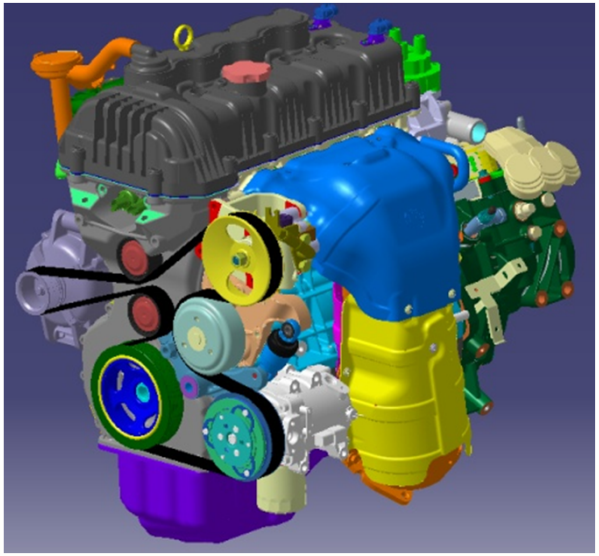
H16 Engine

CHANGAN EADO, CS35

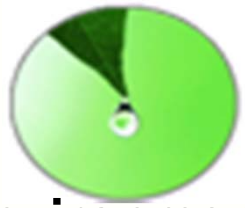


CHANGAN

Contents

Chapter 1 H16 Engine General Information

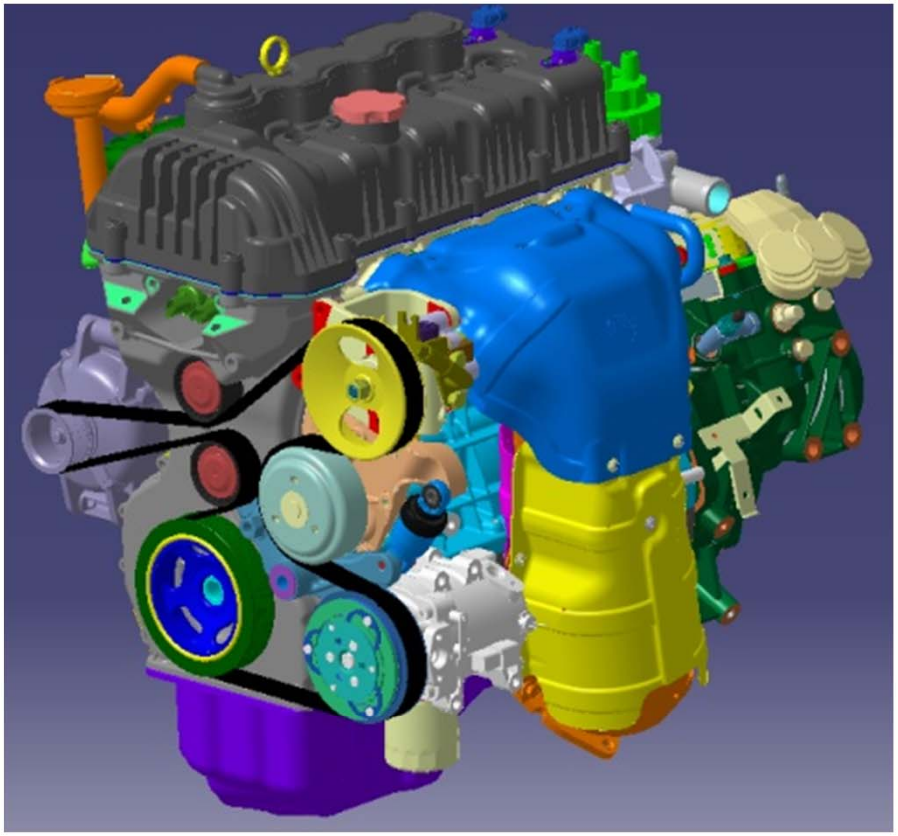
Economy



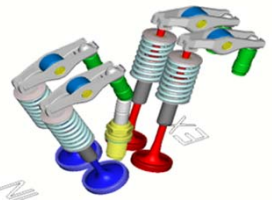
Environmental

Efficient

BLUE core™



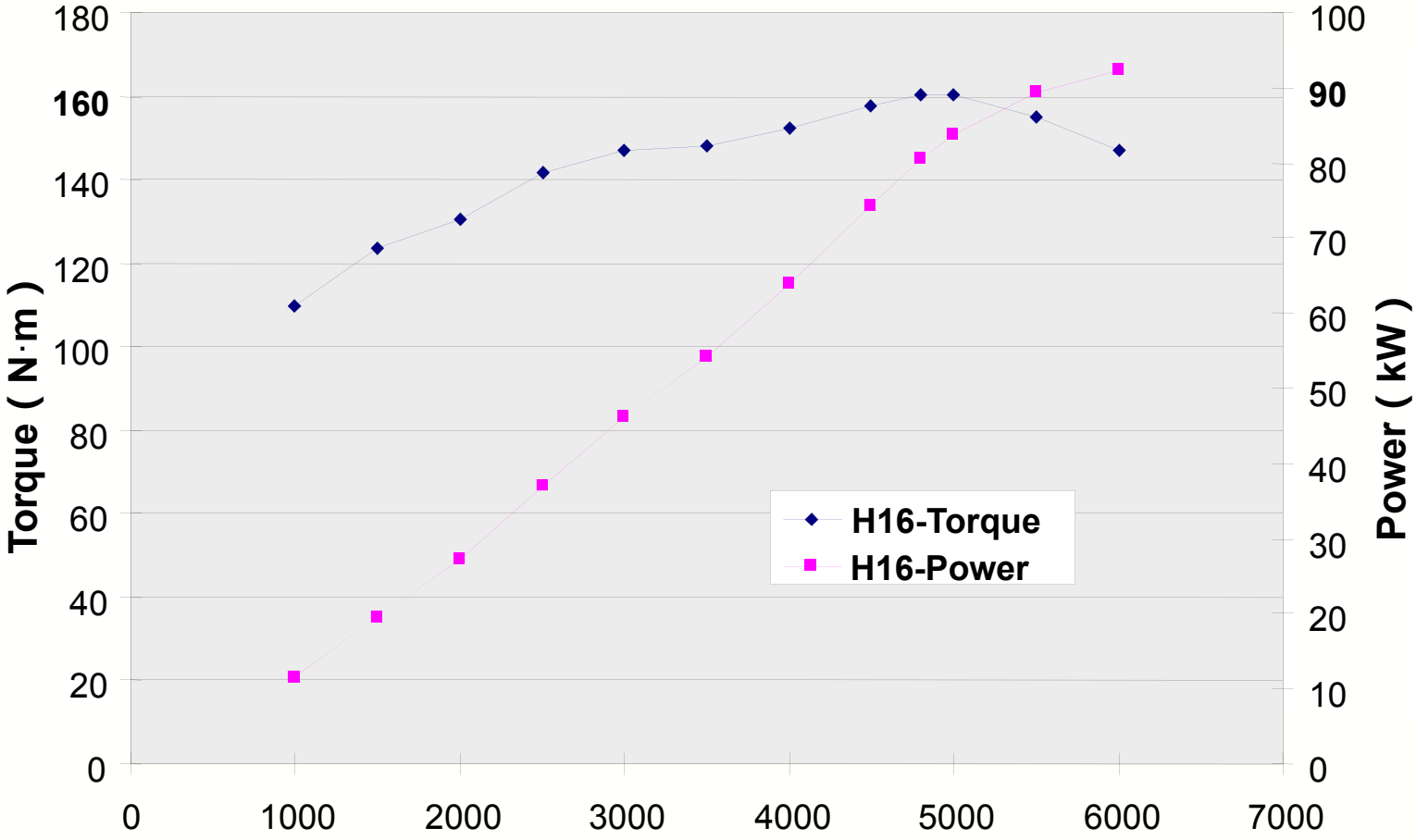
DVVT



◆ Basic parameters

Item	Specification
Engine type	In-line, 4 cylinders, 4 stroke, 16valves,water cooled, DOHC,DVVT,RFF
Displacement (ml)	1598
Fuel supply	Multi-point gasoline injection
Air intake style	Natural aspiration
Combustion chamber type	Wedge
Cylinder center distance (mm)	86
Cylinder diameter * Stroke (mm)	78x83.6
Compression ratio	10.4 : 1
Max power @ rpm	92kW@6000rpm
Max torque @ rpm	160N·m@4000-5000rpm
Emission standard	Euro Ⅳ
Ignition sequence	1-3-4-2
Engine oil type	No under SL 5W/30+(3.5L)
Idle speed	690~750RPM

◆ Power-Torque Diagram



Chapter 2 H16 Engine Character

◆ H16 Engine Main Character

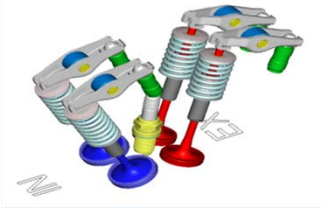
◆ DVVT (Dual Variable Valve Timing)

- 5% more torque output
- Reduce CO2 discharge
- Saving 5% fuel @ NEDC condition

◆ Friction reduction technology

- Smaller crankshaft journal and connecting rod diameter
- Low tension piston ring

- RFF(Roller Finger Follower)
- low viscosity lubricant (SL 5W30)



◆ NVH Structural Optimization

- Upper and lower crankcase structure
- Direct installation of A/C compressor and Generator
- RFF –Free valve clearance adjustment

◆Free-maintenance design

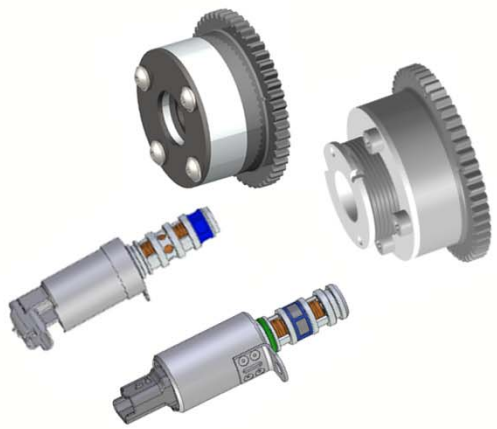
- RFF
- Automatic hydraulic tension device
- Timing chain system

◆Lightweight design

- Plastic air intake manifold
- Plastic cylinder head cover
- Aluminum alloy cylinder block and cylinder head

1, DVVT

Adopting the DVVT technology makes the engine achieve better power output performance at wider range speed. Meet the Euro Ⅳ standard and could be updated to Euro Ⅴ.



