GROUP 11

ENGINE

CONTENTS

GENERAL DESCRIPTION

M2110200001USA0000010000

This vehicle is equipped with the newly developed 6B31 engine, a 3.0L V6 Single Over Head Camshaft (SOHC) 24-valve engine.

The features of this engine are as follows:

- The 3.0L engine employs the Mitsubishi Innovative Valve timing and lift Electronic Control system (MIVEC).
- An aluminum alloy cylinder block is used to be lightweight and compact.
- The cylinders are offset from the center of the crankshaft.

MAJOR SPECIFICATIONS

ITEMS		SPECIFICATIONS
Total displacement cm^3(cu in)		2,998 (182.9)
Bore × Stroke mm (in)		87.6 (3.45) × 82.9 (3.26)
Compression ratio		9.5
Combustion chamber		Pentroof type
Camshaft arrangement		SOHC
Valve timing	Intake Open	-1° BTDC Low speed cam
		18° BTDC High speed cam
	Intake Close	37° ABDC Low speed cam
		86° ABDC High speed cam
	Exhaust Open	55° BBDC
	Exhaust Close	17° ATDC
Maximum output kW/r/min (HP/r/min)		164/6,250(220/6,250)
Maximum torque N·m/r/min (lbs-ft/r/min)		276/4,000(204/4,000)
Lash adjuster		Exhaust side only
Fuel system		Electronic-controlled multiport fuel injection
Ignition system		Electronic-controlled 6-coil

BASE ENGINE

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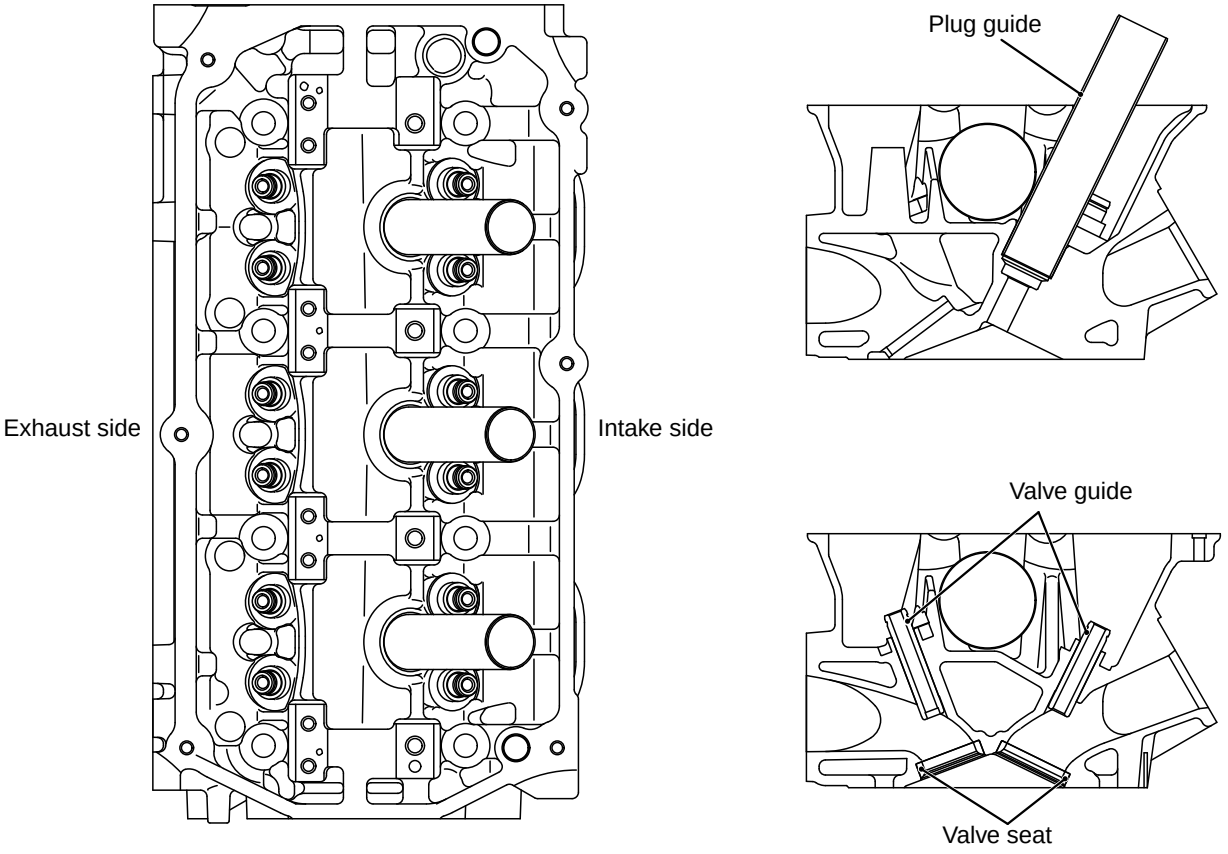
CYLINDER HEAD



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A cylinder head made of an aluminum alloy, which is lightweight and offers a high level of cooling efficiency, has been adopted. A pent roof combustion chamber with a center spark plug has been adopted. It has a small valve compound angle to create a compact chamber.

Cross-flow type intake and exhaust ports have been adopted. Two intake ports and two exhaust ports are provided independently on the right and left sides.
Four camshaft bearings are provided at the intake and exhaust sides, respectively. The No. 4 bearing sustains the thrust load of the camshaft.

