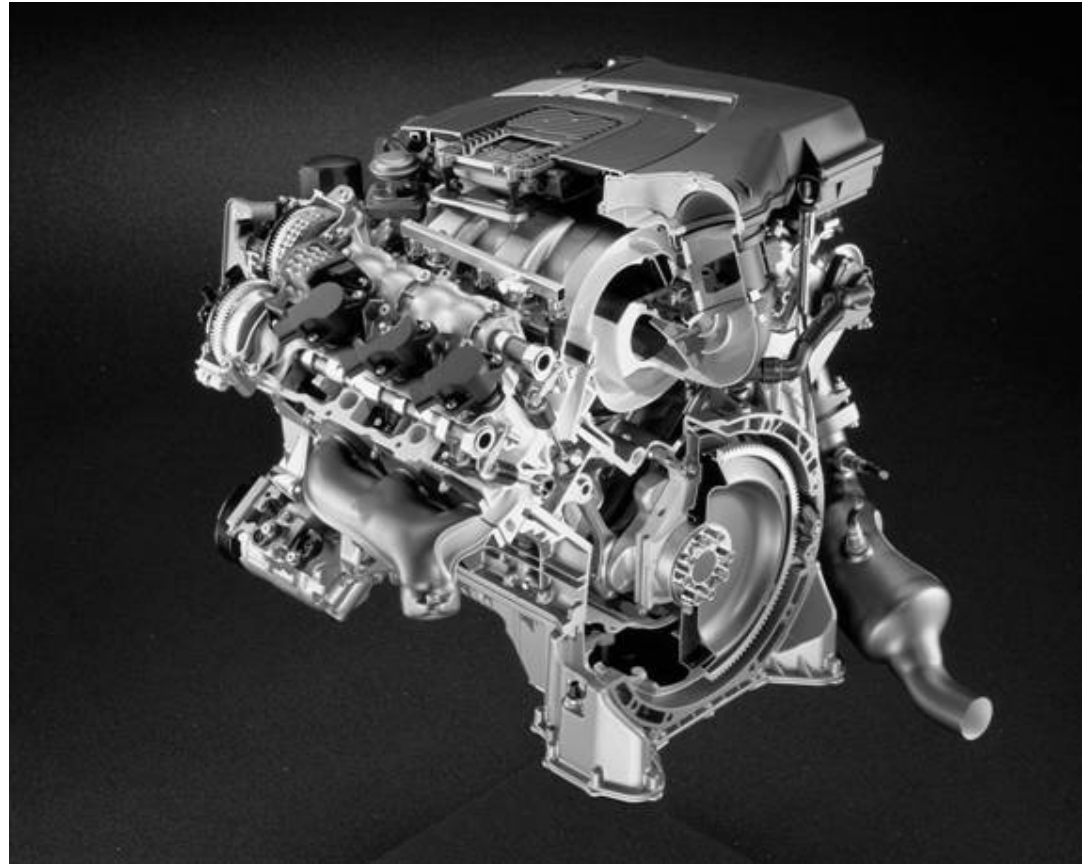




Mercedes-Benz

# M272 Engine



# Objectives

Students will be able to:

- identify differences between M112 and M272
- explain the camshaft adjusters operation
- identify major components of the M272
- explain function of the swirl flaps
- explain function of the temperature management system

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# M272 – M112 Comparison

## **M272**

**3.5 litre**

268 hp @ 6000 rpm

258 lb-ft @ 2500 to 5000 rpm

Compression Ratio 10.7 : 1

Sparkplugs per cylinder 1

ME 9.7

Coil On Plug

## **M112**

**3.2 litre**

214 hp @ 5700 rpm

228 lb-ft @ 5700 rpm

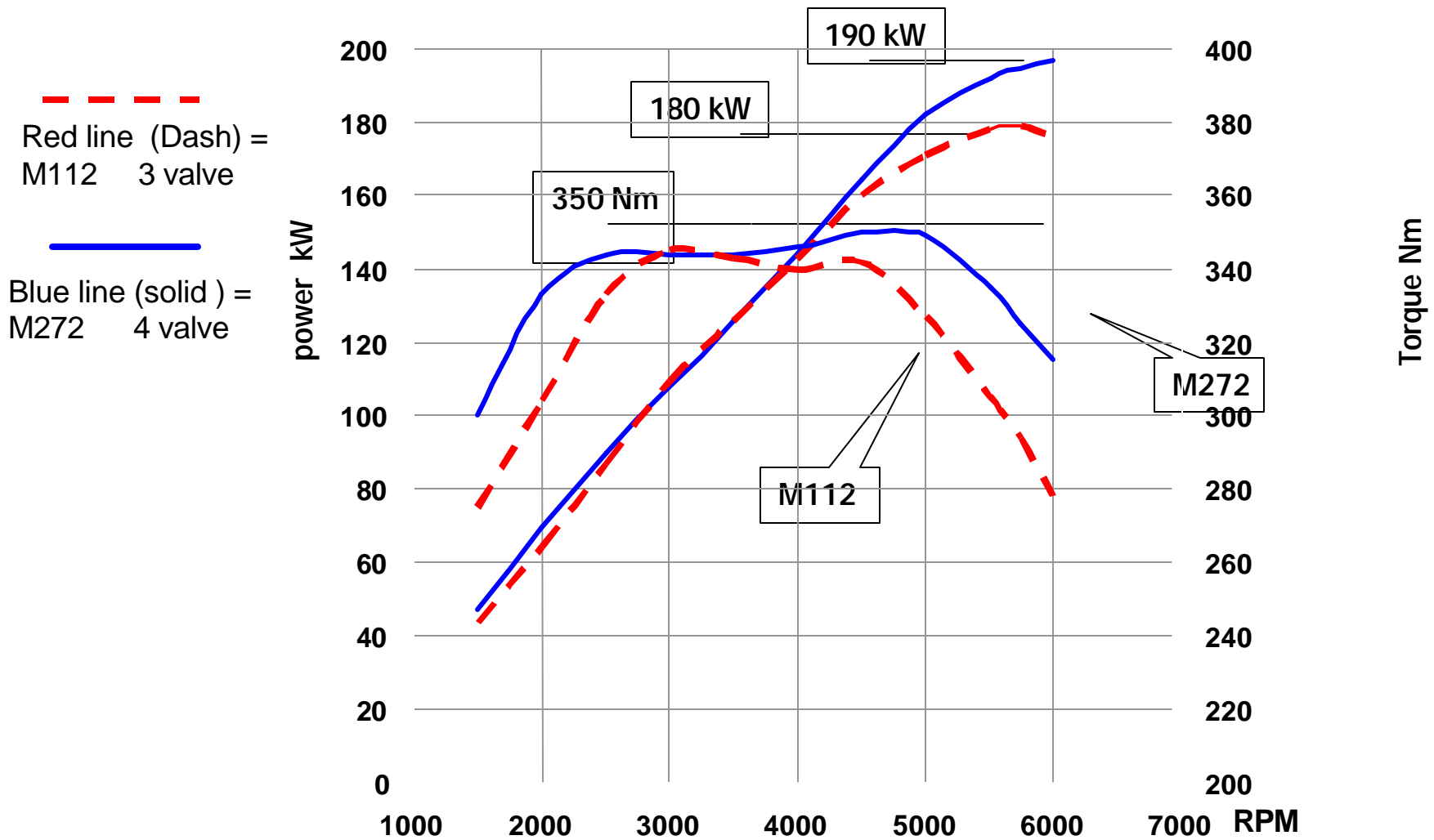
Compression Ratio 10.0 : 1

Sparkplugs per cylinder 2

ME 2.8

Double ignition coils

# Comparison



New M272 introduced in the new SLK 171

Lets look at some highlights

# M272 HighLights

- M112 replacement
- 3.5 litre displacement
- Counter rotating balance shaft
- Stiffer engine with lateral main bearing attachments
- 4 valve continuously variable camshafts intake and exhaust (DOHC)



