

**INDUSTRIAL
DIESEL ENGINE**

**AU-4LE2
BV-4LE2
MODEL**

WORKSHOP MANUAL

ISUZU MOTORS LIMITED

General Information

General Information

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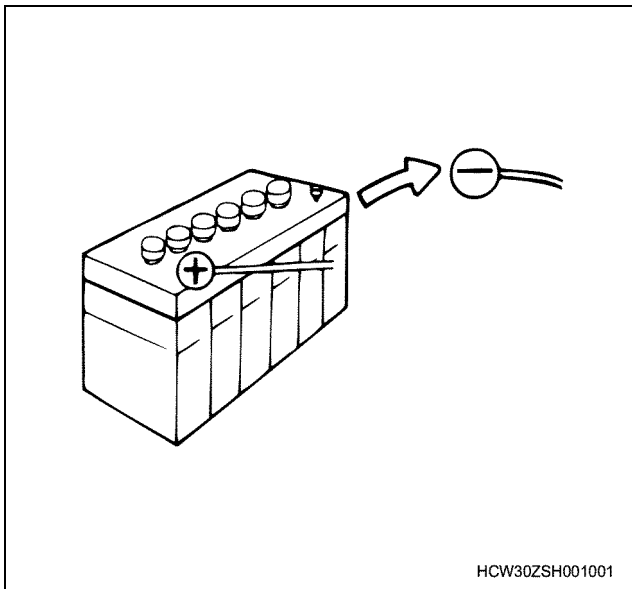
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General Information

Service Precautions

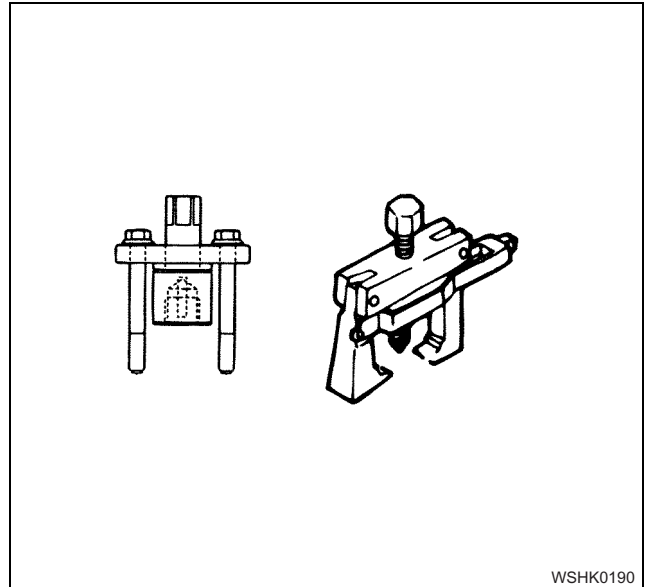
In order to carry out work safely

1. Always use an engine stand when taking the engine down from the vehicle.
Do not place the engine directly onto the ground, or place in a manner that interferes with the oil pan.
2. If you are working together with others, always pay attention to each other's safety.
3. If you are repairing any part of the electrical system, always remove the minus side cable from the battery terminal before starting work. If you are removing the battery cover, always remove the cover in a place that is away from sources of fire/heat.

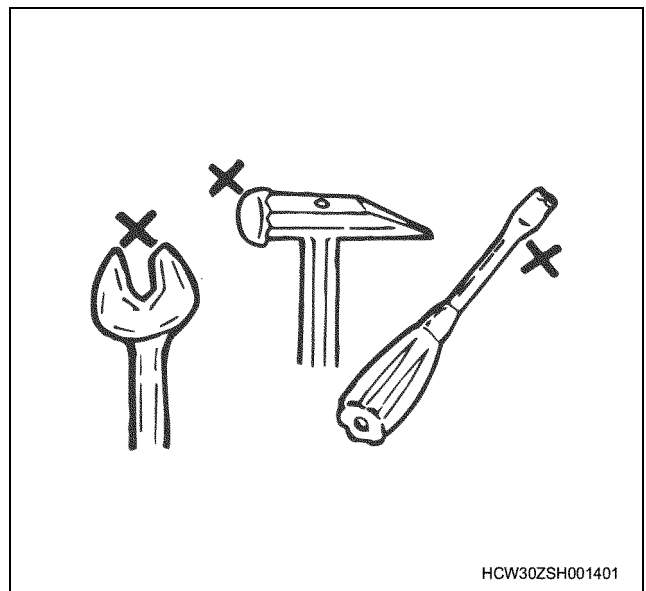


4. Do not perform painting work or leave the engine running for long periods of time in an enclosed or badly ventilated indoor workshop.

