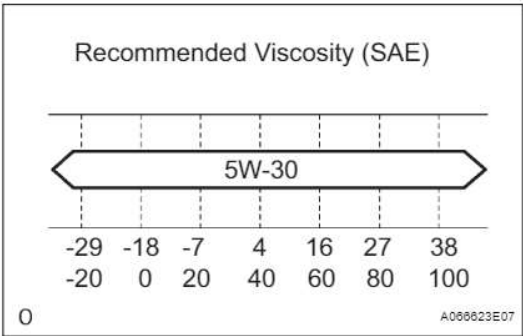


LUBRICATION SYSTEM

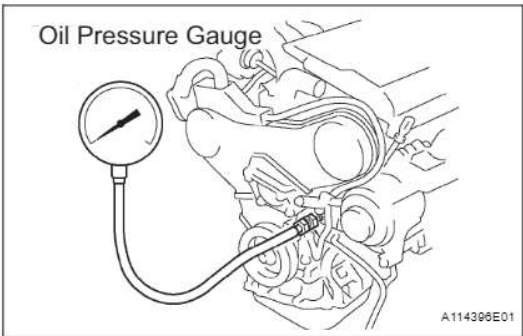
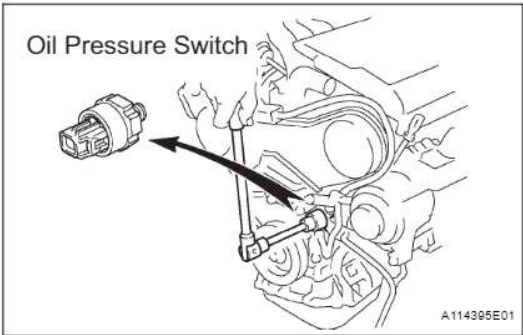
ON-VEHICLE INSPECTION

1. CHECK ENGINE OIL LEVEL
- (a) Warm up the engine, stop the engine and wait 5 minutes. The oil level should be between the dipstick's low level mark and full level mark. If the oil level is low, check for leakage and add oil up to the full level mark.
- NOTICE:
- Do not fill with engine oil above the full level mark.



2. CHECK ENGINE OIL QUALITY
- (a) Check the oil for deterioration, entry of water, discoloring or thinning. If the quality is visibly poor, replace the oil.
- Oil grade:
- API grade SL, Energy-Conserving or ILSAC, multigrade engine oil is recommended. SAE 5W-30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather.

3. REMOVE OIL PRESSURE SWITCH
- (a) Disconnect the oil pressure switch connector.
- (b) Using a 24 mm deep socket wrench, remove the oil pressure switch



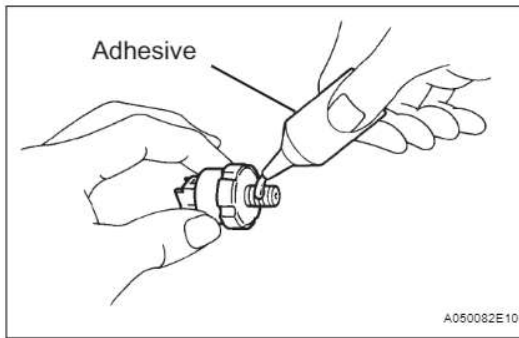
Standard

Condition	Specified Condition
Idle	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more
3,000 rpm	245 to 539 kPa (2.5 to 4.5 kgf/cm ² , 36 to 78 psi) or more

7. INSTALL OIL PRESSURE SWITCH
- (a) Remove the oil pressure gauge.

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3MZ-FE LUBRICATION – LUBRICATION SYSTEM



- (b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- (c) Using a 24 mm deep socket wrench, install the oil pressure switch.

Torque: 15 N*m (152 kgf*cm, 11 ft.*lbf)

NOTICE:

Do not start the engine for at least 1 hour after installation of the switch.

- (d) Connect the oil pressure switch connector.

8. START ENGINE AND CHECK FOR ENGINE OIL LEAKS

OIL FILTER

REMOVAL

CAUTION:

- Prolonged and repeated contact of mineral oil with the skin will deplete the skin's natural fats, leading to dryness, irritation and dermatitis. In addition, used engine oil contains harmful contaminants which may cause skin cancer.
- Wear protective clothing and gloves to minimize the length and frequency of contact between the skin and used oil. If contact does occur, wash your skin thoroughly with soap and water or waterless hand cleaner. Do not use gasoline, thinners or solvents to wash the skin.
- In order to preserve the environment, dispose of used oil and used oil filters only at designated disposal sites.

1. REMOVE ENGINE UNDER COVER RH

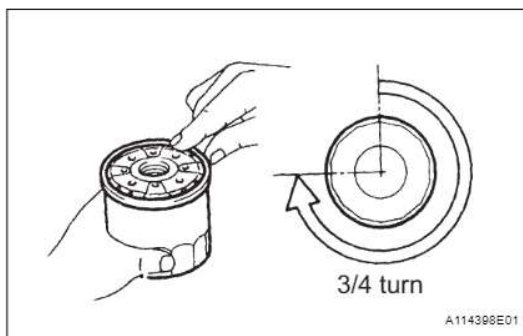
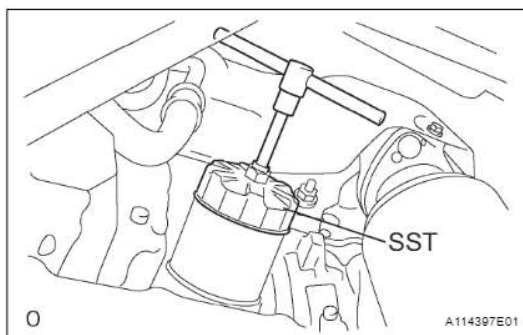
2. DRAIN ENGINE OIL

- Remove the oil filler cap.
- Remove the oil drain plug, and drain the oil into a container.

3. REMOVE OIL FILTER SUB-ASSEMBLY

- Using SST, remove the oil filter.

SST 09228-07501



INSTALLATION

1. INSTALL OIL FILTER SUB-ASSEMBLY

- Check and clean the oil filter installation surface.
- Apply clean engine oil to the gasket of a new oil filter.
- Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
- Using SST, tighten the oil filter an additional 3/4 turn.

SST 09228-07501

2. ADD ENGINE OIL

- Clean and install the oil drain plug with a new gasket.

Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf)

LU

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3MZ-FE LUBRICATION – OIL FILTER

- (b) Fill with fresh engine oil.
- Standard**

Item	Capacity
Drain and refillw/ oil filter change	4.7 liters (5.0 US qts, 4.1 Imp. qts)
Drain and refillw/o oil filter change	4.5 liters (4.8 US qts, 4.0 Imp. qts)
Dry fill	5.5 liters (5.8 US qts, 4.8 Imp. qts)

- (c) Install the oil filler cap.