# M272 HighLights



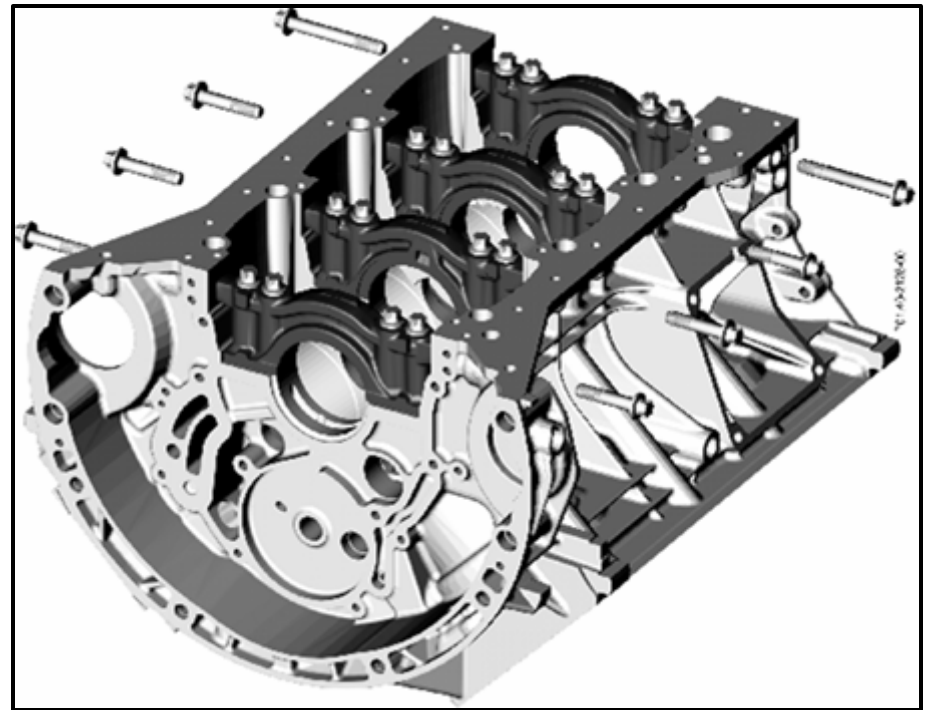
- 90 degree V-6
- Two stage Intake manifold
- Turbulence flaps in the intake ports
- ME 9.7 control unit mounted on top of engine
- Electrically assisted thermostat
- No EGR valve
  - Both cams adjust



Lets take a look at what changed mechanically

# Motor Mechanicals

- Based off of M112 engine
- Bore and Stroke increase compared to M112
- Die cast aluminum crankcase
- Silitec coated cylinder liners
- Starter openings both sides of block
- 8 lateral main bearing bolts



# Crankshaft

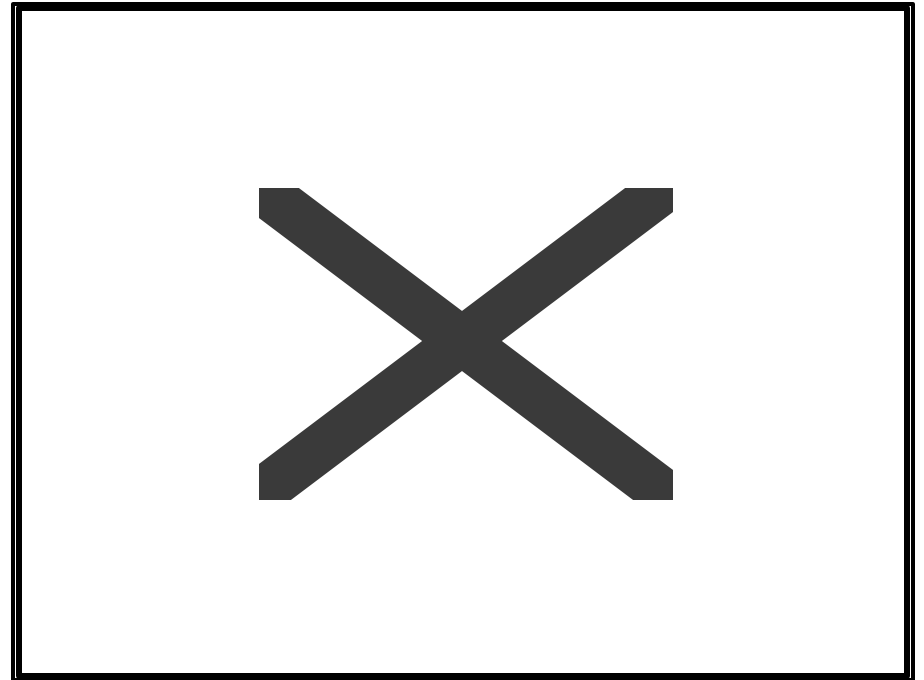
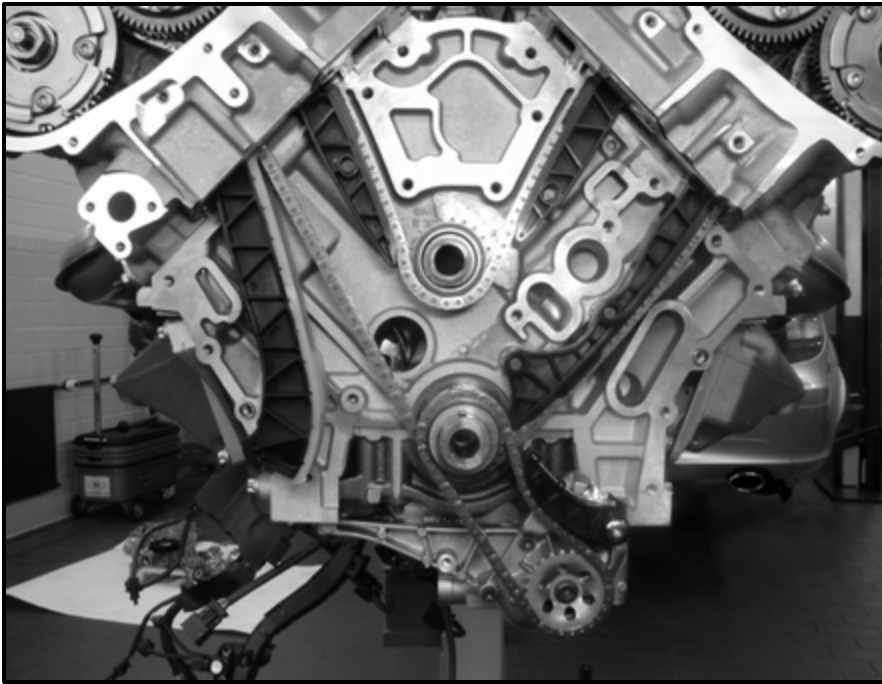
- Crankshaft lighter as compared to M112
- Wider main bearings as compared to M112 used to reduce vibration
- Iron coated cast aluminum pistons