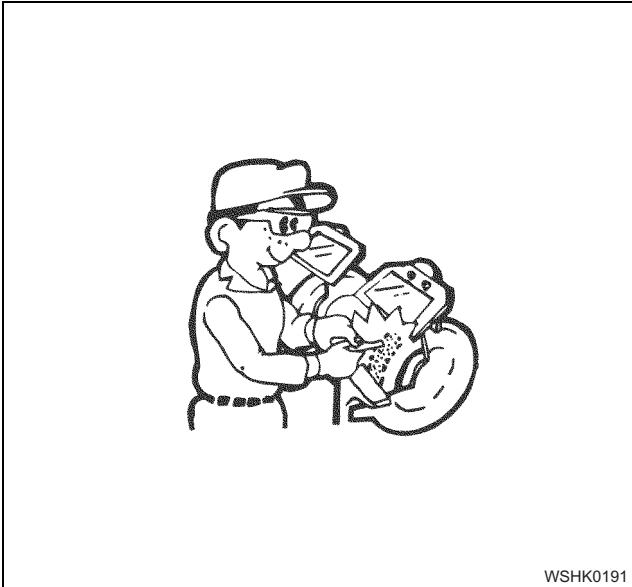
5. Always use the correct specialized tool indicated in the instructions. Using the incorrect tool may cause damage to the parts or injury to the person using the tool.



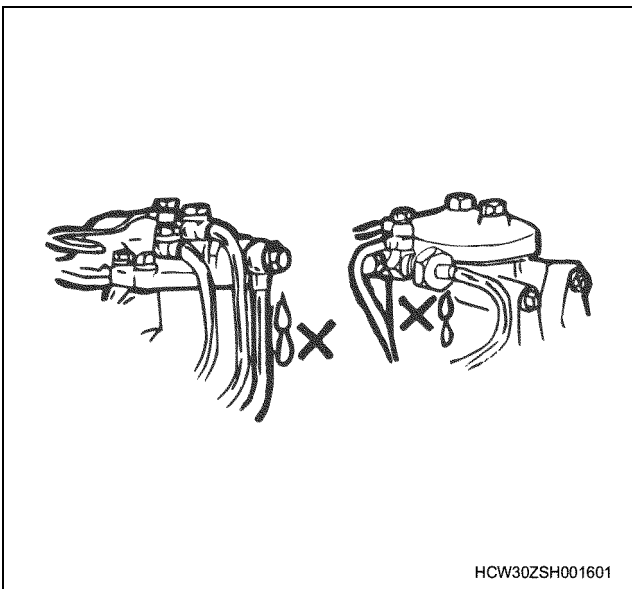
6. All regular tools, gauges and special tools should be regularly inspected, and prepared before starting work. Do not use bent spanners, hammers with damaged edges, chipped chisels, or any other faulty or damaged tools.



7. Always pay close attention to safety and handling requirements when using grinders, cranes, welders, and other such equipment. Moreover, always wear the correct protective garments and use the necessary safety tools for the job in hand.



8. Always check that there are no fuel leaks when performing maintenance work on the fuel system. (It may cause a fire.)



9. Pay close attention to the risk of ignition if you are handling parts that carry a high voltage. Furthermore, any oil or grease spilt onto rubber parts must be wiped off immediately, as it will cause deterioration of the rubber.



Replacement parts and part numbers

1. Always replace packing, oil seals, O-rings, caulking lock nuts, folding lock plates, split pins and other such parts with brand new parts.
2. The parts numbers contained in this manual may not represent the supply condition of the parts, and the part numbers may be changed due to revisions. Therefore, parts should always be checked against a parts catalogue before use.

0A-4 General Information

Liquid gasket

- Each time you disassemble parts that use liquid gasket, completely remove the old gasket residue from each of the parts and matching sections using a scraper, then clean each of the parts to completely remove oil, water, and dirt etc. from the various surfaces by a cloth. Using the specified type of liquid gasket, apply new liquid gasket to each of the surfaces before reassembling the parts.
- In order to make it easier to clean liquid gasket surfaces, apply gasket remover liquid (Pando- 391D made by ThreeBond Co., Ltd.) and leave the part to stand for approximately 10 minutes, after which the old liquid gasket residue will be easier to remove.
However, this should not be used on resin components or painted components.

- Please take care not to apply too much or too little liquid gasket.
Also, you should always re-apply the liquid gasket upon itself when you start and finish application.
- Make sure that there are no gaps when reinstalling the liquid gasket parts to each other. If there are gaps between the two parts, re-apply the liquid gasket. Some parts, especially the oil pan, use the same size studs as a guide to eliminate the need for knock pin positioning etc.
- Re-install these parts within 5 minutes of applying the liquid gasket.
If more than 5 minutes passes, remove the previous liquid gasket and re-apply it.
- Please wait for at least 30 minutes since the last part is installed before starting the engine.

Liquid gasket

| | Applied area | | Use conditions | | Liquid gasket name |
|---|-------------------------------|---------------------|-----------------------|--------------------|--------------------|
| | Parts | Matching parts | Seal object | Application groove | |
| 1 | Rocker bracket | Cylinder head | Engine oil (10W — 30) | Equipped | TB 1207B |
| 2 | Air inlet pipe | Cylinder head cover | Air | Equipped | TB 1207C |
| 3 | Timing case | Cylinder block | Engine oil (10W — 30) | Equipped | TB 1207B |
| 4 | Housing cover; injection pump | Cylinder block | Engine oil (10W — 30) | None | TB 1207C |
| 5 | Solenoid; fuel cut | Cylinder block | Engine oil (10W — 30) | Equipped | TB 1207C |
| 6 | Retainer; oil seal | Cylinder block | Engine oil (10W — 30) | Equipped | TB 1207B |
| 7 | Housing ASM; PCV | Cylinder head cover | Blow-by gas | None | TB 1207C |
| 8 | Indicator; air cleaner | Air cleaner | Air | None | (Seal tape) |

- Always use the liquid gasket products listed above, or a liquid gasket identical to the ones listed above.
- Use the correct quantity of liquid gasket. Always follow the handling instructions for each product.

