overall length × overall width × overall height (mm {in})			* 756.3{29.78} × 557{21.93} × 747.3{29.42}
Dry weight (kg)			* 210
Firing order			1 — 3 — 4 — 2
Fuel injection timing (BTDC) (at stop)			* 2°
Compression pressure (MPa {psi})			3.04 {441} / 250 rpm
Valve clearance (at cold condition) (mm {in})		Intake air	0.40 {0.016}
		Exhaust	0.40 {0.016}
Opening/closing period of valve	Intake valve	Open (before top dead center)	15°
		Closed (after bottom dead center)	29°
	Exhaust valve	Open (before bottom dead center)	40°
		Closed (after top dead center)	16°
Injection pump type			Bosch type, PFR1KZ model, four
Governor type			Centrifugal type, all speeds controlled
Nozzle type			Multi-hole type (KBDL model)
Injection pressure (MPa {psi})			* First step: 16.7 {2422} Second step: 25.0 {3626}
Fuel type			Diesel (JIS K2204)
Cooling method			Forced circulation, water cooling pressurization type
Cooling fan			* ϕ500 × 8 pieces
Coolant amount (L {qts})			Approx. 4.3 {4.5} (Engine only)
Lubrication oil amount: total (L {qts})			* Approx. 12.1 {12.8} at MAX, 9.3 {9.8} at MIN
Lubricant type (API service category)			CD or CF-4 * (CE, CF, CH-4, CI-4 or CI-4 Plus)
Generator output (V — A)			* 24 — 30 (Mitsubishi) * 24 — 50 (Nikko)
Starter output (V — kW)			* 24 — 3.2

Caution: This specification may be changed partially without notice.
* mark may vary depending on each machine. Refer to the machine manufacturer specification.

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N·m {kgf·m}

Strength classification	8.8		9.8 9T	
Shape of bolt head	Hexagon head bolt	Flange bolt	Hexagon head bolt	Flange bolt
M6 × 1	5.6 — 11.2 {0.6 — 1.1}	6.6 — 12.2 {0.6 — 1.2}	—	—
M8 × 1.25	13.4 — 25.7 {1.4 — 2.6}	15.3 — 28.4 {1.6 — 2.9}	16.7 — 30.4 {1.7 — 3.1}	18.1 — 33.6 {1.9 — 3.4}
M10 × 1.25	31.3 — 52.5 {3.2 — 5.4}	35.4 — 58.9 {3.6 — 6.1}	37.3 — 62.8 {3.8 — 6.4}	42.3 — 70.5 {4.3 — 7.2}
*M10 × 1.5	31.3 — 51.4 {3.2 — 5.2}	34.5 — 57.5 {3.5 — 5.8}	36.3 — 59.8 {3.7 — 6.1}	40.1 — 66.9 {4.1 — 6.8}
M12 × 1.25	69.3 — 104.0 {7.1 — 10.6}	77.7 — 116.5 {7.9 — 11.9}	75.5 — 113.8 {7.7 — 11.6}	85.0 — 127.5 {8.7 — 13.0}
*M12 × 1.75	64.8 — 96.1 {6.6 — 9.8}	71.4 — 107.2 {7.3 — 10.9}	71.6 — 106.9 {7.3 — 10.9}	79.5 — 119.2 {8.1 — 12.2}
M14 × 1.5	106.2 — 158.8 {10.8 — 16.2}	114.9 — 172.3 {11.7 — 17.6}	113.8 — 170.6 {11.6 — 17.4}	123.4 — 185.1 {12.6 — 18.9}
*M14 × 2	100.6 — 149.8 {10.3 — 15.3}	108.2 — 162.2 {11.1 — 16.6}	106.9 — 160.0 {10.9 — 16.3}	115.5 — 173.3 {11.8 — 17.7}
M16 × 1.5	154.3 — 232.5 {15.7 — 23.7}	171.1 — 256.7 {17.4 — 26.2}	160.0 — 240.3 {16.3 — 24.5}	176.9 — 265.3 {18.0 — 27.1}
*M16 × 2	147.6 — 221.4 {15.0 — 22.6}	162.5 — 243.8 {16.6 — 24.9}	153.0 — 229.5 {15.6 — 23.4}	168.5 — 252.7 {17.2 — 25.8}
M18 × 1.5	222.5 — 334.3 {22.7 — 34.1}	—	229.5 — 345.2 {23.4 — 35.2}	—
*M18 × 2.5	223.6 — 335.4 {22.8 — 34.2}	—	230.5 — 346.2 {23.6 — 35.3}	—
M20 × 1.5	307.4 — 461.7 {31.4 — 47.1}	—	316.8 — 475.6 {32.3 — 48.5}	—
*M20 × 2.5	284.0 — 472.1 {29.0 — 43.5}	—	293.2 — 440.3 {29.2 — 44.9}	—
M22 × 1.5	413.6 — 620.5 {42.2 — 63.3}	—	424.6 — 636.5 {43.3 — 64.9}	—
*M22 × 2.5	385.7 — 578.0 {39.3 — 58.9}	—	394.2 — 592.3 {40.0 — 60.4}	—
M24 × 2	490.8 — 810.5 {50.0 — 82.7}	—	554.1 — 830.6 {56.5 — 84.7}	—
*M24 × 3	462.8 — 693.1 {47.2 — 70.7}	—	520.7 — 781.6 {53.1 — 79.7}	—