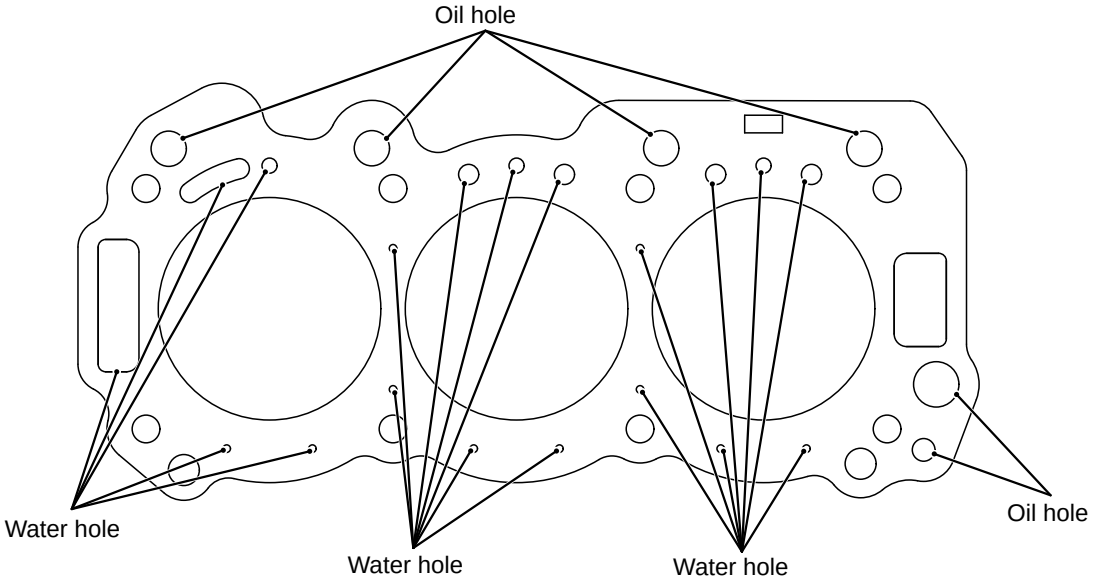
VALVE SEAT

The valve stem seals use springs with good seal performance to prevent oil draining down.
The oversize valve guides are available as spare parts: 0.3.

VALVE GUIDE

A sintered alloy material is used for the valve guides.
The three kinds of the oversize valve guides are available as spare parts: 0.05, 0.25 and 0.50.

CYLINDER HEAD GASKET



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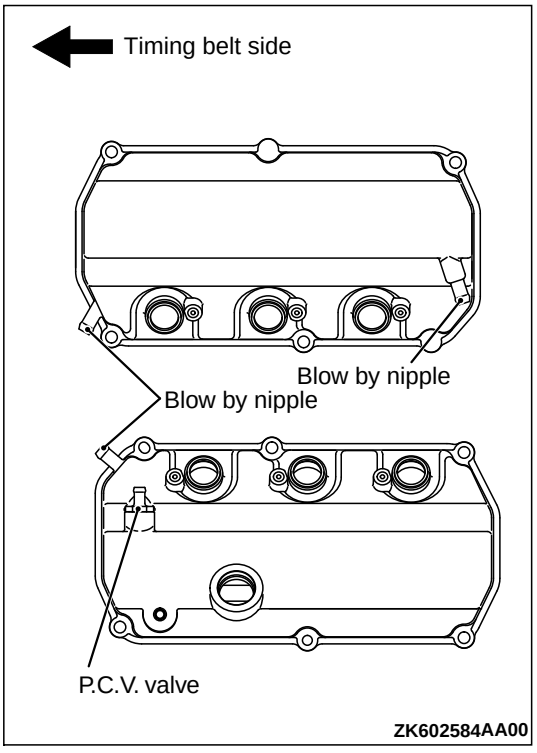
A 2-layer metal gasket with good sealability and heat resistance is used for the cylinder head gasket.



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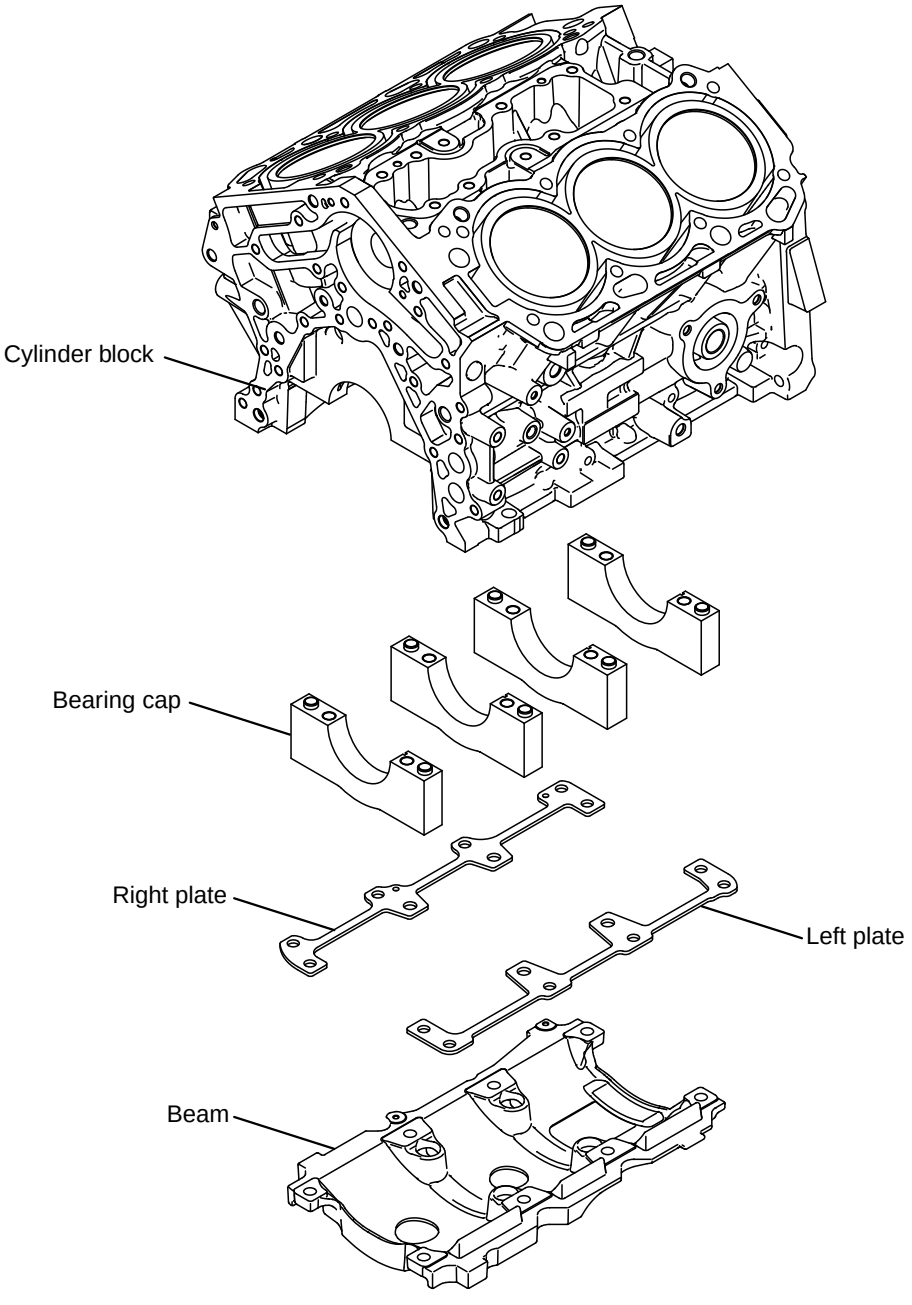
ROCKER COVER

A lightweight resin material is used for the cylinder gasket cover.