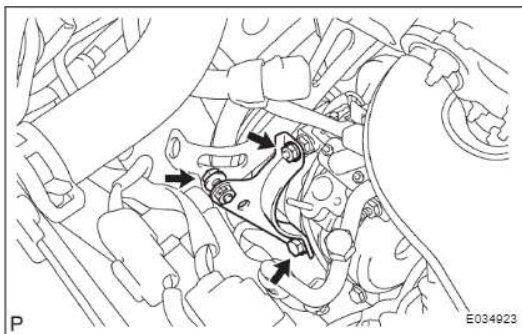
3. CHECK FOR ENGINE OIL LEAKS
4. INSTALL ENGINE UNDER COVER RH

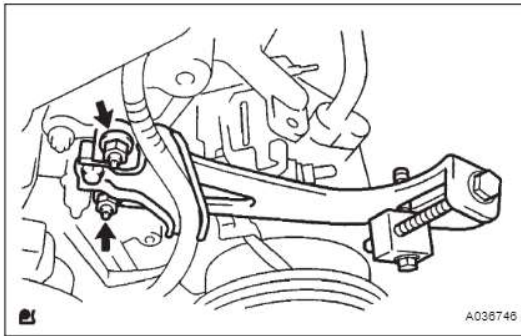
LU-10

3MZ-FE LUBRICATION – OIL PUMP

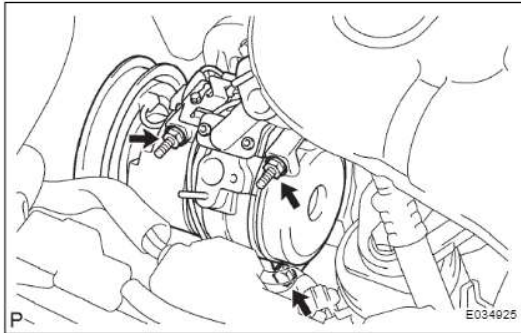
REMOVAL

1. REMOVE FRONT WHEEL RH
2. REMOVE FRONT FENDER APRON SEAL RH
3. REMOVE ENGINE UNDER COVER RH
4. DRAIN ENGINE OIL
 - (a) Install a new gasket after draining engine oil.
Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf)
5. REMOVE FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
6. REMOVE V BELT NO.1 (See page [EM-19](#))
7. REMOVE VANE PUMP V BELT (See page [EM-19](#))
8. REMOVE ENGINE MOVING CONTROL ROD (See page [EM-64](#))
9. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page [EM-64](#))
10. REMOVE GENERATOR BRACKET NO.2
11. REMOVE CRANKSHAFT PULLEY (See page [EM-96](#))
12. REMOVE TIMING BELT NO.1 COVER
13. REMOVE TIMING BELT NO.2 COVER
14. REMOVE ENGINE MOUNTING BRACKET RH
15. REMOVE TIMING BELT GUIDE NO.2
16. REMOVE TIMING BELT (See page [EM-20](#))
17. REMOVE EXHAUST PIPE NO.1 SUPPORT BRACKET
18. REMOVE FRONT EXHAUST PIPE ASSEMBLY (See page [EX-3](#))
19. REMOVE EXHAUST PIPE SUPPORT BRACKET NO.1
20. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH
 - (a) Remove the 2 bolts, nut and drive belt adjusting bar bracket.



3MZ-FE LUBRICATION – OIL PUMP**LU-11**

- (b) Remove the 2 nuts and generator bracket adjusting bar with the wire harness clamp bracket.
- (c) Disconnect the compressor, magnetic clutch connector and wire harness clamp.



- (d) Remove the 3 bolts, compressor and magnetic clutch.
HINT:
Hang up the hoses instead of detaching.

21. REMOVE NO.2 TIMING BELT IDLER SUB-ASSEMBLY**22. REMOVE CAMSHAFT TIMING PULLEY****23. REMOVE NO.1 TIMING BELT IDLER SUB-ASSEMBLY**

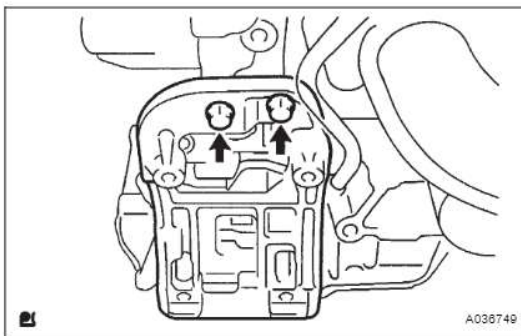
- (a) Using a 10 mm socket hexagon wrench, remove the timing belt idler and plate washer.

24. REMOVE CRANKSHAFT TIMING PULLEY (See page EM-98)**25. REMOVE TIMING BELT NO.3 COVER****26. REMOVE COMPRESSOR MOUNTING BRACKET NO.1**

- (a) Remove the 2 bolts and mounting bracket.

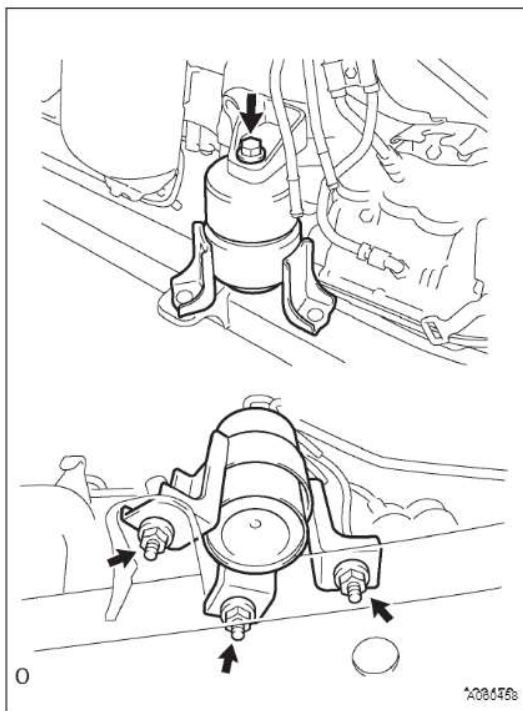
27. REMOVE OIL LEVEL GAGE GUIDE

- (a) Remove the bolt and gage guide.

**LU**

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3MZ-FE LUBRICATION – OIL PUMP

**28. SEPARATE ENGINE MOUNTING INSULATOR**

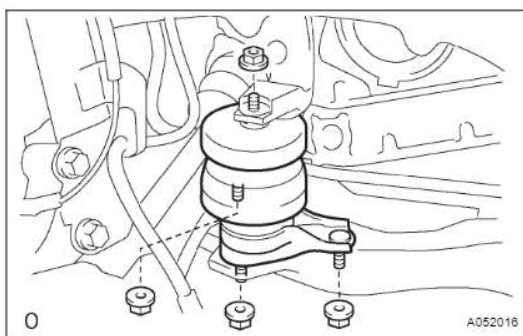
- (a) Remove the 3 nuts and bolt. Then separate the engine mounting insulator.

NOTICE:

Do not remove the engine mounting insulator.

29. REMOVE ENGINE MOUNTING INSULATOR RH

- (a) Remove the bolt and disconnect the power steering return hose clamp from the frame.



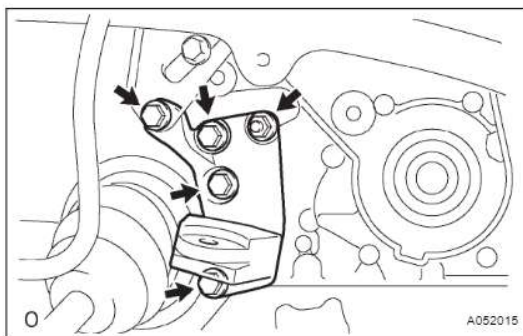
- (b) Remove the 4 nuts.

- (c) Prepare a jack. Place a wooden block on the jack and set the jack under the engine. Remove the engine mounting insulator.

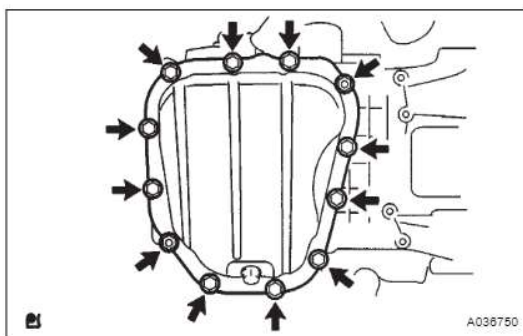
- (d) Raise the jack and lift up the engine. Then remove the engine mounting insulator RH.