Application procedure

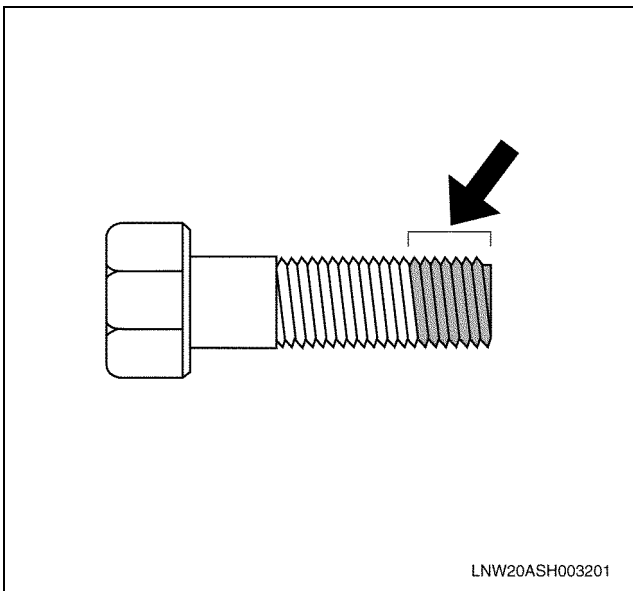
1. Wipe the contact surfaces clean of all water, oil or grease. The contact surfaces should be dry.
2. Apply a regular bead width of liquid gasket to one of the contact surfaces. Make sure that the bead does not break at this point.

Note:

If there are special regulations concerning the application procedure in the repair document, please follow those regulations.

Work procedure

1. Wipe the joint surfaces of the bolt, bolt hole, and threads clean of water, grease, and oil. The contact surfaces should be dry.
2. Apply Loctite to the top 1/3 of the screw.
3. Tighten the bolt to the specified torque.



Important:

After tightening the bolt, do not apply excessive torque or try to rotate the bolt until at least one hour has passed, and the Loctite has hardened.

Procedure for using the plastigauge

| Type | Measurable range mm {in} |
|--------------|-------------------------------|
| PG-1 (Green) | 0.025 — 0.076 {0.001 — 0.003} |
| PR-1 (Red) | 0.051 — 0.152 {0.002 — 0.006} |
| PB-1 (Blue) | 0.102 — 0.229 {0.004 — 0.009} |

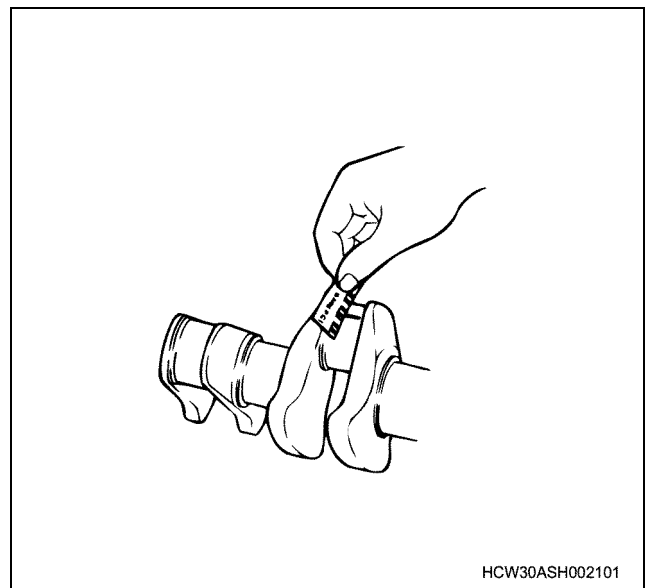
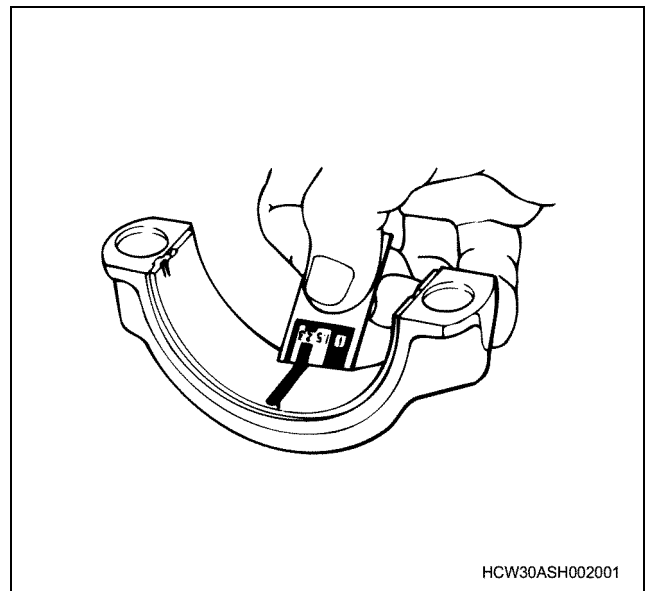
Example: Procedure for measuring the clearance between the connecting rod bearing and crank pin.