CYLINDER BLOCK



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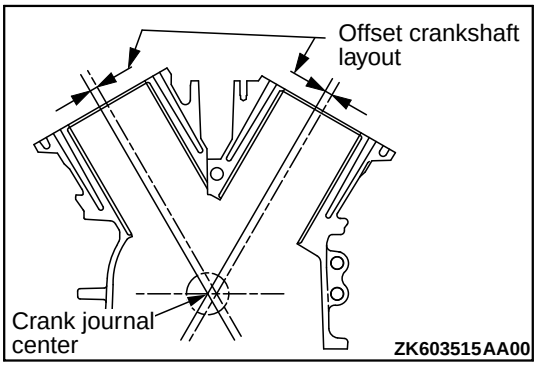
An aluminum alloy material is used for the cylinder block to be lightweight.
The crankshaft journal has 4 bearings. The No.3 bearing carries the thrust load of the crankshaft.
A full Siamese type water jacket is used.

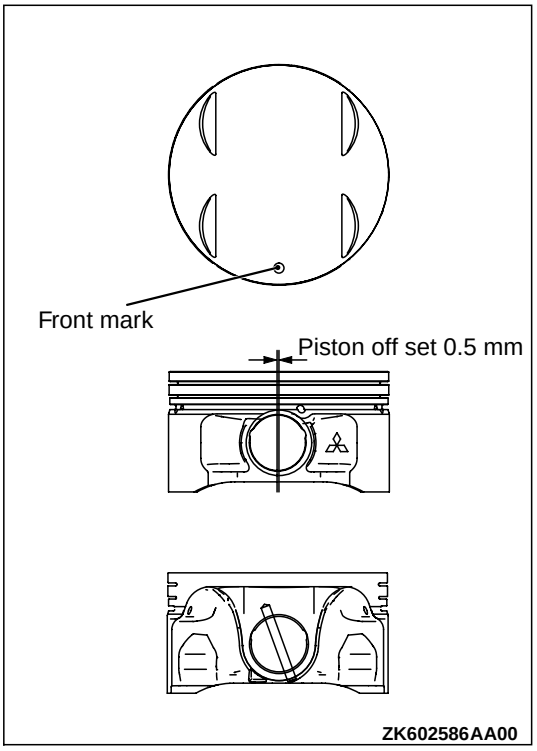
Items	Specifications
Bore mm (in.)	87.6(3.45)
Bore pitch mm (in.)	98(3.86)
Stroke mm (in.)	82.9(3.26)



The cylinders are offset from the center of the crankshaft.

PISTON

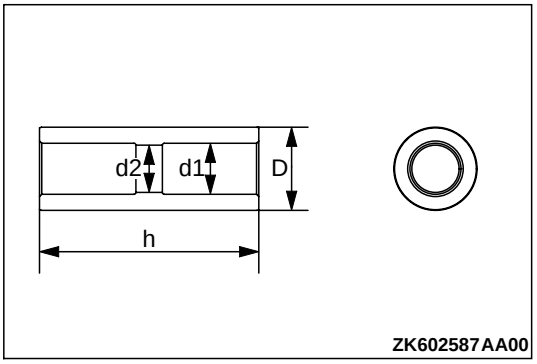
Special aluminum alloy is adopted to improve heat efficiency and achieve lower weight.
That contributes to higher engine performance and better fuel economy. Piston pinhole center is offset by 0.5 mm from piston center towards the thrust side.
Out side surface of piston skirt has striation-like finishing better oil holding ability (and superior durability against scuffing.)



Items	Specifications
Basic diameter mm (in.)	87.6(3.45)
Pin hole diameter mm (in.)	22(0.87)
Overall height mm (in.)	47.78(1.88)

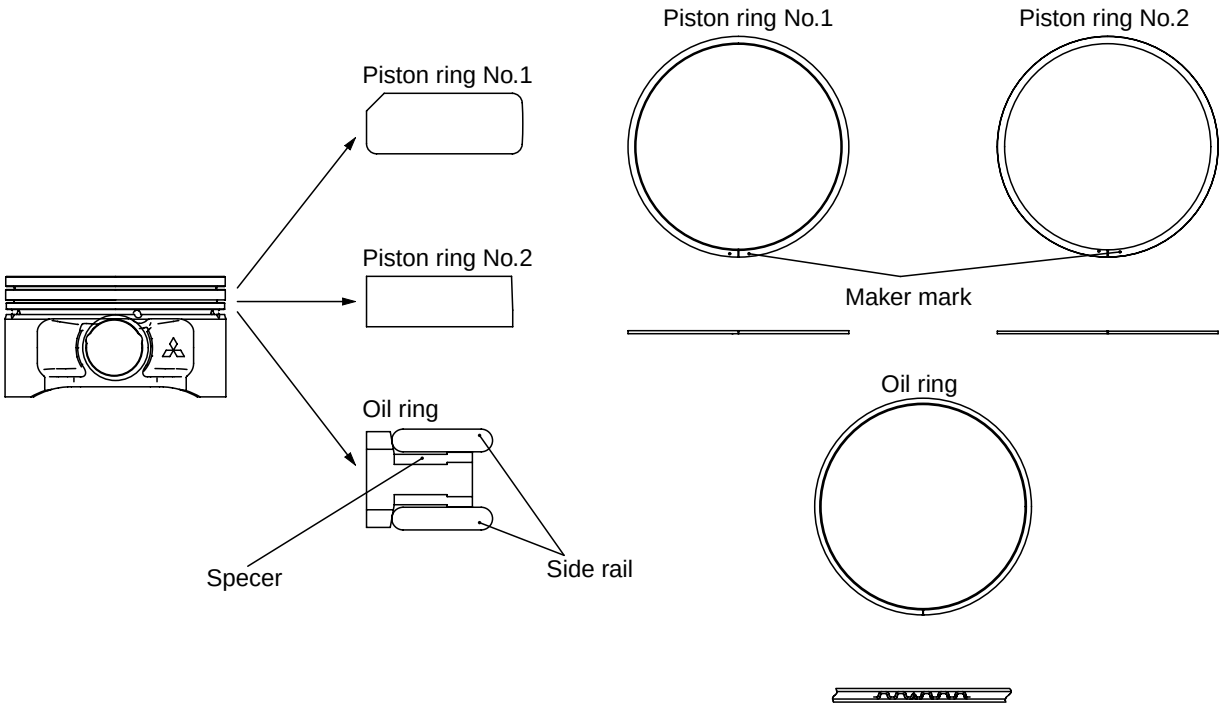
PISTON PIN

Semi-floating piston pin is adopted. Piston pin is into the small end of connecting rod so that it floats in piston.