NOTICE:

Be careful not to damage the contact surfaces of the oil pan.

**30. REMOVE ENGINE MOUNTING BRACKET RH**

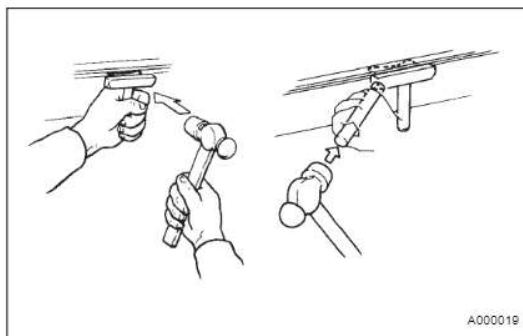
- (a) Remove the 4 bolts, nut and bracket.

**31. REMOVE NO.2 OIL PAN SUB-ASSEMBLY**

- (a) Remove the 10 bolts, 2 nuts and oil pan.

LU

3MZ-FE LUBRICATION – OIL PUMP



- (b) Insert the blade of SST between the oil pan No. 1 and oil pan No. 2, cut through the sealer and remove oil pan No. 2.

SST 09032-00100

NOTICE:

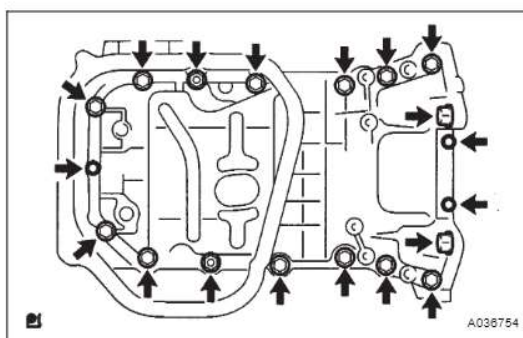
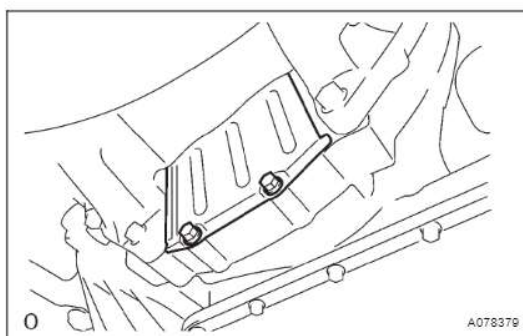
- Do not damage the contact surface of oil pan No. 1 and oil pan No. 2.
- Do not damage the flange portion of oil pan No. 2 during removal.

32. REMOVE OIL STRAINER SUB-ASSEMBLY

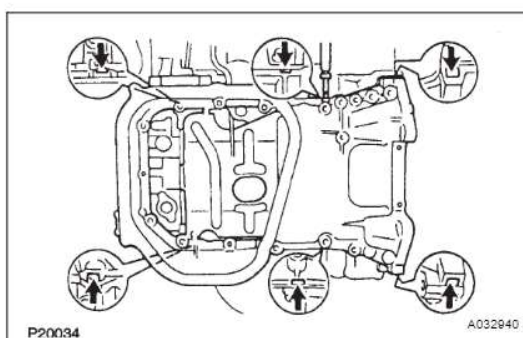
- (a) Remove the bolt, 2 nuts, oil strainer and gasket.

33. REMOVE OIL PAN SUB-ASSEMBLY

- (a) Remove the 2 bolts and flywheel housing under cover.



- (b) Uniformly loosen the 17 bolts and 2 nuts. Remove the bolts and nuts.



- (c) Using a screwdriver, remove the oil pan by prying the portions between the cylinder block and oil pan shown in the illustration.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and oil pan.

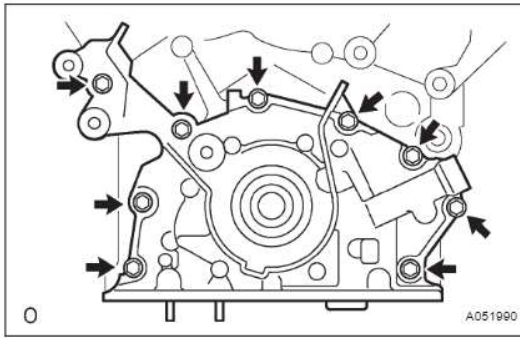
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34. REMOVE CRANKSHAFT POSITION SENSOR

- (a) Disconnect the sensor connector.
(b) Remove the bolt and sensor.

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3MZ-FE LUBRICATION – OIL PUMP

**35. REMOVE OIL PUMP ASSEMBLY**

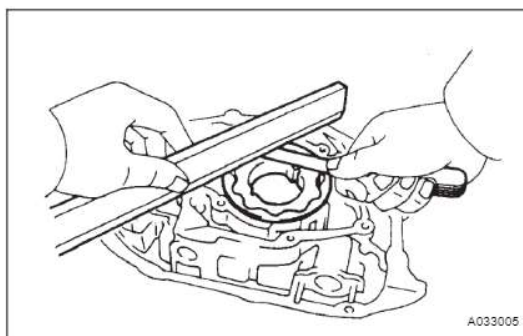
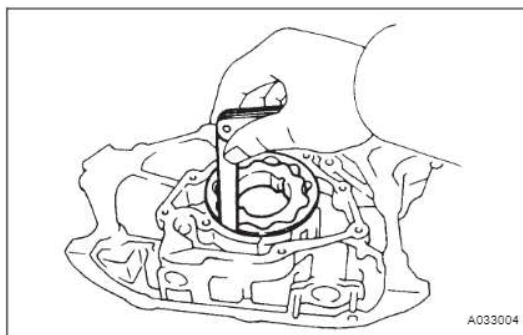
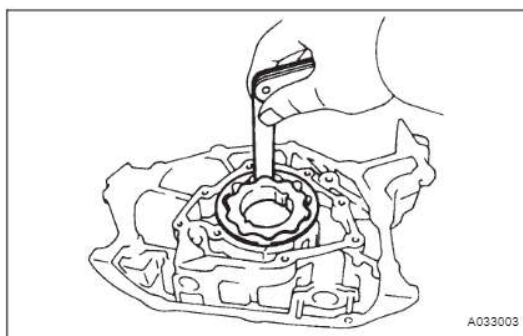
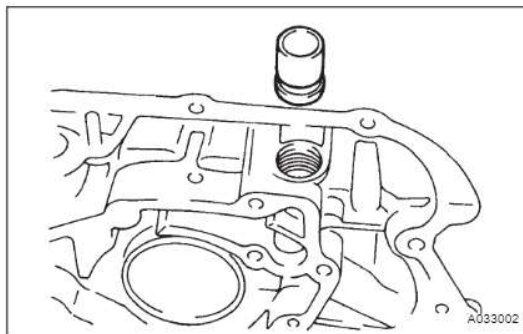
- (a) Remove the 9 bolts.
- (b) Using a screwdriver, remove the oil pump by prying between the oil pump and main bearing cap.
- (c) Remove the O-ring.