- **5% more power output**
- **10%-15% more torque output**
- **5~7% accelerating time decrease**
- **Saving 5% fuel @ NEDC condition**

NEDC: New European Driving Cycle

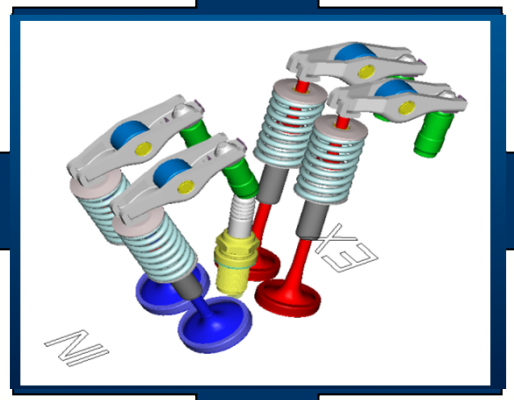
2, Friction reduction technology

- RFF
- Low tension piston ring
- Adopt smaller crankshaft journal diameter and connecting rod diameter
- External hanging oil pump
- low viscosity lubricant (SL 5W30)

RFF rocker arm with roller and hydraulic tappet

Reduce the energy loose caused by friction
reduce fuel consumption

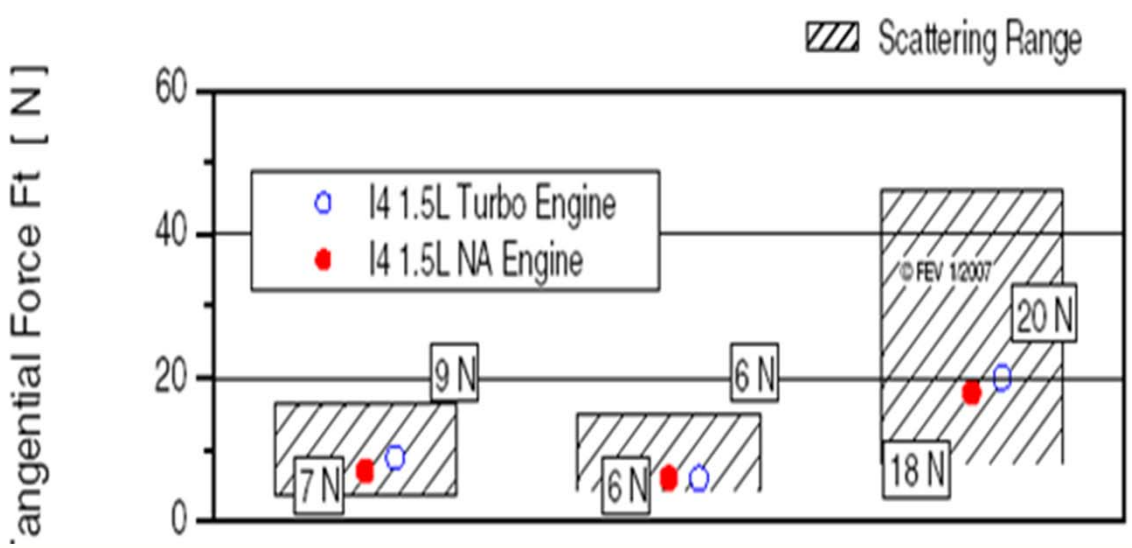
Reduce the noise
Better NVH
performance

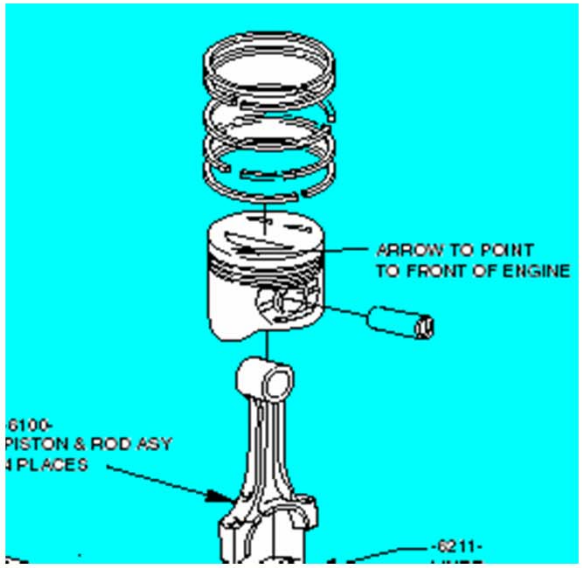


Valve clearance
is free adjustment;
Maintenance free

Easy to be assembled

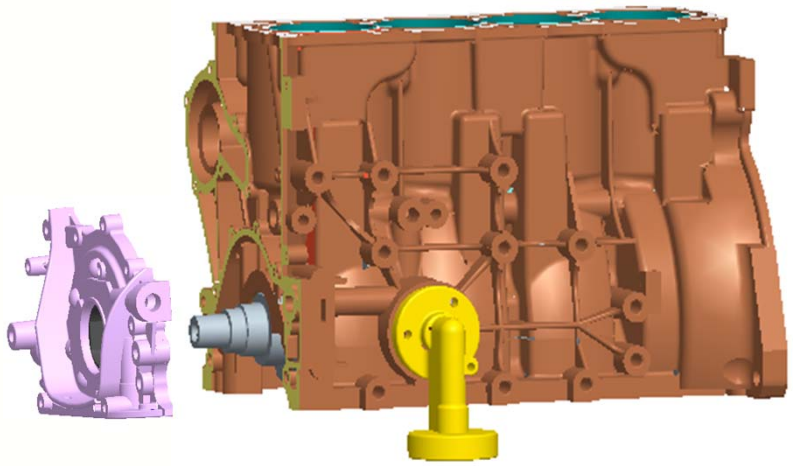
Low tension piston ring

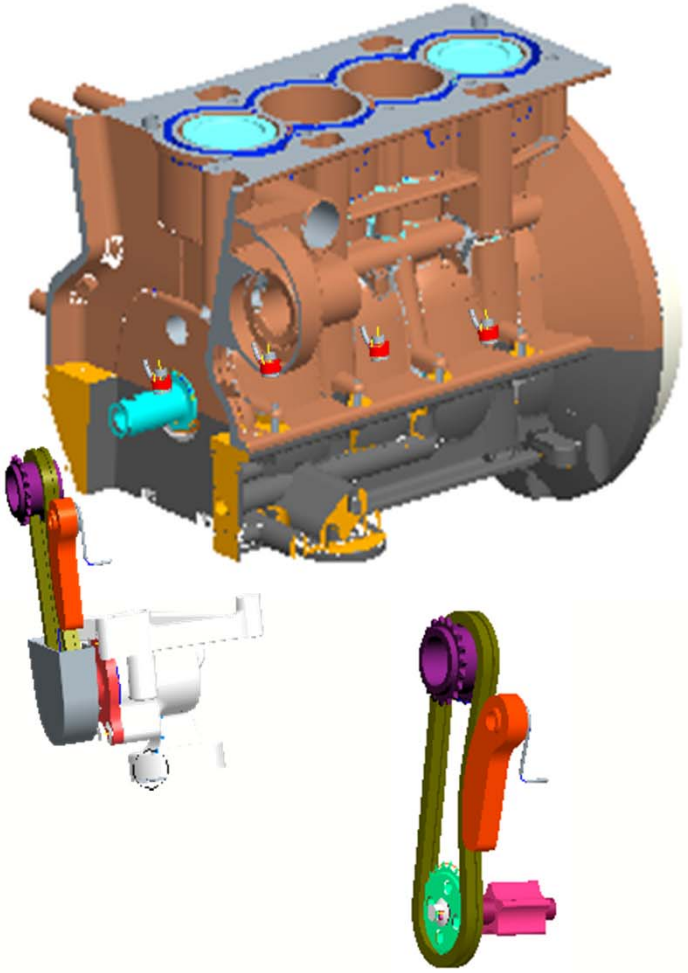




External hanging oil pump

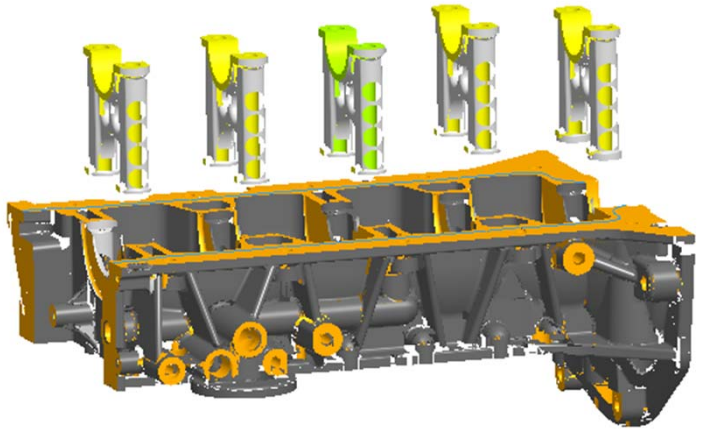
Adopt the external hanging oil pump. It makes the axial dimension of engine shorter and improves the friction situation of crankshaft.

