

---

**GROUP 11**

# **ENGINE MECHANICAL**

## **CONTENTS**

<b>GENERAL INFORMATION .....</b>	<b>11-2</b>	<b>BASE ENGINE .....</b>	<b>11-3</b>
----------------------------------	-------------	--------------------------	-------------

## GENERAL INFORMATION

M2112000100761

The 4G69-SOHC-MIVEC engine is based on 4G64-SOHC engine installed on SPACE WAGON, but employs the new Mitsubishi Innovative Valve timing & lifting Electronic Control system (MIVEC). The followings are main design changes:

- The cylinder head is designed to reexamine the port profile and to improve the coolant flow.
- The rocker cover is designed to reduce noise by using aluminium die-casting.
- The cylinder block is designed to be lightweight.
- The piston diameter is larger and has molybdenum coating.
- The connecting rod is designed to be lightweight.
- The crankshaft is designed to be lightweight.
- The counter balancer shaft is designed to be lightweight.
- The crankshaft pulley hub is made aluminium.

## MAJOR SPECIFICATIONS

ITEM		4G69-SOHC-MIVEC
Total displacement mL		2,378
Combustion chamber		Pent roof type
Bore × Stroke mm		87.0 × 100.0
Compression ratio		9.5
Camshaft arrangement		SOHC-16 valve
Valve timing	Intake Open	6° BTDC <Low speed cam A>
		6° BTDC <Low speed cam B>
		20° BTDC <High speed cam>
	Intake Close	38° ABDC <Low speed cam A>
		38° ABDC <Low speed cam B>
		72° ABDC <High speed cam>
	Exhaust Open	60° BBDC
	Exhaust Close	16° ATDC
Maximum output kW/rpm		113/5,750
Maximum torque N·m/rpm		216/3,500
Lash adjuster		Not quipped

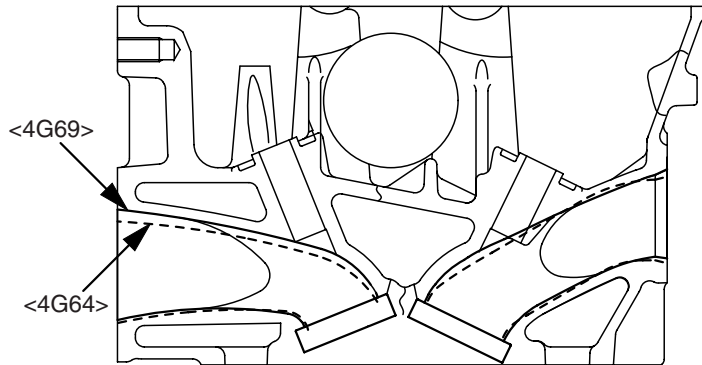
## BASE ENGINE

M2112001000596

### GENERAL DESCRIPTION

The following changes are applied based on the previous 4G64-SOHC engine.

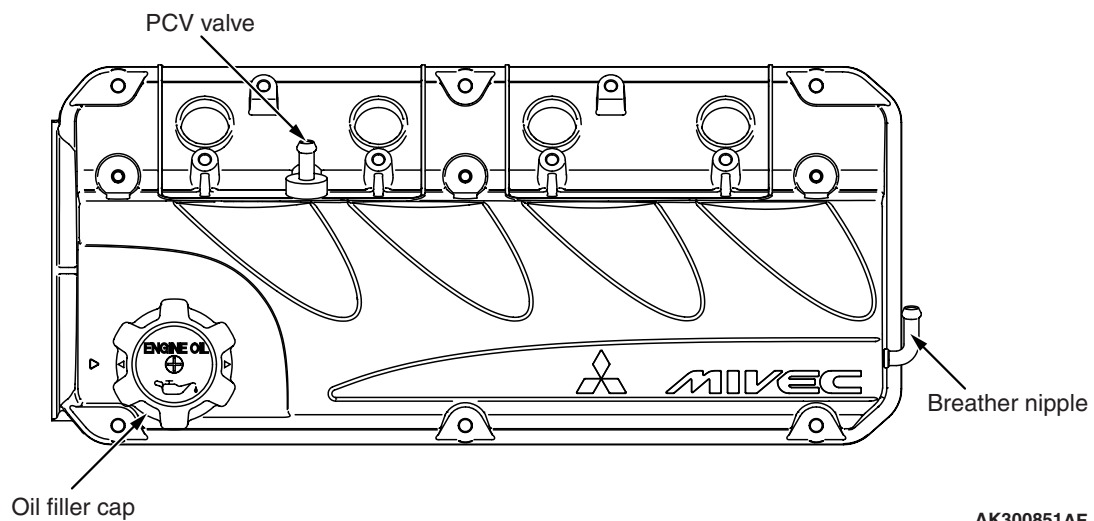
### CYLINDER HEAD



AK304624AB

The cylinder head optimizes the port profile with increasing the diameter of the intake and exhaust valve.