DISASSEMBLY

1. **REMOVE OIL PUMP RELIEF VALVE**
(a) Remove the plug, spring and relief valve.
2. **REMOVE OIL PUMP COVER**
(a) Remove the 10 screws and the oil pump cover.
3. **REMOVE OIL PUMP ROTOR**

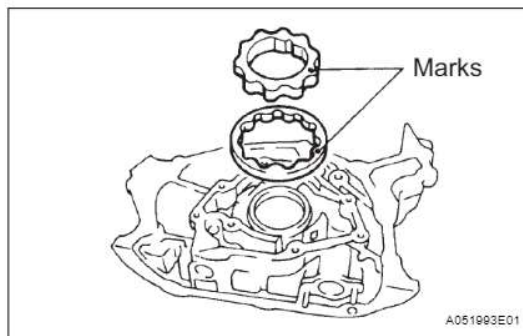
INSPECTION

1. **INSPECT OIL PUMP RELIEF VALVE**
 - (a) Apply a light coat of engine oil.
 - (b) Check that the valve falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.
2. **INSPECT OIL PUMP ROTOR**
 - (a) Apply a light coat of engine oil to the oil pump rotor set and place them into the oil pump body. Check that the rotors revolve smoothly.
If the result is not as specified, replace the oil pump assembly.
 - (b) Check the clearance between the drive rotor tips and driven rotor grooves.
 - (1) Insert a feeler gauge between each drive tip and driven rotor groove. Measure the clearances.
Specified tip clearance:
0.060 to 0.300 mm (0.0024 to 0.0118 in.)
If the body clearance is greater than the maximum, replace the oil pump assembly.
 - (c) Check the clearance between the driven rotor and body.
 - (1) Insert a feeler gauge between the driven rotor and body. Measure the clearance.
Specified body clearance:
0.250 to 0.500 mm (0.0098 to 0.0128 in.)
If the tip clearance is greater than the maximum, replace the oil pump assembly.
 - (d) Check the clearance between the body and drive/driven rotor.
 - (1) Place a precision straight edge on the top surface of the body. Insert a feeler gauge between the bottom edge of the precision straight edge and the top surface of the drive/driven rotor. Measure the clearance.
Specified rotor clearance:
0.030 to 0.150 mm (0.0012 to 0.0059 in.)
If the rotor clearance is greater than the maximum, replace the oil pump assembly.



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3MZ-FE LUBRICATION – OIL PUMP



REASSEMBLY

1. INSTALL OIL PUMP ROTOR

- (a) Apply a light coat of engine oil to the oil pump gear set and place it into the pump body with the marks facing the pump body cover side.

2. INSTALL OIL PUMP COVER

- (a) Install the oil pump cover with the 10 screws.
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

3. INSTALL OIL PUMP RELIEF VALVE

- (a) Apply a light coat of engine oil to the relief valve, and insert the relief valve and spring into the pump body hole.
(b) Install the plug.
Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

INSTALLATION

1. INSTALL OIL PUMP ASSEMBLY

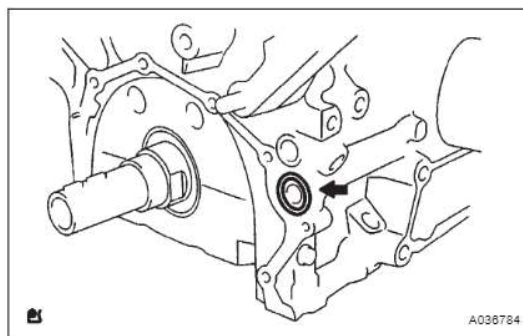
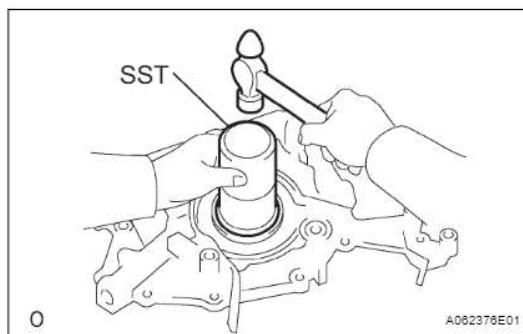
- (a) Using SST and a hammer, install a new oil seal. Tap the surface of the SST with the hammer until the oil seal's surface is flush with oil pump body edge.

SST 09223-00010

NOTICE:

- Be careful not to tap the oil seal at an angle.
- Keep the gap between the oil pump body edge and oil seal free from contamination.

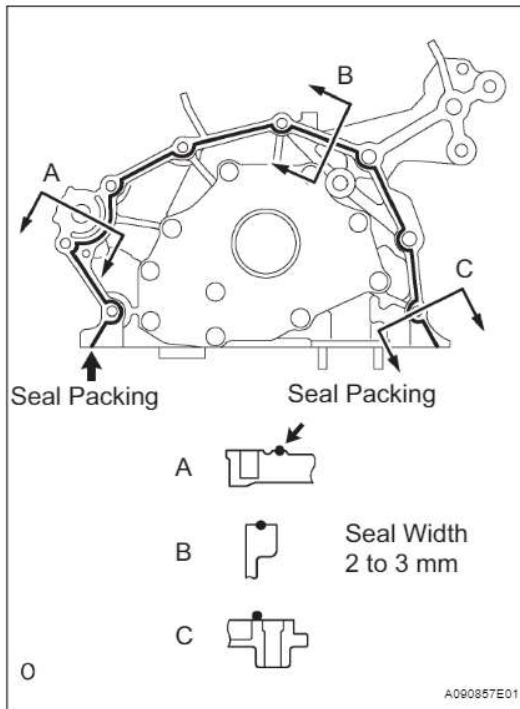
- (b) Apply a small amount of MP grease to the oil seal lip.
(c) Remove any old seal packing material from the contact surface.
(d) Apply a light coat of engine oil to a new O-ring and place it on the cylinder block.



LU

3MZ-FE LUBRICATION – OIL PUMP

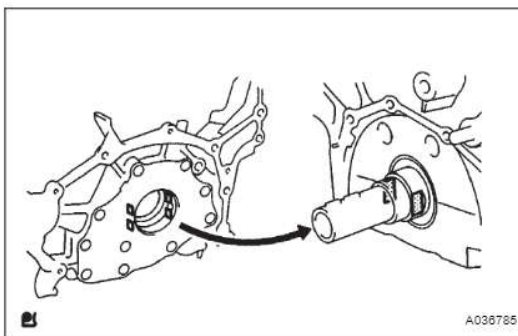
LU-17



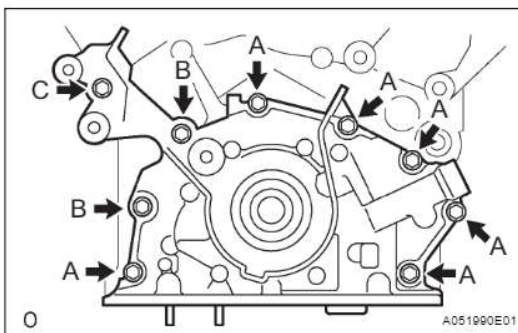
- (e) Apply a continuous bead of seal packing (diameter: 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

Seal packing:**Part No. 08226-00080 or equivalent****NOTICE:**

- Remove any oil from contact surface.
- Apply seal packing to the inner side of the bolt holes.
- Install the oil pump within 3 minutes after applying seal packing.
- Do not expose the seal to engine oil for at least 2 hours after installing the oil pump.



- (f) Align the key of the oil pump drive gear with the key way located on the crankshaft, and slide the oil pump into place.