The * mark indicates where soft materials have been used for internal thread sections, such as castings.

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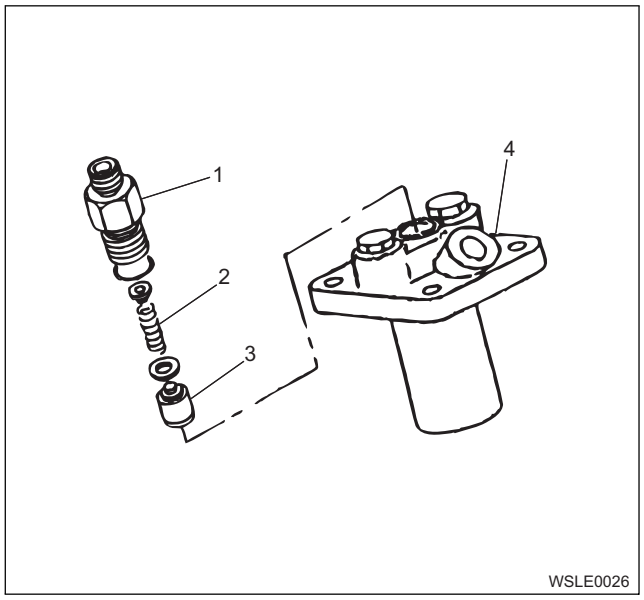
Inspection and adjustment of injection timing

1. Remove the No.1 cylinder injection pipe.
2. Then remove the delivery valve holder of the No.1 cylinder injection pump, and pull out the delivery valve and the delivery spring.



Name
1. Delivery Valve Holder
2. Delivery Spring
3. Delivery Valve
4. Injection Pump

