
CFMOTO

# 450SR

# Contents

# Contents

# 1. Introduction

Zircon black

Nebula black

As the second member of the CFMOTO SR family, the 450SR inherits sport-oriented design for track but smart compromised for street riding, with the new design chassis, engine, suspension, wheel rim, braking, etc., it only has 168kg cub weight, gives a agile and fast handling on every corner and every lean over.

The very new 449.5cc parallel twin-cylinder engine is the first 270° crankshaft engine with dual balance shaft in the history of CFMOTO and it was totally designed by CFMOTO R&D independently. Which provides the bike exciting acceleration, linear throttle response and lower vibration.

For riding more fun, the 450SR equipped with a 5-inch TFT curved screen instrument, which can pair with phone via bluetooth to navigation, call the contacts, control music, etc. Besides, the T-box, with a built-in 4G module and 6D sensor, can realize motorcycle-phone interconnection, real-time viewing of vehicle location, riding condition, OTA upgrade, etc.

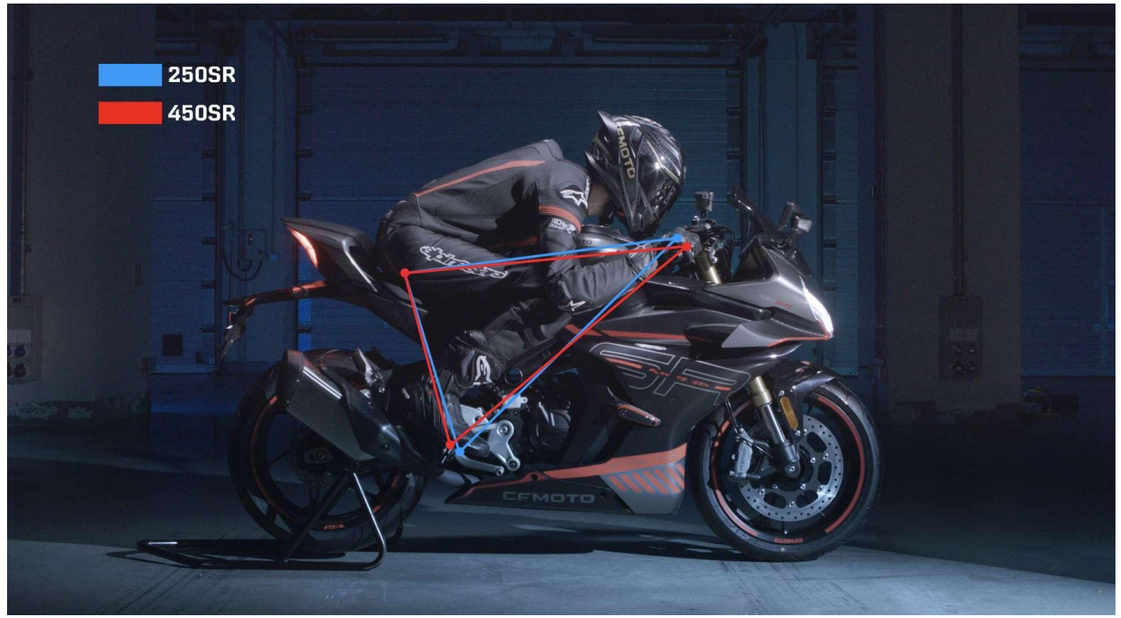
# 2. Specifications

| Body work | |
|---|---|
| Length x Width x Height | 1990mm×735mm×1130mm |
| Wheelbase | 1365mm |
| Min. Ground Clearance | 140mm |
| Front Rake | 24.5° |
| Curb Weight | 168kg |
| Fuel Capacity | 14L |
| Chain | 106-link 520 O-ring chain |
| Front Brake | Single disc with Brembo 4-piston calipers |
| | Front brake disc diameter: 320mm |
| Rear Brake | Disc brake with single-piston floating brake caliper |
| | Rear brake disc diameter: 220mm |
| Shock Absorber | Inverted telescopic fork |
| | Linkage swing arm with monoshock absorber |
| Steering Angle | 70° |
| Tires | Front: CST ADRENO HS AS5 110/70 ZR17M/C 54H |
| | Rear: CST ADRENO HS AS5 150/60 ZR17M/C 66H |
| Tire Pressure | 250kPa |
| | 280kPa |
| Color(s) Available | Zircon black |
| | Nebula black |
| Battery | 12V96Wh(Li-ion battery) |

| Engine | |
|---|---|
| Model | 272MQ |
| Type | Parallel twin cylinder, liquid cooled, 4-stroke |
| Vlave train | Chain drive DOHC 8 valves |
| Displacement | 449.5ml |
| Bore ×Stroke | 72mm×55.2mm |
| Maximum Power | 37kw/9500rpm |
| Maximum Torque | 39N·m/7600rpm |
| Compression Ratio | 11.5:1 |
| Fuel Supply | EFI |
| Ignition | BOSCH MSE6.0 ECU |
| Transmission | 6-gear constant mesh transmission |
| Cold Valve Clearance | IN: 0.10~0.15mm |
| | EX: 0.25~0.31mm |
| Spark Plug | NGK LMAR9AI-10 1.0mm |
| Idle Speed | 1400±140r/min |
| Engine Oil | SAE10W-40 API SJ JASO MA2 or higher |
| Engine Oil Capacity | Oil change with filter: 2.8L |
| | Overhaul: 2.9L |

# 3. Body work

## 3.1 Exterior

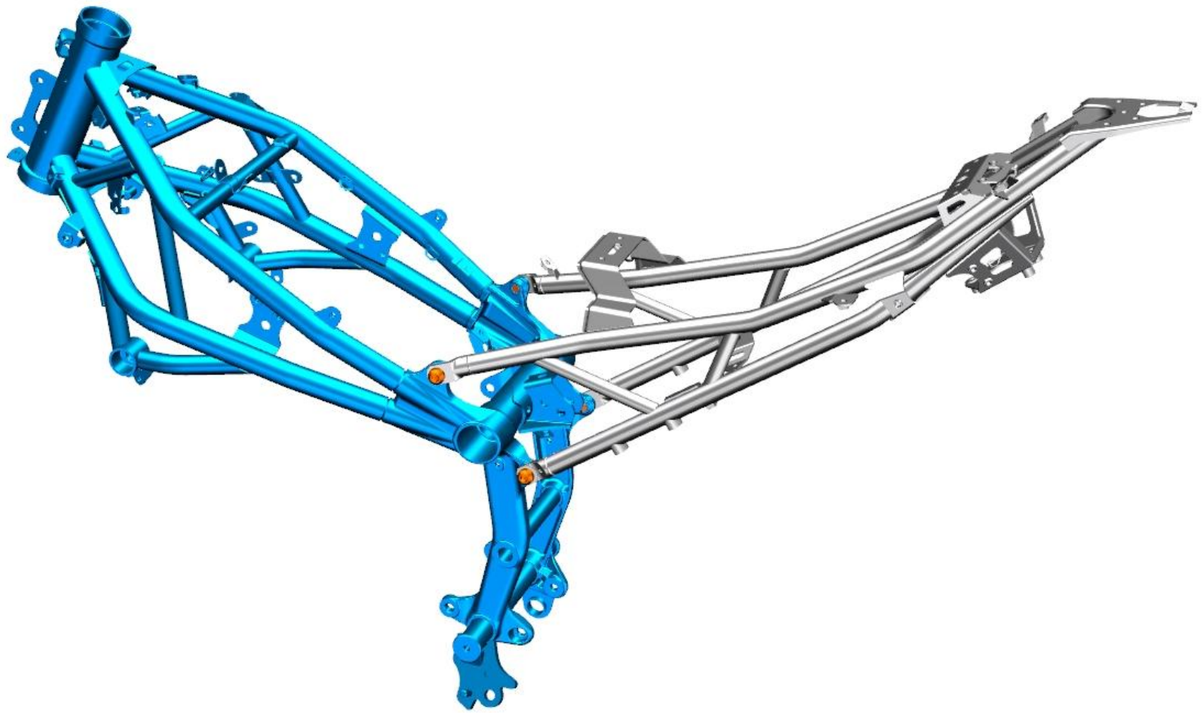



For more aggressive riding and more agile handling, the 450SR riding triangle is adjusted by setting a higher footpeg and lower handlebar compare with the 1st generation SR model--250SR/300SR.

Another impressive design is the front wing, which can provide 2kg down force at 120km/h.

# 3. Body work

## 3.2 Chassis



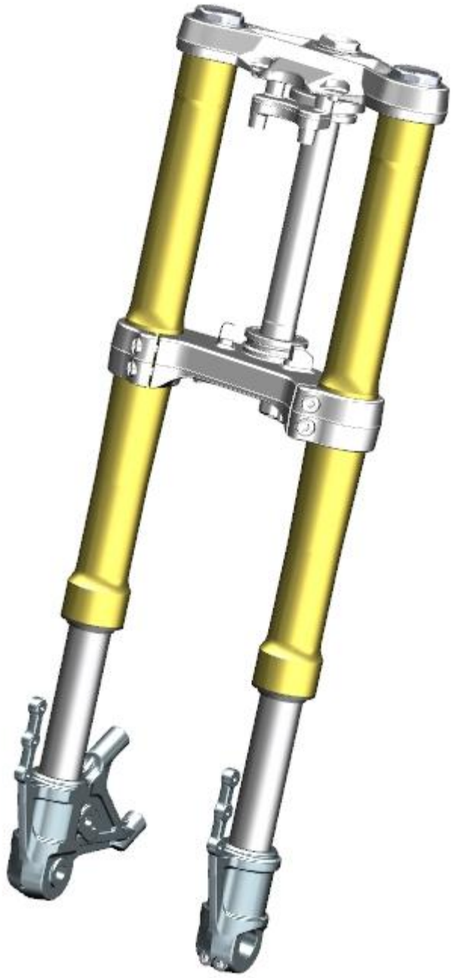
The frame is developed with a purpose of rigidness and lightweight. The high-strength chromium-molybdenum alloy steel, characterized by high stiffness and thinner tube thickness, is used to make the chassis. As a result the chassis weigh is less than 11kg.

The subframe is a kind of individual strcuture fixed on the chassis by 4 bolts, and because was welded by the CR-MO alloy steel same with chassis, the weight is less than 4kg.

The torque of the 4 bolts is 50N·m.