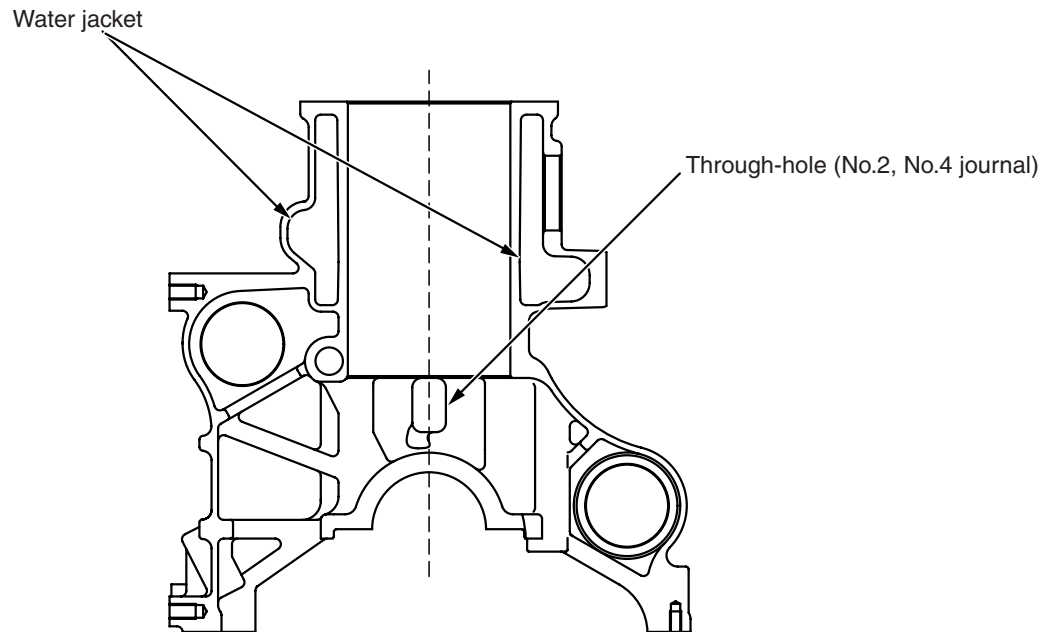
### ROCKER COVER



AK300851AF

The rocker cover is designed to reduce noise by using aluminium die-casting.