3. Install the delivery valve holder and tighten it, leaving the delivery valve and spring removed.

   Tightening torque:
   39.2 — 44.1 N·m {4.0 — 4.5 kgf·m/28.9 — 32.5 lb·ft}

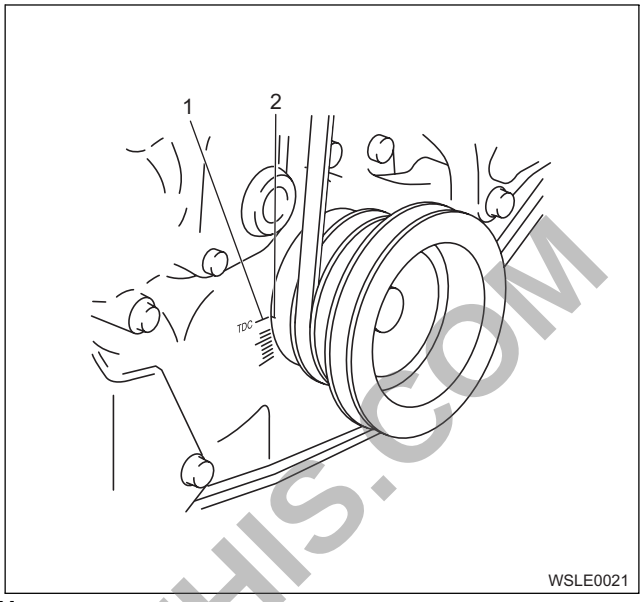
4. Turn the starter switch to the drive position with the lever of the sedimenter in the open position. Then rotate the crankshaft slowly feeding fuel by the electromagnetic pump, the gap with the fuel tank, the feed pump lever, etc. And when the fuel stops flowing from the delivery holder and bulging at the dent on top, stop the crankshaft rotating.

Note:
Take extreme care to rotate the crankshaft as slowly as possible and not to miss the position where the fuel stops bulging.

5. Check the degree in the timing mark on the timing gear case where the mark groove of the crank pulley is positioned in above 4. status.
   Adjust if the value is out of the standard value of the injection timing.

* Injection timing	BTDC 2°

Note:
Injection timing varies depending on the machine specification.



Name
1. TDC Mark
2. Mark Groove

6. Adjust injection timing by the shim between the injection pump and the cylinder block.
   The following nine types of identifying symbols are stamped (or sealed) on the shim.

The identifying symbols and thickness of the shim					mm {in}
Symbol	Thick-ness	Symbol	Thick-ness	Symbol	Thick-ness
2	0.2 {0.008}	5	0.5 {0.020}	8	0.8 {0.031}
3	0.3 {0.012}	6	0.6 {0.024}	10	1.0 {0.039}
4	0.4 {0.016}	7	0.7 {0.028}	12	1.2 {0.047}

CAUTION:
Adjust the shims for each injection pump of four cylinders at the same time.

Note:
If the shim is thickened by 0.1 mm {0.0039 in}, the injection timing is delayed for approx. 0.6 degree, and if thinned by 0.1 mm {0.0039 in}, put forward for approx. 0.6 degree.

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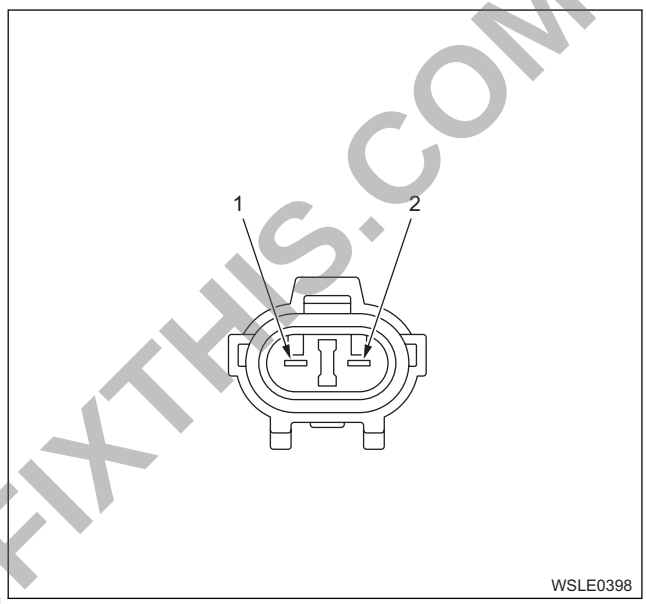
Specifications

CASE Part No.		8971822892
Nominal output	(V-A)	24-30
Rated speed	(r/min)	5,000
Regulator-type		IC type
Regulated voltage	(V)	28.5±0.5
Mass	(kg)	5.1