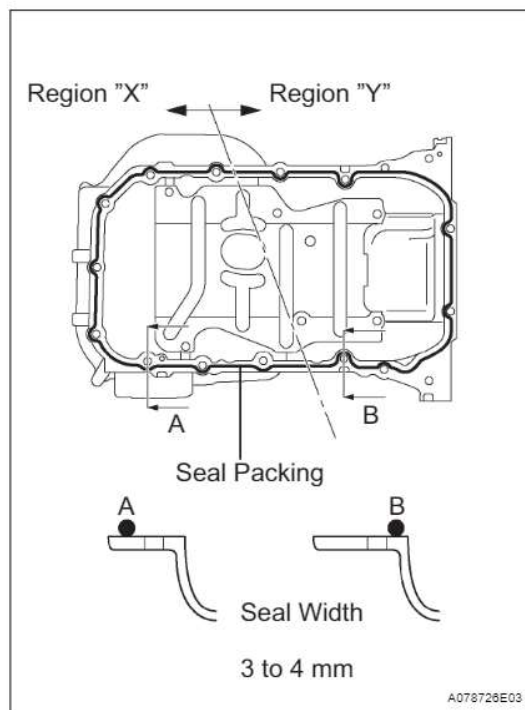
- (g) Install the oil pump by tightening the 9 bolts uniformly.

Torque: Bolt A**8.0 N*m (82 kgf*cm, 71 in.*lbf)****Bolt B****20 N*m (203 kgf*cm, 15 ft.*lbf)****Bolt C****43 N*m (439 kgf*cm, 32 ft.*lbf)****2. INSTALL CRANKSHAFT POSITION SENSOR****Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)**

LU

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3MZ-FE LUBRICATION – OIL PUMP

**3. INSTALL OIL PAN SUB-ASSEMBLY**

- (a) Remove any old seal packing from the contact surface.
- (b) Apply a continuous bead of seal packing (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the contact surface.
 - Apply seal packing to the outer side of the bolt holes in the region "X".
 - Apply seal packing to the inner side of the bolt holes in the region "Y".
 - Install the oil pan within 3 minutes after applying seal packing.
 - Do not expose the seal to engine oil for at least 2 hours after installing the oil pan.
- (c) Install the oil pan No. 1 by tightening the oil pan's 17 bolts and 2 nuts uniformly.

Torque: 10 mm head

8.0 N*m (82 kgf*cm, 71 in.*lbf)

12 mm head

20 N*m (204 kgf*cm, 15 ft.*lbf)

14 mm head

37 N*m (379 kgf*cm, 27 ft.*lbf)

- (d) Install the flywheel housing under cover with the 2 bolts.

Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)

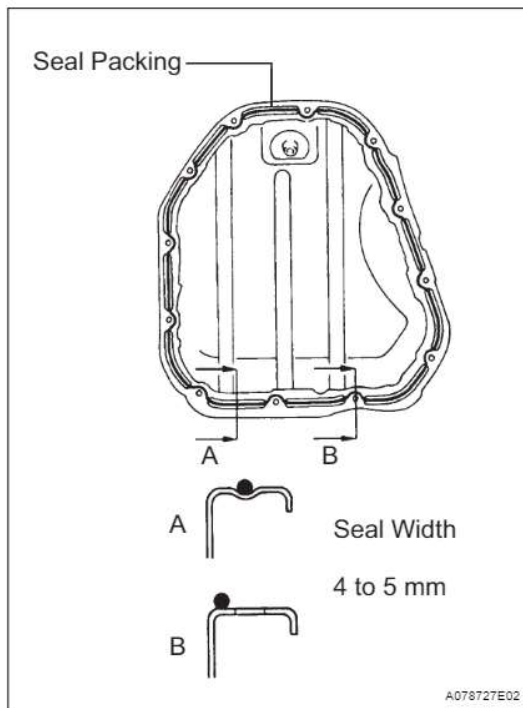
4. INSTALL OIL STRAINER SUB-ASSEMBLY

- (a) Install a new gasket and the oil strainer with the bolt and 2 nuts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

3MZ-FE LUBRICATION – OIL PUMP

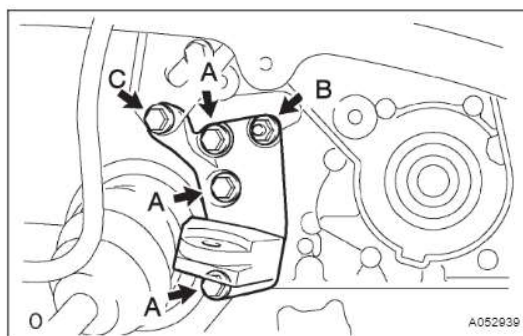
LU-19

**5. INSTALL NO.2 OIL PAN SUB-ASSEMBLY**

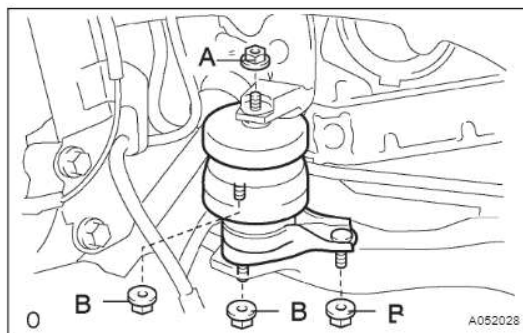
- Remove any old seal packing from the contact surface.
- Apply a continuous bead of seal packing (diameter: 4 to 5 mm (0.16 to 0.20 in.)) as shown in the illustration.

Seal packing:**Part No. 08826-00080 or equivalent****NOTICE:**

- Remove any oil from the contact surface.
 - Apply seal packing to the inner side of the bolt holes.
 - Install the oil pan within 3 minutes after applying seal packing.
 - Do not expose the seal to engine oil for at least 2 hours after installing the oil pan.
- Install the oil pan with the 10 bolts and 2 nuts.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

**6. INSTALL ENGINE MOUNTING BRACKET RH**

- Install the engine mounting bracket RH.

Torque: Bolt A**54 N*m (550 kgf*cm, 40 ft.*lbf)****Nut B****54 N*m (550 kgf*cm, 40 ft.*lbf)****Bolt C****43 N*m (439 kgf*cm, 32 ft.*lbf)****7. INSTALL ENGINE MOUNTING INSULATOR RH**

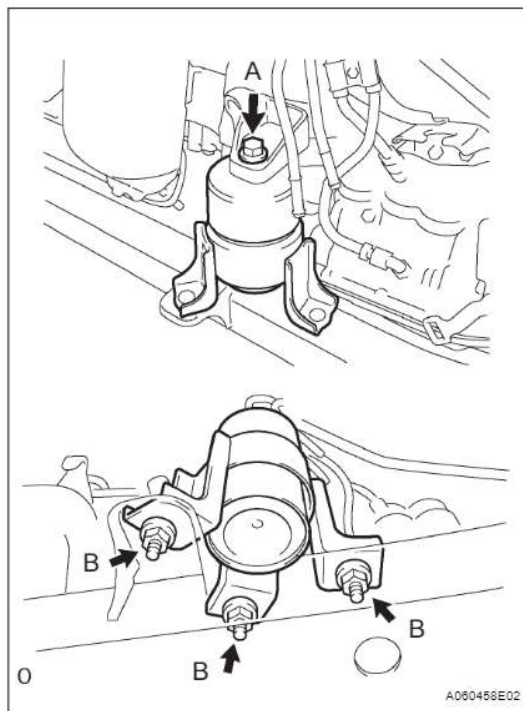
- Install the engine mounting insulator RH.

Torque: Nut A**95 N*m (969 kgf*cm, 70 ft.*lbf)****Nut B****87 N*m (887 kgf*cm, 64 ft.*lbf)**

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3MZ-FE LUBRICATION – OIL PUMP

**8. INSTALL ENGINE MOUNTING INSULATOR**

- (a) Install the engine mounting insulator.