- Clean the connecting rod and bearing, and install the bearing to the rod.
- Cut the plastigauge to the same width as the crank pin, and while avoiding the oil hole of the crank pin lay the gauge parallel to the pin.
- Line up the marks on the connecting rod and cap, and install the crank pin. Apply molybdenum disulfide to the thread section and seating surface of the tightening bolt, and rotate both cap and bolt to the correct torque.

Important:

Do not move the connecting rod while using the plastigauge.

- Gently remove the cap and connecting rod, and measure the crushed width of the plastigauge (clearance between rod and pin) using the scale printed on the bag.



0A-6 General Information

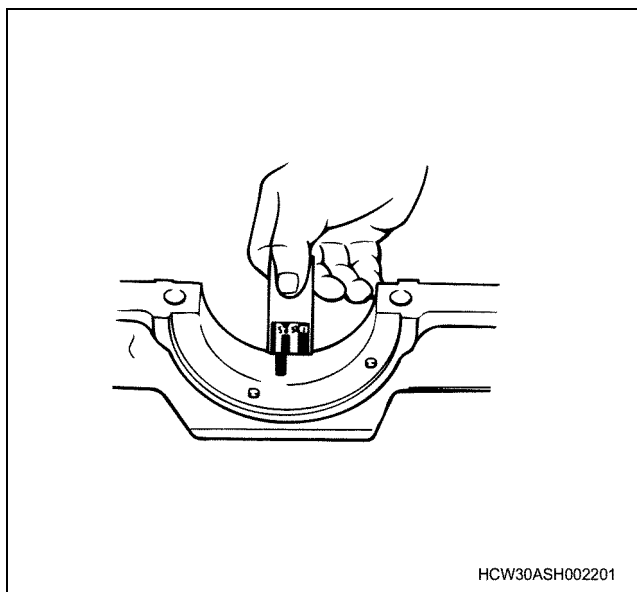
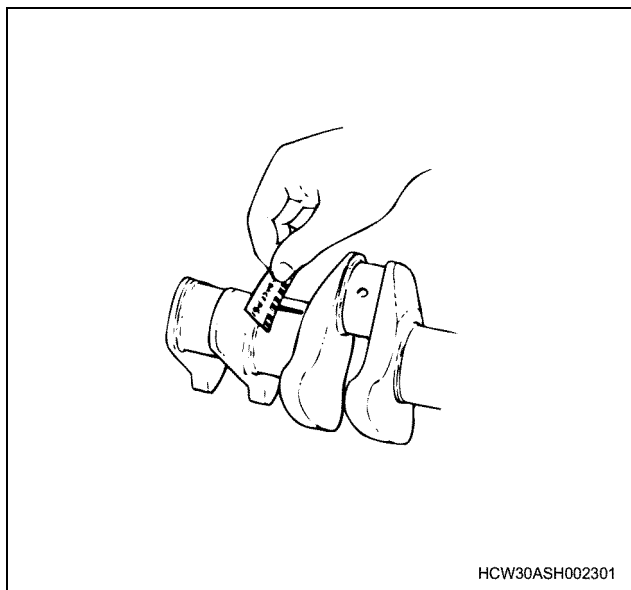
Example: Measuring the clearance between the crank bearing and crank journal

- Clean the clamp face of the cylinder block and crankcase bearing, and also the bearing, and install the cylinder block to the crankcase.
- Gently rest the crankshaft on the cylinder block, and rotate it approximately 30 degree to stabilize it.
- Cut the plastigauge to the same size as the journal width, and while avoiding the oil hole of the journal lay the gauge parallel to the journal.
- Gently rest the crankcase on the cylinder block, apply molybdenum disulfide to the thread section and seating surface of the tightening bolt, and tighten in sequence to the correct torque.

Important:

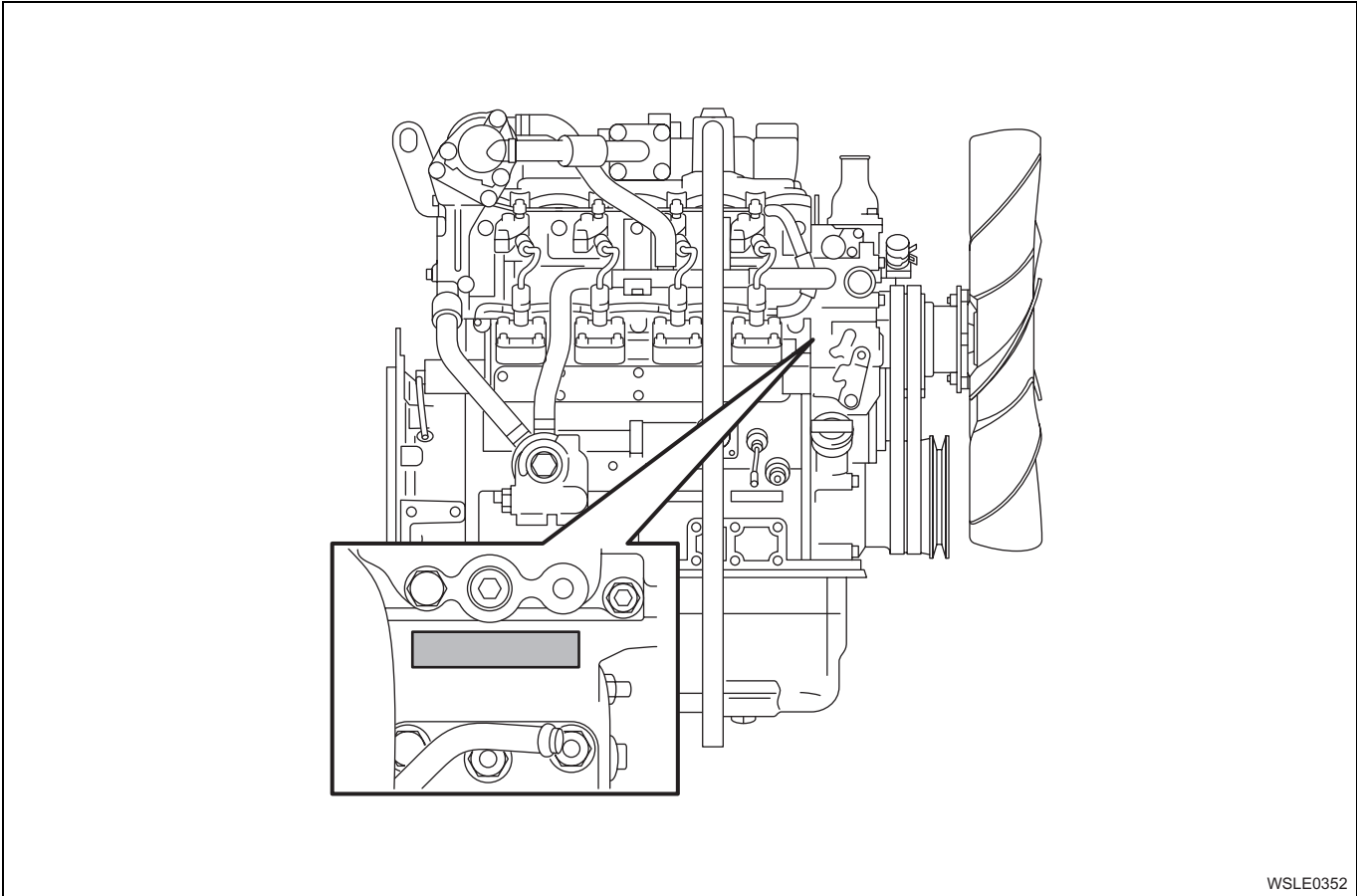
Do not rotate the crankshaft while using the plastigauge.

- Gently remove the crankcase, and measure the crushed width of the plastigauge (clearance between bearing and journal) using the scale printed on the bag.



Reading the Model

Engine number stamping position



General Information

Terminology, description of abbreviations

Terminology definitions

Maintenance standard

The generic name for reference values required for maintenance, such as nominal dimension, assembly specification, and limit.

Nominal dimension

Shows the standard value at the point of manufacture that does not include the common difference.

Assembly specification

Shows the standard value after assembling, repairing, or adjusting.

Service limit

When this value (dimensions) is reached, it shows that the part has reached its full limit and must be replaced or repaired.

Wear

Shows the difference between the dimension of non-worn part (nominal dimension unless there is such part) and that of the most worn part (the dimension of worn part).

Uneven wear

Shows the difference between the maximum and the minimum wear amount.

Front/Rear, Right/Left, Top/Bottom

These show each orientations of parts installed to the vehicle when looking from the vehicle's forward direction.

Unit

Units written to SI conventions (mainly torque, pressure, force)

[Example] Length: mm, Torque: N·m {kgf·m}

Warning

Items that carry the warning mark pose a danger to life or threat of serious injury if not strictly observed.

Caution

Items that carry the caution mark may cause injury or lead to accidents if not strictly observed.

Important

Items that carry the important mark may cause the vehicle to break down, or may prevent the guaranteed normal operation of the system or related parts if not strictly observed.

Note

Items that should receive special mention within a work procedure.