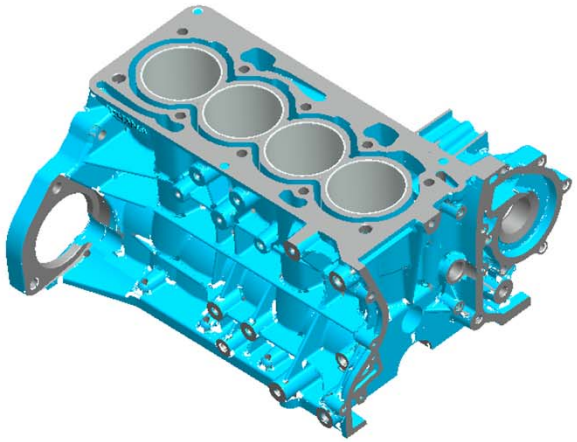


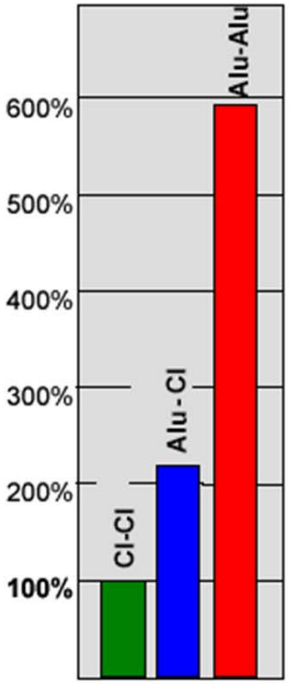


Cast iron inserted bearing seat of crankshaft

The inserted bearing seat of crankshaft and the cylinder sleeve are all made of cast iron. It makes the bearing bush more durable even under lower oil pressure for lubrication.







Main bearing oil flow

Reduce the bearing oil flow loss 50%

Reduce oil pump load

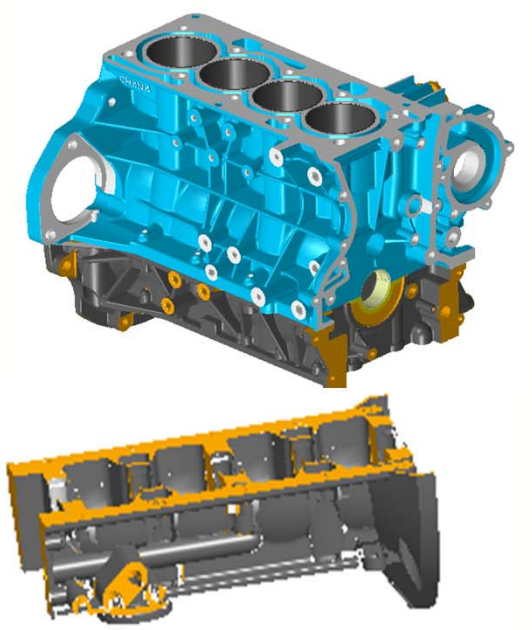
Reduce energy consumption

3, NVH Structural Optimization

38.5dB

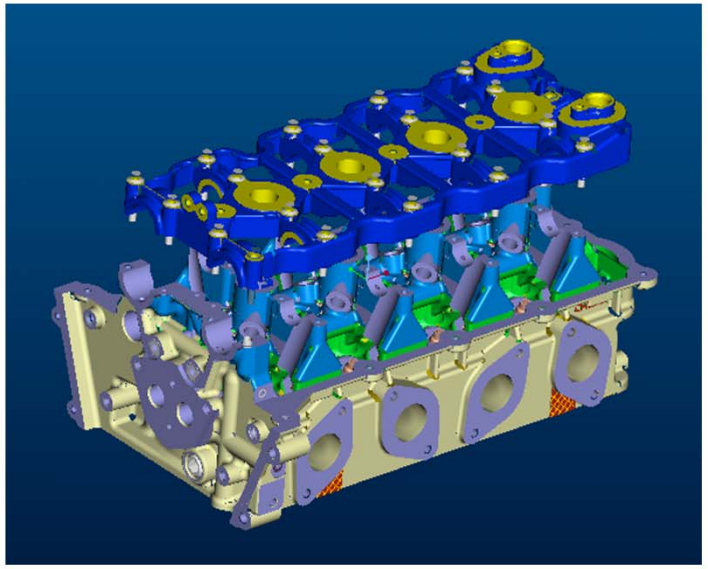
- RFF
- Adopt upper and lower crankcase structure
- Integrated camshaft cover
- Adopt plastic cylinder head cover and vibration isolation rubber cushion
- Accessory is installed directly and cancel the bracket to reduce noise

Upper and lower crankcase structure



➢Reduce 3dB(A).

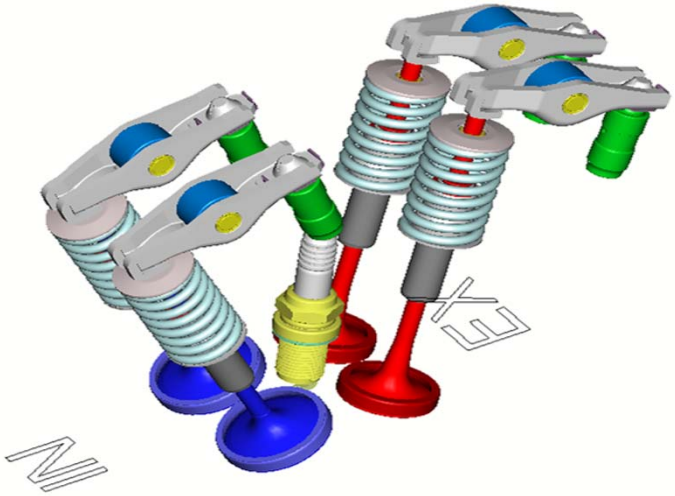
Integrated camshaft cover



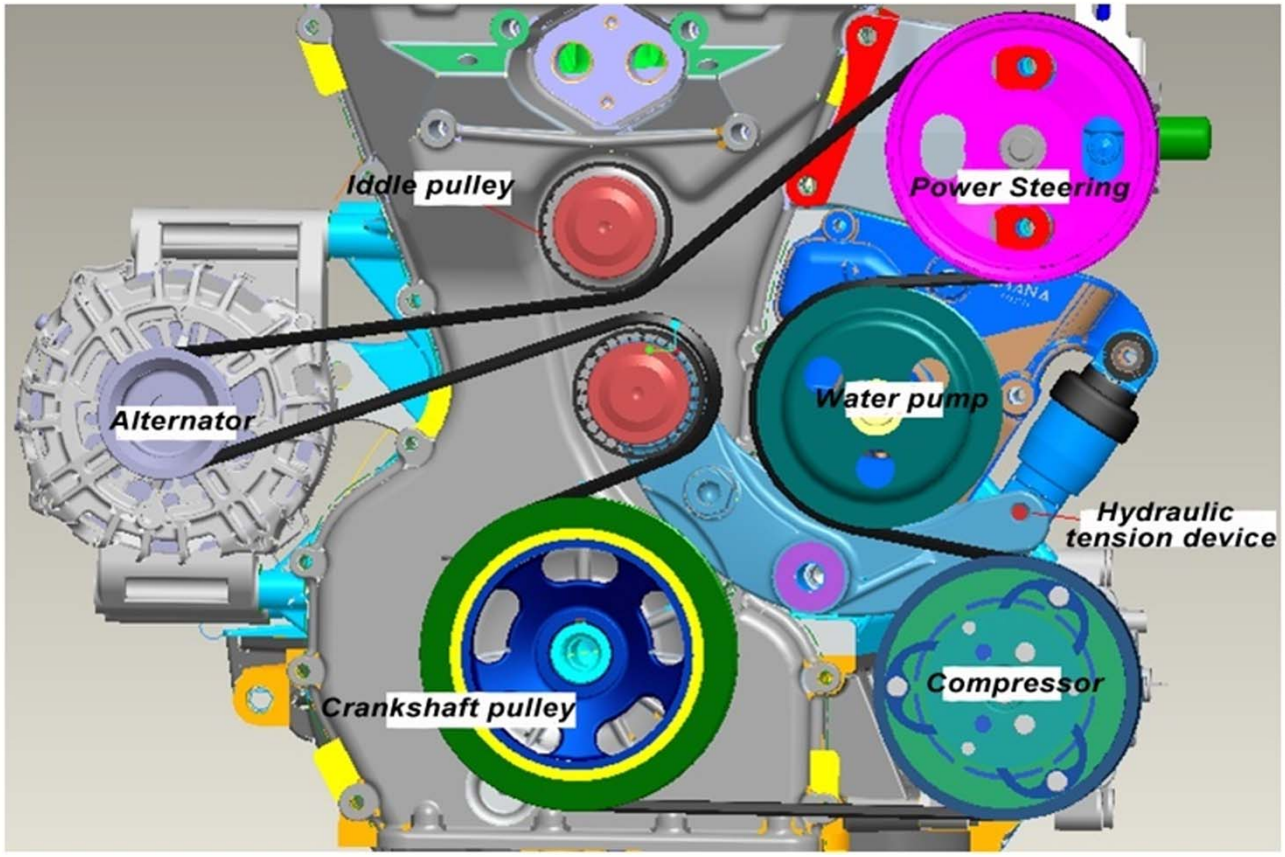
➢Improve the integral rigidity of the cylinder head, and NVH performance.