Items	Specifications
Outer diameter (D) mm (in.)	22(0.87)
Inner diameter (d1) mm (in.)	13.5(0.53)
Inner diameter (d2) mm (in.)	12.5(0.49)
Overall length (h) mm (in.)	58(2.28)

PISTON RING



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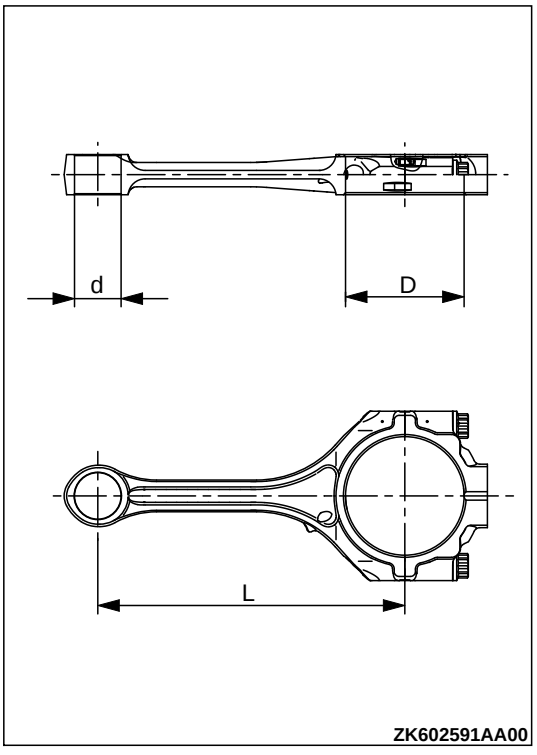
Piston ring consists of ring No.1, No. 2, and oil ring.

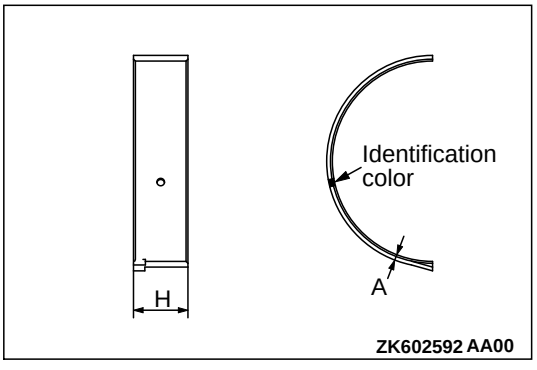
Items	Piston ring No.1	Piston ring No.2	Oil ring
Shape	Barrel	Taper	3-piece, Barrel
Surface treatment (cylinder contact surface)	Chrome nitride (PVD)	Parkerizing + resin coating	Hard plated Parkerizing
Supplier mark	1T	2T	None



CONNECTING ROD

High strength carbon steel (forging) material is adopted.
Rod has "H" shaped cross section.
Big-end is lubricated through crankshaft oil passage between main journal and pin.

Items	Specifications
Small end hole diameter (d) mm (in.)	22(0.87)
Big end hole diameter (D) mm (in.)	56(2.20)
Center-to-center distance (L) mm (in.)	145(5.71)

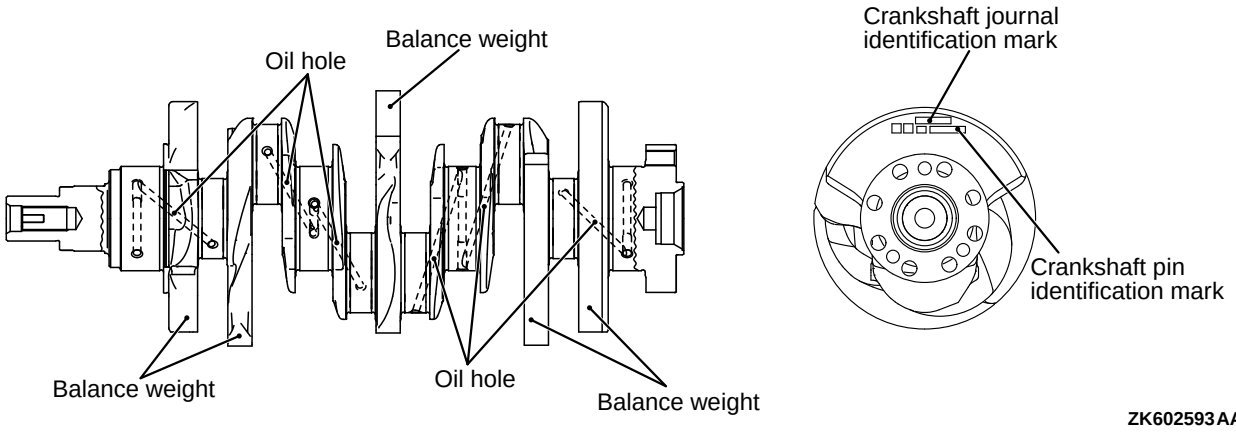


CONNECTING BEARING

Upper and lower bearings are same parts.
This part consists of overlay (surface), copper alloy plate (middle) and steel plate (back side).
To reduce friction loss, width of connecting rod bearing is designed as short as possible composed with crankshaft journal.

Items	Specifications
Width (H) mm (in.)	14.4(0.57)
Thickness (A) mm (in.)	1.5(0.06)