Description of abbreviations

| Abbreviation | Description |
|--------------|---|
| AC | Alternating Current |
| ACC | Accessory |
| ACG | Alternating Current Generator |
| API | American Petrol Institute |
| ASM (Assy) | Assembly |
| ATDC | After Top Dead Center |
| BAT, BATT | Battery |
| BRG, Brg | Bearing |
| BKT, BRKT | Bracket |
| BTDC | Before Top Dead Center |
| CO | Carbon Oxide |
| CONN | Connector |
| CPU | Central Processing Unit |
| C/U | Control Unit |
| DC | Direct Current |
| DI | Direct Injection |
| ECU | Engine Control Unit/Electronic Control Unit |
| ECM | Engine Control Module |
| EGR | Exhaust Gas Recirculation |
| Exh, EXH | Exhaust |
| Ft, FRT | Front |
| FWD | Forward |
| F/C | Fuel Cut |
| GND | Ground |
| IC | Integrated Circuit |
| ID Plate | Identification Plate |
| IN | Intake, Inlet |
| ISO | International Organization for Standardization |
| I/PUMP | Injection Pump |
| JIS | Japanese Industrial Standard |
| L/H, LH | Left Hand |
| M/V | Magnetic Valve |
| NOx | Nitrogen Oxide |
| N-TDC | Number - Top Dead Center |
| OPT | Option |
| P | Pole(S) |
| PCV | Pump Control Valve/Positive Crankcase Ventilation |

| Abbreviation | Description |
|--------------|--|
| PM | Particulate Matter |
| PS | Pre-Stroke |
| PTO | Power Take Off |
| QOS | Quick On System |
| Rr, RR | Rear |
| R/H, RH | Right Hand |
| R/L | Relay |
| STD | Standard |
| SW | Switch |
| TICS | Timing & Injection rate Control System |
| VGS Turbo | Variable Geometry turbocharger System |
| W/L | Warning Lamp |

SI (International System of Units)

With regards the conversion to SI (International System of Units)

The introduction of the SI systems aims to internationally unify the metric system and the various units used by different countries (traditional weights and measures, the foot pound method etc.), and to curb the confusion that occurs between the different units (conversion calculations etc.).

The new calculating method which adopted SI units was completely adopted in Japan in 1992, and is standardized by JIS-Z-8203.

All of the units in this manual are written in line with the International System of Units SI units, and conventional units are written in { } brackets.

SI

Abbreviation of French word "Le Systeme International d'Unites"

Connection between main SI units and conventional units

| | SI | Conventional unit | Item, unit conversion |
|-----------------------------------|----------------|-----------------------------|--|
| Length | m | m | Same as the conventional unit |
| Weight (Mass) | kg | kg | Same as the conventional unit |
| Force | N | * kg, kgf | 1 kgf = 9.80665 N |
| Torque | N·m | * kg·m, kgf·m | 1 kgf·m = 9.80665 N·m |
| Pressure | Pa | * kg/cm ² , mmHg | 1 kgf/cm ² = 9.80665 kPa, 1 mmHg = 133.3 Pa |
| Power output, horsepower | W | PS | 1 PS = 0.74 kW |
| Capacity, air volume displacement | m ³ | Liter, L, cc | 1 Liter = 1 dm ³ , 1 cc = 1 m Liter = 1 cm ³ |
| Fuel consumption | g/(kW·h) | g/(PS·h) | 1 g/(PS·h) = 1.360 g/(kW·h) |

*1 Published service data may conveniently use kg for force and mass (weight) instead of kgf.

*2 Some conversion results may be rounded off to 1 or 2 decimal places.

Converting expressions of quantity

When converting, prefixes such as k (kilo) or m (milli) are used.

| | | | |
|---|-------|------------------|-----------|
| M | Mega | 10 ⁶ | 1,000,000 |
| k | Kilo | 10 ³ | 1,000 |
| h | Hecto | 10 ² | 100 |
| d | Deci | 10 ⁻¹ | 0.1 |
| c | Centi | 10 ⁻² | 0.01 |
| m | Milli | 10 ⁻³ | 0.001 |
| μ | Micro | 10 ⁻⁶ | 0.000001 |

- 200 kgf/cm² = 19,620 kPa = 19.6 MPa
- 40 mmHg = 5,332 Pa = 5.3 kPa

Conversion formula

Length

- km × 0.6214 = mile
- m × 3.281 = ft
- mm × 0.03937 = in

Pressure

- kPa × 0.0101972 = kg/cm²
- kPa × 0.145038 = psi
- MPa × 10.197162 = kg/cm²
- MPa × 145.03774 = psi