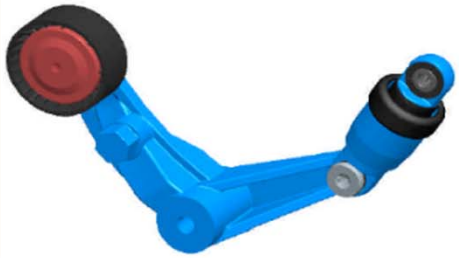
4, Free-maintenance design

- RFF –Free valve clearance adjustment
- Automatic hydraulic tension device
- Timing chain system



Eliminate the adjustment bracket of tensioner makes it more convenient to be assembled.

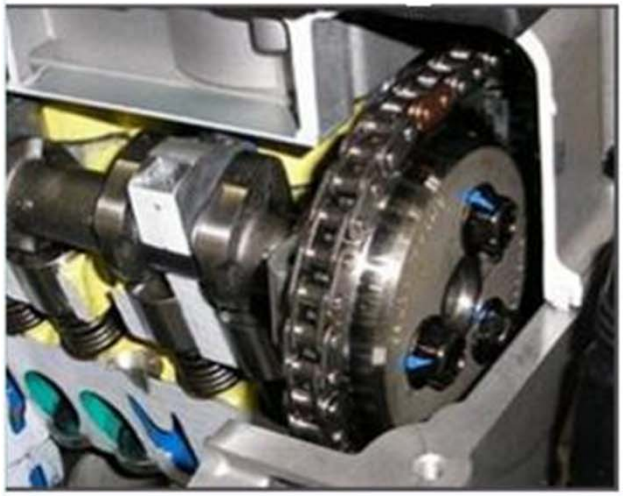


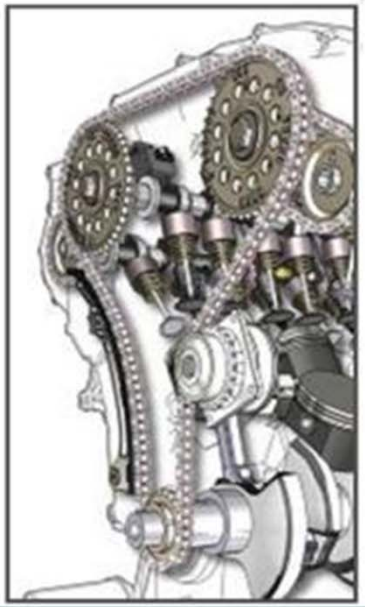


Automatic hydraulic tension device

Maintenance Free Timing Chain

Timing Chain:
Maintenance Free



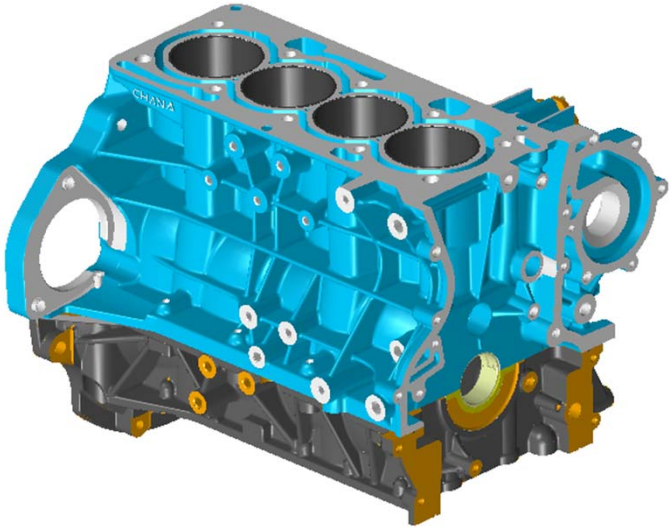


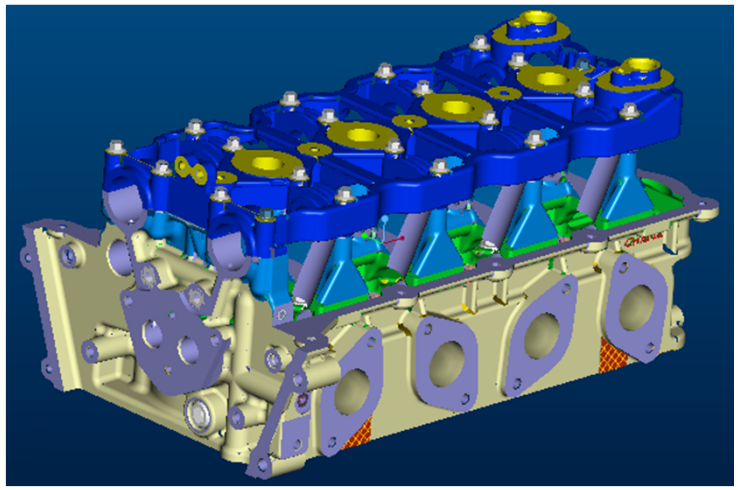
Rubber Timing Belt:
80,000-100,000 KM

5, Lightweight design

Cylinder block and cylinder head

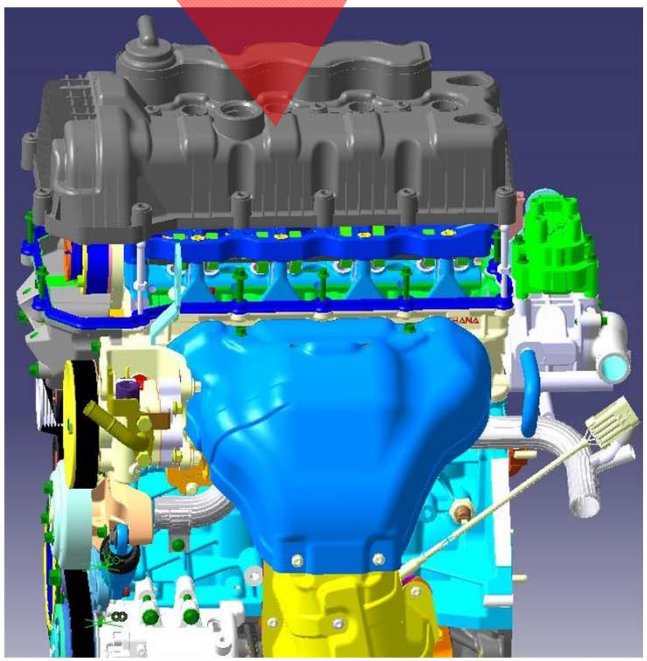
The cylinder block and the cylinder head are all made of aluminum alloy. It makes the parts strong enough to meet the rigidity requirement by adding a lot of strengthen tendons at the cost of about 10% weight decrease.