Torque: Bolt A**87 N*m (887 kgf*cm, 64 ft.*lbf)****Nut B****52 N*m (531 kgf*cm, 38 ft.*lbf)****9. INSTALL OIL LEVEL GAGE GUIDE**

- (a) Install a new O-ring to the gage guide.

- (b) Install the gage guide with the bolt.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)**10. INSTALL COMPRESSOR MOUNTING BRACKET NO.1****Torque: 25 N*m (250 kgf*cm, 18 ft.*lbf)****11. INSTALL TIMING BELT NO.3 COVER****12. INSTALL NO.1 TIMING BELT IDLER SUB-ASSEMBLY**

- (a) Using a 10 mm hexagon wrench, install the plate washer and idler pulley with the pivot bolt.

Torque: 34 N*m (347 kgf*cm, 25 ft.*lbf)**13. INSTALL NO.2 TIMING BELT IDLER SUB-ASSEMBLY (See page EM-140)****14. INSTALL CAMSHAFT TIMING PULLEY (See page EM-138)****15. INSTALL COMPRESSOR AND MAGNETIC CLUTCH**
Torque: 25 N*m (250 kgf*cm, 18 ft.*lbf)**16. INSTALL EXHAUST PIPE SUPPORT BRACKET NO.1 (See page EX-4)****17. INSTALL FRONT EXHAUST PIPE ASSEMBLY (See page EX-4)****18. INSTALL EXHAUST PIPE NO.1 SUPPORT BRACKET (See page EX-4)****19. INSPECT TIMING BELT****20. INSTALL TIMING BELT (See page EM-21)****21. INSTALL TIMING BELT TENSIONER ASSEMBLY (See page EM-23)****22. INSTALL TIMING BELT GUIDE NO.2****23. INSTALL ENGINE MOUNTING BRACKET RH****24. INSTALL TIMING BELT NO.2 COVER (See page EM-23)****25. INSTALL TIMING BELT NO.1 COVER (See page EM-24)****26. INSTALL CRANKSHAFT PULLEY (See page EM-143)****27. INSTALL GENERATOR BRACKET NO.2**
Torque: 28 N*m (286 kgf*cm, 21 in.*lbf)**28. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page EM-82)**

3MZ-FE LUBRICATION – OIL PUMP**LU-21**

29. INSTALL ENGINE MOVING CONTROL ROD (See page [EM-83](#))
30. INSTALL VANE PUMP V BELT (See page [EM-6](#))
31. INSTALL V BELT NO.1 (See page [EM-24](#))
32. INSPECT DRIVE BELT TENSION (See page [EM-24](#))
33. INSTALL FRONT SUSPENSION UPPER BRACE CENTER (W/ FRONT SUSPENSION BRACE UPPER CENTER)
Torque: 80 N*m (816 kgf*cm, 59 ft.*lbf)
34. ADD ENGINE OIL
35. CHECK FOR ENGINE OIL LEAKS
36. INSTALL FRONT WHEEL RH
37. CHECK FOR EXHAUST GAS LEAKS