Tightening torque

- N·m × 0.101972 = kg·m
- N·m × 0.737562 = lb·ft

Speed

- km/h × 0.6214 = MPH

Temperature

- °C × 1.8 + 32 = °F

0A-10 General Information

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} | — |

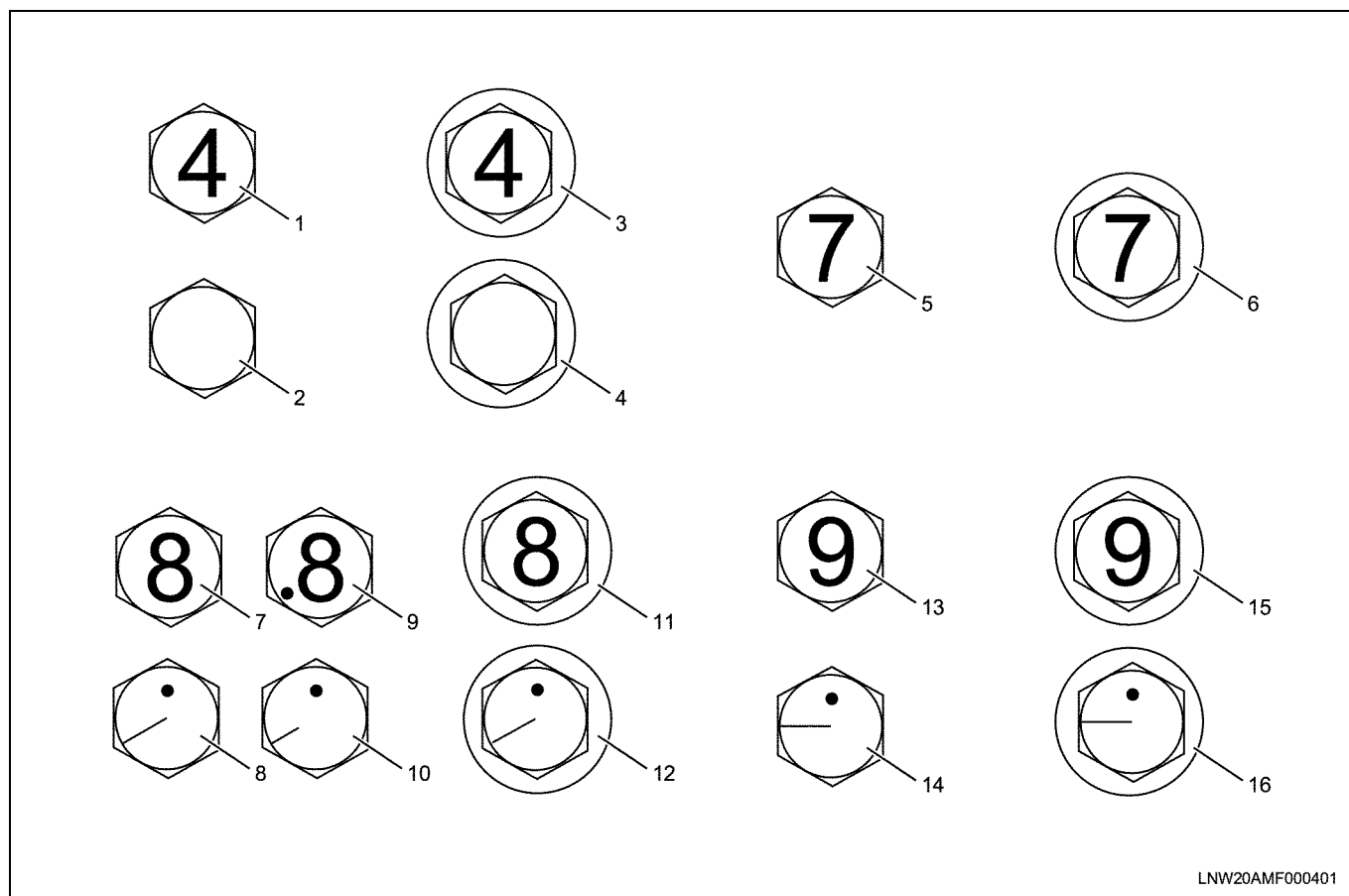
The * mark indicates where soft materials have been used for internal thread sections, such as castings.

| 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.

0A-12 General Information

Designations for Isuzu standard bolt heads



Name

- | | |
|--|--|
| 1. Hexagon Head Bolt (4.8, 4T) | 9. Hexagon Head Bolt (Nonthermal Refined 8.8) |
| 2. Hexagon Head Bolt (4.8, 4T) | 10. Hexagon Head Bolt (Nonthermal Refined 8.8) |
| 3. Flange Bolt (4.8, 4T) | 11. Flange Bolt (8.8) |
| 4. Flange Bolt (4.8, 4T) | 12. Flange Bolt (8.8) |
| 5. Hexagon Head Bolt (7T) | 13. Hexagon Head Bolt (9.8, 9T) |
| 6. Flange Bolt (7T) | 14. Hexagon Head Bolt (9.8, 9T) |
| 7. Hexagon Head Bolt (Thermal Refined 8.8) | 15. Flange Bolt (9.8, 9T) |
| 8. Hexagon Head Bolt (Thermal Refined 8.8) | 16. Flange Bolt (9.8, 9T) |

Flare nut

| | Pipe diameter | Tightening torque (for medium and large size vehicles) | Width across flats of flare nut (mm) | |
|---|---------------|--|---|-----|
| | | | Old | New |
| Flare nut tightening torque (service standard value) N·m {kgf·m} | φ 4.76 mm | 12.8 — 18.6 {1.3 — 1.9} | 14 | 14 |
| | φ 6.35 mm | 23.5 — 49 {2.4 — 5.0} | 17 | 17 |
| | φ 8.0 mm | 23.5 — 49 {2.4 — 5.0} | 19 | 17 |
| | φ 10.0 mm | 44.1 — 93.2 {4.5 — 9.5} | 22 | 19 |
| | φ 12.0 mm | 58.8 — 137.3 {6.0 — 14.0} | 27 | 24 |
| | φ 15.0 mm | 78.5 — 156.9 {8.0 — 16.0} | 30 | 30 |