Connector Terminal

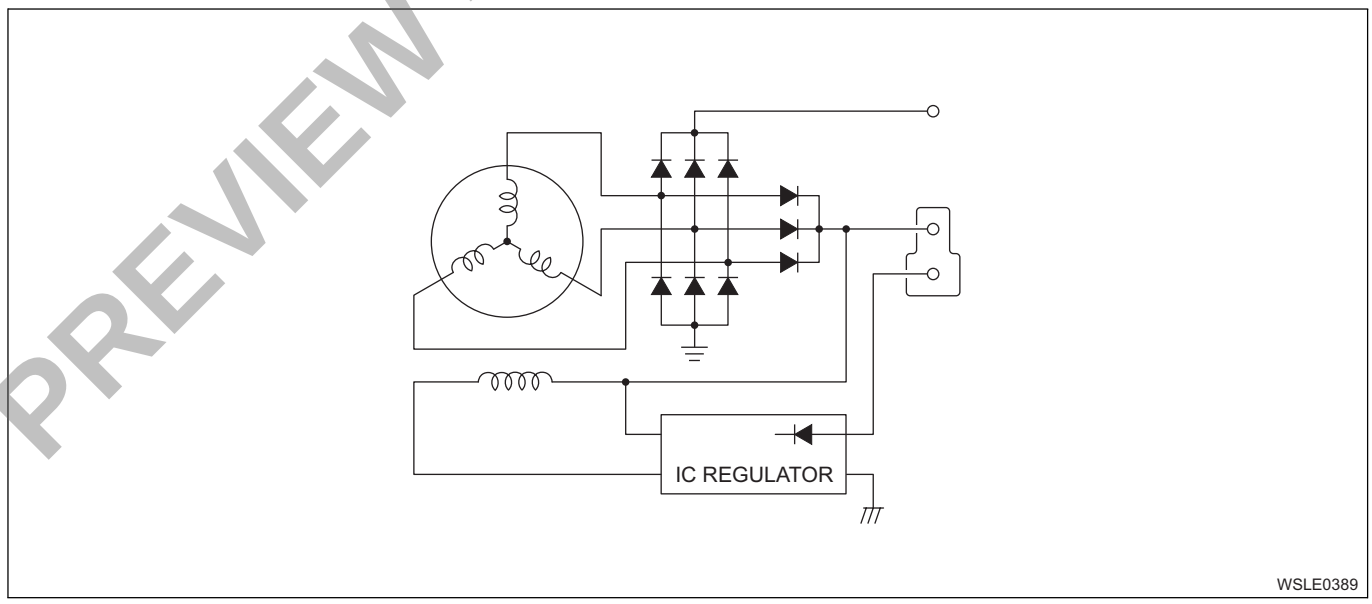
Terminal symbol	Lead wire color	Wire specifications
R	R	AEX 0.75f
L	L	AEX 0.75f