## CYLINDER BLOCK

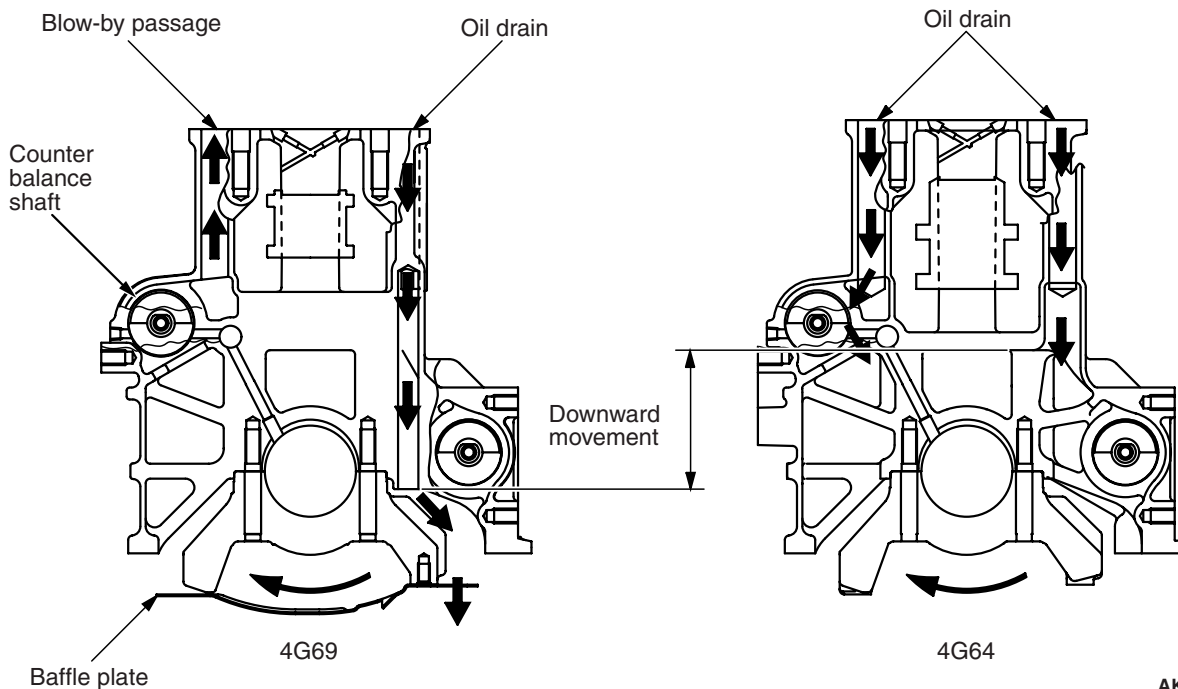


AK300819AH

To reduce the weight, the cylinder block height is reduced.

The water jacket is designed to improve fuel economy and to achieve quicker warm up of the engine by raising the bottom.

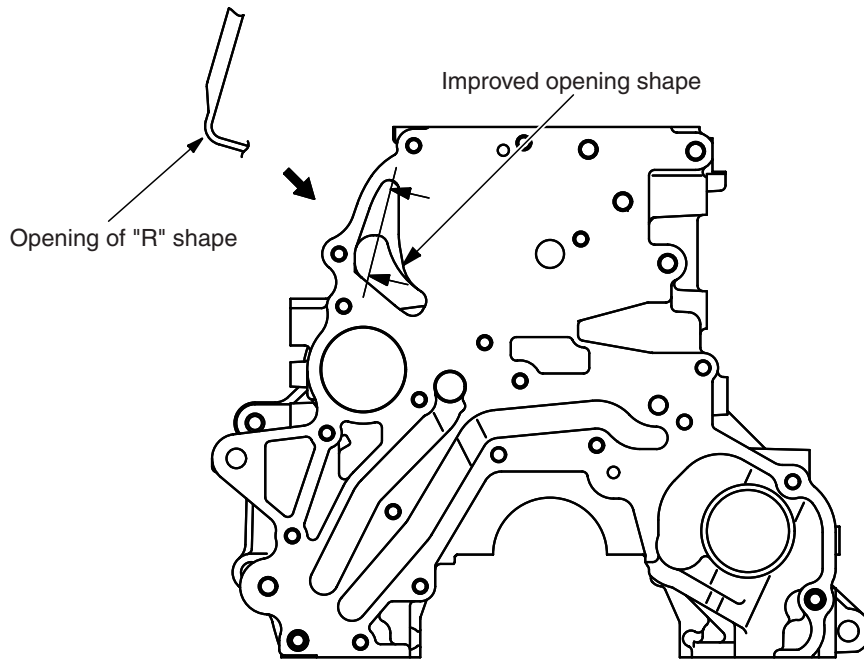
The through-hole is added on the bulkhead of the journal between No.1 and No.2 cylinders, also between No.3 and No.4 cylinders so that the pressure pulsation within the crankcase due to the piston vertical motion can be eliminated and friction can be reduced.



AK300820AF

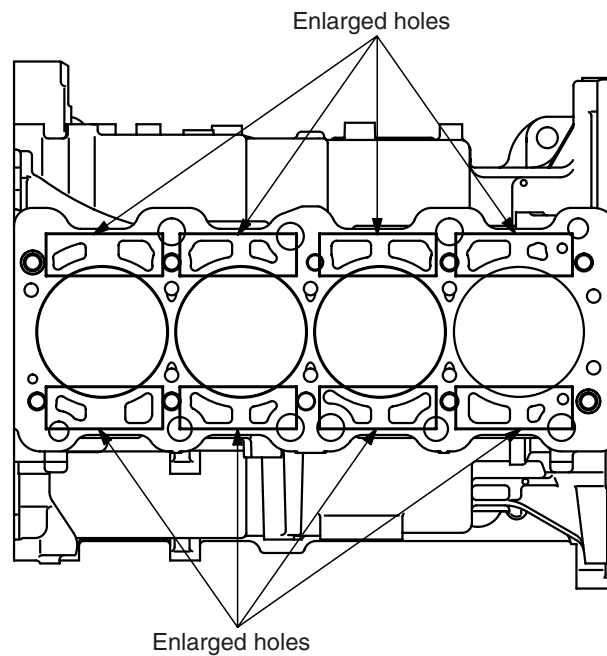
Oil dropping into the cylinder block from the cylinder head affects the crankshaft or the connecting rod movement and then produces rotational resistance.

