

1. General Description

A: SPECIFICATIONS

Engine	Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement		Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke		mm (in) 99.5 × 79.0 (3.917 × 3.110)	
	Piston displacement		cm ³ (cu in) 2,457 (150)	
	Compression ratio		8.2	
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm ² , psi) 981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	Max. retard	ATDC 5°
			Min. advance	BTDC 15°
		Closing	Max. retard	ABDC 65°
			Min. advance	ABDC 45°
	Exhaust valve timing	Opening	BBDC 55°	
		Closing	ATDC 5°	
	Valve clearance	Intake	mm (in) 0.20 ^{+0.04} _{-0.06} (0.0079 ^{+0.0016} _{-0.0024})	
		Exhaust	mm (in) 0.35±0.05 (0.0138±0.0020)	
	Idling speed [At neutral position on MT]		rpm 700±100 (No load) 800±100 (A/C switch ON)	
Firing order		1 → 3 → 2 → 4		
Ignition timing		BTDC/rpm 17°±10°/700		

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.205 — 0.244 in)	
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)	
	Tensioner bush I.D.		18.0 — 18.08 mm (0.7087 — 0.7118 in)	
	Clearance between spacer and bush	STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)	
		Limit	0.175 mm (0.0069 in)	
	Side clearance of spacer	STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)	
Limit		0.81 mm (0.0319 in)		
Camshaft	Bend limit		0.020 mm (0.0079 in)	
	Thrust clearance	STD	0.068 — 0.116 mm (0.0027 — 0.0046 in)	
		Limit	0.14 mm (0.0055 in)	
	Cam lobe height	Intake	STD	46.55 — 46.65 mm (1.833 — 1.837 in)
			Limit	46.45 mm (1.829 in)
		Exhaust	STD	46.75 — 46.85 mm (1.841 — 1.844 in)
			Limit	46.65 mm (1.837 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance	STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)	
Limit		0.10 mm (0.0039 in)		
Cylinder head	Surface warpage limit		0.05 mm (0.0020 in)	
	Surface grinding limit		0.3 mm (0.012 in)	
	Standard height		127.5 mm (5.02 in)	
Valve seat	Refacing angle		90°	
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter		6.000 — 6.012 mm (0.2362 — 0.2367 in)	
	Protrusion above head		15.8 — 16.2 mm (0.622 — 0.638 in)	
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter	Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)	
		Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)	
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
	Limit	—	0.15 mm (0.0059 in)	
Overall length	Intake	104.4 mm (4.110 in)		
	Exhaust	104.65 mm (4.120 in)		
Valve spring	Free length		47.32 mm (1.863 in)	
	Squareness		2.5°, 2.1 mm (0.083 in)	
	Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)	
		Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.50 mm (1.043 in)	

GENERAL DESCRIPTION

MECHANICAL

Cylinder block	Surface warpage limit (mating with cylinder head)		0.05 mm (0.0020 in)	
	Surface grinding limit		0.1 mm (0.004 in)	
	Standard height		201.0 mm (7.91 in)	
	Cylinder bore	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper	STD	0.015 mm (0.0006 in)	
		Limit	0.050 mm (0.0020 in)	
	Out-of-roundness	STD	0.010 mm (0.0004 in)	
		Limit	0.050 mm (0.0020 in)	
Piston clearance	STD	-0.010 — 0.010 mm (-0.0004 — 0.0004 in)		
	Limit	0.030 mm (0.0012 in)		
Enlarging (boring) limit		0.5 mm (0.020 in)		
Piston	Outer diameter	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS	99.745 — 99.765 mm (3.9270 — 3.9278 in)	
		0.50 mm (0.0197 in) OS	99.995 — 100.015 mm (3.9368 — 3.9376 in)	
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit		Piston pin must be fitted into position with thumb at 20°C (68°F).	
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
	Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)	
		Limit	1.5 mm (0.059 in)	
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
Second ring		STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)	
		Limit	0.15 mm (0.0059 in)	
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance	STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)	
		Limit	0.4 mm (0.016 in)	
Connecting rod bearing	Oil clearance		STD	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion	STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)	
		0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)	
		0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)	
		0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)	
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit		0.035 mm (0.0014 in)	
	Crank pin and crank journal	Out-of-roundness	0.005 mm (0.0002 in) or less	
		Grinding limit	0.25 mm (0.0098 in)	
	Crank pin outer diameter	STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)	
		0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)	
		0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)	
		0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)	
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance	STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)	
		Limit	0.25 mm (0.0098 in)	
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
#3		STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	
#4		STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)	
		Limit	0.045 mm (0.0018 in)	
#5		STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	