CRANKSHAFT

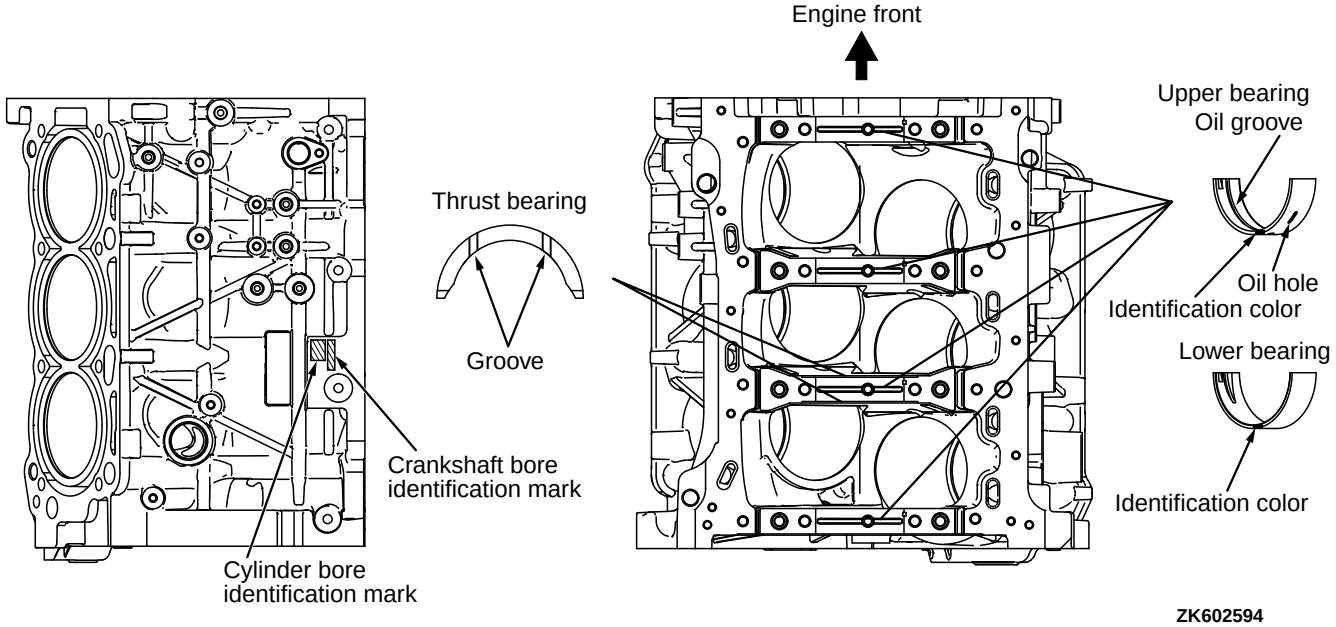


Forging steel is adopted.
This crankshaft has 4-main bearings and 5-balancing weights.
Crankshaft pins are located in every 60 degrees.
Lubrication oil is lead from main journal to pin.

Timing belt sprocket and crankshaft pulley are assembled at front end.

Items	Specifications
Pin outer diameter mm (in.)	53(2.09)
Journal outer diameter mm (in.)	69(2.72)

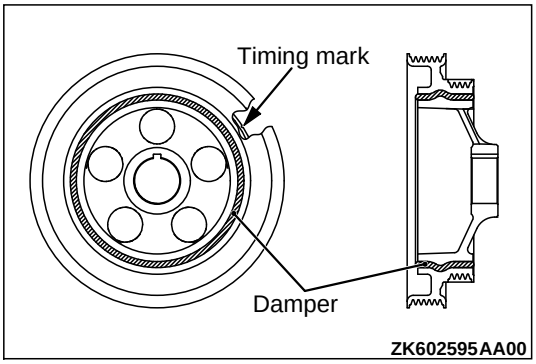
CRANKSHAFT BEARING AND THRUST BEARING



Main bearing consists of aluminum alloy (surface) and steel plate (backside).
Thrust bearing, which controls axial movement of crankshaft, is assembled at No.3 journal.

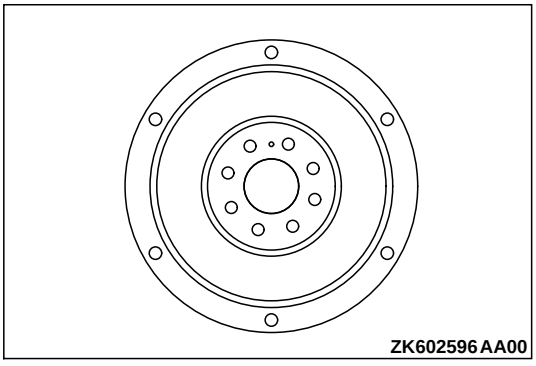
Items		Specifications
Crankshaft bearing	Width	18.5(0.73)

Items		Specifications
	mm (in.)	
	Thickness mm (in.)	2.0(0.08)
Crankshaft thrust bearing	Thickness mm (in.)	2.0(0.08)



CRANKSHAFT PULLEY

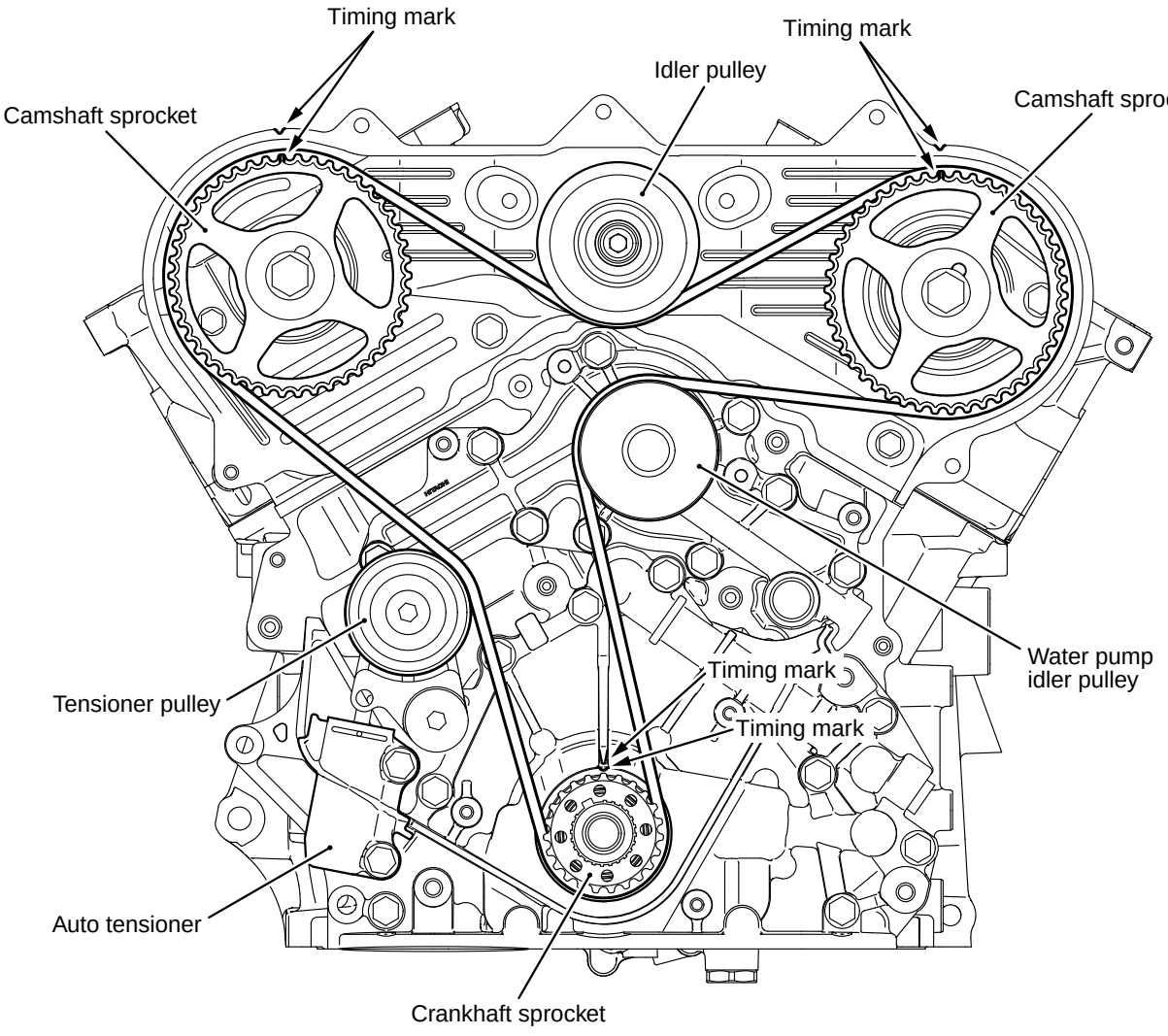
The outer ring has 6-rib for power steering pump and 4-rib for alternator and air-compressor drive belt.
Timing mark notch is applied at the flange of 4-rib side.