Balance shaft, familiar function

Oil sensor, now a switch

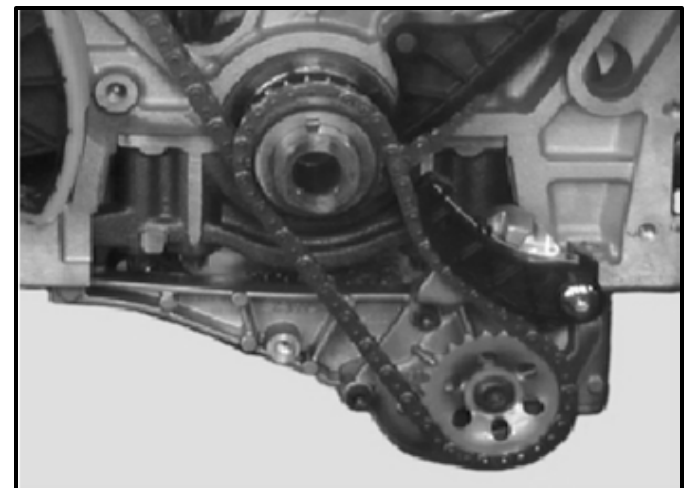
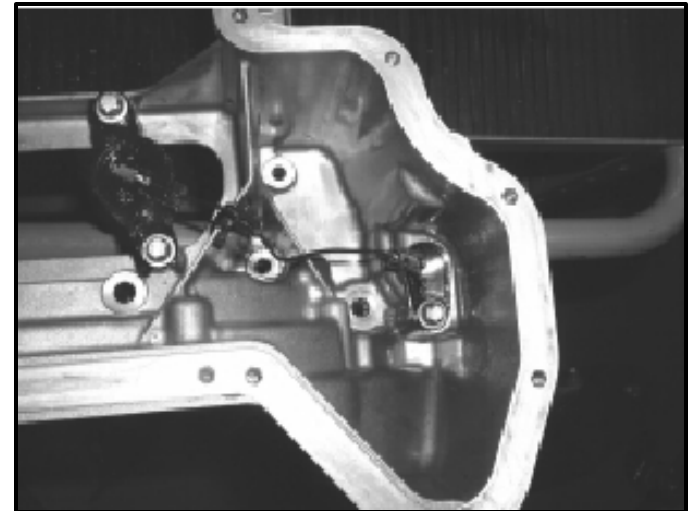
# Balance Shaft



- Balance shaft similar to the M112
- Balance shaft rotates opposite crankshaft

# Oil Level Switch

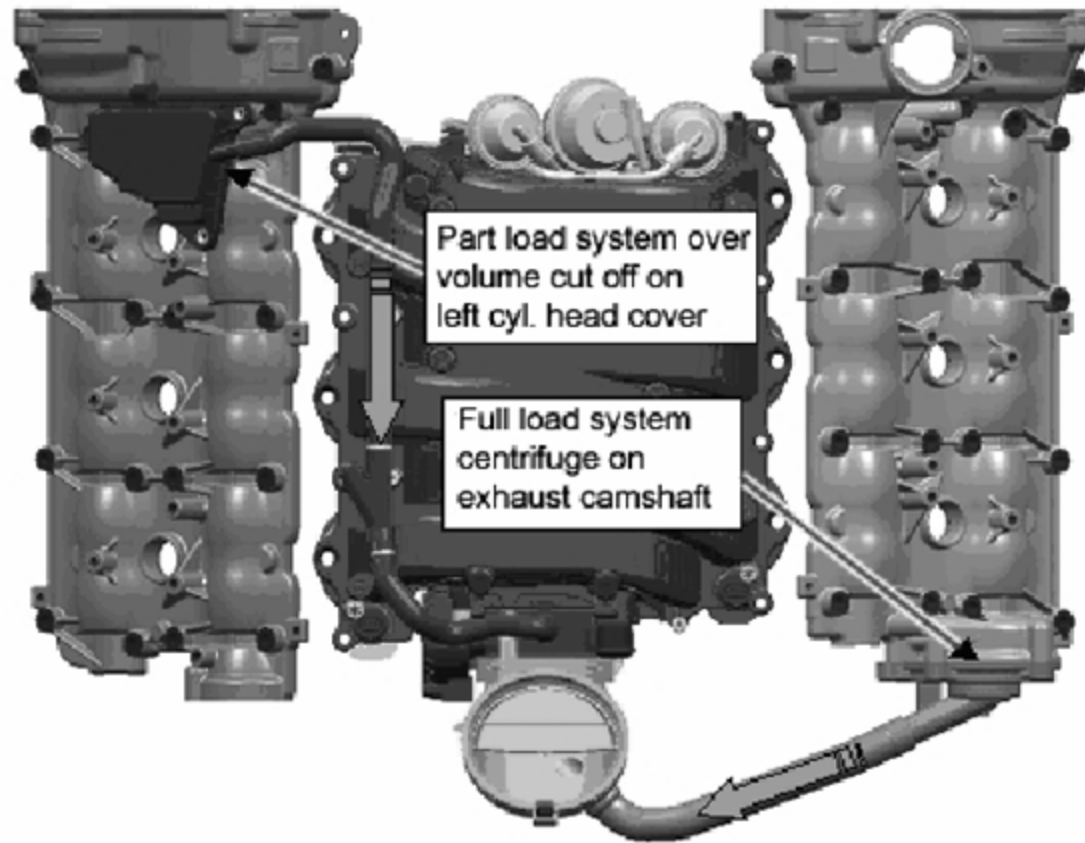
- Reed contact oil level switch S43 replaces B40
- Only one pin of the two pin connector used
- S43 mounted in oil pan
- Chain driven oil pump
- Vehicle equipped with an oil level dipstick