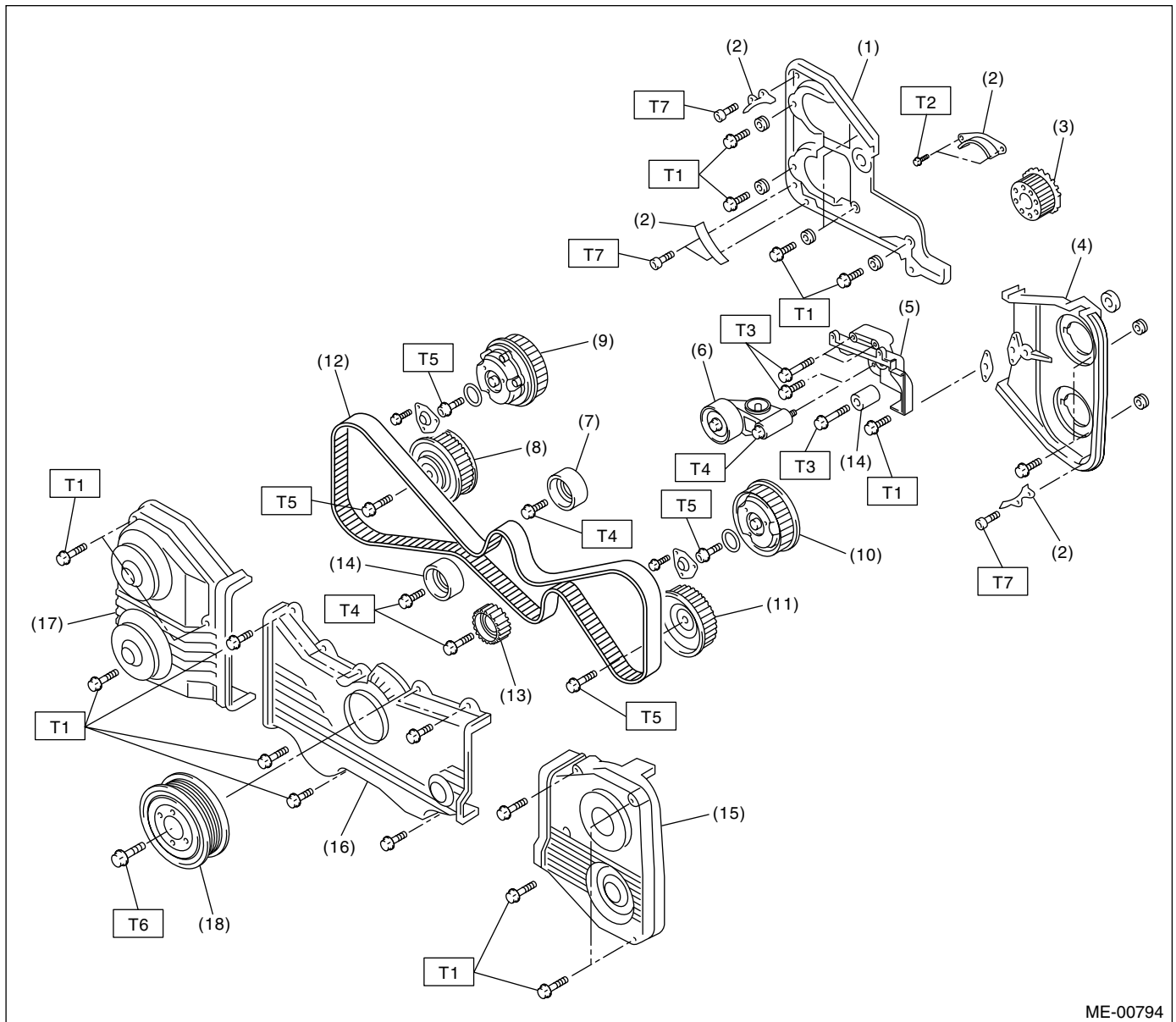
GENERAL DESCRIPTION

MECHANICAL

Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. TIMING BELT

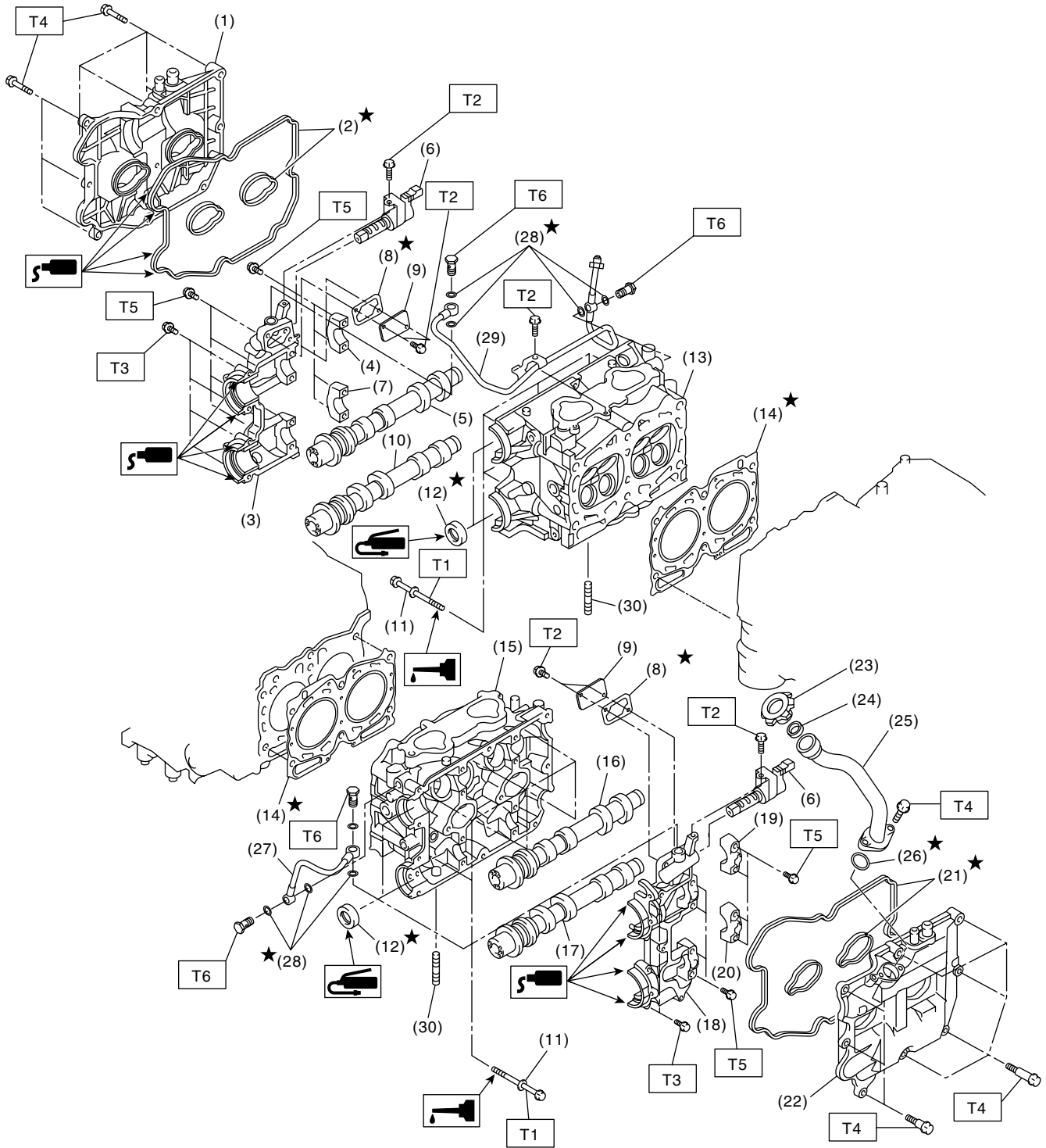


ME-00794

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|--|-------------------------------------|
| (1) Timing belt cover No. 2 (RH) | (11) Exhaust camshaft sprocket (LH) |
| (2) Timing belt guide | (12) Timing belt |
| (3) Crankshaft sprocket | (13) Belt idler No. 2 |
| (4) Timing belt cover No. 2 (LH) | (14) Belt idler |
| (5) Tensioner bracket | (15) Timing belt cover (LH) |
| (6) Automatic belt tension adjuster ASSY | (16) Front belt cover |
| (7) Belt idler | (17) Timing belt cover (RH) |
| (8) Exhaust camshaft sprocket (RH) | (18) Crankshaft pulley |
| (9) Intake camshaft sprocket (RH) | |
| (10) Intake camshaft sprocket (LH) | |