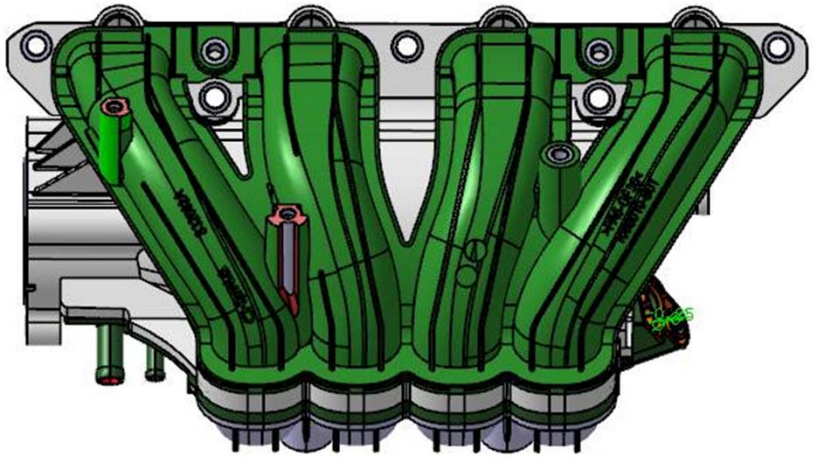


Cylinder head cover and air intake manifold

Plastic cylinder head cover



Plastic air intake manifold

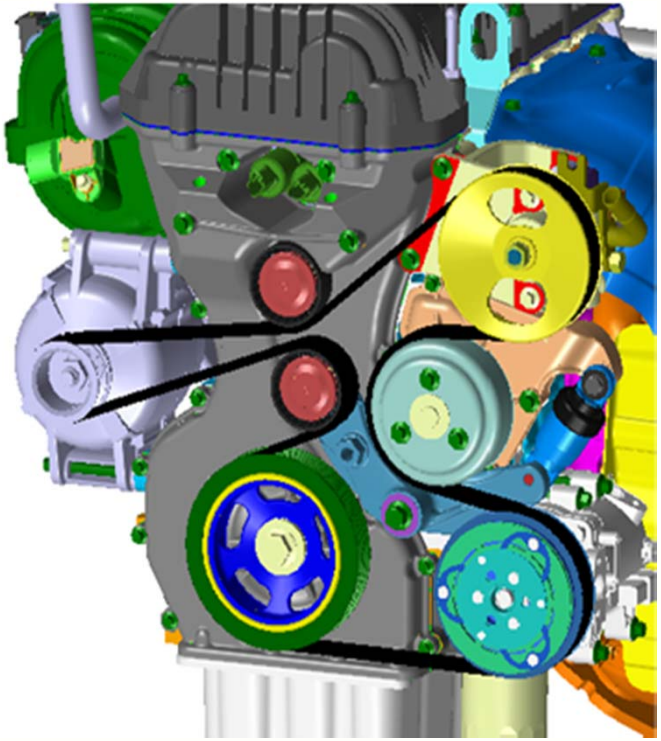


3.06(Al)--1.55kg(Plastic) -49%

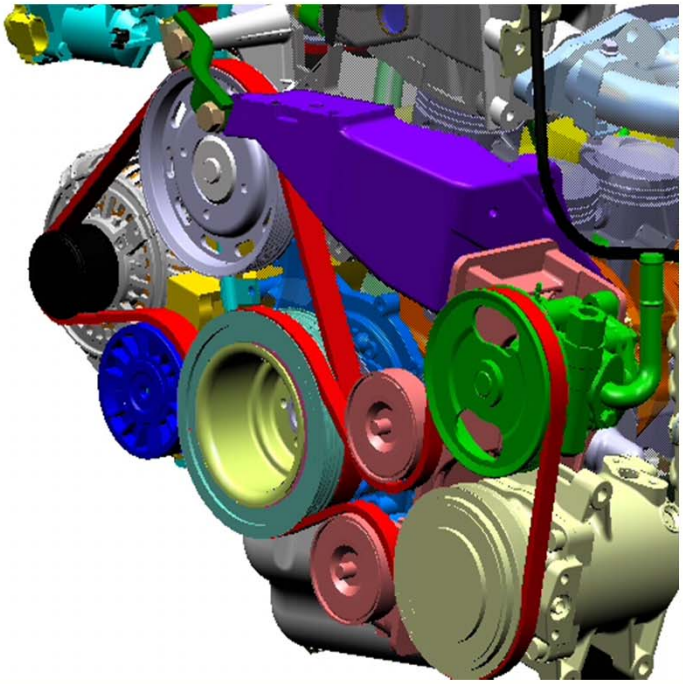
4.0kg(Al)--2.2kg(Plastic) -45%

Accessory assembly

H16 engine



Former engine

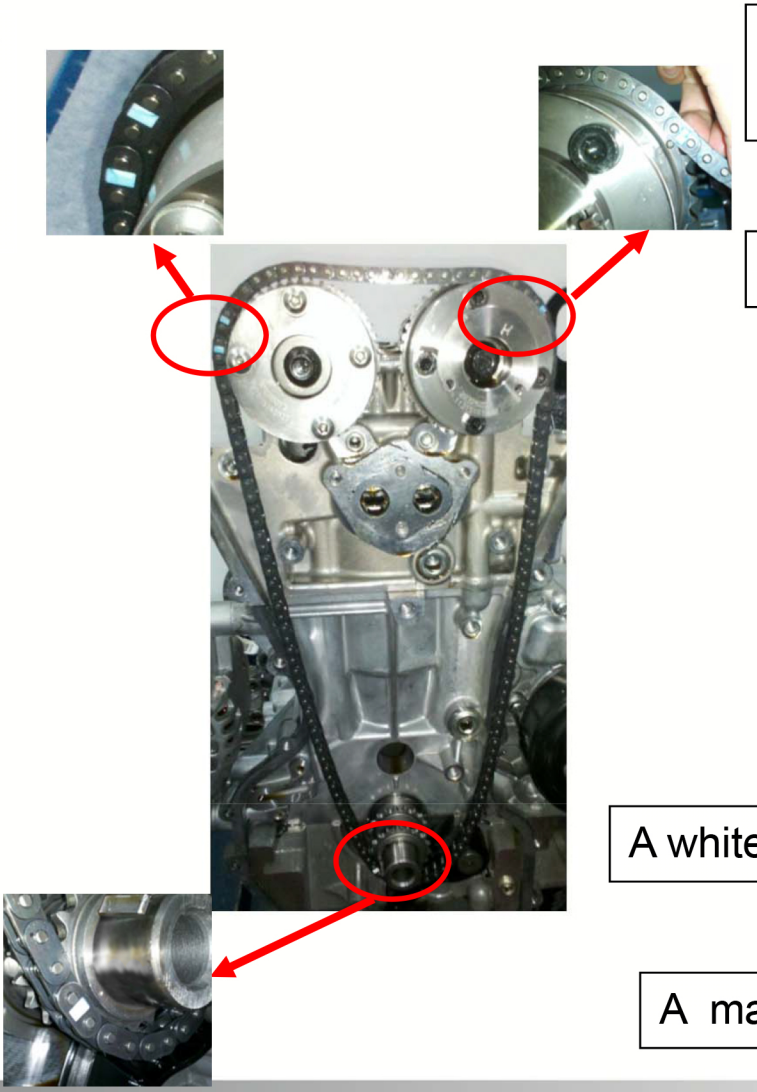


➢Accessories are installed directly on the engine, and cancel the mounting bracket. Be installed easily and reduce the weight and noise