# Partial and full load crankcase ventilation system

# Crankcase Ventilation

Crankcase ventilation diagram





Cylinder head

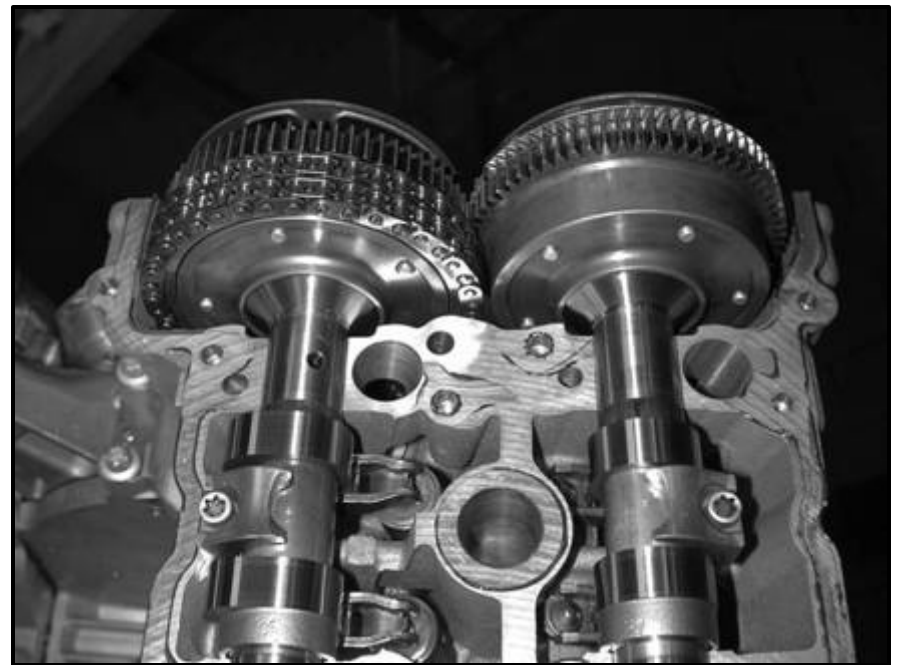
4 valves

DOHC

Cam adjusters

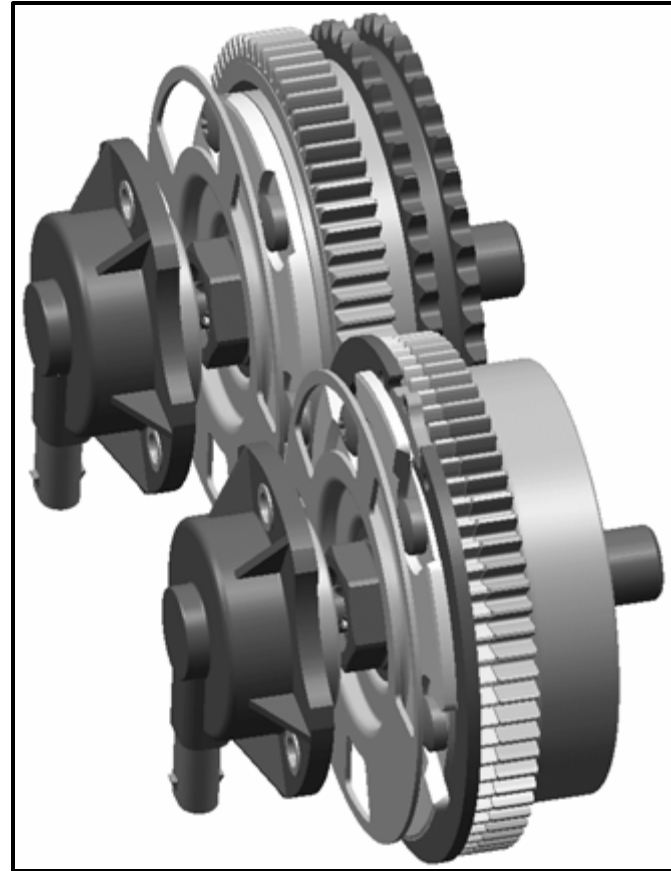
# Cylinder Head

- New design cast aluminum cylinder heads
- 4 overhead camshafts (DOHC)
- 4 valves per cylinder, improve torque and horsepower compared to 3 valve engines
- Camshaft upper bearing surfaces integrated into cam housing cover
- Nickel coated high strength steel exhaust valves



# Cylinder Head

- 4 Cam adjusters
- 4 Cam Sensors
- ME can detect Cam position with ignition on
- Intake cam is chain driven and drives exhaust cam via gear



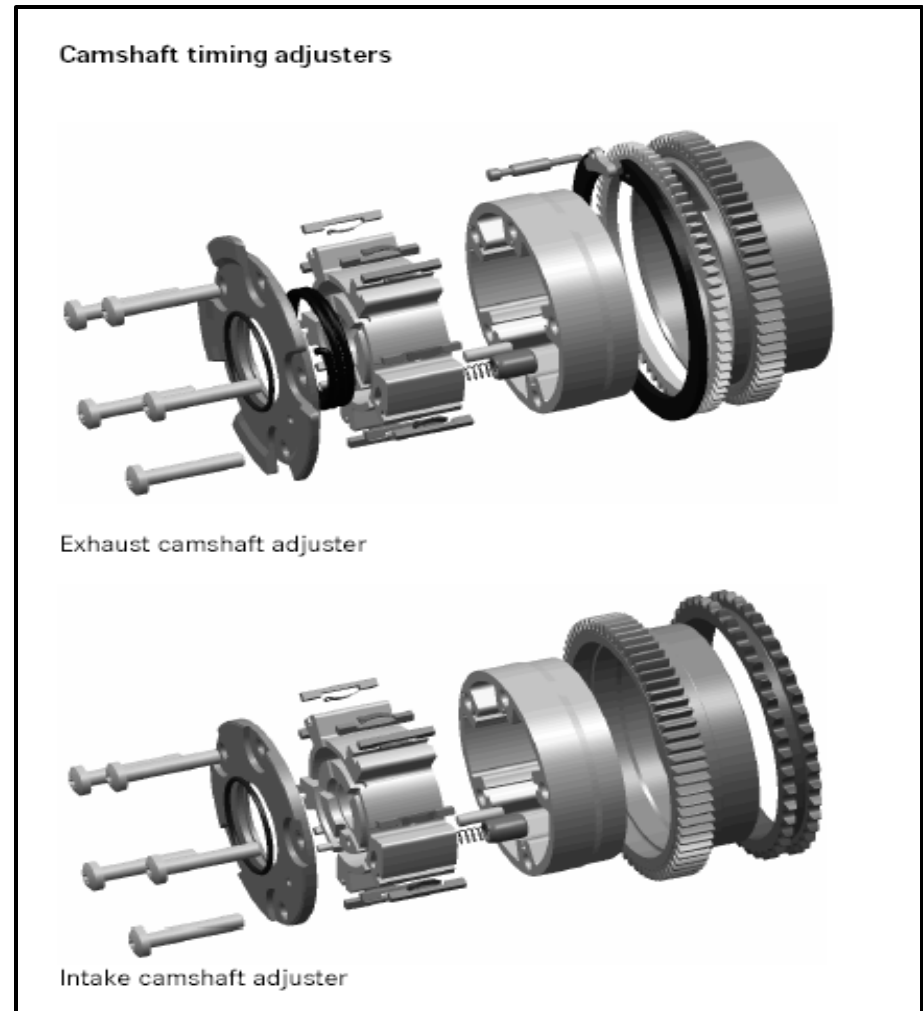
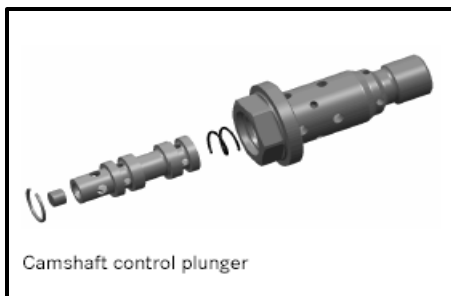
# Chain Tensioner

- Step type chain tensioner with internal spring
- Located at the lower right front engine
- Must be manually reset if removed
- **Failure to preset tensioner before assembly will result in engine damage**