To prevent this, the location of the oil drain hole and the profile of the passage are changed.



AK300821AD

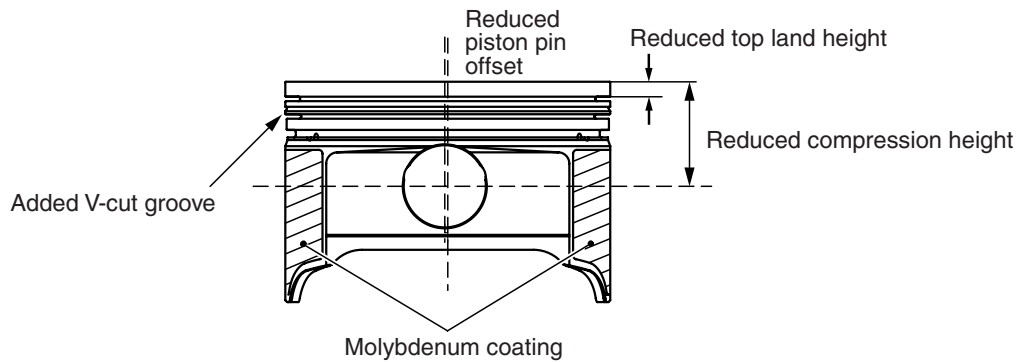
The inlet profile for the coolant fed from the water pump is modified to increase the amount of coolant being circulated.



AK300822AD

While maintaining the current deformation amount for the cylinder bore, expanding the profiles of the water holes on the cylinder block reduces residual sand within the water jacket.

## PISTON



AK300824 AF

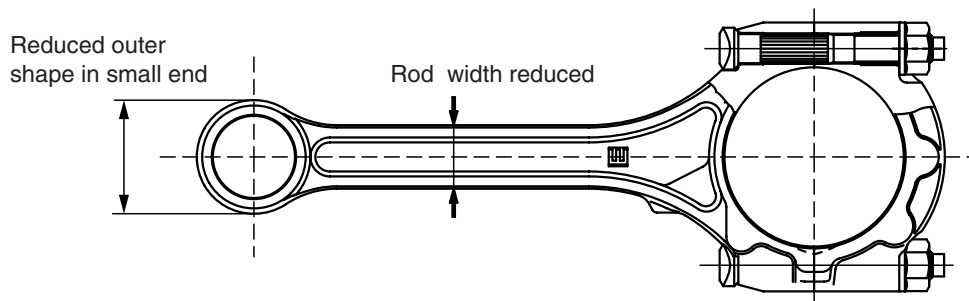
The piston is designed to be lightweight by reducing the compression height and reducing the unburned gas less by reducing the top land height.

Application of Molybdenum coating to the skirt reduces friction.

Addition of V-cut groove on the second land reduces oil consumption.

The piston pin offset is reduced to improve the knock control performance.

## CONNECTING ROD

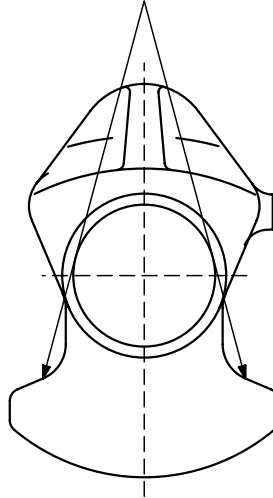


AK300828AF

The connecting rod is designed to be lightweight by changing the profiles of the small end and the connecting rod.

## CRANKSHAFT

Removed shoulder wall thickness

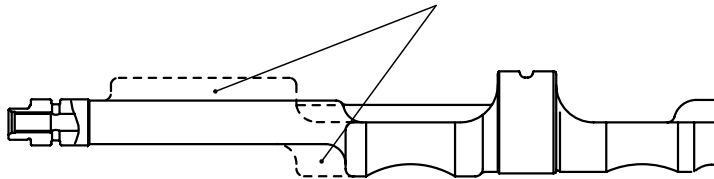


AK300825 AD

The crankshaft is designed to be lightweight by changing the profile of the balance weight.