Chapter 3 Installation and Maintenance

1, Timing chain Installation and Adjustment

The mark on the phaser sits between the two white mark on the chain



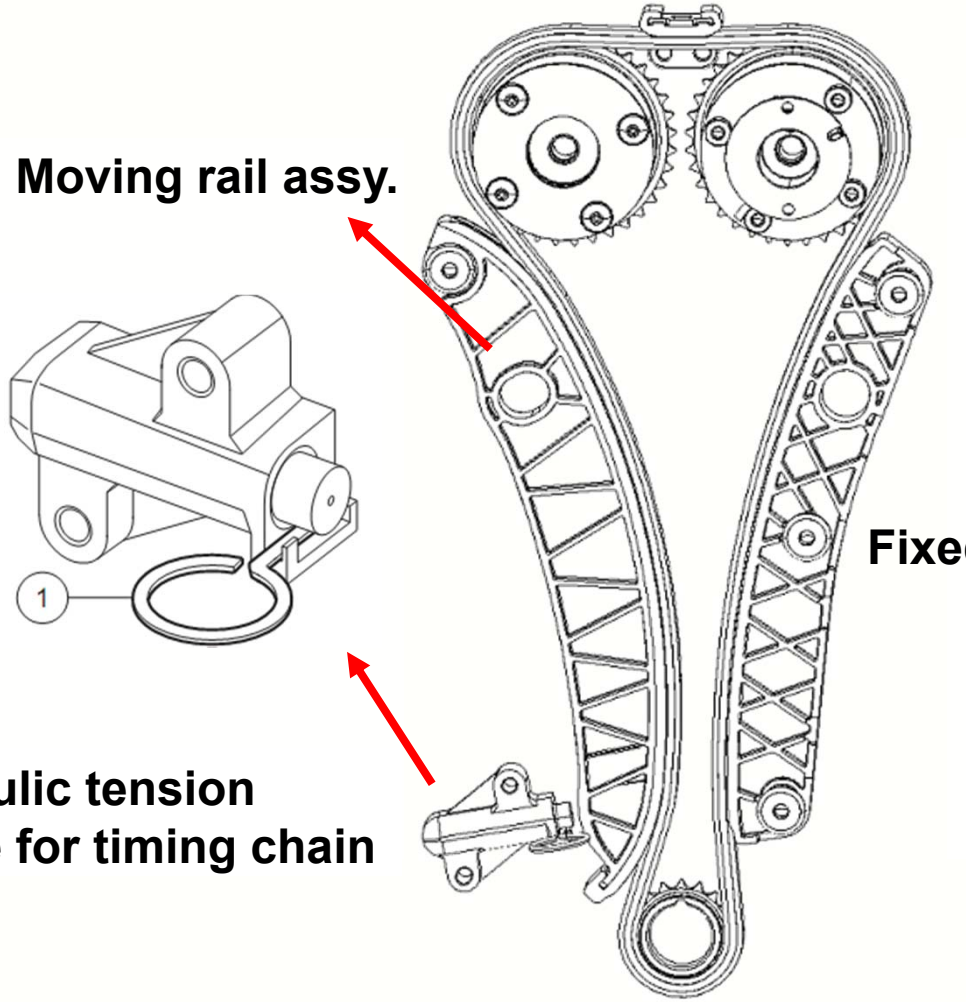
two white mark on the chain

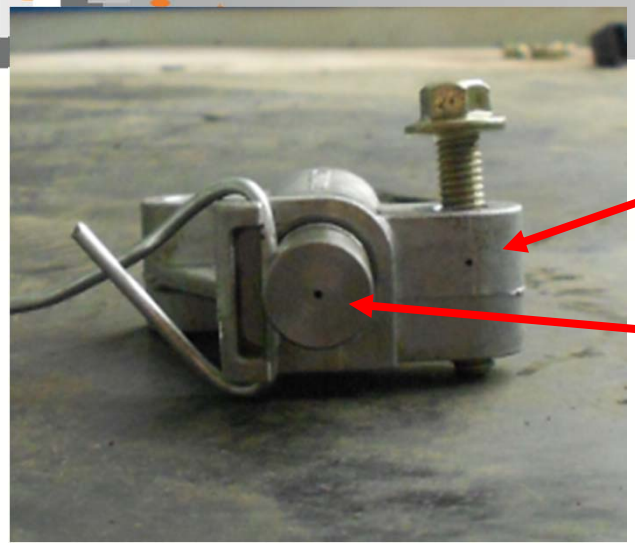
A mark on the phaser

A white mark on the chain

A mark on the sprocket

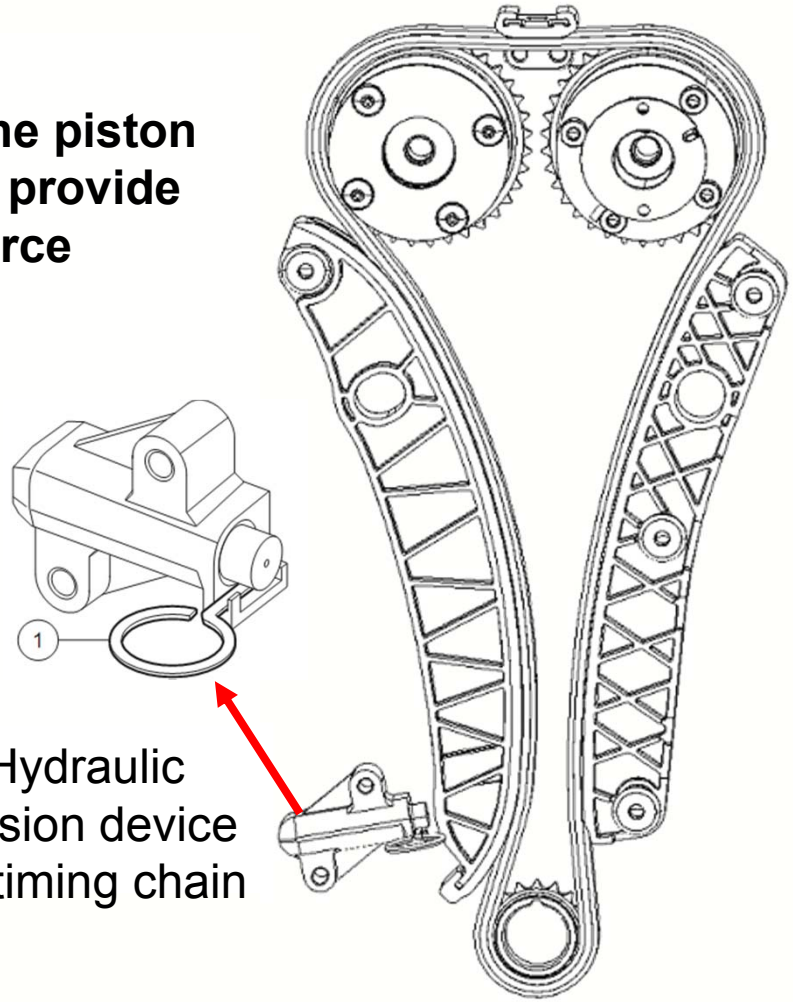
When installing, please install the fixed rail at first and then moving rail. After install, please check the moving rail can move to ensure the normal movement.





Oil from here is used to lubricate the chain

Oil from the piston is used to provide tension force



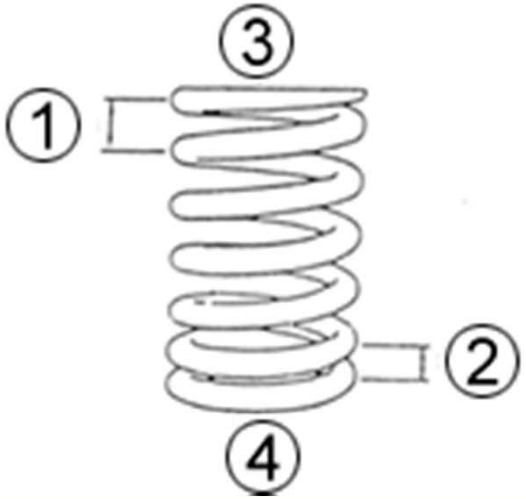
Hydraulic tension device for timing chain

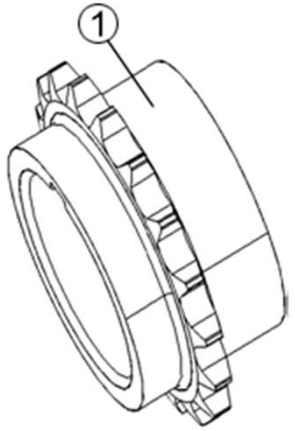
Warning: Do not pull out the locking pin before finish the assembling work including inspect whether the timing marks are alignment, if the timing chain is inserted into the rails.

2, valve spring and oil pump sprocket Installation

Valve Spring

There is a yellow mark on the long pitch of the spring, make sure the mark is on the upper side when you assemble it.

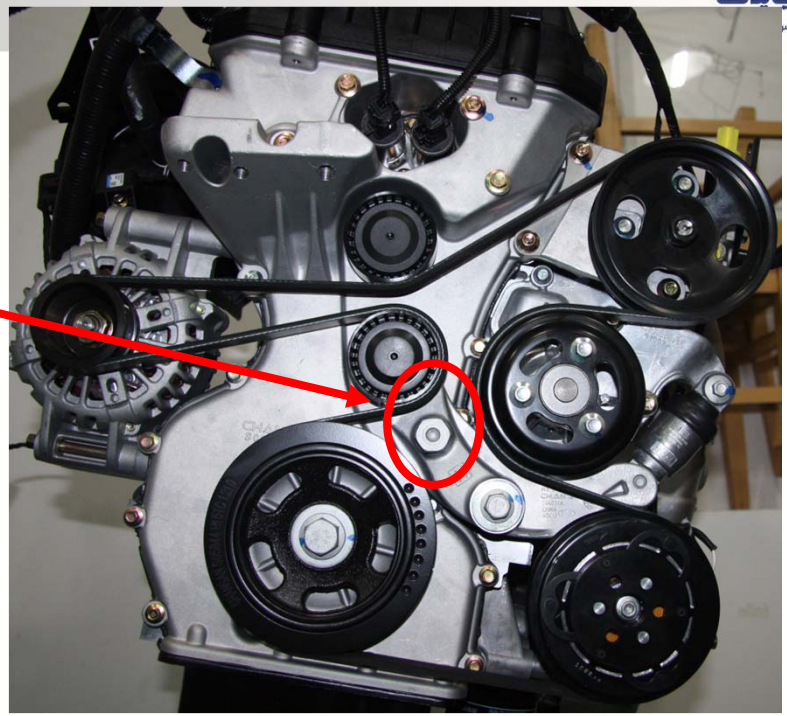




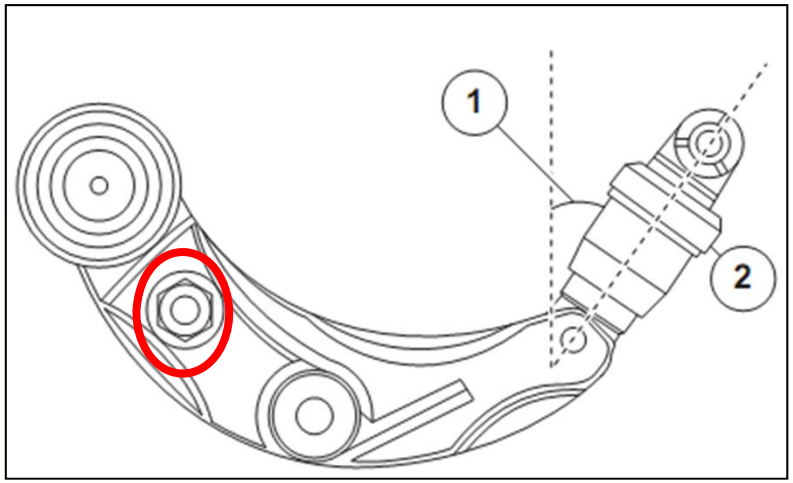
When install the oil pump sprocket, the longer end should face inside

3, Belt tensioner

CAUTION: The bolt clockwise is for tension; and the anticlockwise for loose, and the belt can be taken off

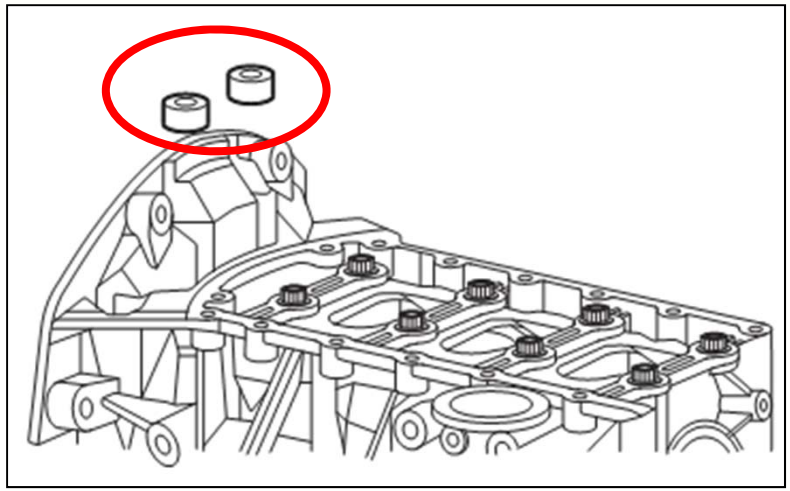


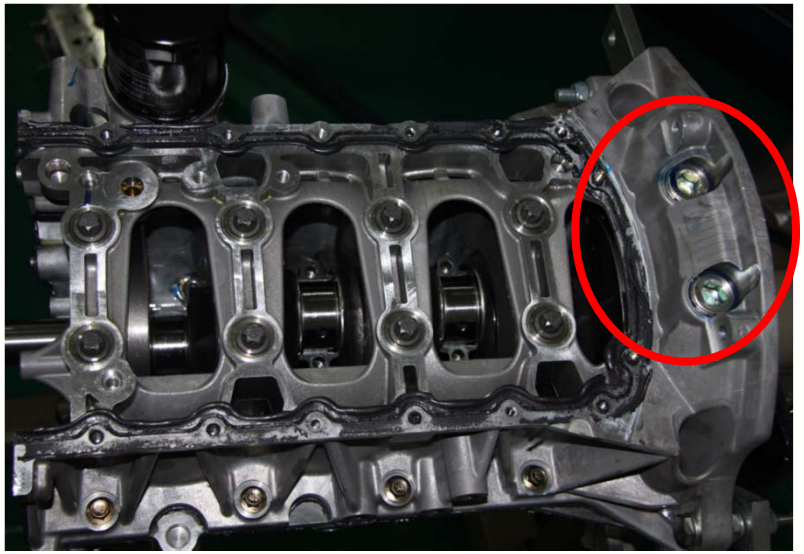
The maximum tilt angle shall not be more than 45 ° during the placement and the transportation.