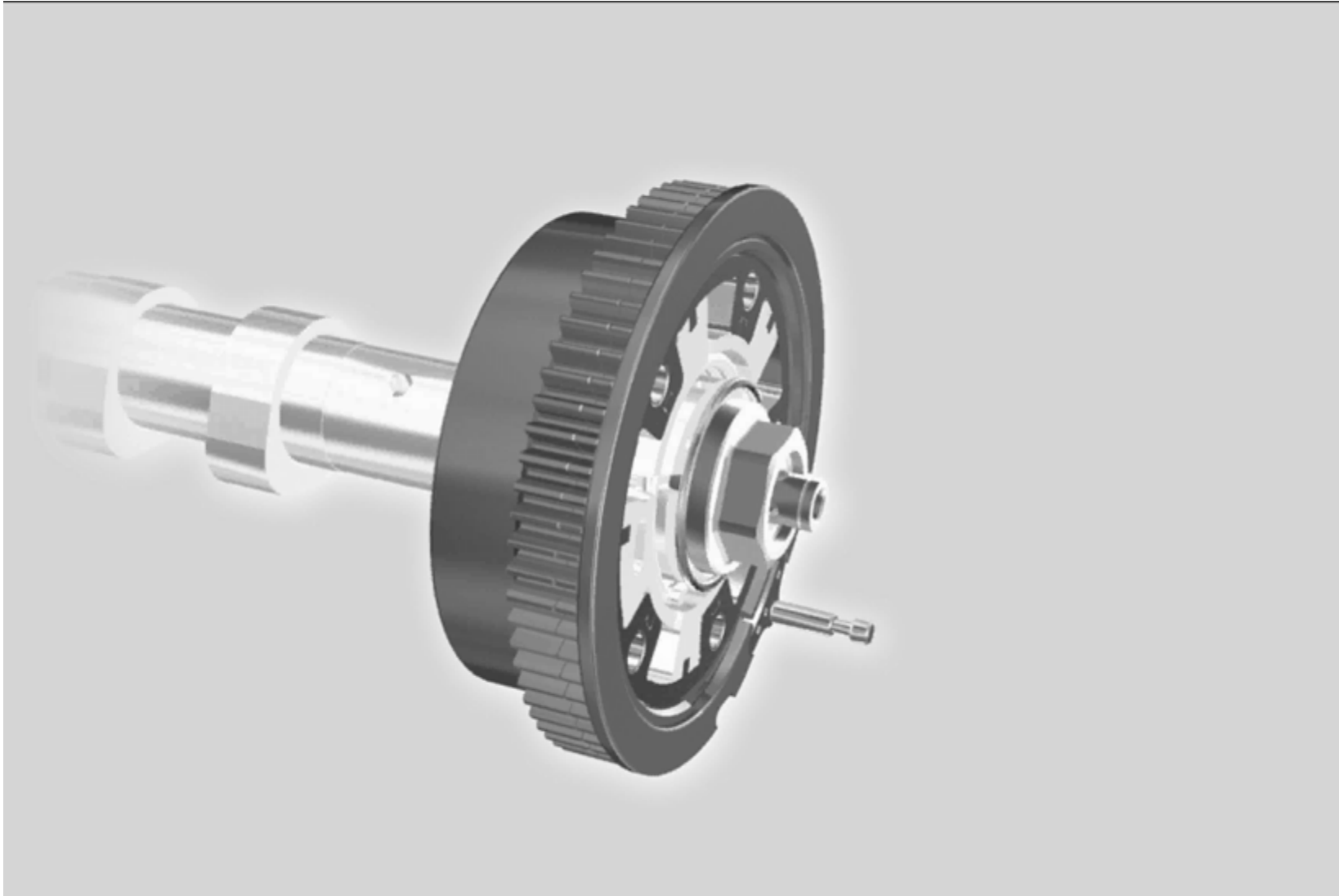


# Camshaft Timing Adjusters

- Vane type, oil pressure controlled adjusters
- Continuously variable
- 40° advanced for intake (from 4° BTDC to up to 36° ATDC)
- 40° retard for exhaust (from 30° BTDC to up to 10° ATDC)



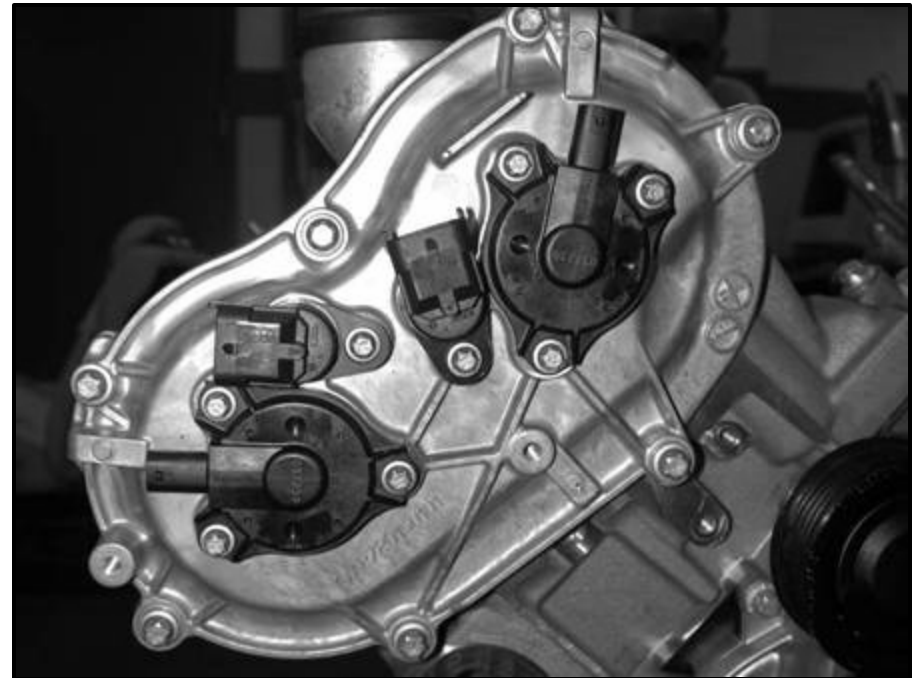
# Exhaust Cam Gear



Note: Retaining nut at front timing adjuster is reverse thread

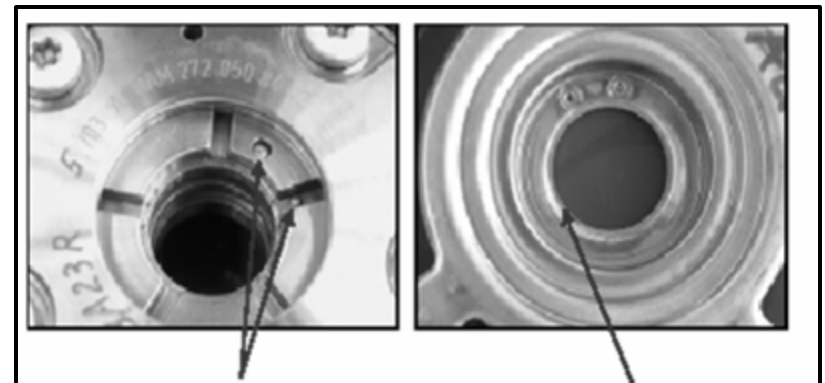
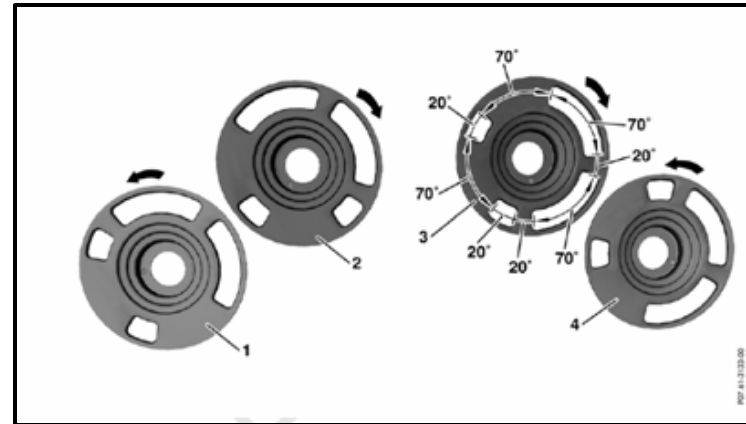
# Camshaft Position Sensors

- 4 Hall effect sensors, one for each camshaft
- True Power On (TPO) sensor technology capable of detecting cam position with stationary engine
- Right and left camshaft signals staggered by 240° camshaft angle
- Signal is low in absence of a window