## BALANCER SHAFT

Reduced balancer masses

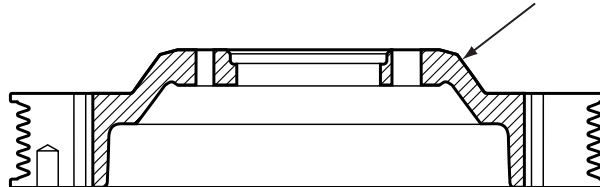


AK305807 AB

In accordance with the more lightweight piston and connecting rod, the balancer shaft is designed to be lightweight by reducing the unbalance mass of the balancer shaft.

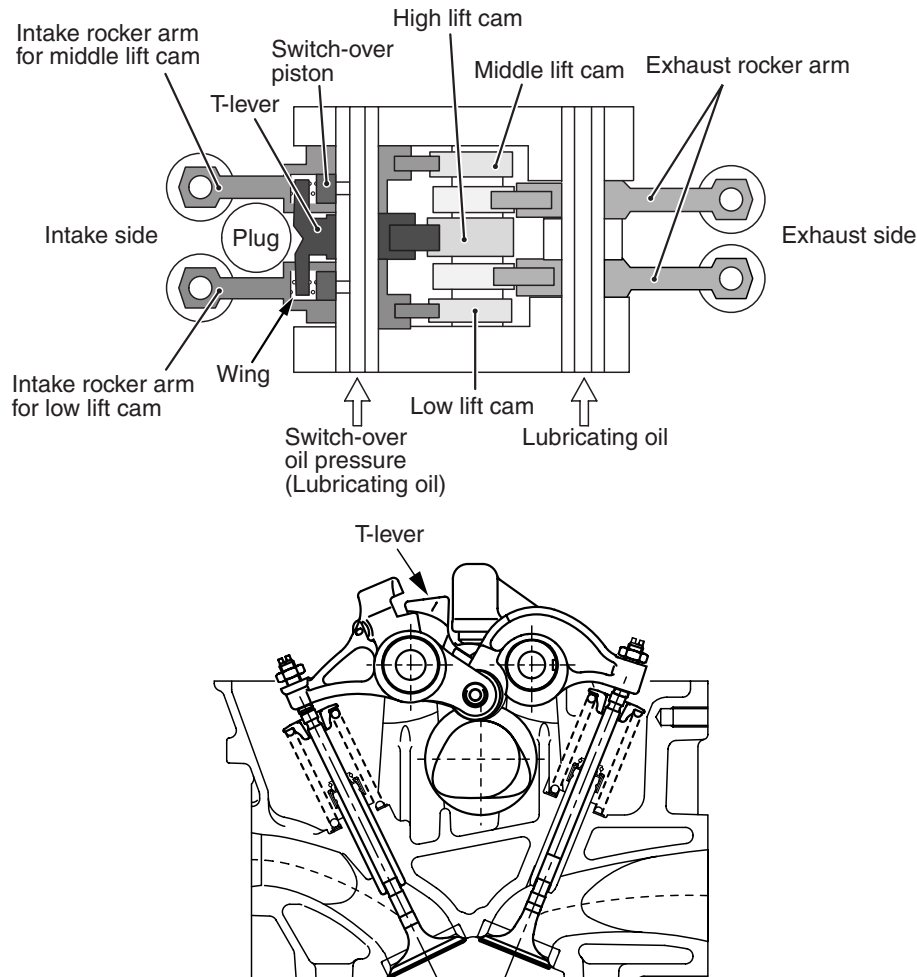
## CRANKSHAFT PULLEY

Aluminium hub



AK303978 AD

The crankshaft pulley increases the pulley diameter of the auxiliary drive belt. The hub is made of aluminium to reduce its weight.

**MITSUBISHI INNOVATIVE VALVE TIMING & LIFTING ELECTRONIC CONTROL SYSTEM (MIVEC)**

AK403562AB

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 the low fuel economy, the low exhaust gas and the high torque. In the range of the high engine speed, the high output due to the increment in the intake air amount is reached by increasing the open valve period and the lift.