Name

1. R Terminal
2. L Terminal

Internal Connections



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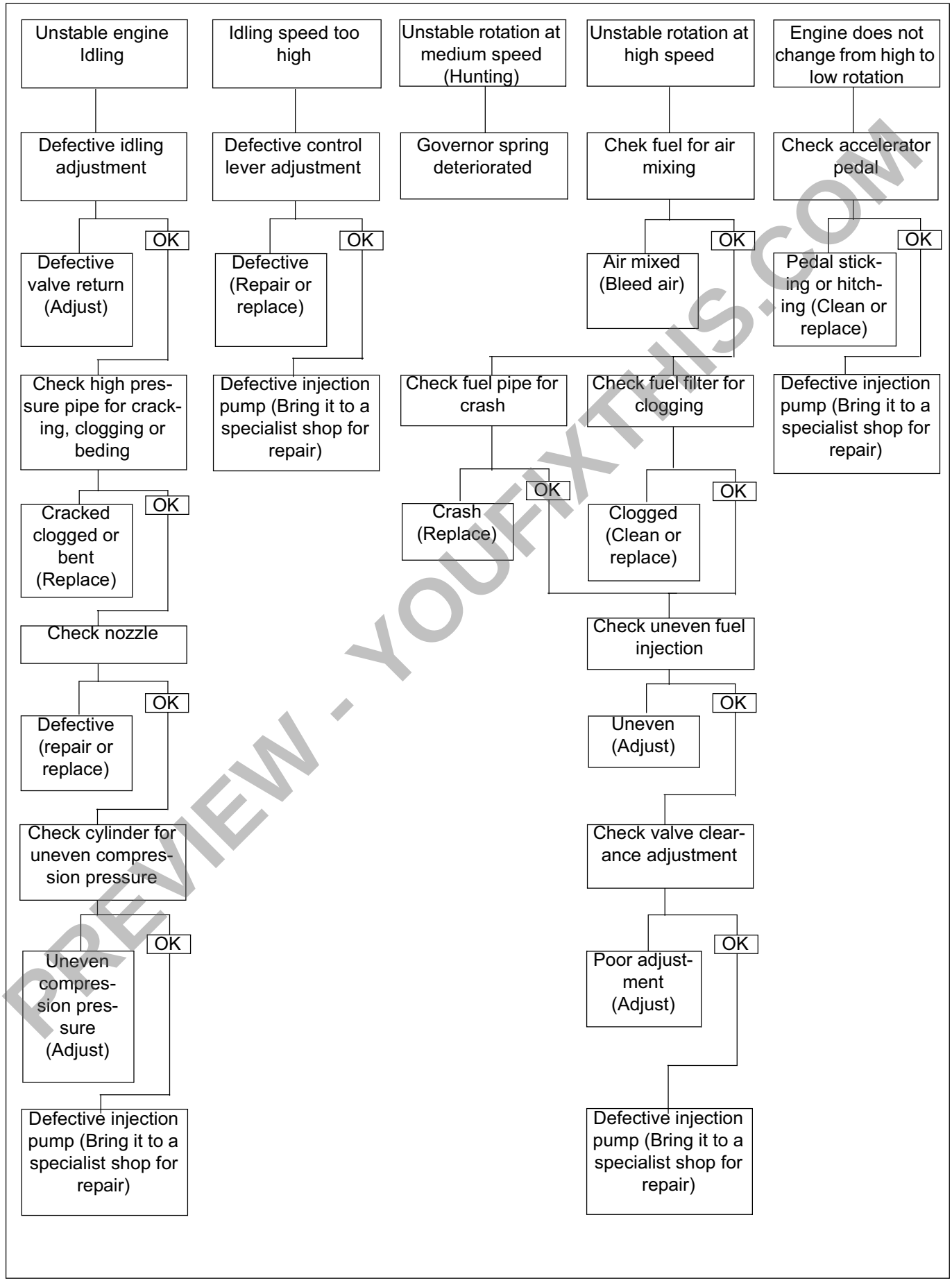
Engine speed lacks smoothness (Unstable engine rotation)



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Trouble Diagnosis

Symptom	Trouble cause
No generation of electric power	a. Defective IC regulator b. Open circuit in field coil
Output shortage	a. Defective diode b. Defective stator coil c. Defective rectifier d. Internal short circuit in field coil
Too high regulated voltage	a. Defective IC regulator
Noise	a. Defective bearing b. Defective rectifier c. Foreign material in generator

Maintenance Standard

Item		Standard value and limit
CASE Part No.		8-97182-289-2
Manufacturer code No.		A002TA8383
Rated output V-A		24-30
Output characteristic (hot)	Voltage V	27
	Current A	18 or more
	Revolution speed r/min	1,800
Field coil resistance Ω: at 20°C		6.4 — 7.6
Regulated voltage by regulator V		28-29
Revolution direction (viewed from pulley side)		Clockwise