# Impulse Wheels

- Four impulse wheels used on the M272 mounted on the front of each camshaft timing adjuster
  - Each impulse wheel has a different part number
- The openings of the impulse wheels help ME determine the camshafts exact position
- **Can only be used one time!**
- **If new impulse wheels are not used the pins could shear off causing massive damage to adjusters**



Both locating pins sheared off when reinstalled

Gouging of mounting surface

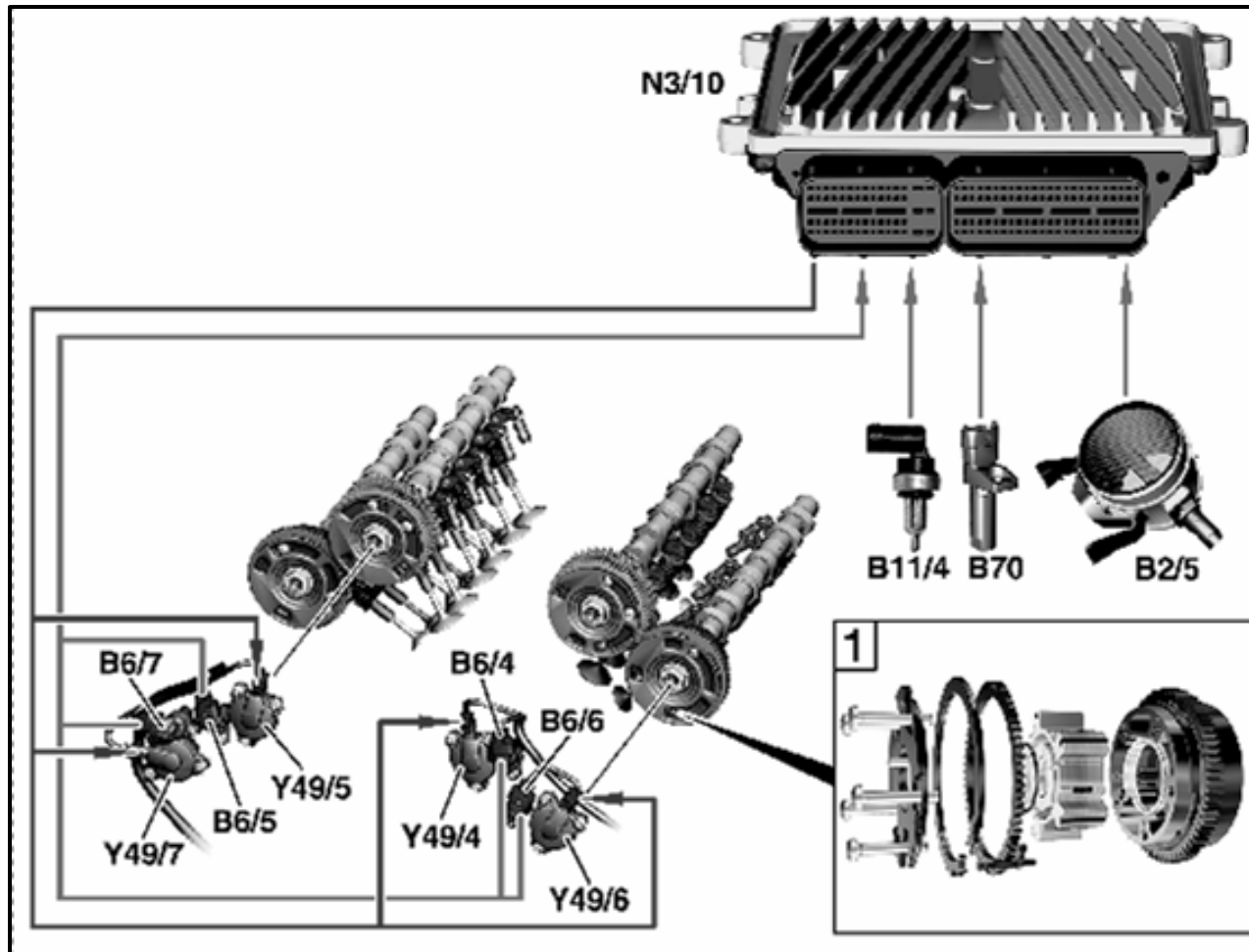


# Exhaust Cam Gear

- Exhaust Cam 2 piece gear
- Smaller outer gear spring loaded for noise reduction
- Gear must be held in place prior to disassembly
- Segment Ring must be replaced once removed
- Adjuster bolt reverse threaded



# Camshaft Timing Network



- B6/4 – Camshaft position sensor (intake left)
- B6/6 – Camshaft position sensor (exhaust left)
- B6/7 – Camshaft position sensor (exhaust right)
- B6/5 – Camshaft position sensor (intake right)
- B11/4 – Engine coolant temperature sensor
- B70 – Crankshaft hall sensor
- B2/5 – MAF
- N3/10 – ME 9.7
- Y49/5 – Camshaft timing control solenoid (exhaust right)
- Y49/7 – Camshaft timing control Solenoid (Intake right)
- Y49/4 – Camshaft timing control solenoid (intake left)
- Y49/6 – Camshaft timing control Solenoid (exhaust left)

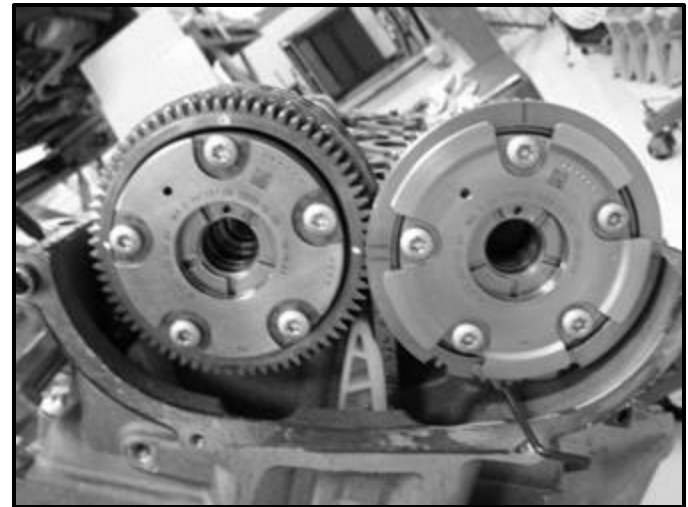
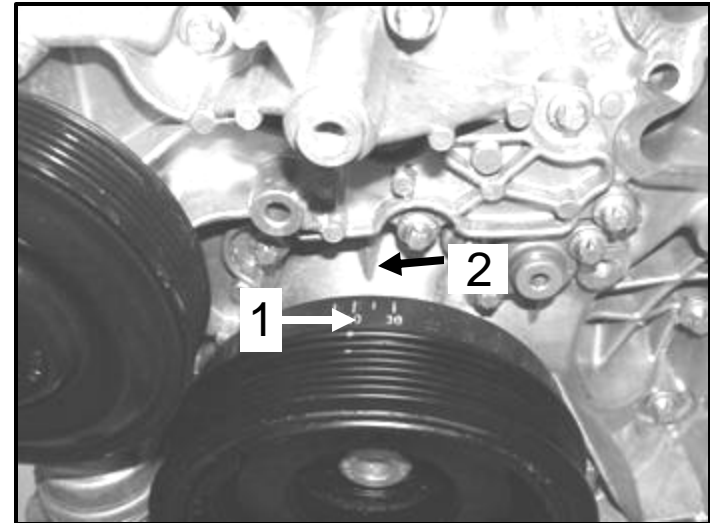
# Camshaft Position