- Tightening torque: N-m (kgf-m, ft-lb)**
- T1: 5 (0.5, 3.6)**
T2: 10 (1.0, 7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: <Ref. to ME(STI)-56, INSTALLATION, CRANKSHAFT SPROCKET.>
T6: <Ref. to ME(STI)-44, INSTALLATION, CRANKSHAFT PULLEY.>
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT



ME-00765

(1) Rocker cover (RH)	(13) Cylinder head (RH)	(27) Oil pipe (LH)
(2) Rocker cover gasket (RH)	(14) Cylinder head gasket	(28) Gasket
(3) Camshaft cap (Front RH)	(15) Cylinder head (LH)	(29) Oil pipe (RH)
(4) Intake camshaft cap (RH)	(16) Intake camshaft (LH)	(30) Stud bolt
(5) Intake camshaft (RH)	(17) Exhaust camshaft (LH)	
(6) Variable valve timing solenoid valve	(18) Camshaft cap (Front LH)	
(7) Exhaust camshaft cap (Center RH)	(19) Intake camshaft cap (Rear LH)	
(8) Gasket	(20) Exhaust camshaft cap (Rear LH)	
(9) Oil return cover	(21) Rocker cover gasket (LH)	
(10) Exhaust camshaft (RH)	(22) Rocker cover (LH)	
(11) Cylinder head bolt	(23) Oil filler cap	
(12) Oil seal	(24) Gasket	
	(25) Oil filler duct	
	(26) O-ring	

Tightening torque: N·m (kgf·m, ft·lb)

**T1: <Ref. to ME(STi)-63,
INSTALLATION, CYLINDER
HEAD ASSEMBLY.>**

T2: 8 (0.8, 5.9)

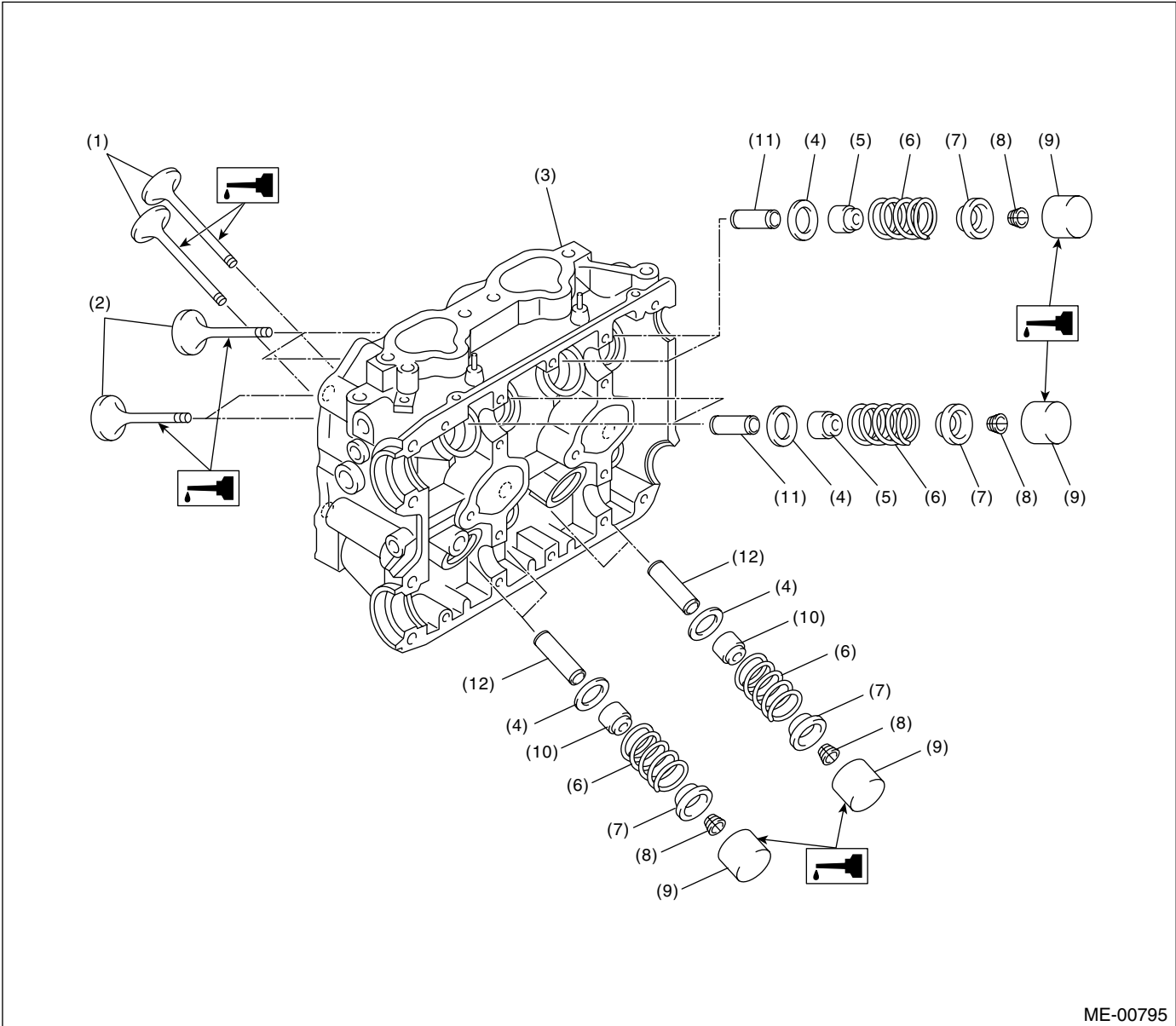
T3: 10 (1.0, 7)