# 3. Body work

## 3.3 Suspension

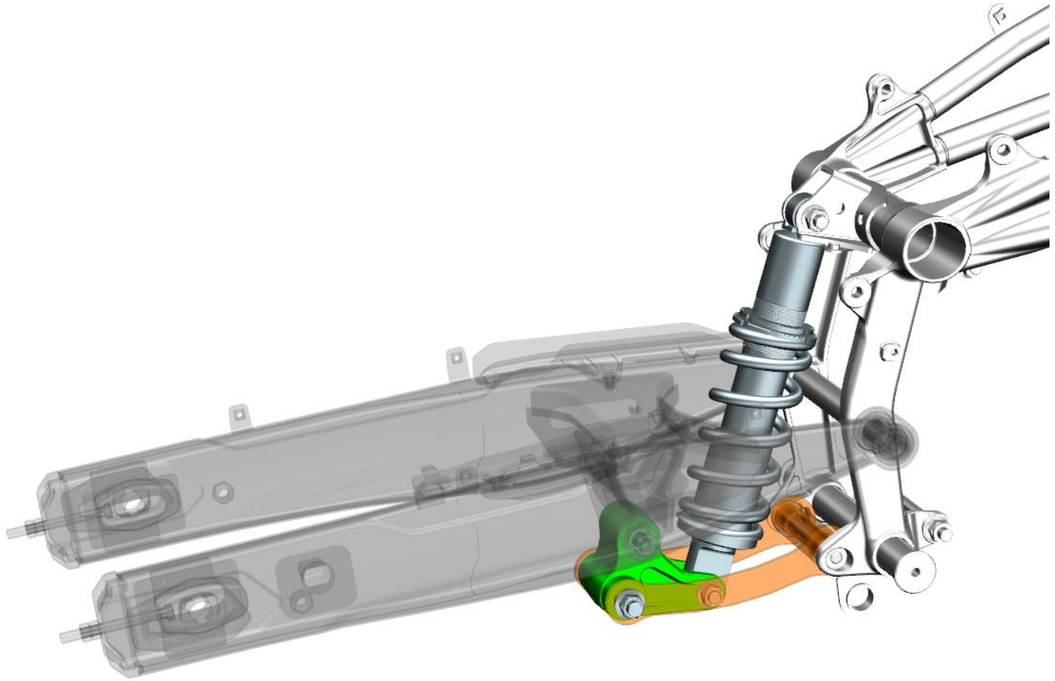


The tuning of front absorber is stiffer but with smart compromised for street road, that makes the front fork has better support in hard braking, more stable leaning in corner, but still comfortable on street road.

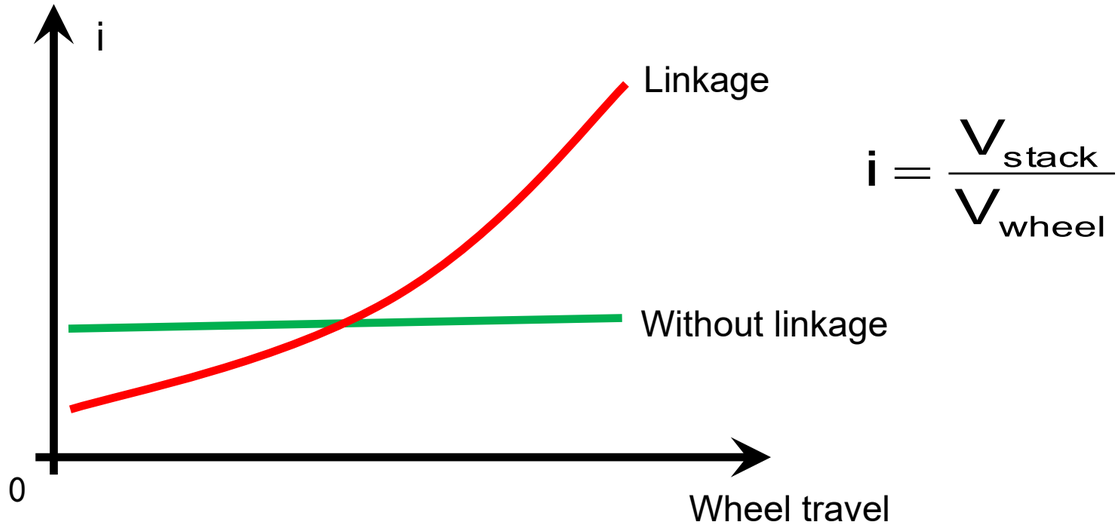
Note:
The screws on the left fork need to be tightened to 25N·m with LOCTITE® 243 thread locker. These screws are to lock the wheel shaft,  if the wheel shaft is not been lock solidly, the wobble of the brake disc following front wheel may push the pistons back to the caliper, that may cause the front braking malfunction!

# 3. Body work

## 3.3 Suspension



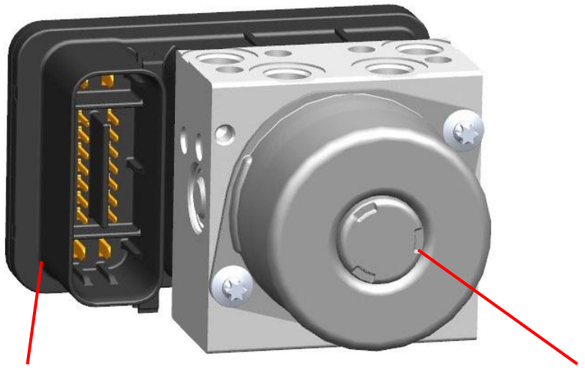
The rear suspension is a linkage mechanism similar with 700CL-X series. The stack moves slower in the initial stroke, but with the wheel travel goes up, the stack moves faster in the cartridge. That makes the damping softer at first but stiffer later on, to allow the suspension soft enough to absorb bumpings and stiff enough to support the aggressive riding.




$$i = \frac{V_{stack}}{V_{wheel}}$$

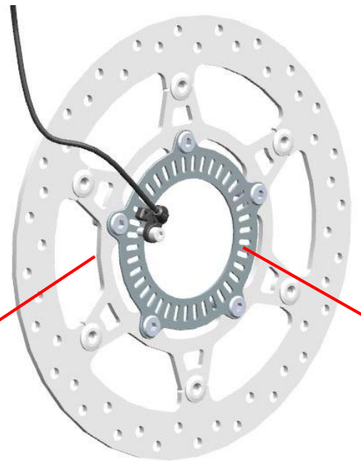
# 3. Chassis

## 3.4 Braking system



ABS ECU

ABS hydraulic unit



Wheel speed sensor

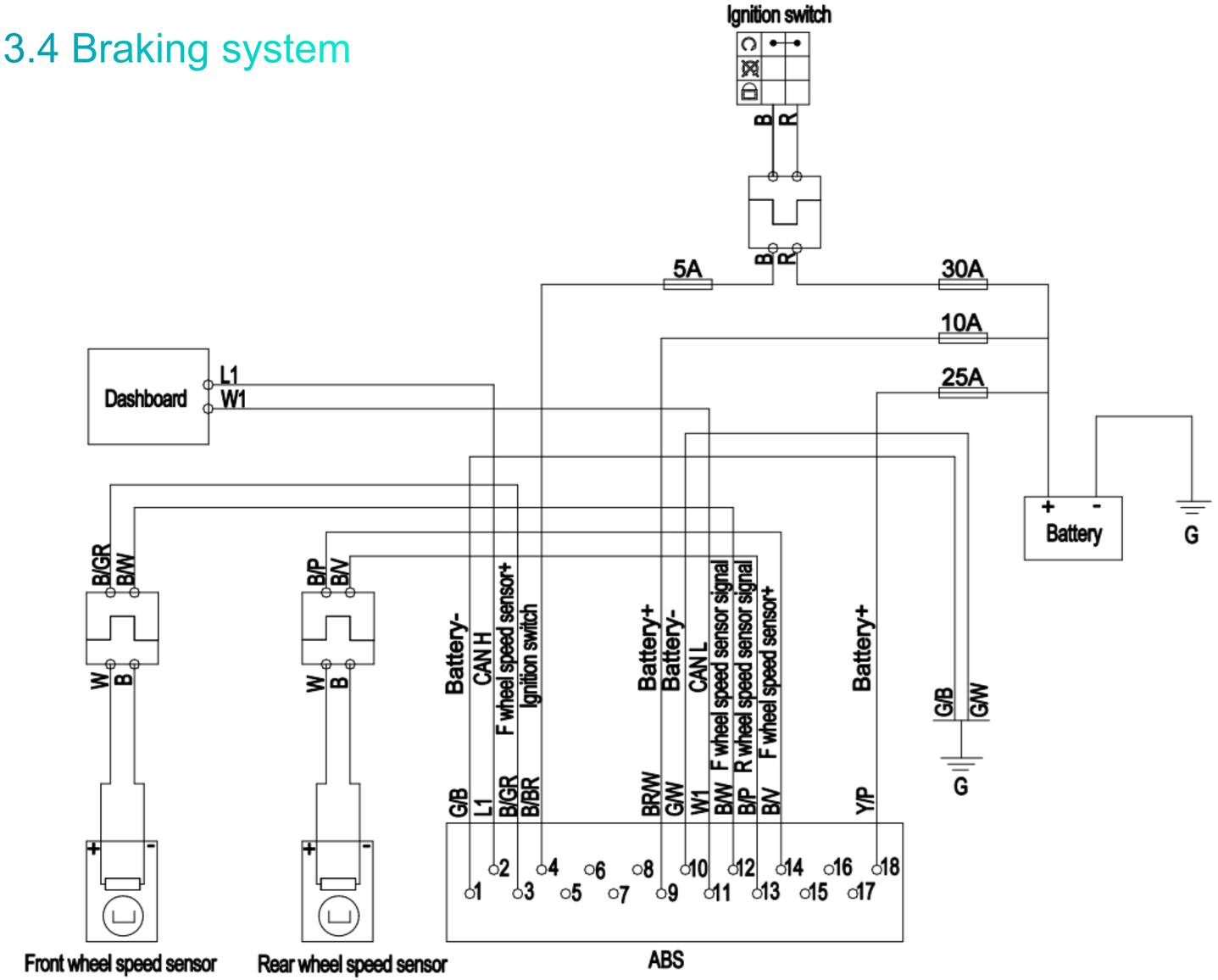
Counter disc

The ABS used on 450SR is same with waht is used on 800MT on hardware. The one-piece BOSCH 9.1 ABS ECU and ABS hydraulic unit on the is not repairable, therefore it is very importance that the service procedures for brake fluid replacement and air bleeding are followed. The air bleeding can be done by DSCAN.

Besides the ABS ECU and ABS hydraulic unit, the ABS system consists of wheel speed sensors and counter discs on both front and rear wheel that detect wheels rotational speed. They feed their information back to the ABS ECU by hard wire. If a wheel is found to be at risk of locking up, the ABS ECU will activate the ABS hydraulic unit to reduce the braking pressure applied to the brake calipers by the rider. This controls wheel speed within a safe range and preserves the gyrostatic effect of the wheels, keeping the motorcycle stable even on varying surfaces.