DRIVE PLATE

The drive plate is made of sheet metal.
The drive plate is mounted with 8 bolts.

TIMING BELT



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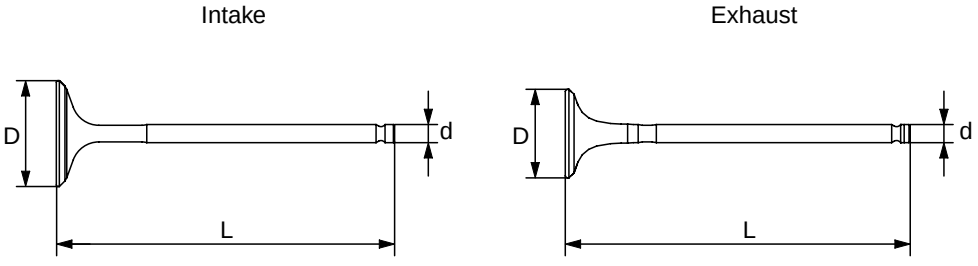
By using the highly strengthen timing belt, the belt is narrow and long-lasting. This allows the friction to be decreased, and the engine weight to be lightweight.

By abolishing a traditional eccentric pulley, the tensioner is designed to be lightweight.
By applying the projection of the timing belt cover, the timing belt is prevented from coming off the tooth.

VALVE



ZK602600

The valve is made of heat resistant steel and has nitride processing on its entire surface.

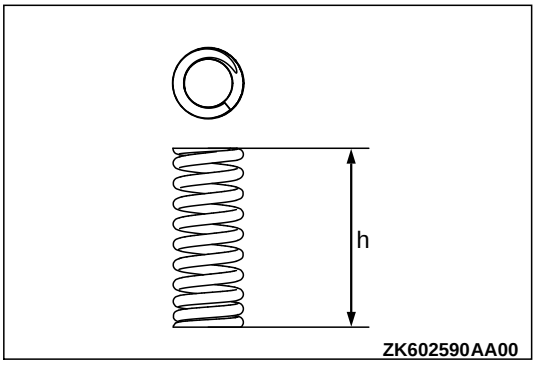
Items	Intake valve	Exhaust valve
Head diameter (D) mm (in.)	35.0(1.38)	29.5(1.16)
Stem diameter (d) mm (in.)	6.0(0.24)	6.0(0.24)
Overall length (L) mm (in.)	111.84(4.40)	114.04(4.49)

VALVE STEM SEAL

Oil is prevented from seeping down by using a good sealing spring on the valve stem seal.

VALVE SPRINGS

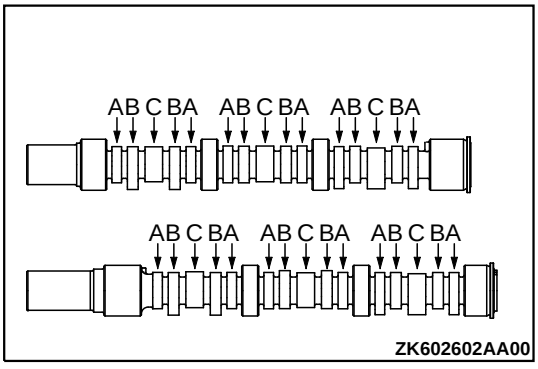
To prevent surging during high speed, variable pitch springs are used.



Items	Intake valve	Exhaust valve
Free height (h) mm (in.)	59.15(2.33)	57.7(2.27)
Total number of windings	10.61	9.39

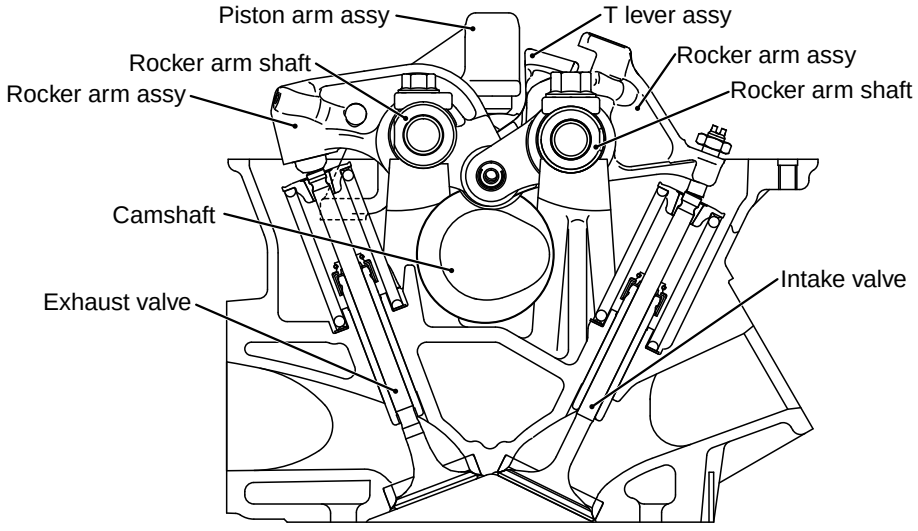
CAMSHAFT

The camshaft has the two kinds of the cams, for high speed and low speed, at the intake side.