T4: 6.4 (0.65, 4.7)

T5: 20 (2.0, 14.5)

T6: 29 (3.0, 21.4)

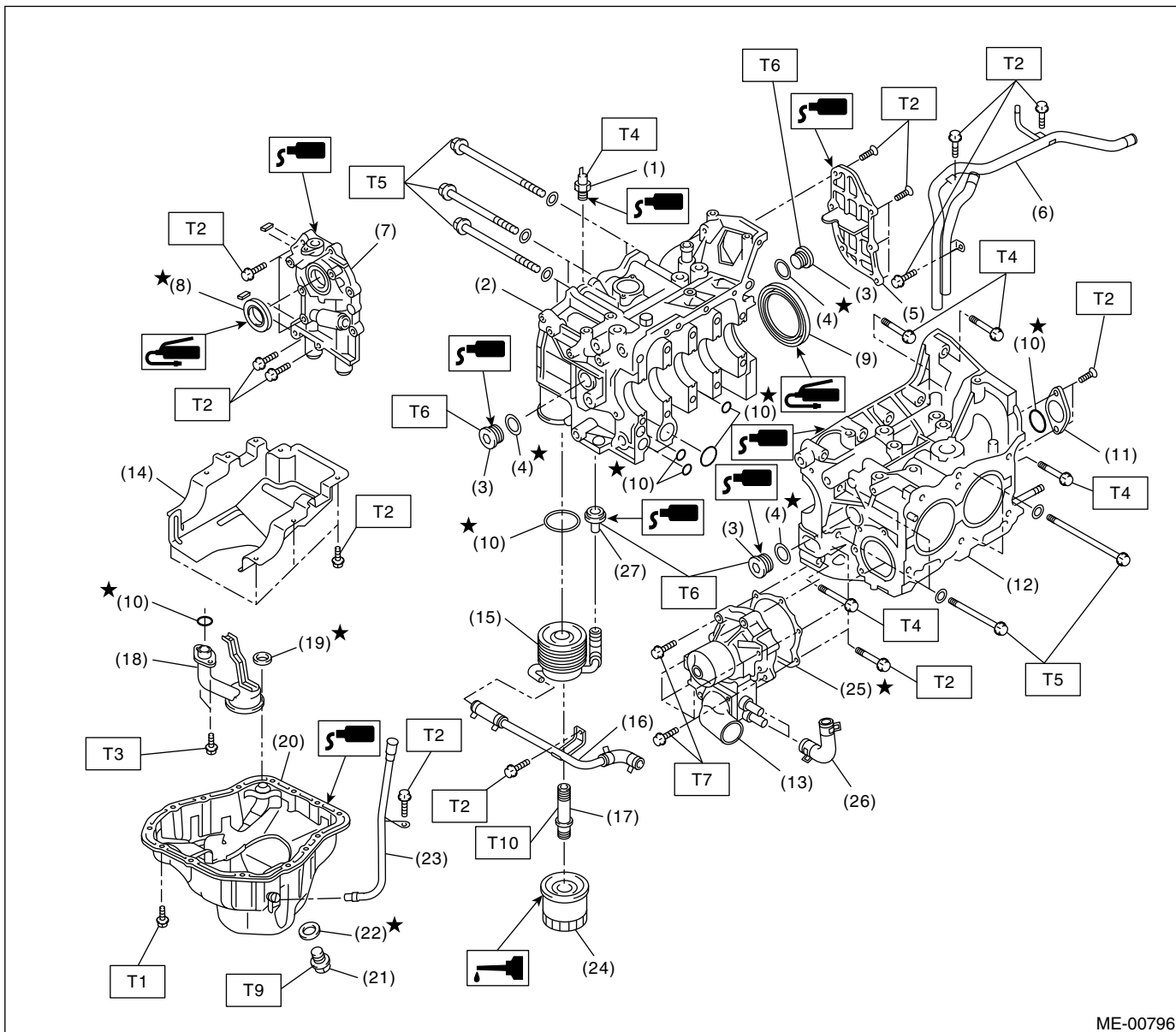
3. CYLINDER HEAD AND VALVE ASSEMBLY



ME-00795

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|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Valve lifter |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (3) Cylinder head | (7) Retainer | (11) Intake valve guide |
| (4) Valve spring seat | (8) Retainer key | (12) Exhaust valve guide |