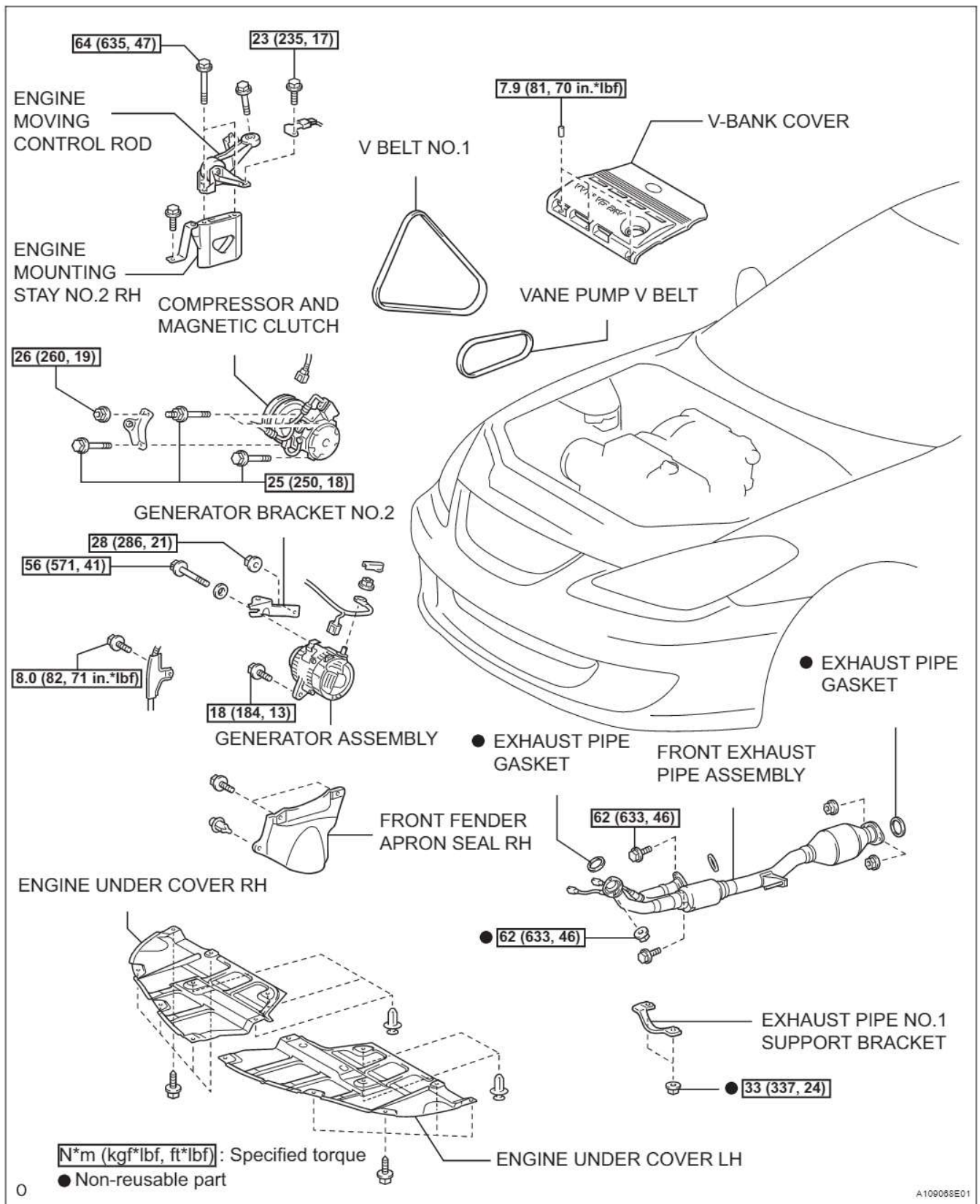
LU

3MZ-FE LUBRICATION – OIL PUMP

LU-5

OIL PUMP

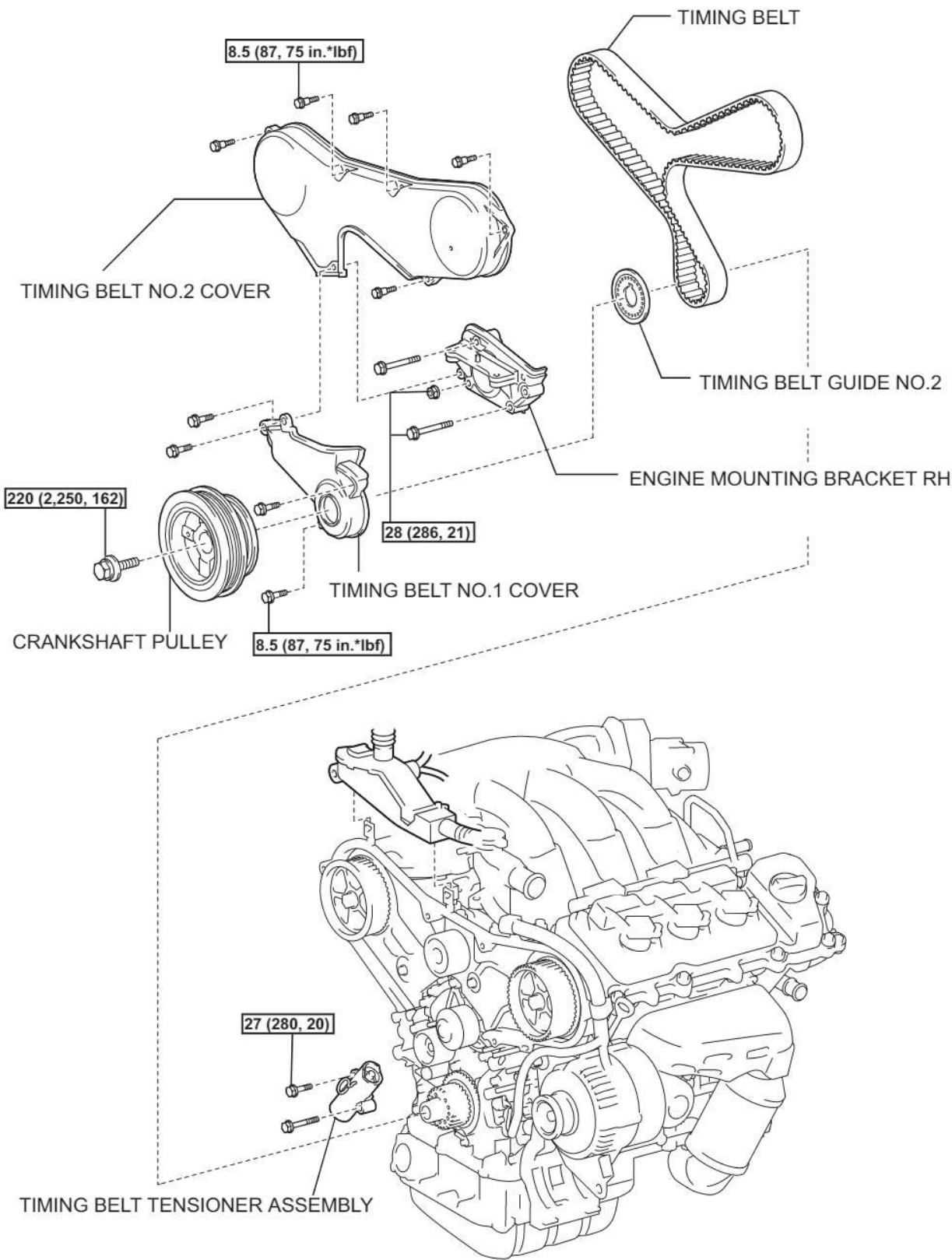
COMPONENTS



LU

LU-6

3MZ-FE LUBRICATION – OIL PUMP



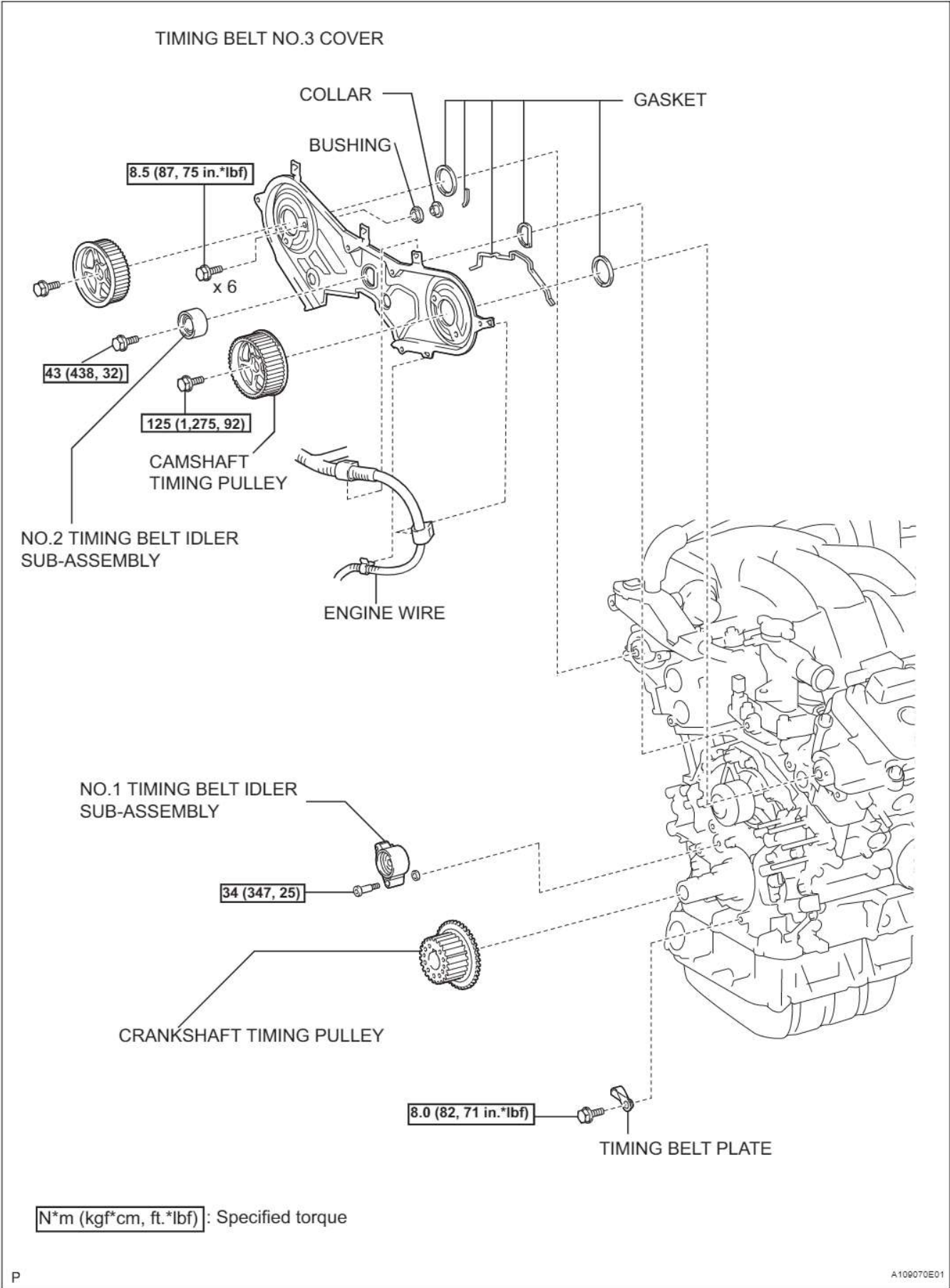
N*m (kgf*cm, ft.*lbf) : Specified torque