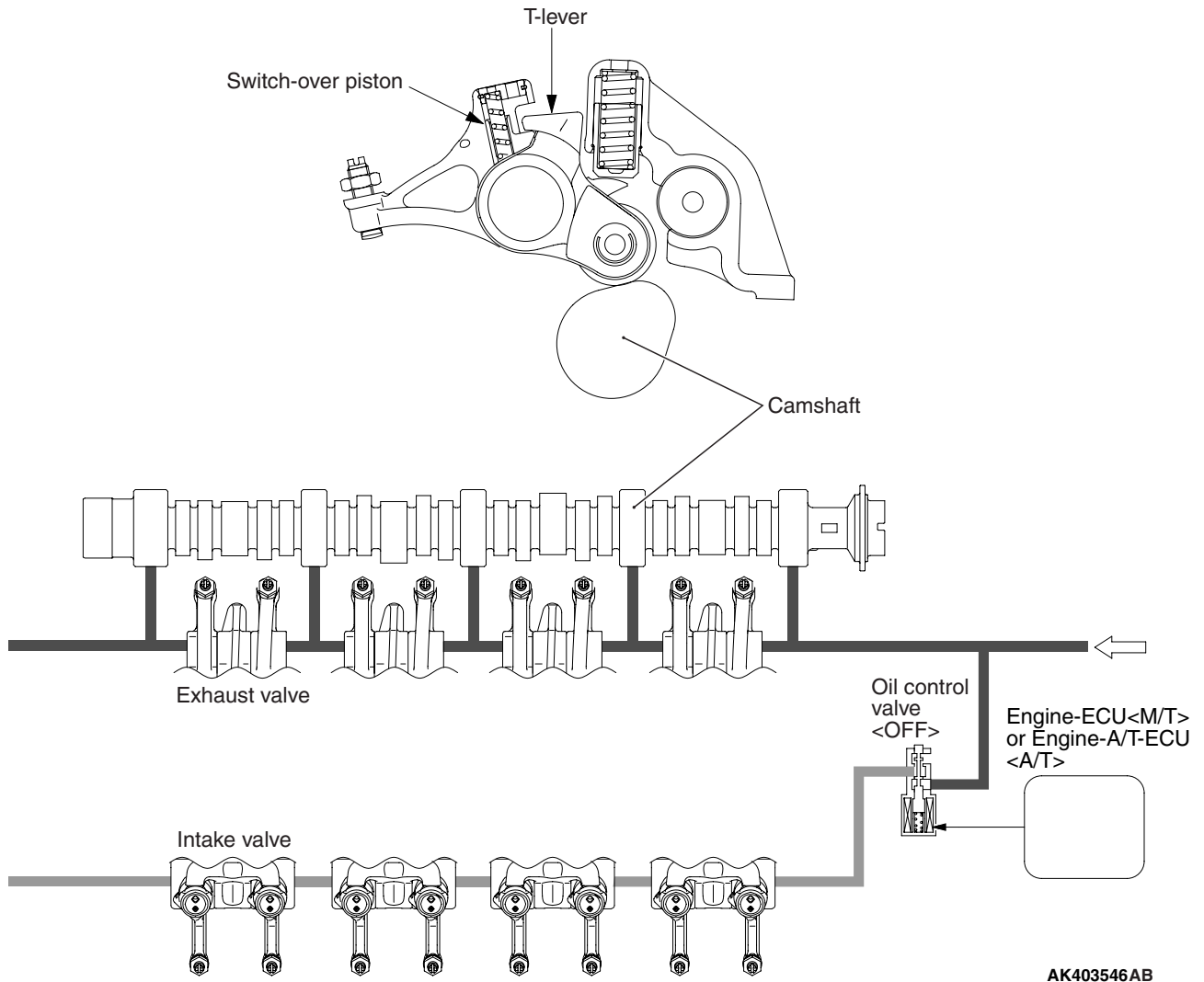
The structure has the T-lever that moves following the high lift cams and is arranged between the high lift cam and two rocker arms, in addition to the low & middle lift cams and two rocker arms that drive the two intake valves respectively.

In the range of the low engine speed, the low and the middle lift cams drive each valve respectively because the wing of T-lever moves freely. In the range of the high engine speed, the oil pressure moves the switch-over piston within the rocker arm. T-lever reaches the rocker arm and pushes it, and then the high lift cam lifts the both valves.