Taper screw from connectors (brass)

| N·m {kgf·m} | | | | |
|-------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Screw size | PT (R) 1/8 | PT (R) 1/4 | PT (R) 3/8 | PT (R) 1/2 |
| — | 2.0 — 14.7 {0.2 — 1.5} | 4.9 — 15.7 {0.5 — 1.6} | 9.8 — 16.7 {1.0 — 1.7} | 9.8 — 17.7 {1.0 — 1.8} |

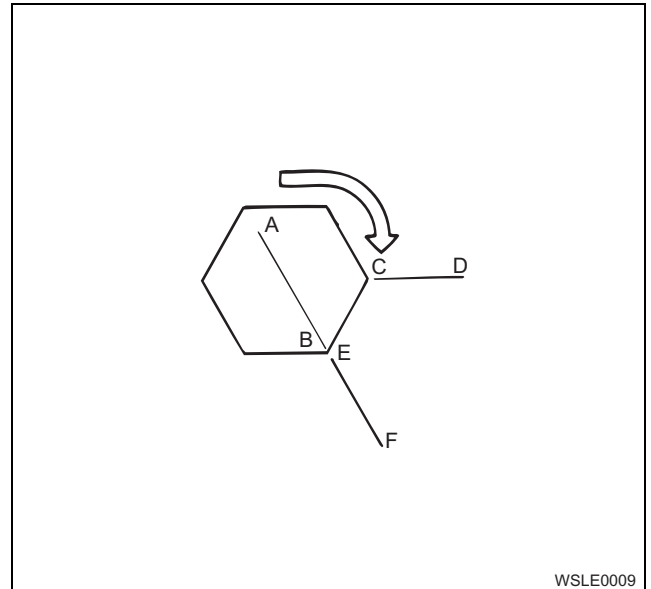
About angle method tightening

Though the general and current way to tighten bolts and nuts is torque indication, using this way results in large unevenness of shaft power to indicated torque. Therefore, bolts may be damaged at upper limit when you try to ensure minimal shaft power.

To ensure shaft power with small unevenness, it is necessary to tighten bolts measuring stretch amount of bolts, but this is actually impossible. So the angle method focuses on screw pitch as equivalent to bolt stretch, and controls using the screw rotation amount. The method can reduce the unevenness of shaft power by tightening to plastic range.

How to tighten

1. Apply molybdenum disulfide or engine oil to the threads and the seating surface of the bolt following the instruction.
2. Tighten all bolts to the pre-indicated tightening torque.
3. Draw lines on the surface of the parts you tighten: the lines which pass through the bolt's center (A — B: bolt side) (C — D: parts side) and the line at the specified tightening angle from the bolt's center (E — F).



Be sure to check the mark to see whether you tighten the bolt to the specified angle or not. If you fail this, you may tighten the bolt by the angle method again by accident and damage the bolt. Take extreme care.

Important:

- Follow the instructed order to tighten bolts.
- Do not retighten if you tighten by the angle method.

Bolt angle gauge (5-8840-0266-0), the tool for tightening bolts by the angle method, is set.

Special tool classification

A; Essential tool

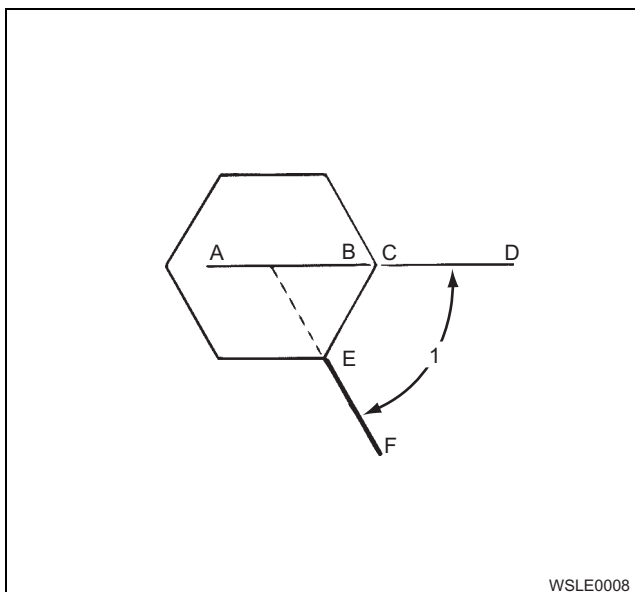
Servicing operation cannot be done with any other tools than the essential tool.

B; Recommend tool

Servicing work can be done with a general-purpose tool commercially available. However, it is advisable to use the recommended tool as much as possible for a reduced work time and an improved safety in work operations.

C; Available tool

Although it takes a more working time, servicing operations can be made with a tool commercially available as substitute for the available tool.



Name

1. Specified Tightening Torque

4. Tighten the bolt with wrench until the line on the bolt (A — B) aligns with the specified angle line (E — F on the surface of the parts).

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