4. CYLINDER BLOCK



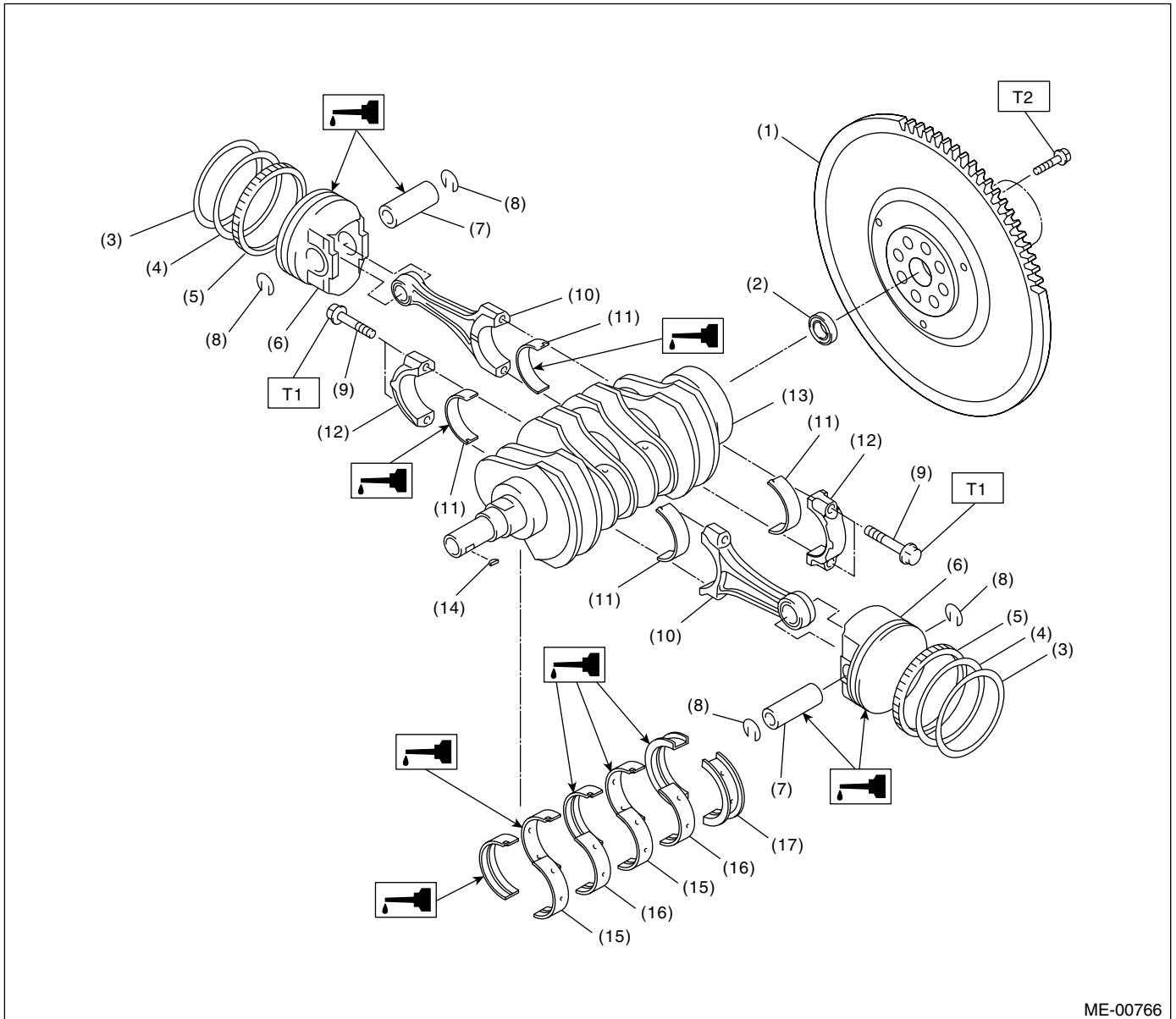
ME-00796

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|--------------------------|----------------------------|
| (1) Oil pressure switch | (16) Water by-pass pipe |
| (2) Cylinder block (RH) | (17) Connector |
| (3) Service hole plug | (18) Oil strainer |
| (4) Gasket | (19) Gasket |
| (5) Oil separator cover | (20) Oil pan |
| (6) Water by-pass pipe | (21) Drain plug |
| (7) Oil pump | (22) Metal gasket |
| (8) Front oil seal | (23) Oil level gauge guide |
| (9) Rear oil seal | (24) Oil filter |
| (10) O-ring | (25) Gasket |
| (11) Service hole cover | (26) Water pump hose |
| (12) Cylinder block (LH) | (27) Plug |
| (13) Water pump | |
| (14) Baffle plate | |
| (15) Oil cooler | |

Tightening torque: N-m (kgf-m, ft-lb)

- T1: 5 (0.5, 3.6)**
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(STi)-74, INSTALLATION, CYLINDER BLOCK.>
T6: 69 (7.0, 50.9)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 54 (5.5, 40)