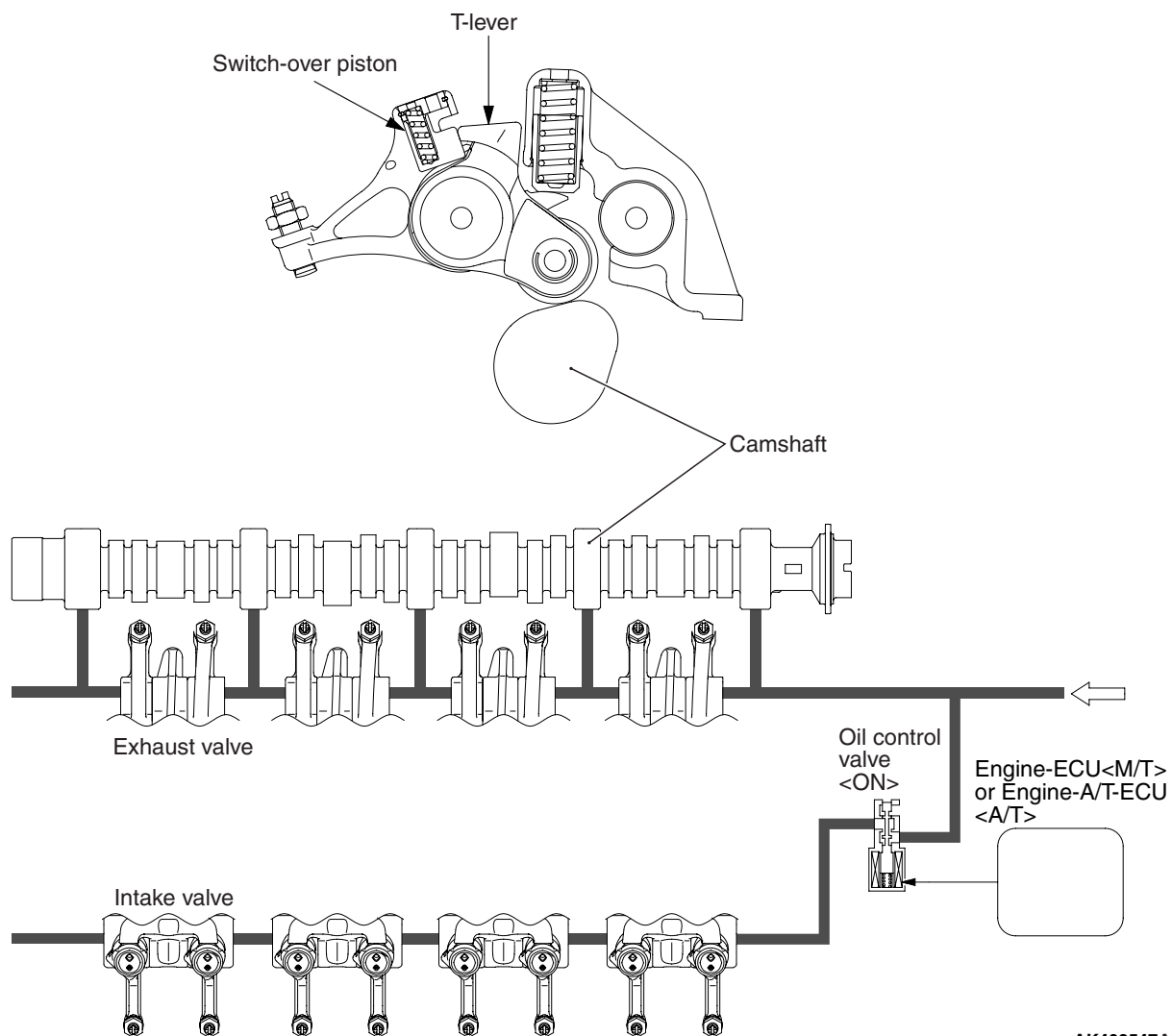
The cam switching is carried out when the torque produced in the low speed mode and the one produced in the high-speed mode crosses each other at an engine speed of 3500 r/min. An accumulator ensures oil pressure at the instant of switching and prevents switching mistakes.

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.