# 3. Chassis

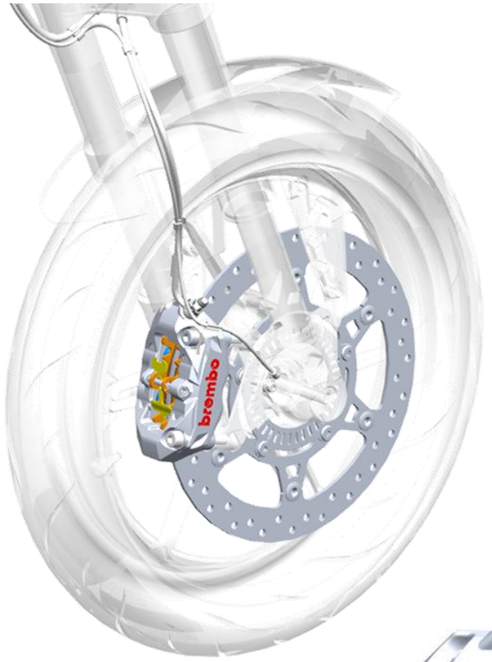
## 3.4 Braking system

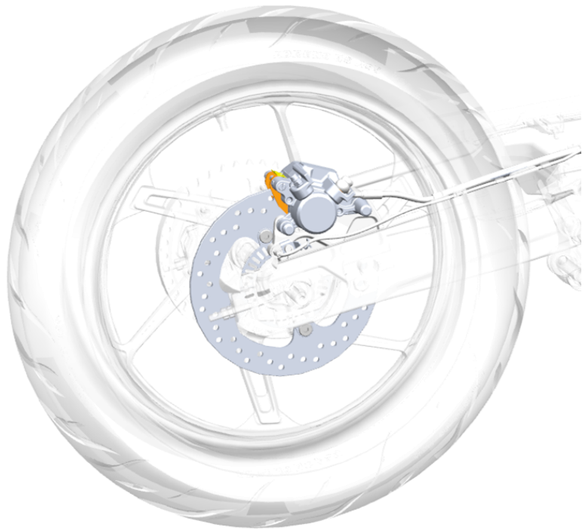


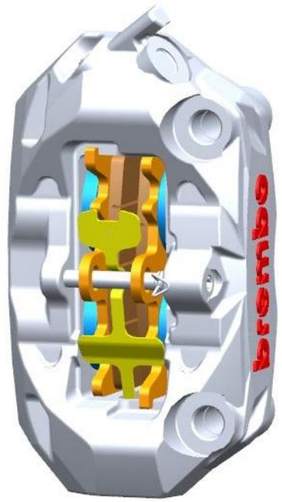

The dashboard received the wheel speed signal sent by ABS ECU via CAN bus to calculate the bike speed.
The ABS ECU pick up the front wheel speed signal priority to display the bike speed, if the front wheel speed signal lost or abnormal, the ABS ECU will send the rear wheel speed signal to the dashbaord as a option.

# 3. Chassis

## 3.4 Braking system





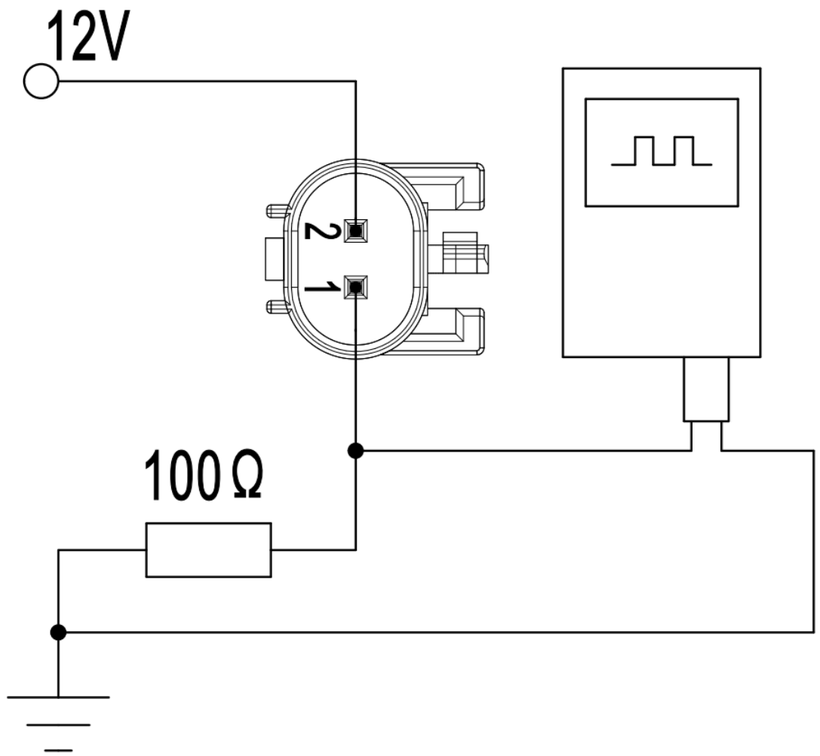

The radially mounted front Brembo® caliper works with single 320mm floating brake disc via 4-pot Ø32mm pistons, provides powerful braking forece and lighter under spring weight.

The rear braking uses a single piston floating caliper with a 240mm single disc.

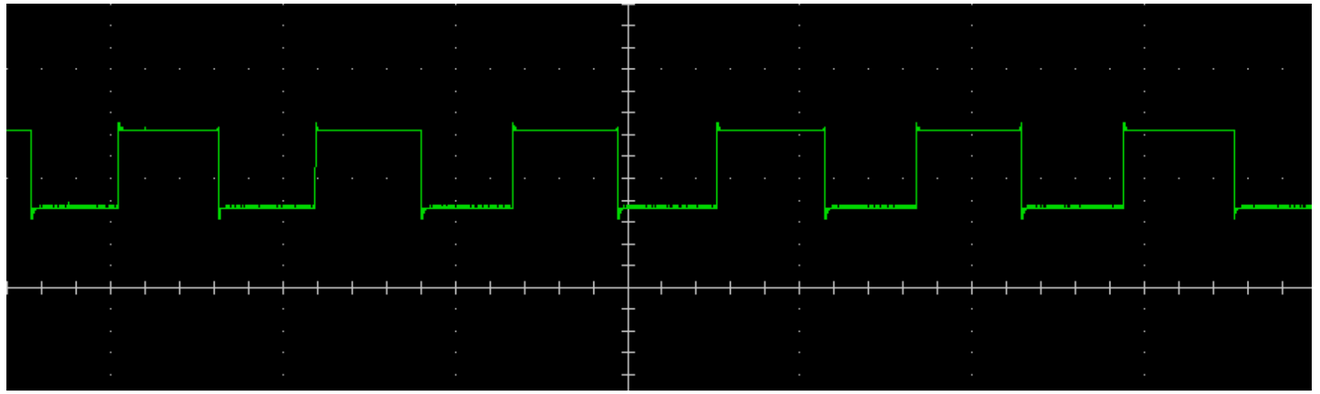
Use only clean DOT 4 brake fluid from a sealed container for service and repair.
Never use DOT 5 brake fluid, oil seals and brake lines are not designed for DOT 5 brake fluid!

# 3. Chassis

## 3.4 Braking system




The core element of the wheel speed sensor is a Hall element, but what different with other Hall element sensors(TPS, for example) is that the sensor here only has 2 terminals instead of 3 terminals.
The test method of the wheel speed sensor on motorcycle is as shown in diagram. Turn the wheel after connect the 100Ω pull-down resistor and oscilloscope, the signal generated by the Hall element will display on the oscilloscope. Screenshoot as below can be taken as a reference.



# 3. Chassis

## 3.5 Tires

| Tires | |
|---|---|
| Front: | CST ADRENO HS AS5 110/70 ZR17M/C 54H |
| Rear: | CST ADRENO HS AS5 150/60 ZR17M/C 66H |
| **Tire pressure** | |
| Front: | 250kPa |
| Rear: | 280kPa |

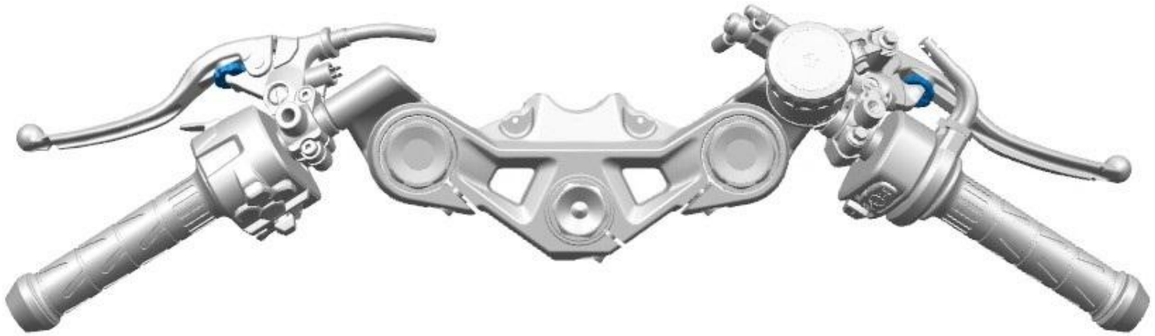
The all new tire is developed by CST with the CFMOTO R&D together, which aims at provides agile handling and high grip both on street and tracks.

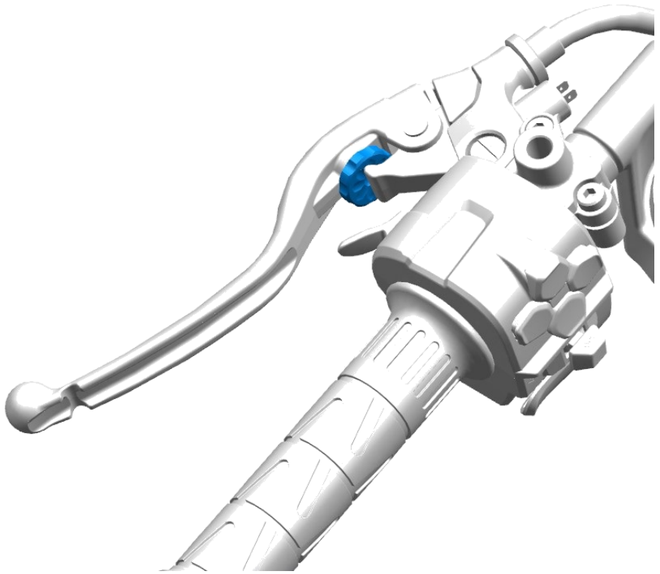
For agile handling, several designs are used in the front tire to achieve this target: Firstly, it needs as light weight as possible. Secondly, the more contact patch area will makes the handling sluggish, so the tire profile is optimized to ensure the contact patch area is smaller as up-right when the bike lean over. Thirdly, the ARMID is used to enhance the tire rigidity.

While on the rear tire, it needs more contact patch area to generate more grip, that’s how the profile is designed, with the bike leans down, there will be more contact patch area, provides more grip. Also, the ARMID is used to enhance the tire rigidity.