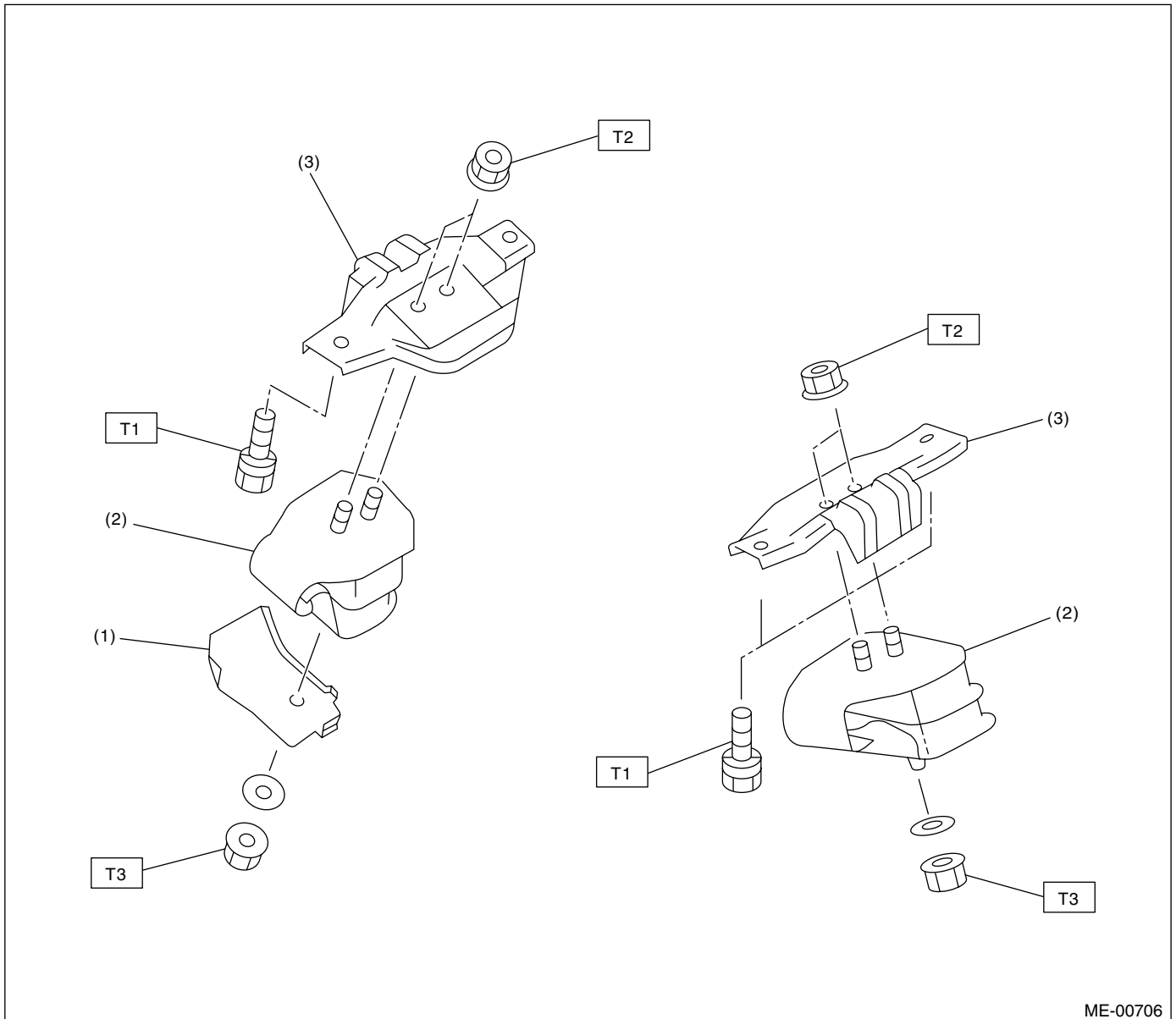
5. CRANKSHAFT AND PISTON



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|------------------|-----------------------------|--------------------------------|
| (1) Flywheel | (8) Circlip | (15) Crankshaft bearing #1, #3 |
| (2) Ball bearing | (9) Connecting rod bolt | (16) Crankshaft bearing #2, #4 |
| (3) Top ring | (10) Connecting rod | (17) Crankshaft bearing #5 |
| (4) Second ring | (11) Connecting rod bearing | |
| (5) Oil ring | (12) Connecting rod cap | |
| (6) Piston | (13) Crankshaft | |
| (7) Piston pin | (14) Woodruff key | |

Tightening torque: N-m (kgf-m, ft-lb)
T1: 52 (5.3, 38.4)
T2: 75 (7.6, 55.3)

6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
- (2) Front cushion rubber
- (3) Front engine mounting bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 30.9)

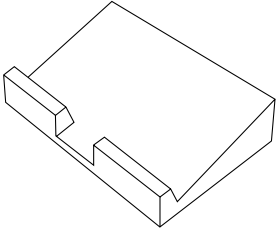
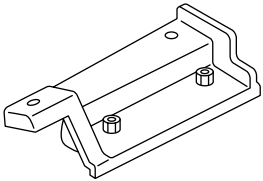
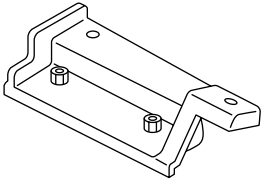
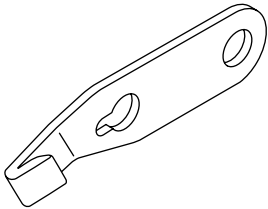
T3: 85 (8.7, 62.7)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498267600</p>	498267600	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve springs.
 <p>ST-498457000</p>	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 <p>ST-498457100</p>	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 <p>ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.