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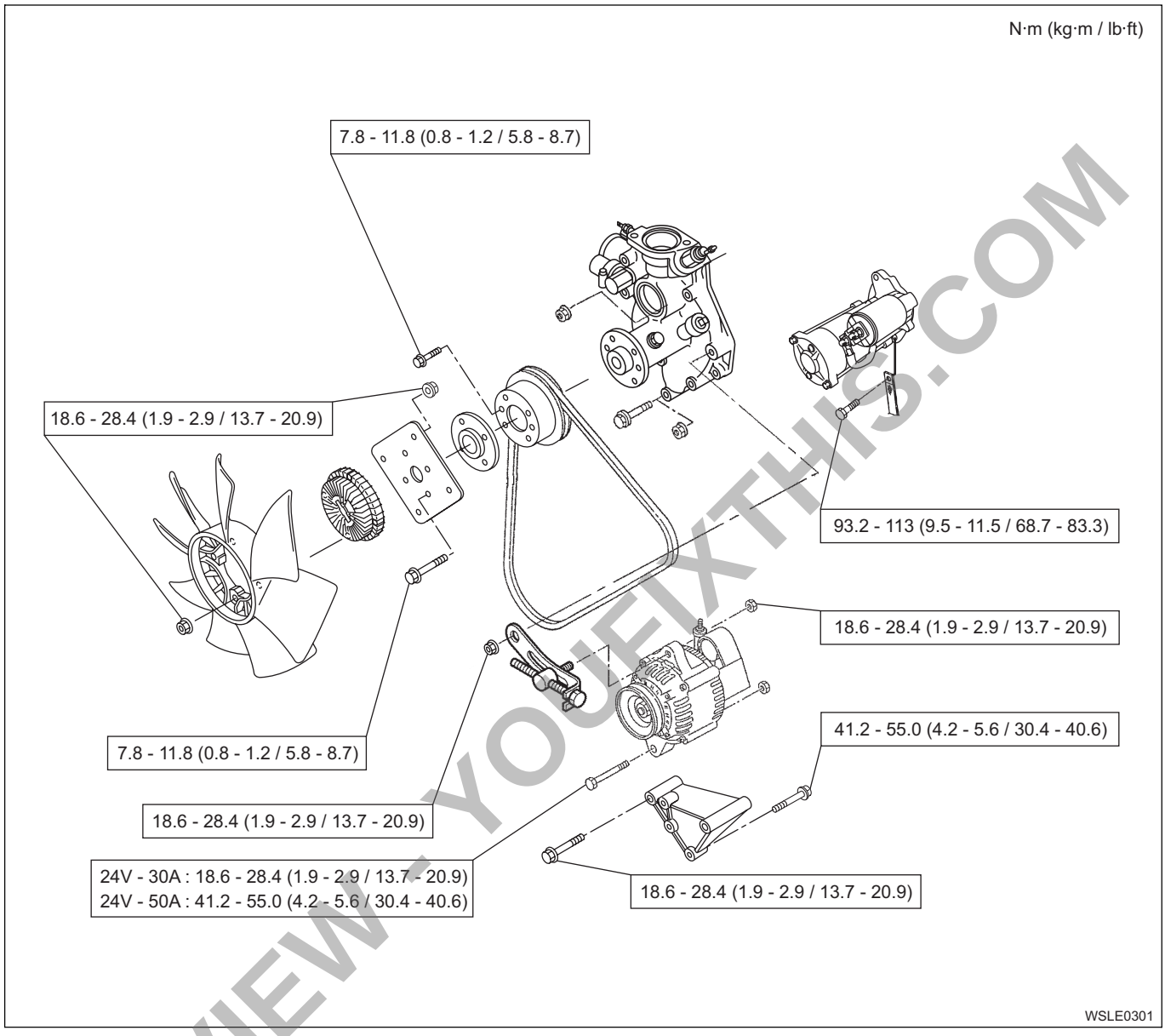
Torque Specifications