# 3. Chassis

## 3.6 Handlebar

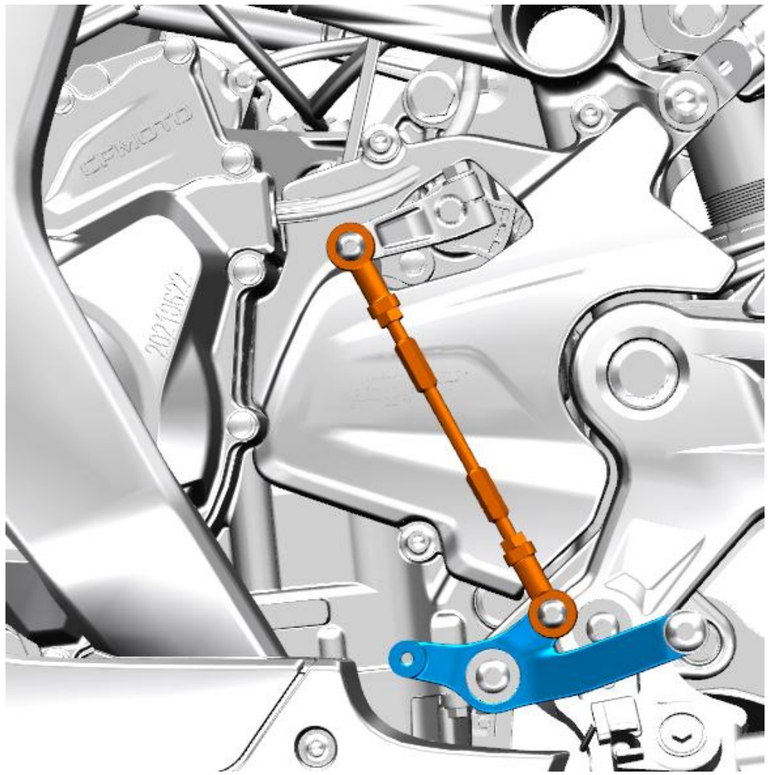


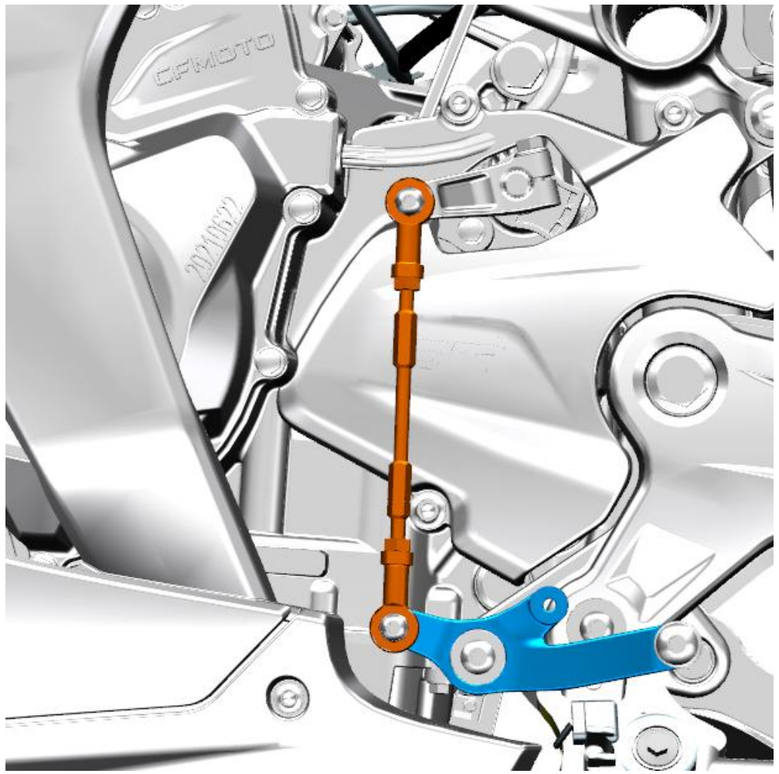


The handlebar is lower than 250SR but not too much aggressive for daily street riding. And both the clutch and brake lever are each adjustable now in order to fit all size riders.

# 3. Chassis

## 3.7 Reverse shifting

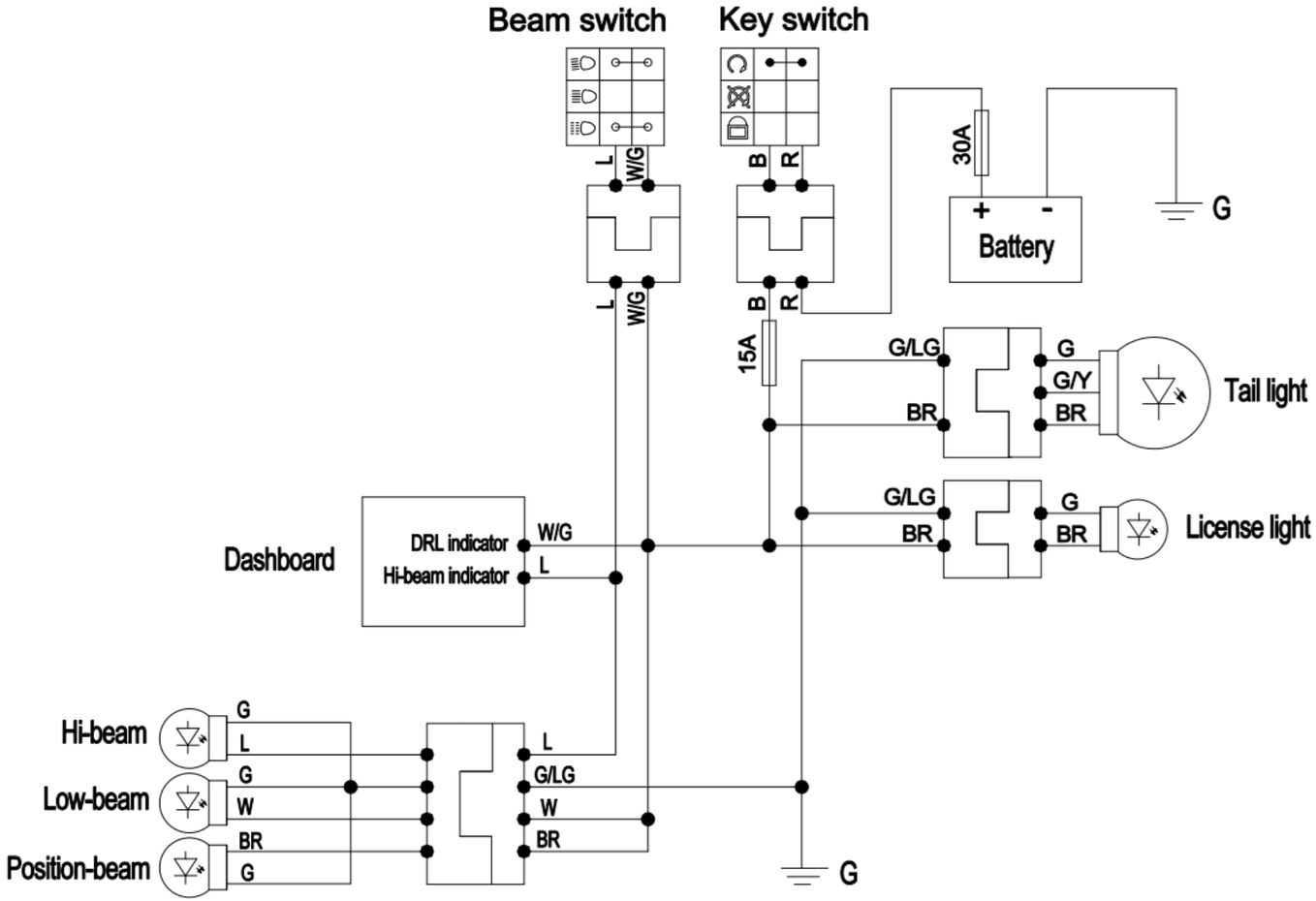




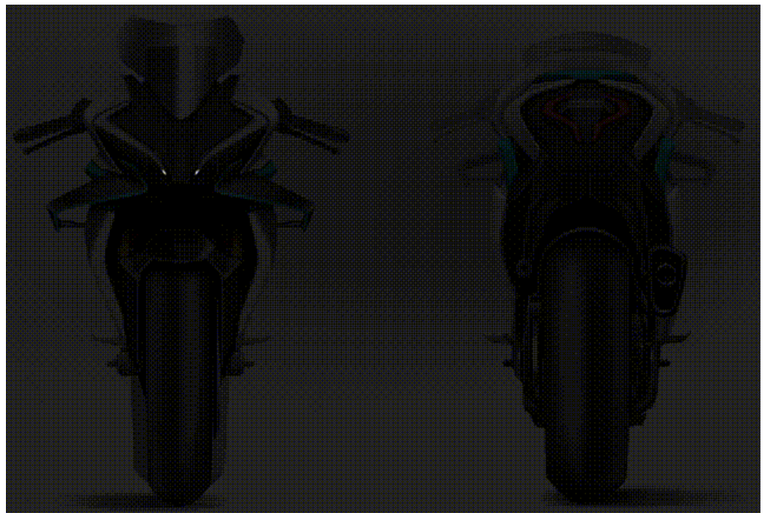
By change the position of the connecting rod form rear to front, the gear shift can be changed into reverse shifting for track racing.

# 3. Chassis

## 3.8 LED lights

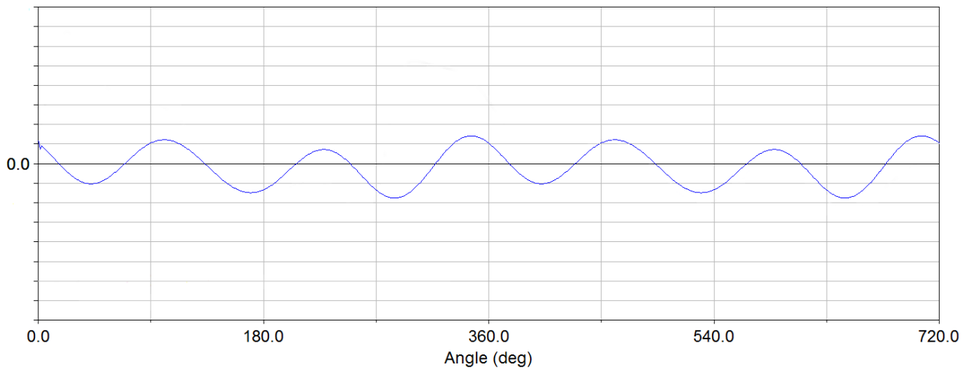



The 450SR used totally new designed LED lights -- flowing headlights and breathing tail lights.
As there is already a control unit inside of the lights, relays are not necessary anymore, the lights are controlled by switch directly.
The GIF animation is as below:

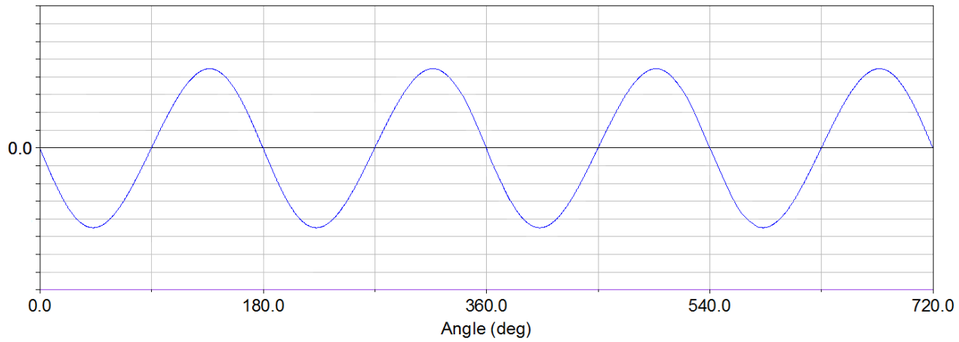


# 4. Engine

## 4.1 Introduction




270° crankshaft




180° crankshaft

The 272MQ engine is a totally new designed engine characterized by 270° crankshaft. Compare with traditional 180° crankshaft, not only the exhaust sounds different, the most important thing is that it will have a linear and faster torque response.