Items	Cam height mm (in)
A: Intake low speed cam	37.28(1.468)
B: Intake low speed cam	36.23(1.426)
C: Exhaust cam	37.84(1.490)

MITSUBISHI INNOVATIVE VALVE TIMING AND LIFTING ELECTRONIC CONTROL SYSTEM (MIVEC)



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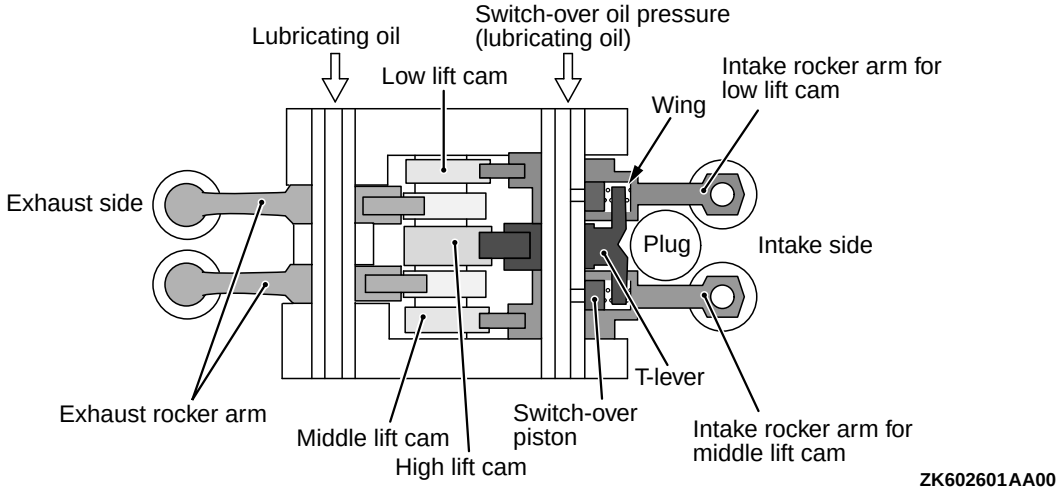

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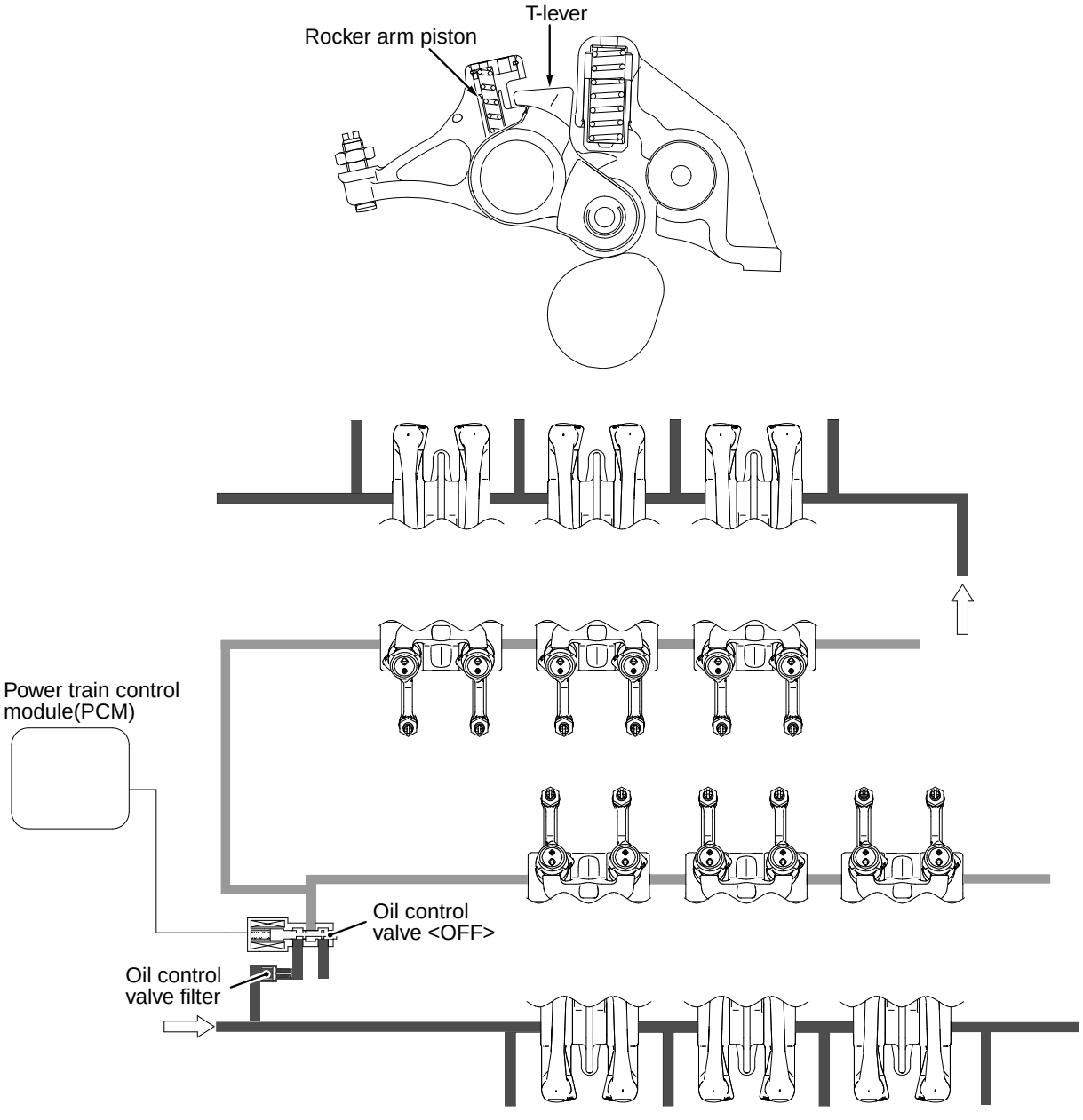
MIVEC has an additional switching system on the two intake valves in the conventional SOHC 4 valve engine. This switching system has two cams for the low mode having a difference between the valve-lifts and for the high mode keeping both valve lifts high.
In the range of the low engine speed, the flow within the valves is enhanced by the difference between the valve-lifts. Also, the stabilization of the combustion is designed for low fuel economy, low exhaust gas and high torque. At high engine speeds, the high output due to the increment in the intake air amount is reached by increasing the open valve period and the lift.
A T-lever moves following the high lift cams and is arranged between the high lift cam and two rocker arms, in addition to the low & middle lift cams and two rocker arms that drive the two intake valves respectively.
In the range of the low engine speed, the low and the middle lift cams drive each valve respectively because the wing of the T-lever moves freely. At high engine speeds, the oil pressure moves the switch-over piston within the rocker arm. The T-lever reaches the rocker arm and pushes it, and then the high lift cam lifts both valves.