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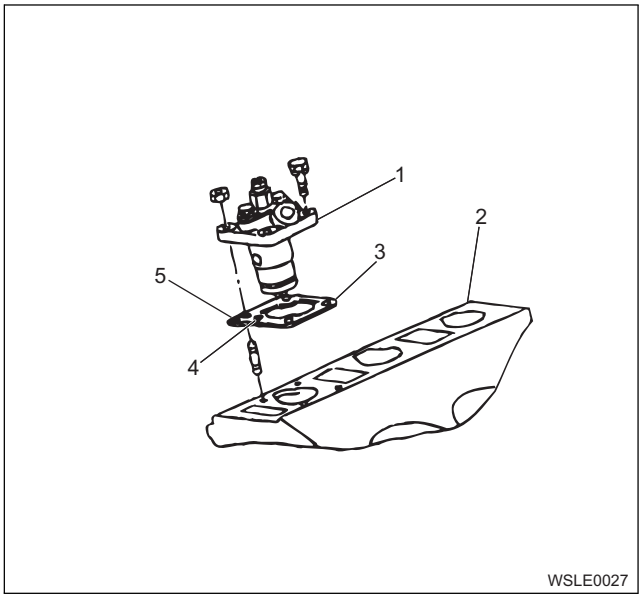


Name

1. Injection Pump
2. Cylinder Block
3. Shim
4. Knock Hole
5. Identifying Symbol

7. Assemble removed delivery valve to the injection pump after cleaning, and tighten the delivery holder to the specified torque.

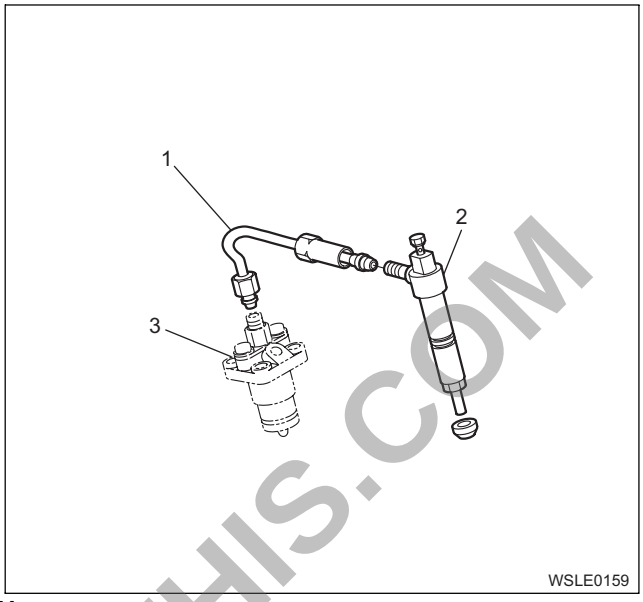
   Tightening torque:
   39.2 — 44.1 N·m {4.0 — 4.5 kgf·m/28.9 — 32.5 lb·ft}

CAUTION:
Be careful with dirt getting inside when removing and installing the delivery valve or spring.

8. Install the injection pipe to the injection pump and the nozzle holder, and tighten it with the sleeve nut.
   a. Screw the thread portion of the sleeve nut two or three turns by your hand.
   b. Hold the delivery valve holder of the injection pump with a wrench and tighten the sleeve nut securely.

      Tightening torque:
      14.7 — 24.5 N·m {1.5 — 2.5 kgf·m/10.8 — 18.1 lb·ft}

Important:
If over-tightening the delivery valve holder, the rack cannot move smoothly as the plunger and the housing are compressed. Therefore, when tightening the sleeve nuts of the injection pipe, hold the delivery valve holder with a wrench to prevent corotation.



Name

1. Injection Pipe
2. Nozzle Holder
3. Injection Pump

Inspection of compression pressure

1. Warm-up the engine.
2. Disconnect the battery cable from the negative terminal and remove all the glow plugs.
3. Disconnect the wire connector of the solenoid for engine stopping.
4. Install the battery cable to the negative terminal.
5. Install an adapter and a gauge of a compression gauge (special tool).
   Special tool
   Compression gauge (with adapter)
   380002626
   Adapter
   380200065

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