- Remove camshaft sensors
- Align balancer (305°) to front cover pointer
- Check impulse wheels stamped numbers
- If above line up properly cam positions are correct



# Camshaft Timing Basic Position

1. Align balancer to 40° ATDC to front cover pointer
2. Front cover pointer
3. Upper camshaft marks
4. Camshaft marks aligned to head



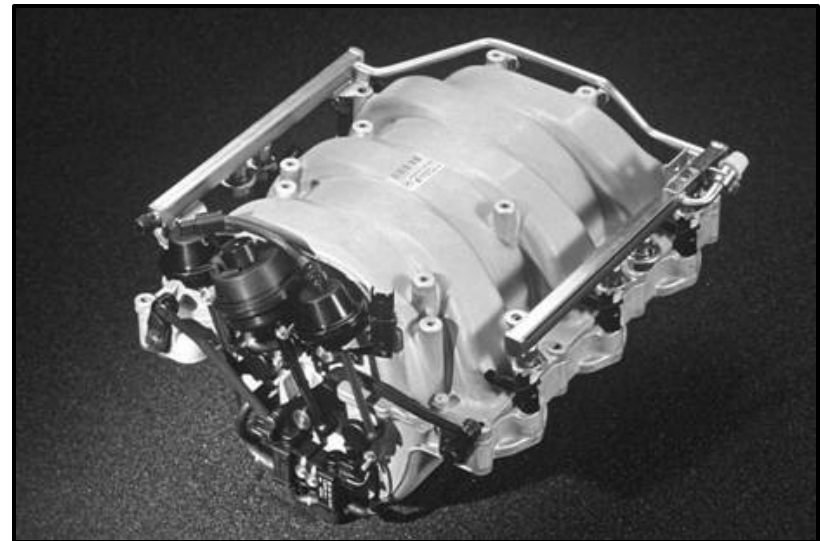
Intake

Variable runners

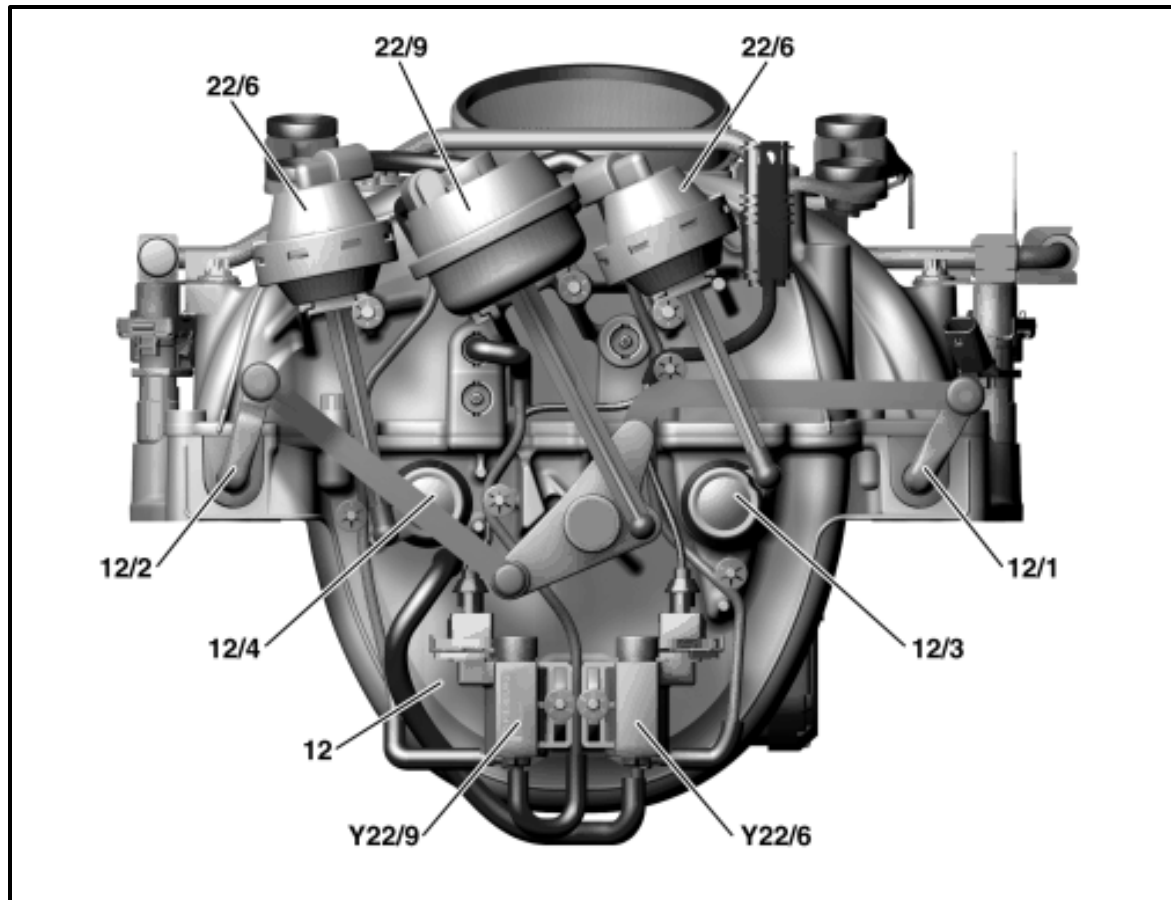
Swirl flaps

# Intake Manifold

- Magnesium cast sectional intake manifold with integrated vacuum reservoir
- Variable intake runner
- Short runner for higher RPM
- Long runner for lower RPM
- Swirl-Flaps also added providing better fuel mixture



# Intake Components



12 Intake manifold with integral vacuum reservoir

12/1 Swirl flap shaft, left cylinder bank

12/2 Swirl flap shaft, right cylinder bank

12/3 Longitudinal switch flap shaft, right cylinder bank

12/4 Longitudinal switch flap shaft, left cylinder bank

22/6 Intake manifold switchover diaphragm

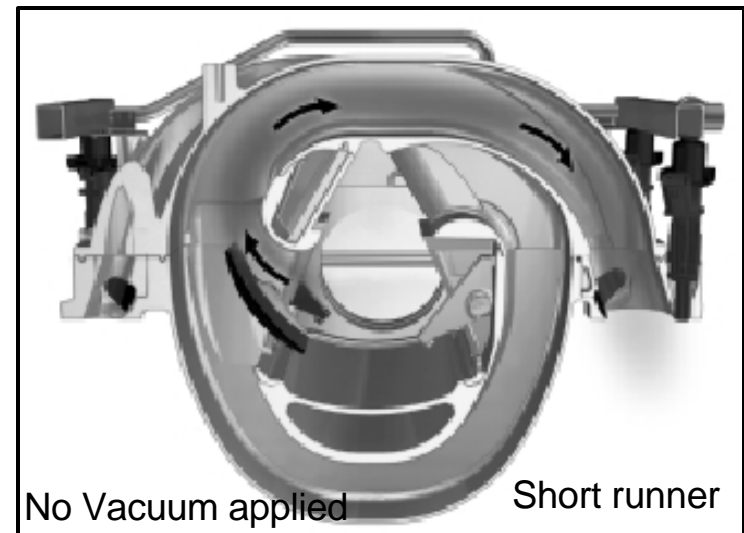
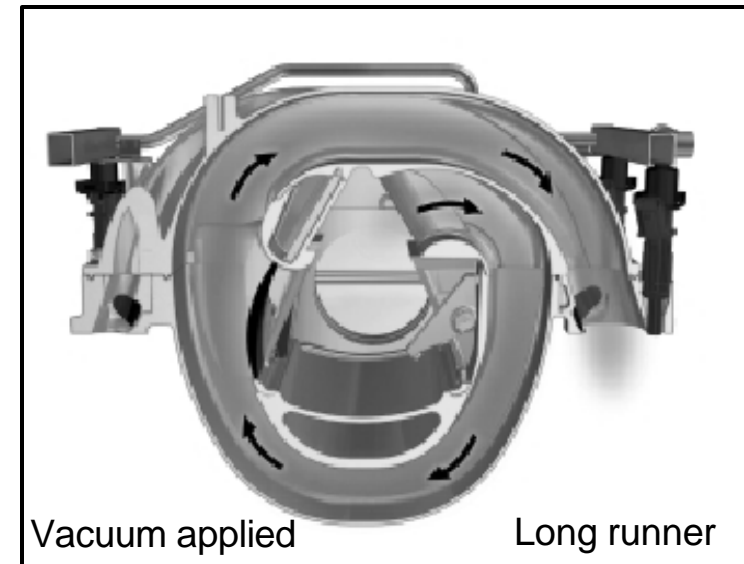
22/9 Swirl valve switchover diaphragm