The cam switching is carried out when the torque produced in the low speed mode and the one produced in the high-speed mode crosses each other at an engine speed. An accumulator ensures oil pressure at the instant of switching and prevents switching mistakes.

The oil passage is divided into two, one for the intake rocker shaft and the other for the exhaust rocker shaft, just in front of the oil control valve (OCV). Oil is always supplied to the exhaust rocker shaft.
Oil supply to the intake rocker shaft is controlled by ON/OFF of the oil control valve (OCV) and carries out the switching for the low, middle and high lift cams.



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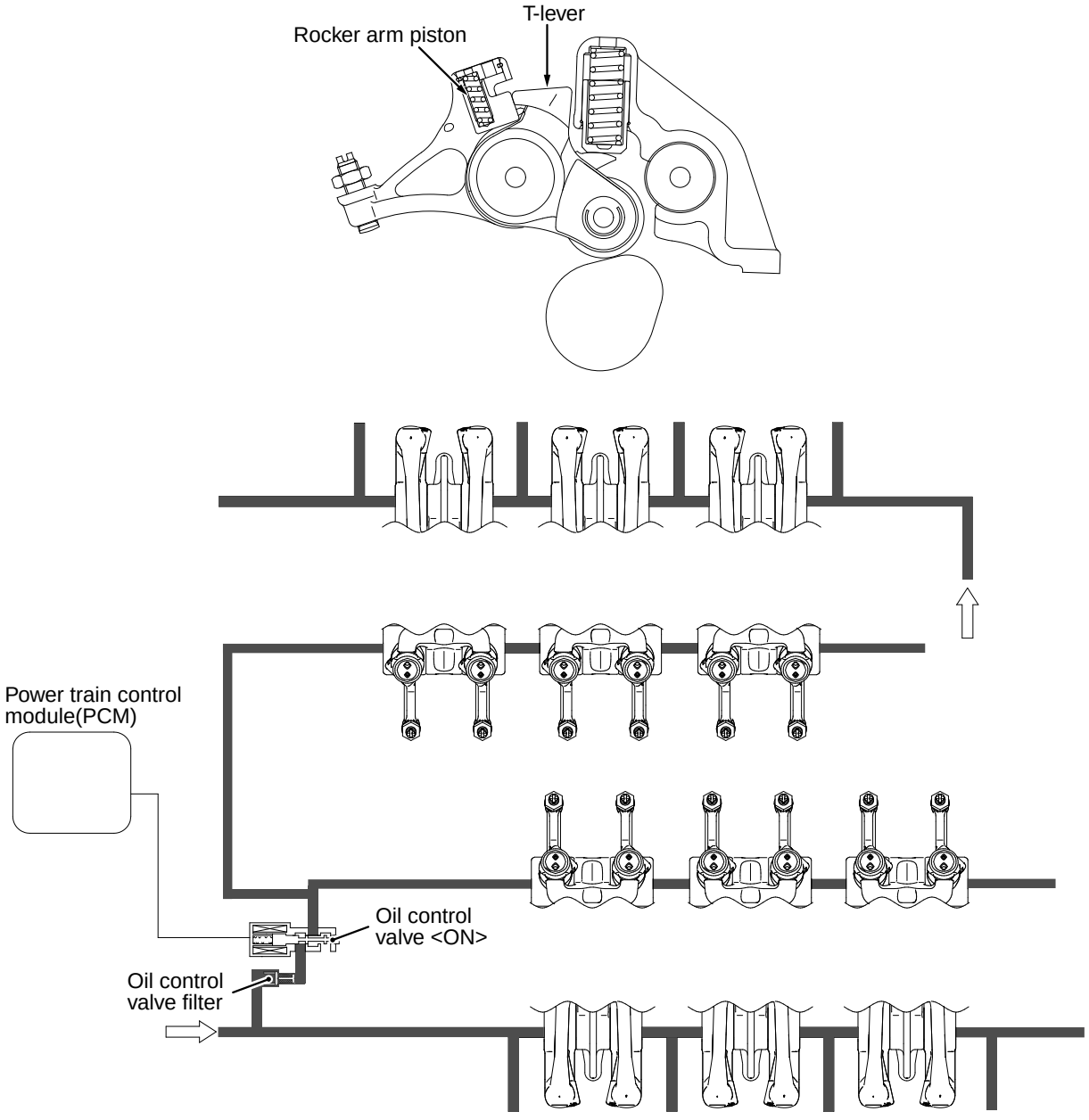
When the OCV is in the OFF position, the switch-over piston does not operate because the switch-over oil pressure within the intake rocker shaft is below the specified pressure, and so the wing of the T-lever does not reach the switch-over piston. Accordingly, the intake valve is driven by the rocker arm for low and middle lift cam.



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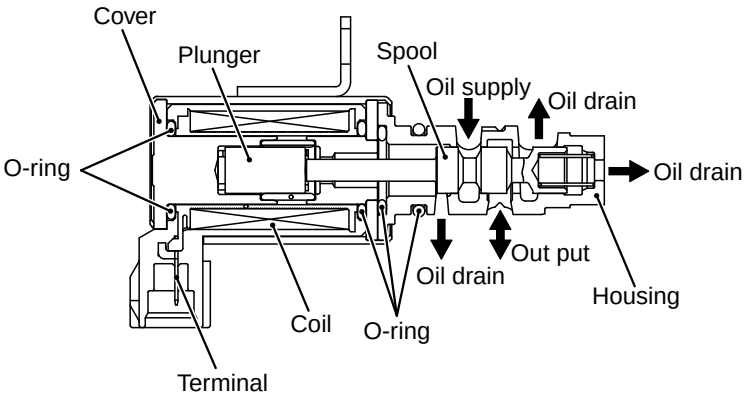
When the OCV is in the ON position, the switch-over piston is pushed by the oil pressure because the switch-over oil pressure within the intake rocker shaft is above the specified pressure, and so the wing of the T-lever reaches the switch-over piston. Accordingly, the intake valve is driven by the T-lever.

OIL FEEDER CONTROL VALVE



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The oil feeder control valve uses electromagnetic valve mechanism to change oil pressure to rocker arm and rocker shaft that drive MIVEC.
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