The engine torque output is a composition of combustion torque(①) and inertial torque(②).

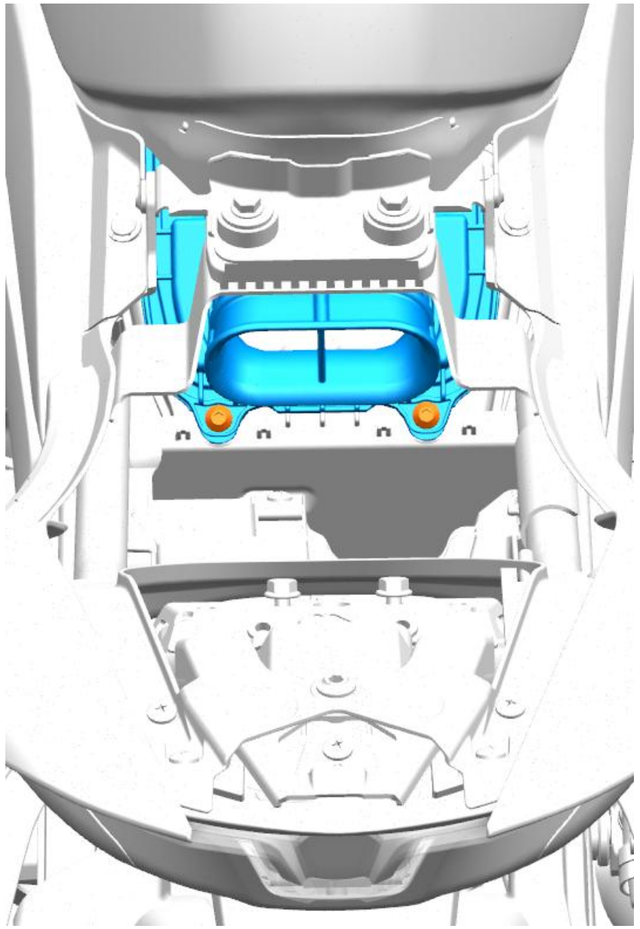
①The combustion torque is the effective torque generated by combustion of air-fuel mixture, that is what the rider really need. The new crankshaft has more averange ignition interval which makes the combustion torque output smoother;

②While the inertial torque is the disturbance torque generated by the high speed reciprocating of pistons and swing of conrods, which is expected as smaller and smoother as possible. The 270° crankshaft will reduce the inertial torque obviously especially in high RPM as shown in diagram.

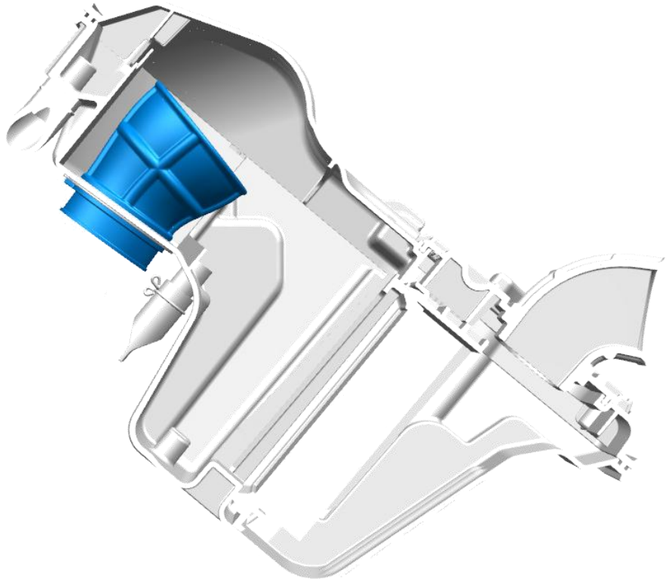
With smooth combustion torque and reduce the inertial torque, and thanks to the light weight forged pistons, this revolutionary engine provides a exciting relationship between the rider and bike via throttle grip and rear wheel.

# 4. Engine

## 4.2 Intake & Exhuast

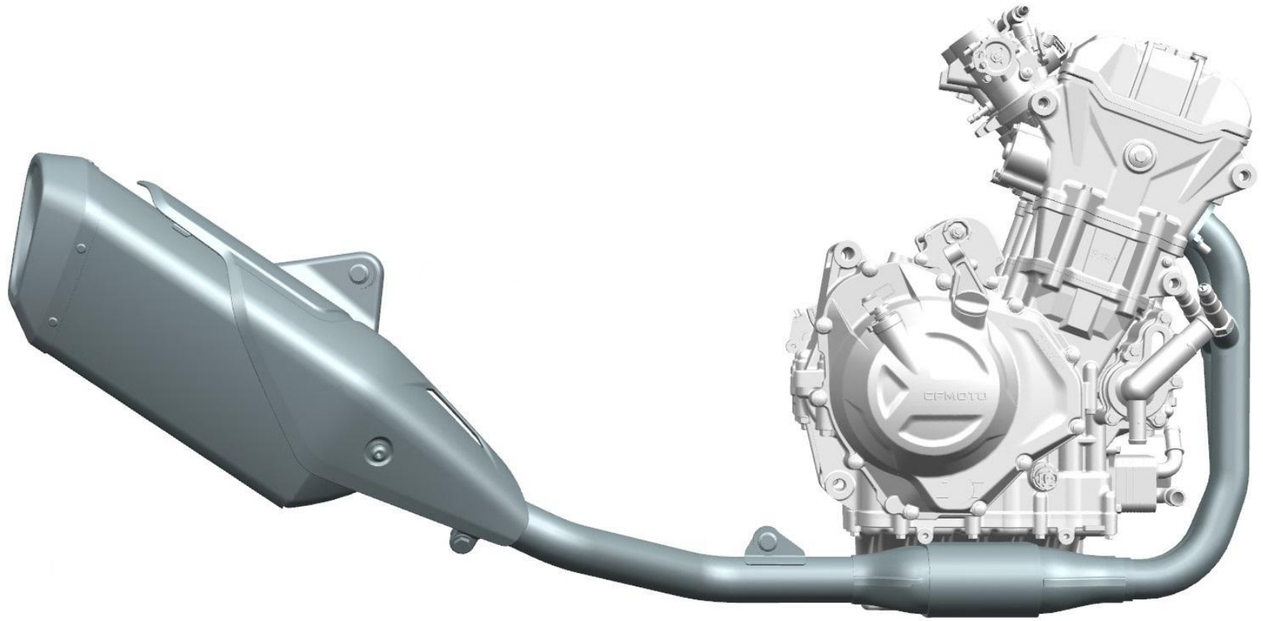


The air filter box is located just under the fuel tank, but the filter element is easy to access by remove the saddle and bettery for maintenance friendly. The hose connected to the throttle body is designed as a taper shape to improve the air intake efficiency.

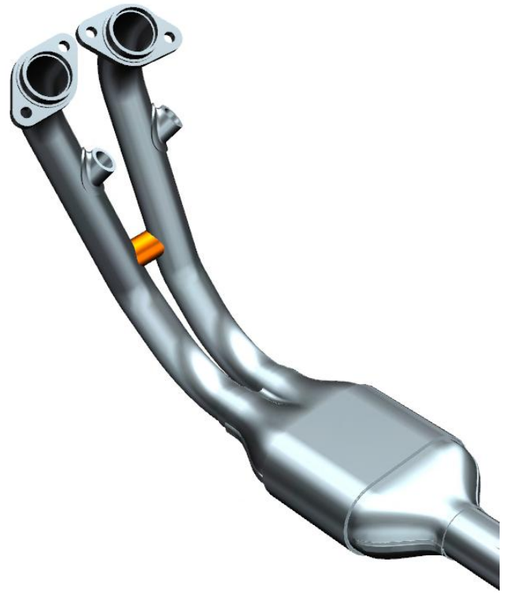


# 4. Engine

## 4.2 Intake & Exhuast

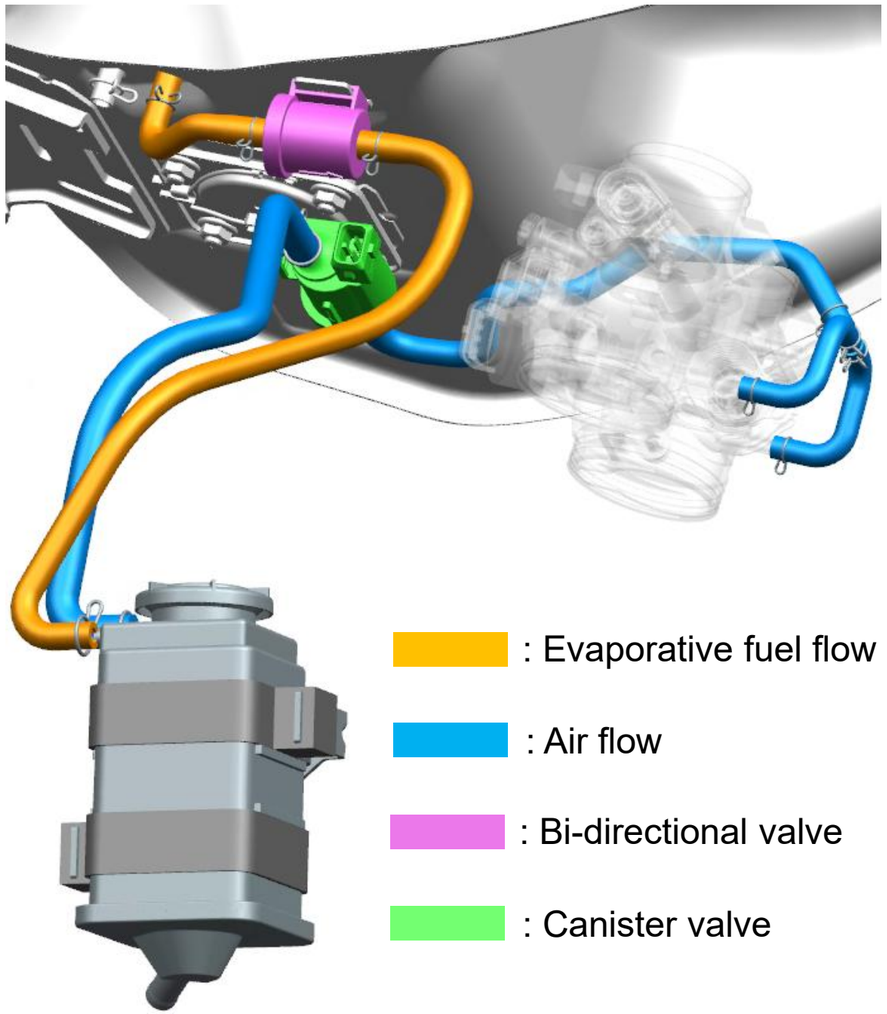


The exhaust pipes are routed through the bottom of the engine, where the catalytic converter is under the oil pan. The exhaust gas are monitored by the ECU via oxygen sensors and then the harmful emissions are converted to harmless gas by the catalytic converter. The dual exhaust pipes are connected in the middle to make the engine torque output linear and smoother.