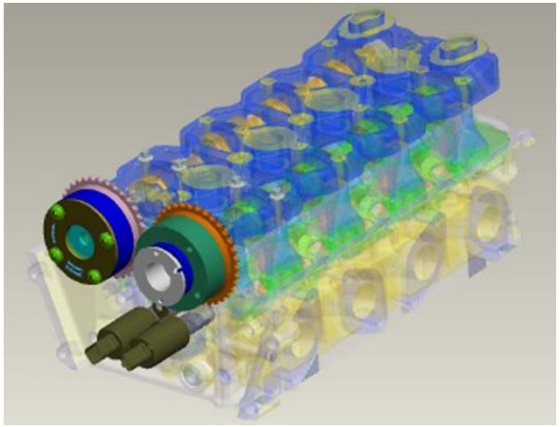
4, Crankcase lower body disassembly

When dismount the crankcase lower body, please dismount the two plugs at first.



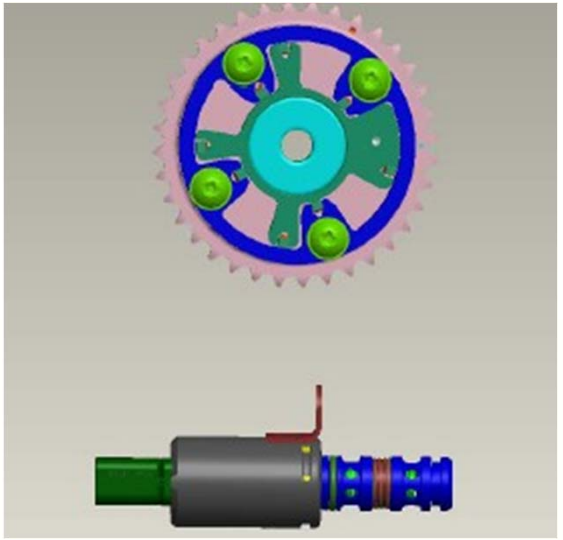


5, DVVT (Dual variable valve timing)



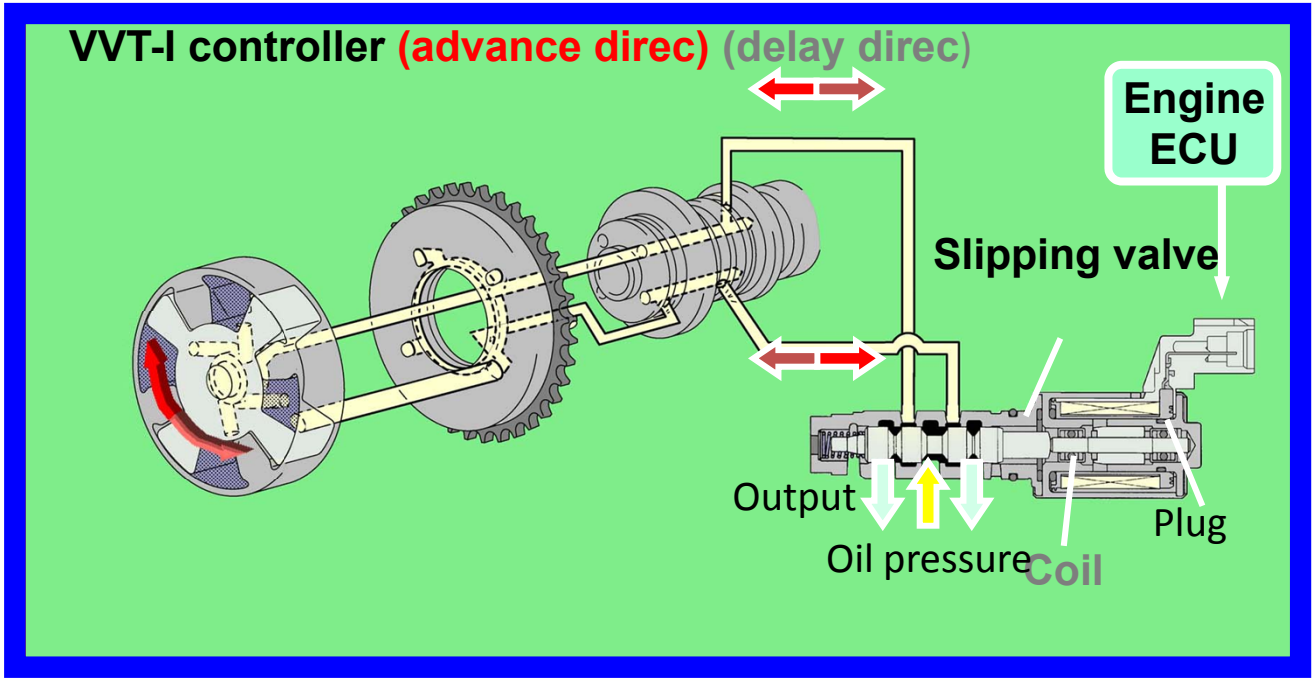
ECU controls the OCV by duty ratio to change the valve open time (advance or lag)

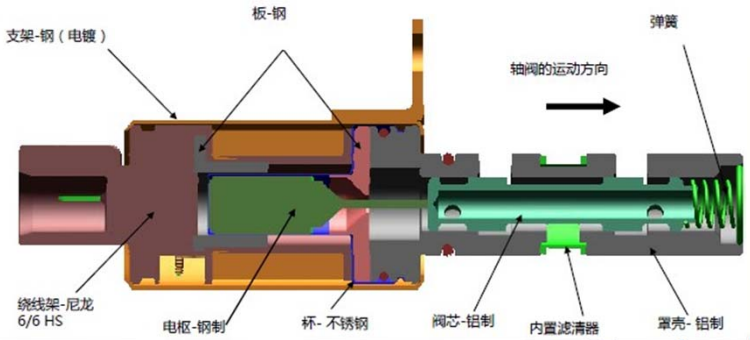
Note：JL478QEB engine is installed with single VVT



OCV (Oil control valve)

Working principle





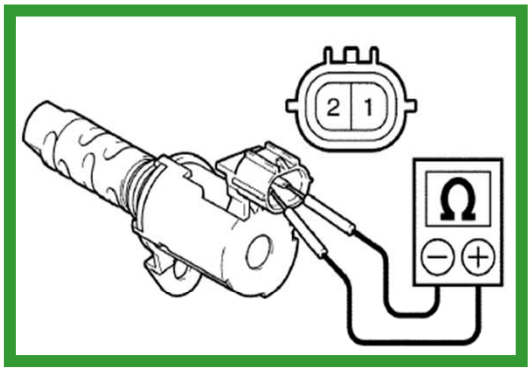
➢ OCV (Oil control valve)

Inspection：

1、Slot width≈1 mm

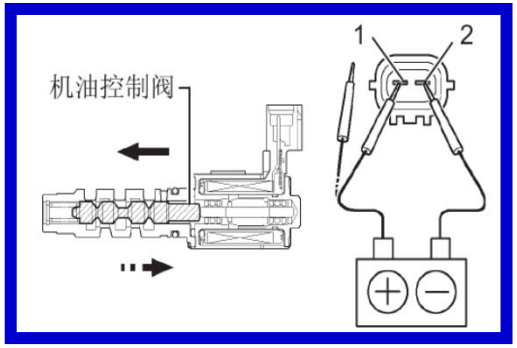
2、Pull down the valve center by 2~3 mm, at the C1 position, then release, it will return.

OCV (Oil control valve)



3、Standard resistance:

7.2 Ω （20 ℃）



4、Use the battery to connect :（+）-1，（-）-2, check the valve move or not.