Y22/6 Variable intake manifold switchover valve

Y22/9 Intake manifold swirl flap switchover valve

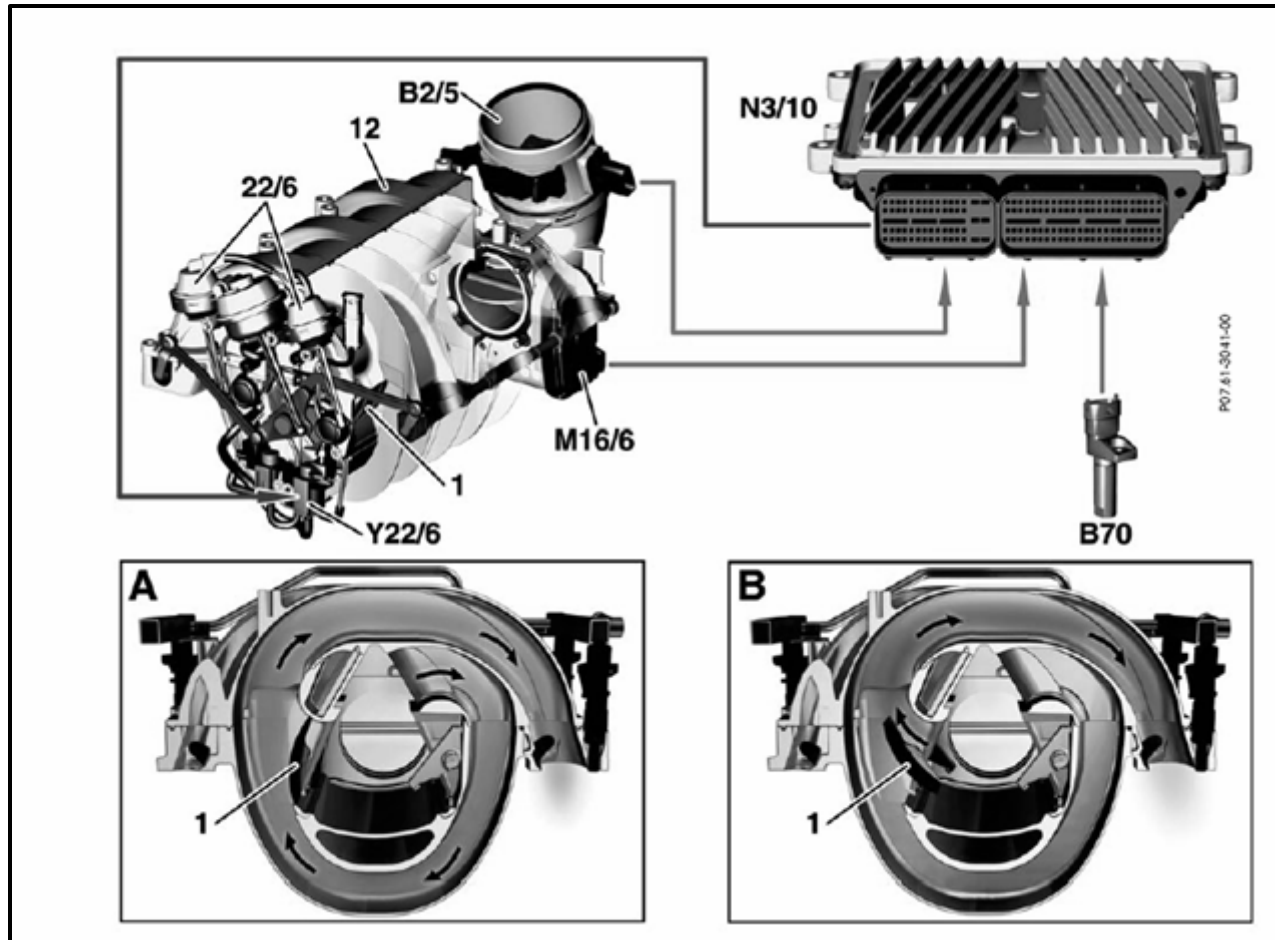
# Variable Length Intake Manifold

- Engine load over 50% from approx. 1750 RPM intake flaps closed (long runner)
  - Better cylinder filling and increased torque
- Above 3900 RPM switchover solenoid deactivated via ME intake flaps open (short runner)
  - Incoming air follows short runner
- Unlike M112, M272 has two diaphragm actuators





# Intake Functional Diagram



A – Long runner

B – Short runner

1- Switchover flaps

12 – Intake manifold with integral vacuum reservoir

B2/5 – Hot film mass airflow sensor

22/6 – Intake manifold switchover diaphragm

Y22/6 – Variable intake manifold switchover valve

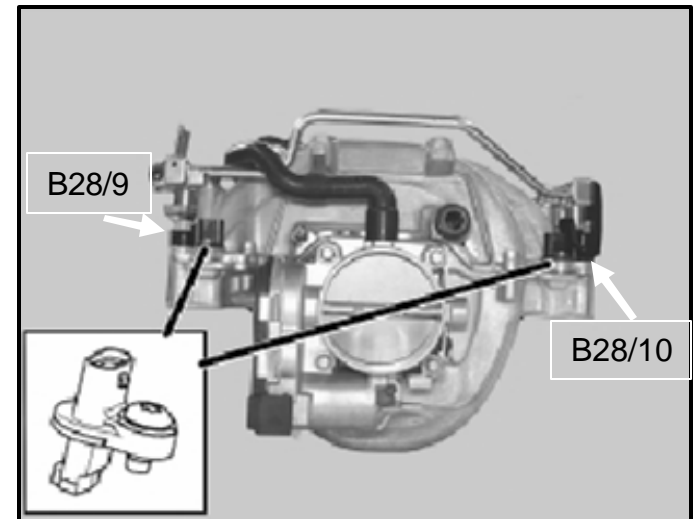
M16/6 – Throttle valve actuator

B70 – Crankshaft hall sensor

N3/10 – ME 9.7

# Swirl Flaps

- Under certain operating conditions intake air is swirled via swirl flap for improved mixture process
- Vacuum diaphragm driven by ME controls flap position
- Swirl flap position sensors (hall sensors) monitor 2 magnets attached to swirl flap actuating shafts to determine flap position (activated/not activated)
- Sensors located at rear of intake manifold



Swirl flap position sensors