# 4. Engine

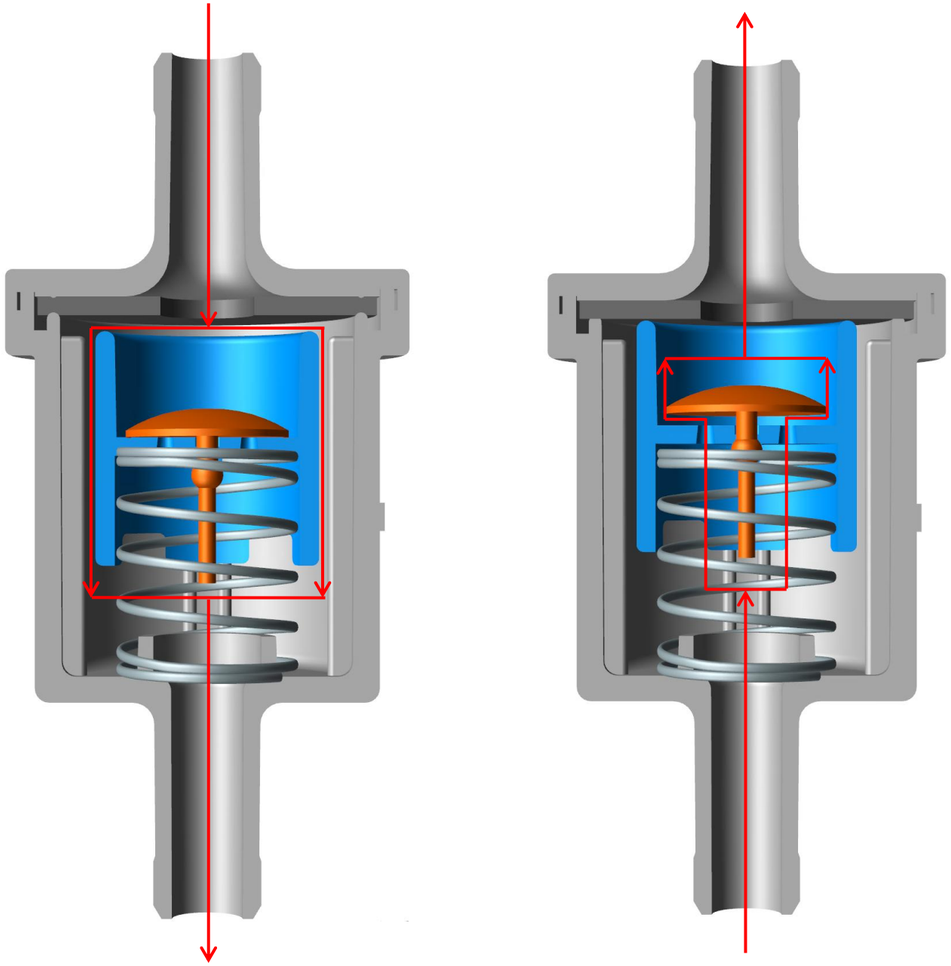
## 4.2 Intake & Exhuast




In order to comply with emission standards in EU, US and other regions, an activated carbon canister is fitted to the 450SR.
Evaporative fuel from the fuel tank are adsorbed by the canister and under some certain running conditions the canister valve is actived by ECU, the emissions are drawn into the throttle body to be burnt.

# 4. Engine

## 4.2 Intake & Exhuast

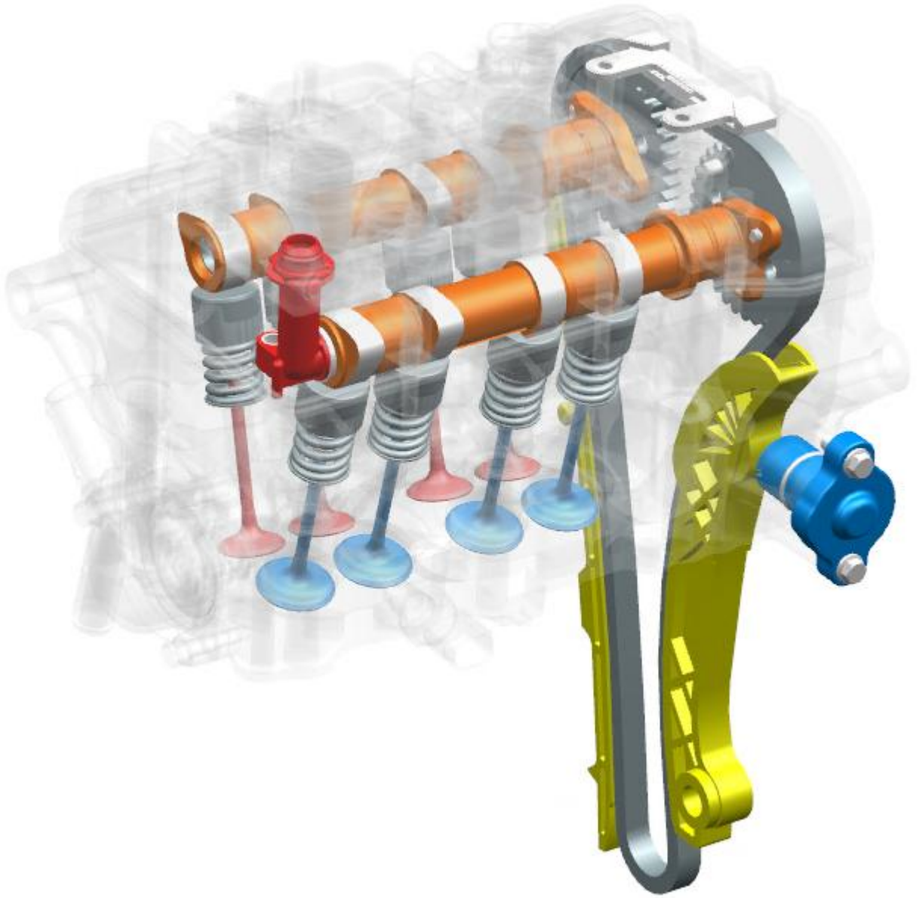


Note the install direction of the bi-directional valve, the arrow should point from fuel tank to the canister.

Even the bi-directional valve can be opened on both direction to balance the pressure on the fuel tank, but the opening pressure is different:
①In the arrow direction, where the evaporative emission flows from fuel tank to canister, the valve opening pressure is higher as it needs to overcome spring elasticity, that can avoid too much fuel flows to canister when the bike tumble.
②With fuel consumed and fuel level decrease, there will be a vacuum inside the fuel tank, air will from canister to fuel tank to balance the pressure. The valve opening pressure is lower now as it just need to left the rubber washer to open the valve.

# 4. Engine

## 4.3 Cylinder head

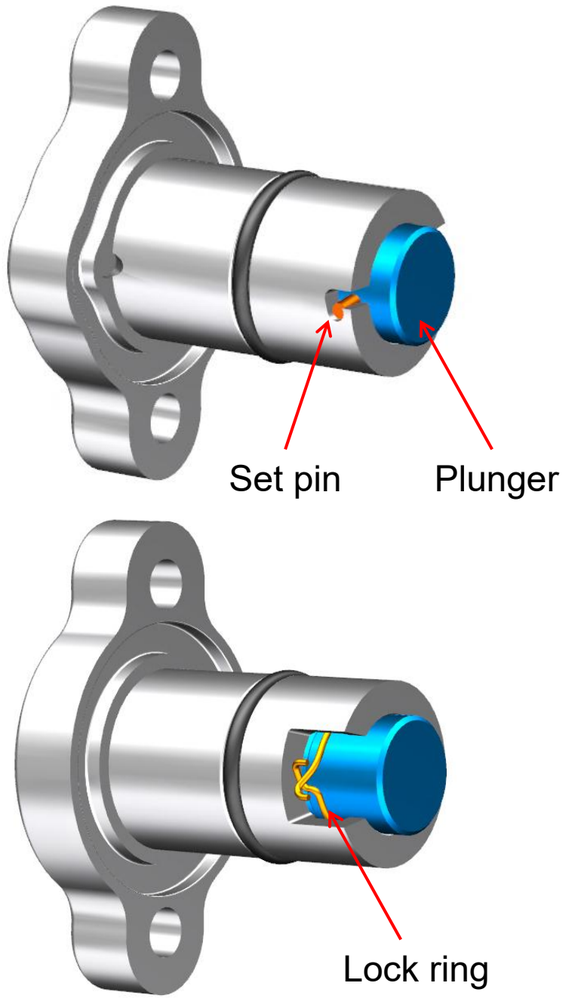


The DOHC cylinder head contains dual camshafts, 8 valves and 2 spark plugs. The camshafts are drived by DID 5×4 timing chain which is tensioned by a DID hydraulic mechanism tensioner, and the 8 valves are drived by camshaft via tappets directly.

The engine ventilation is combined on the intake camshaft instead of on the crankcase, besides the oil-air separator labyrinth on the cylinder head cover, a oil-air separator runner is fixed on the intake cam.