Phaser

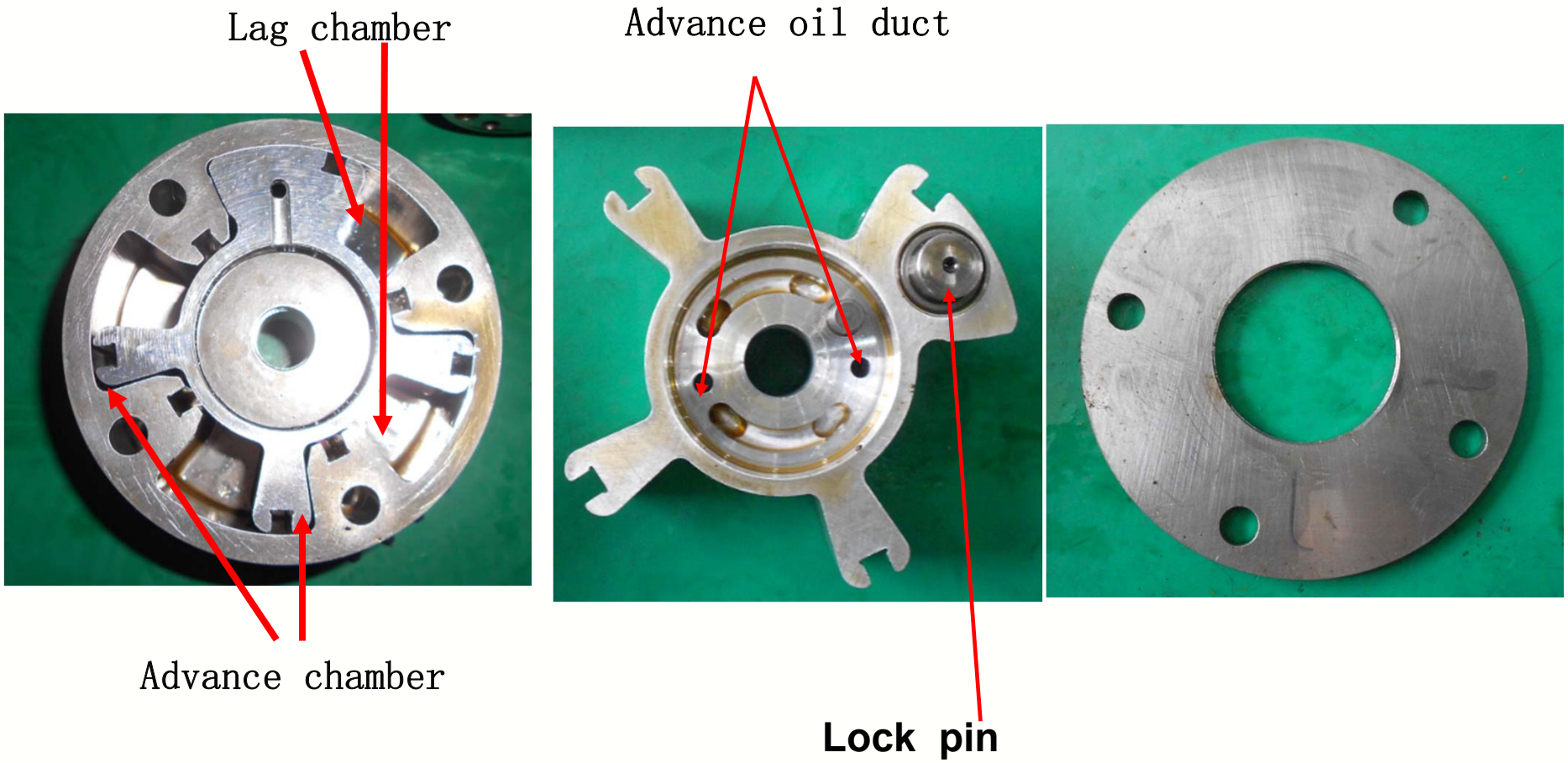
Intake Phaser

Exhaust Phaser:

The difference is the exhaust phaser has two return spring ?

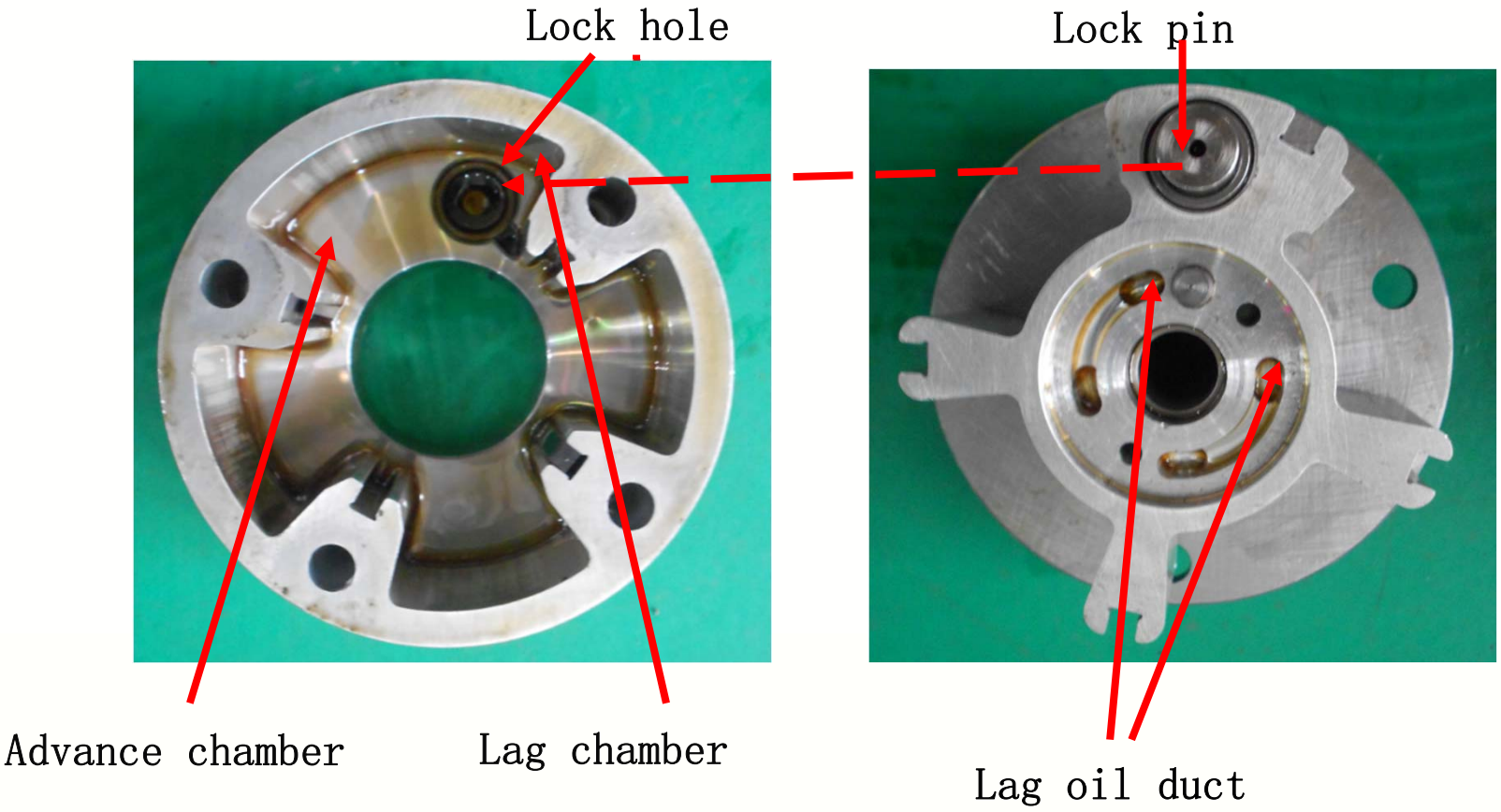
Intake Phaser:

The phaser can’t be disassembled at any time.



Exhaust Phaser:

The phaser can't be disassembled at any time.



Intake Phaser:
Initial position is the maximum lag position

Initial position

Maximum advance position

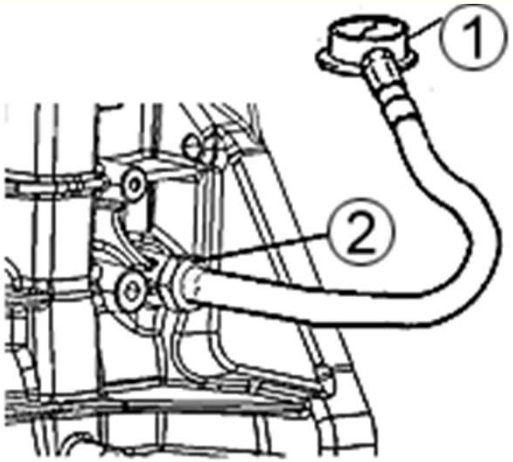
Exhaust Phaser:
Initial position is the maximum advance position

Initial position

Maximum lag position

Critical Information for Maintenance

- Make sure the oil in the engine is enough and clean without leaking
- Remove the oil pressure sensor and install the pressure gauge.
- Start the engine and warm up to 75-85 °C



Oil Pressure Inspection

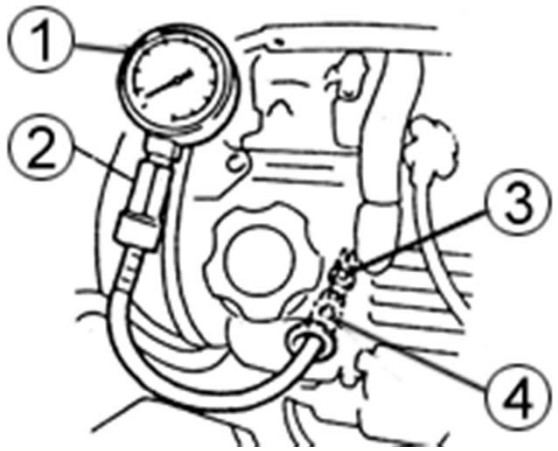
Standard Oil Pressure:

100~200kpa @ idle speed

350~500kpa @ 3000rpm

Critical Information for Maintenance

1. **Engine pre-heated, then stop**
2. **Disconnect fuel injection wiring harness**
3. **Disconnect ignition coil assy and the spark plug**
4. **Install the pressure gauge**
5. **Step the clutch pedal and the acceleration pedal com**
6. **Start the starter and read the measurement**



	Compression pressure
Limited value	**800kPa**
Limited distinction	**100kPa**

Chapter 4 Malfunction and solution

Failure phenomenon：

Model: Unstable idle, Poor power when driving, Engine-check light is on;

DTC: P0016 or P0017 (CS35);

DTC: P0011&P0012 & P0014 or P0015 &P0016 or P0017(EADO)

Failure analysis:

P0016: Relative installation position of camshaft and crankshaft unreasonable (Intake)

P0017: Relative installation position of camshaft and crankshaft unreasonable (Exhaust)

P0011: Intake VCP phase response lagging;

P0012: Intake VCP camshaft phase error big;

Solution 2:(Connect other OCV for testing, only available for exhaust VVT)

1. Disconnect the wiring harness connector of OCV;

2. Connect the wiring harness connector of original OCV to the new OCV ;

3. Start the engine, press the acceleration pedal (Turn on the head light and A/C to make the engine running above 4000rpm) ;

If the new OCV spool no moving, it means problem in ECU or wiring harness poor connection;

If the new OCV spool moving, it means block in OCV, replace it;