P

A109089E01

3MZ-FE LUBRICATION – OIL PUMP

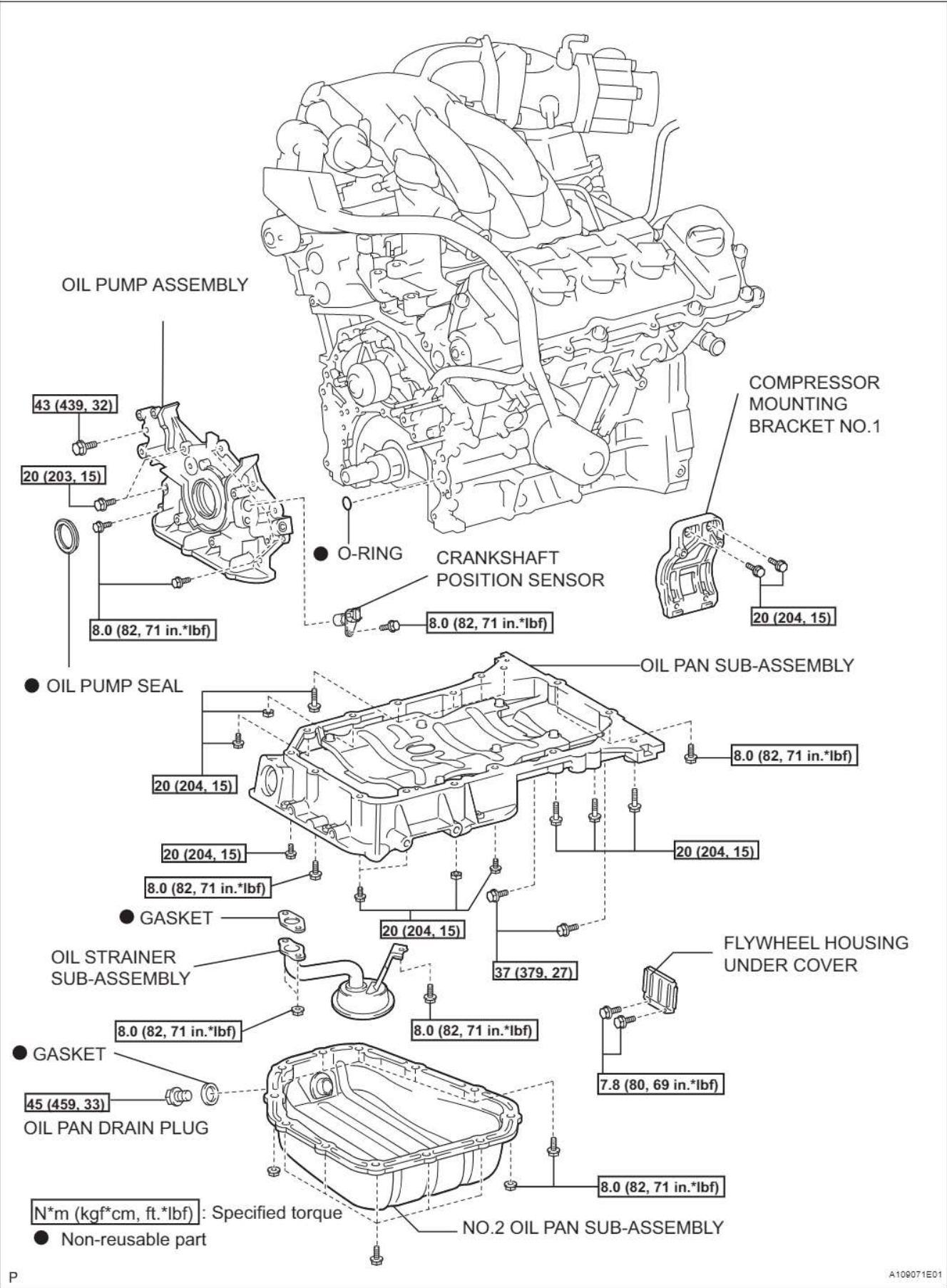
LU-7



LU

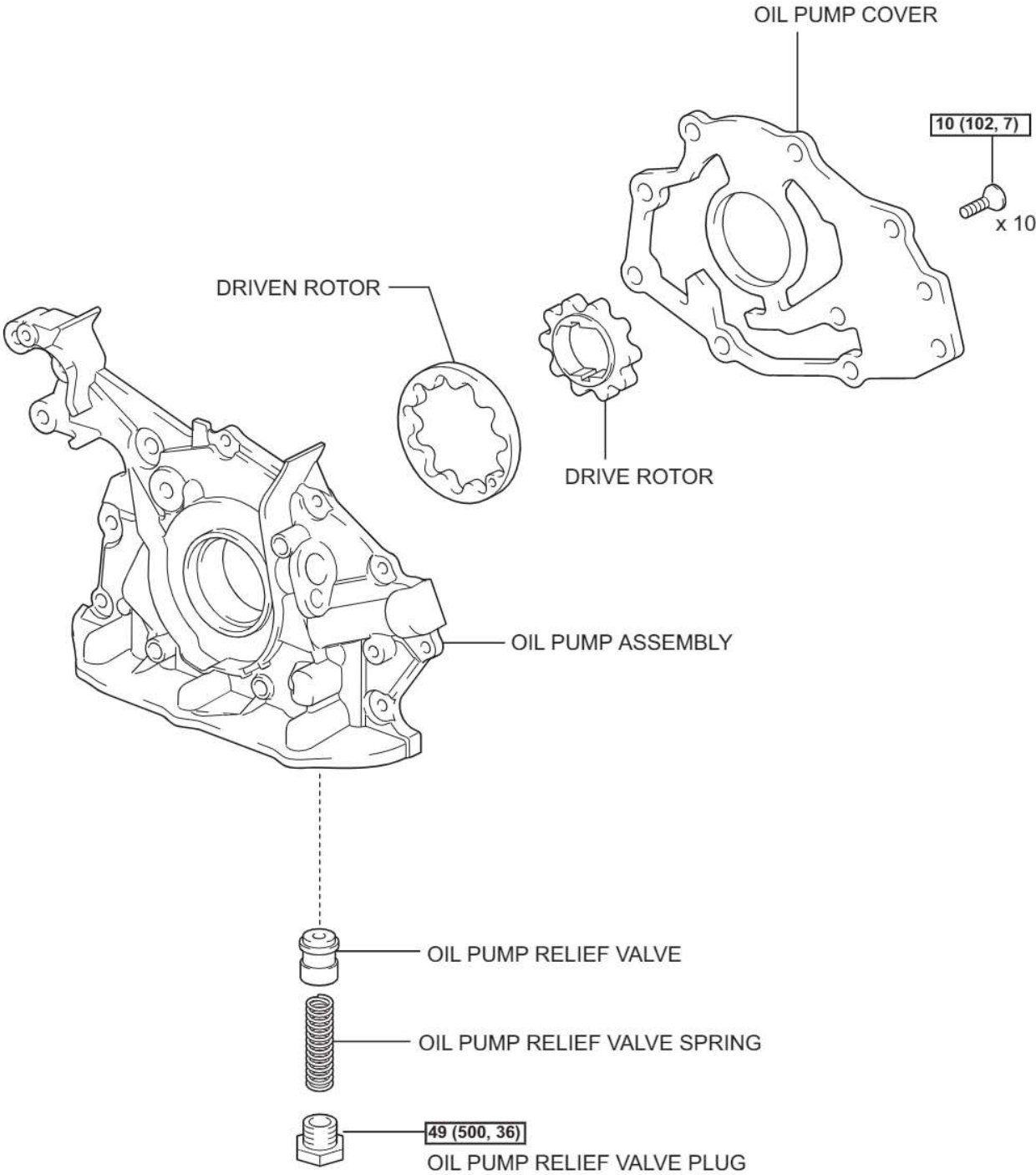
LU-8

3MZ-FE LUBRICATION – OIL PUMP



3MZ-FE LUBRICATION – OIL PUMP

LU-9



N*m (kgf*cm, ft.*lbf) : Specified torque

LU

P

A109072E01