# 4. Engine

## 4.3 Cylinder head

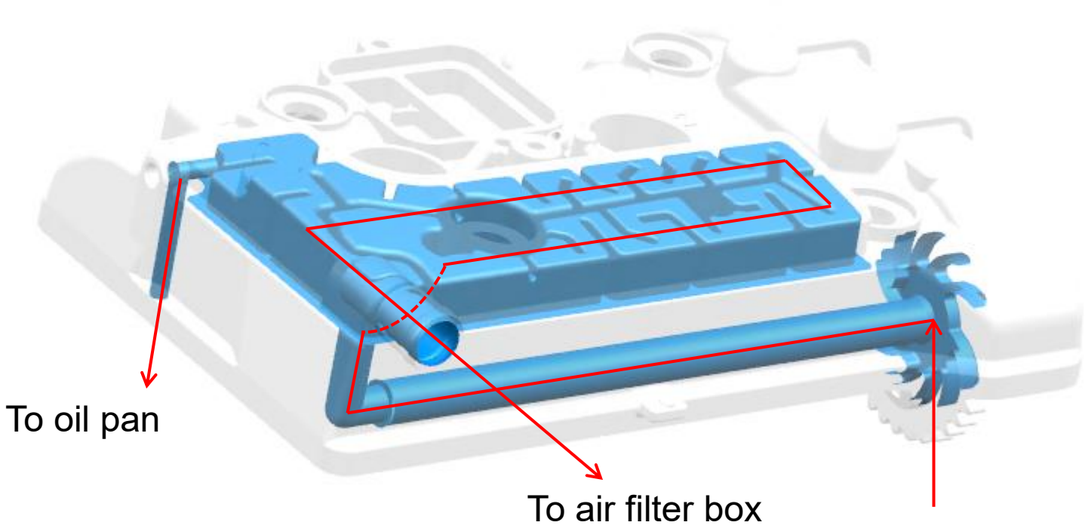


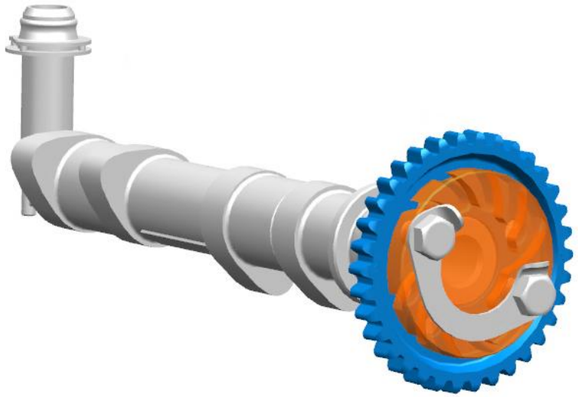

This DID tensioner is quite different with other hydraulic or mechanism tensioner used in CFMOTO, when install the tensioner to the engine, the procedure is different:

① Squeeze the lock ring to unlock the plunger;
② Hold the lock ring and push the plunger back to the tensioner cylinder;
③ The set pin on plunger is to lock the tensioner to the original position, hold the plunger and turn it to make the set pin lock on the tensioner cylinder, now the tensioner is ready to install;
④ After install the tensioner, turn the crankshaft in engine running direction, the set pin will release and the plunger will popup to tension the timing chain.

# 4. Engine

## 4.3 Cylinder head



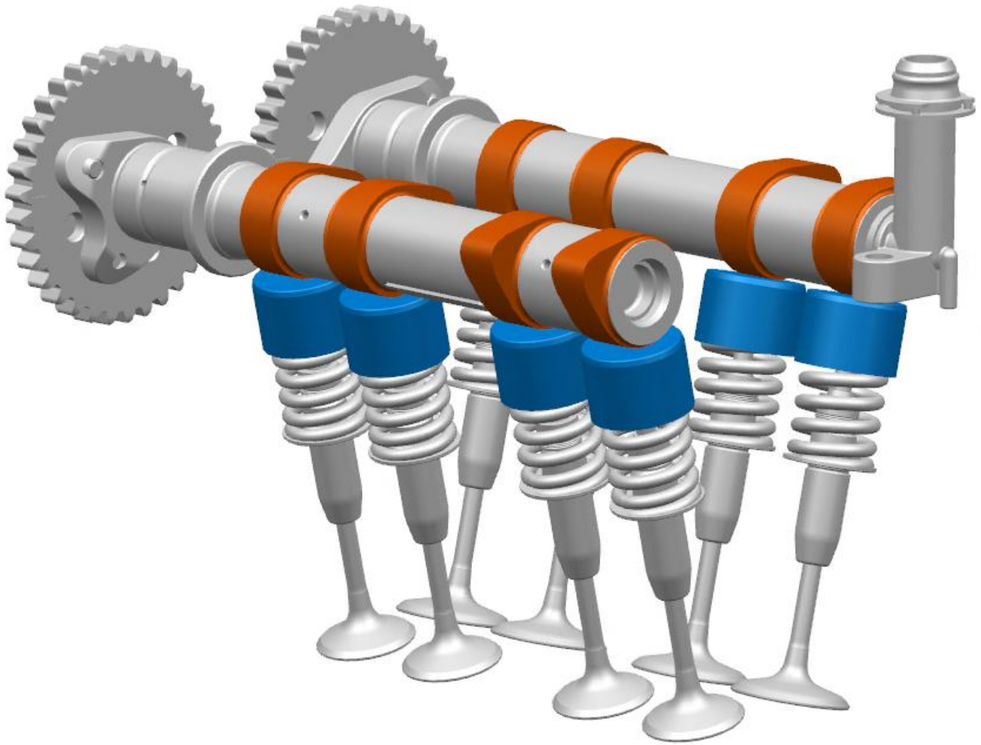



The air-oil separation is as follows:

The air with vaporous oil from crankcase will enters the oil-air separator runner firstly, as the runner rotating with the camshaft, the oil will be thrown out by the centrifugal force and return to the oil pan.
In case a few vaporous oil didn’t separated by the runner and enters into the air box, the air will enter the labyrinth via the hollow intake camshaft. As there are a lot of baffles in the labyrinth, when the mixture air flows through these baffles, the vaporous oil will be deposited to liquid oil by the block of the baffles, finally the clean air will be lead to air filter box and the deposited liquid oil will back to the oil pan.

# 4. Engine

## 4.3 Cylinder head



Valve clearance(when engine is cold):
IN: 0.10~0.15mm(Median is 0.12 and 0.13)
EX: 0.25~0.30mm(Median is 0.27 and 0.28)

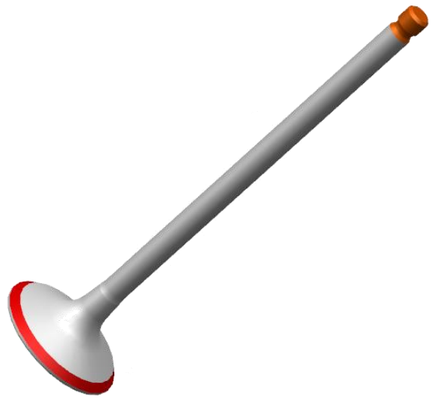
Tappets calculation:
Desired tappet thickness = Present valve clearance - Median of the valve clearance + Present tappet thickness.

Note: As all the tappet thickness is even number, so if the present valve clearance is an odd number, the median of the valve clearance should choose the odd one too to make sure the result is even number.

For example: If the present intake valve clearance is 0.17mm, and the present tappet thickness is 3.66mm, then the desired tappet thickness is 0.17-0.13+3.66=3.70(odd number-odd number), but if the present valve clearance is 0.16mm, and the present tappet thickness is still 3.78mm, then the desired tappet thickness is 0.16-0.12+3.66=3.70(even number-even number), the 370 tappet is required to adjust the clearance to the correct range.

# 4. Engine

## 4.3 Cylinder head



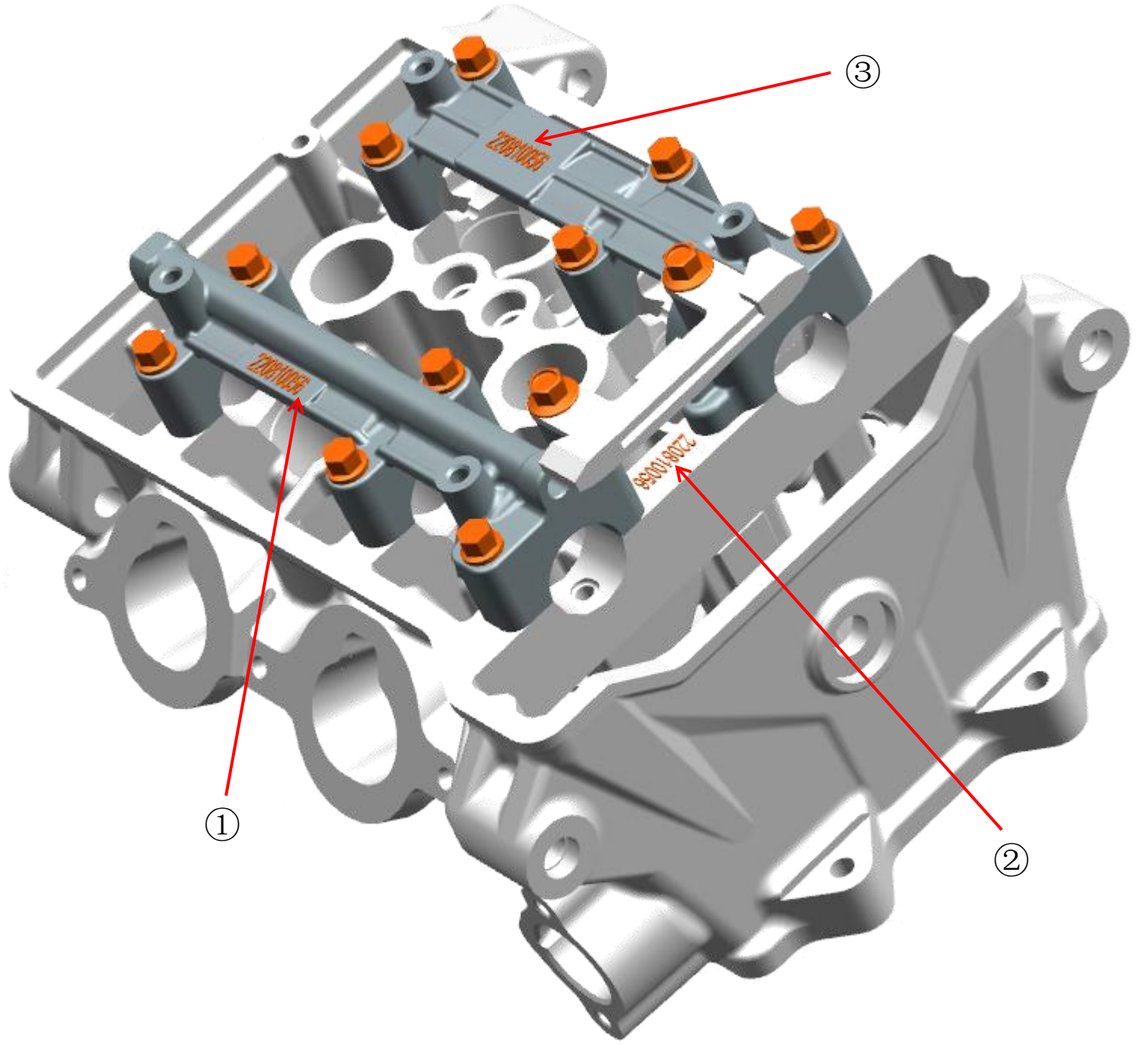
For better durability and higher performance, the tappets are treated by carbonitriding process, which will increase the hardness and reduce the friction.

Besides the tappets, the valves are treated by nitrogen process to increase the fatigue strength, high temp resistance, corrosion resistance and reduce the friction.

Different with the valve body, the end of valve stem is quenched to enhance the hardness. And as the exhaust valve working in high temperature condition, the material of valve line is made by cobalt alloy to improve its abrasive resistance and reliability.