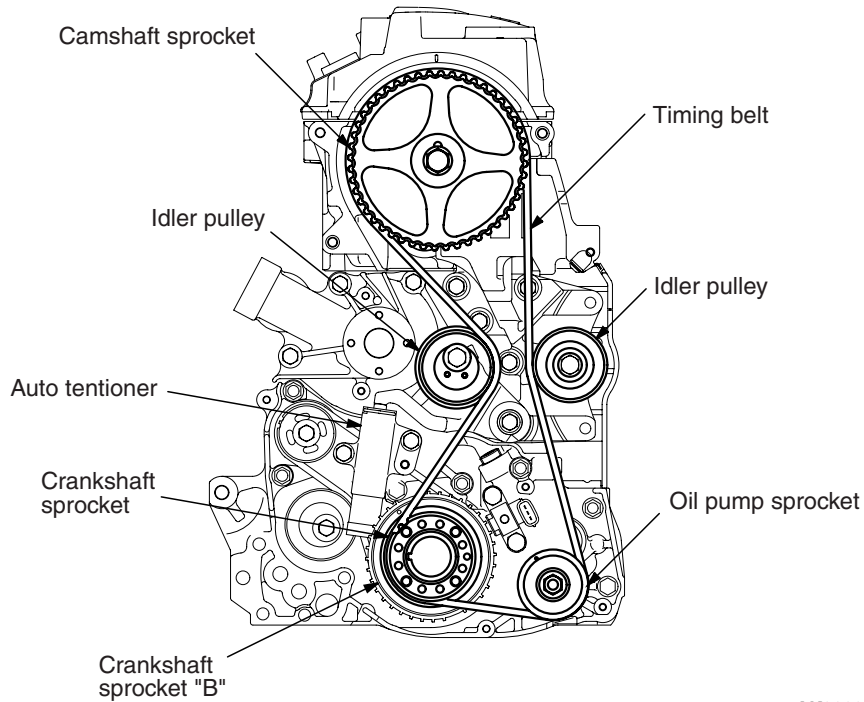
When the OCV is in the OFF position, the switch-over piston does not operate because the switch-over oil pressure within the intake rocker shaft is below the specified pressure, and so the wing of the T-lever does not reach the switch-over piston. Accordingly, the intake valve is driven by the rocker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



AK403547AB

When the OCV is in the ON position, the swicthing 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.

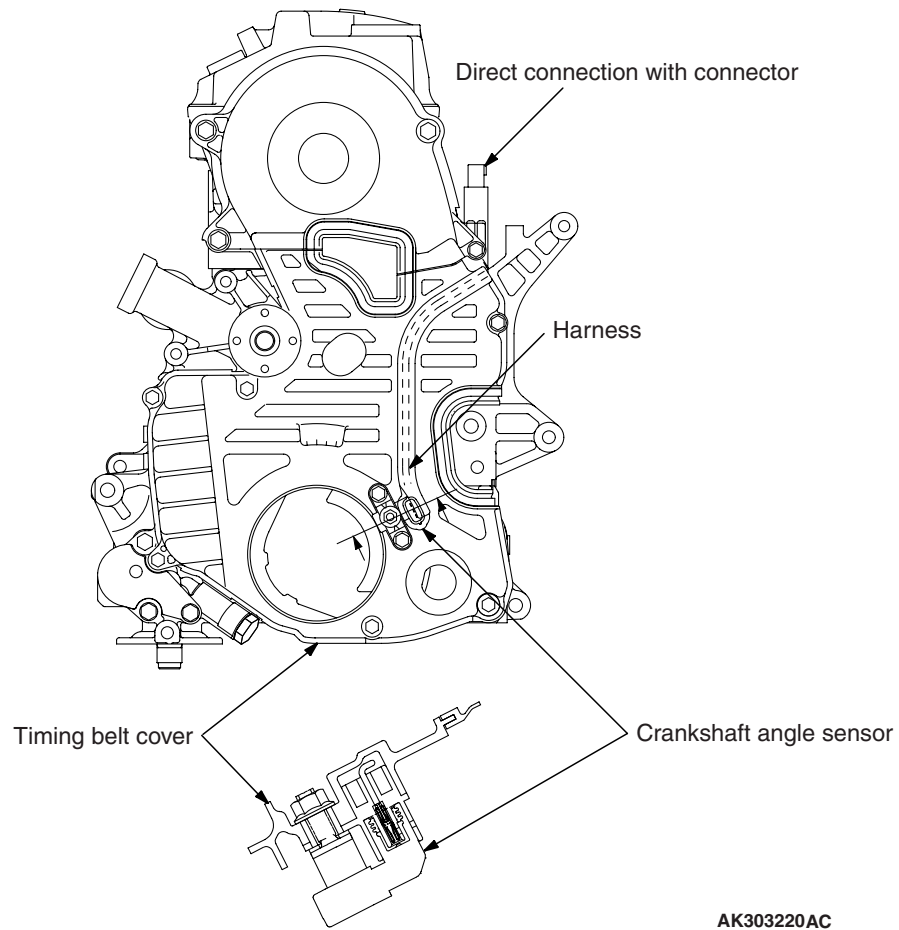
## TIMING BELT



AK300827AG

The timing belt is designed to reduce friction and the weight by narrower width of the timing belt. The weight reduction is designed by the profile change of the each component related to the timing belt.

## TIMING BELT COVER



Uniting the crank angle sensor harness with the timing belt cover reduces installation time and prevents interference with the drive belt or timing belt.