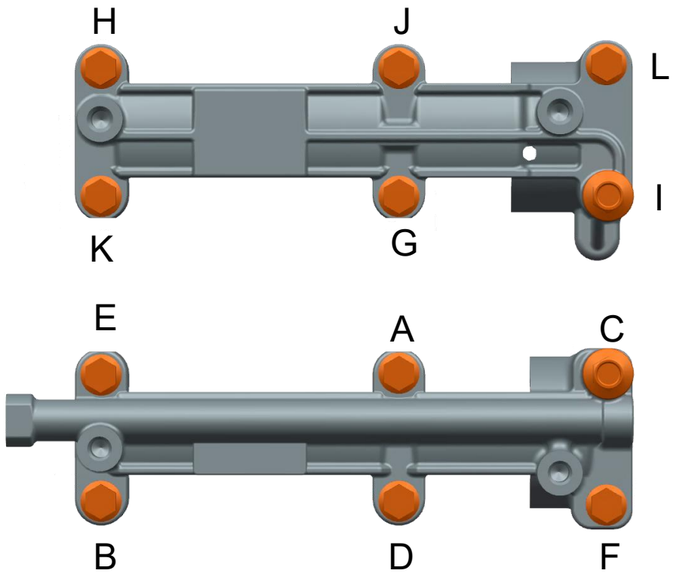
# 4. Engine

## 4.3 Cylinder head



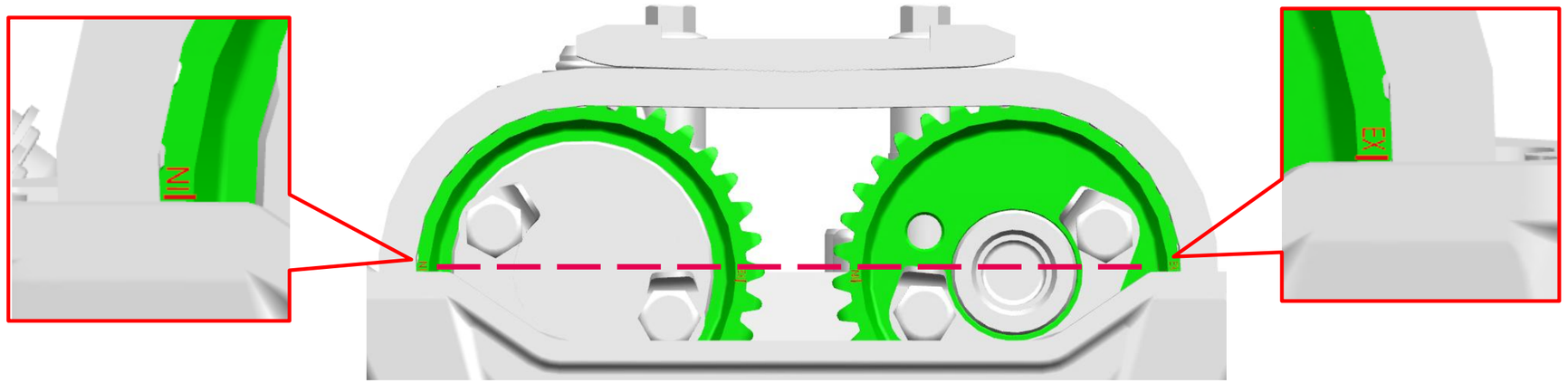

- The 12 bolts need to be tightened to the desire torque following the sequence of A to L by three steps:
  1st: 5 N·m
  2nd: 8 N·m
  3rd: 12 N·m

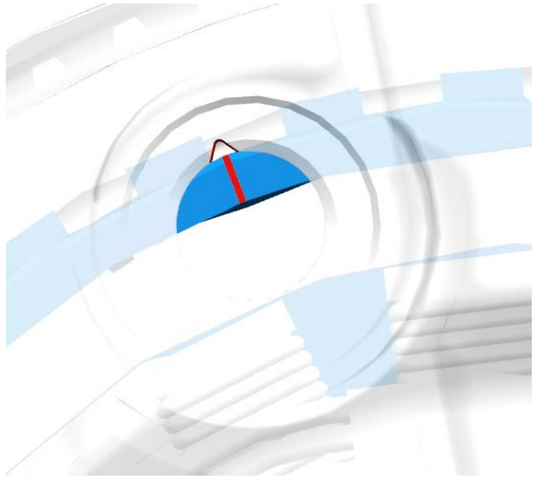
Note: As the camshaft holes are drilled after the camshaft covers installed to the cylinder head to ensure the cylindricity, so the intake and exhaust camshaft covers and the cylinder head are marked by a set of unique numbers(①②③) and need to be used together.



# 4. Engine

## 4.3 Cylinder head



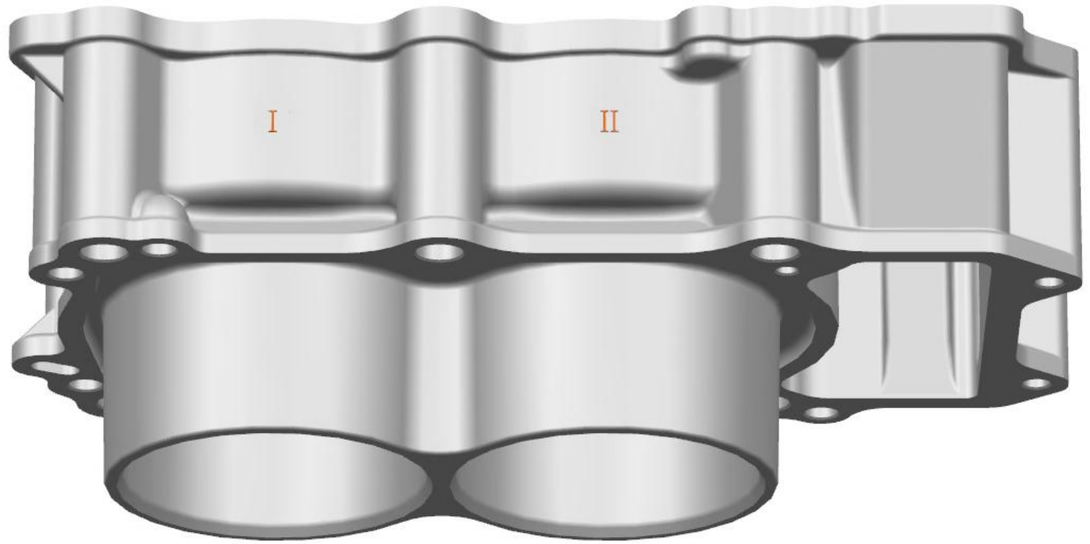
In timing position, the mark “IN” and “EX” on the timing sprocket should towards to the intake and exhaust side respectively and parallel with the cylinder head top surface, meanwhile the slot mark on the magneto rotator shoule align with the slot mark of the timing view on the magneto cover.

# 4. Engine

## 4.4 Piston

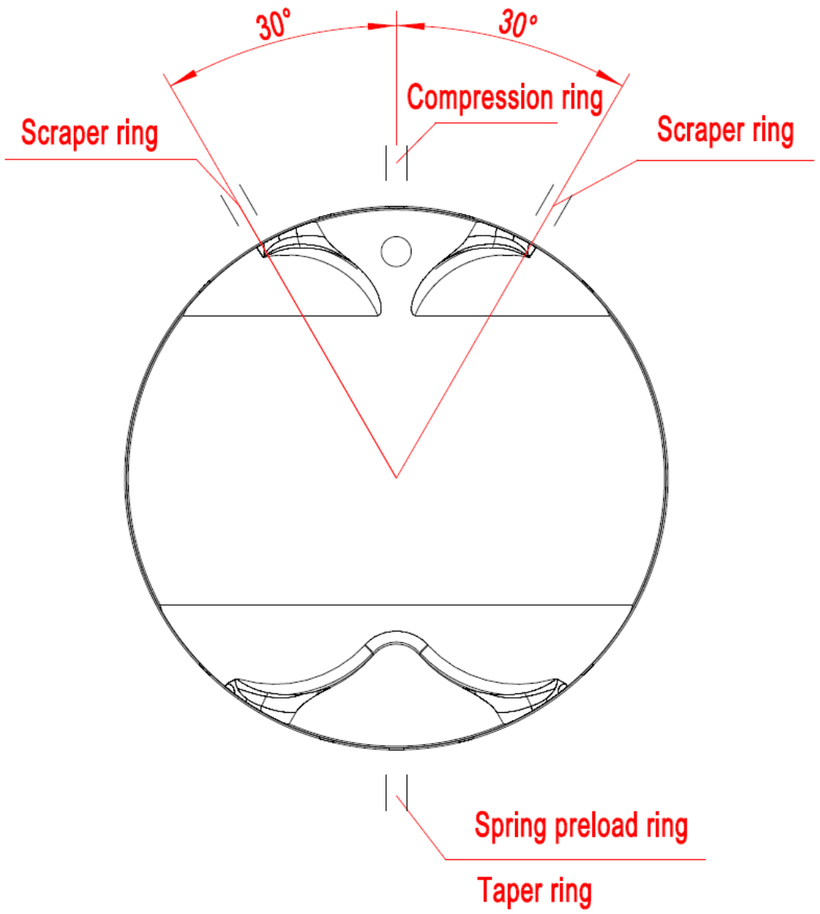


- The forged piston is treaded by graphite coating on the skirt to reduce the friction.
- The piston is grouped into “O” and “ ” by weight tolerance, “Ⅰ” and “Ⅱ” by diameter tolerance.
- The two pistons should be in same weight group in a engine.
- The diameter group should be decided by the mark on the cylinder body.

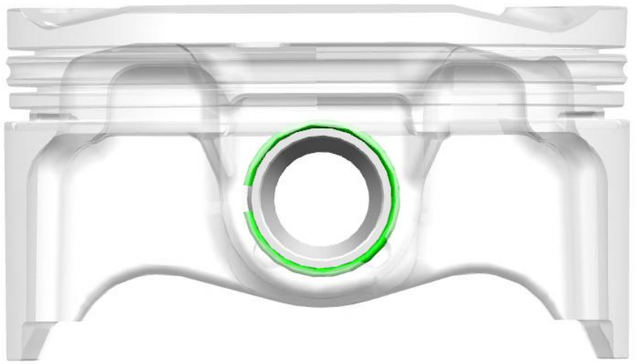


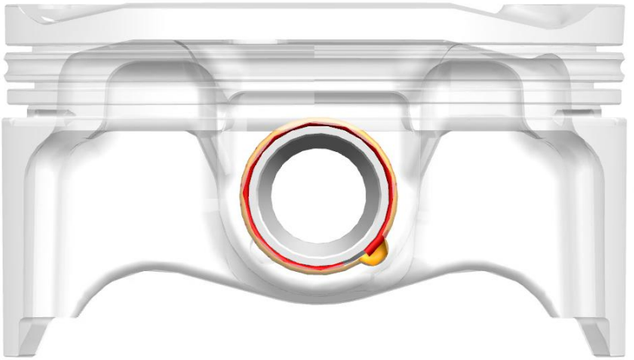
# 4. Engine

## 4.4 Piston



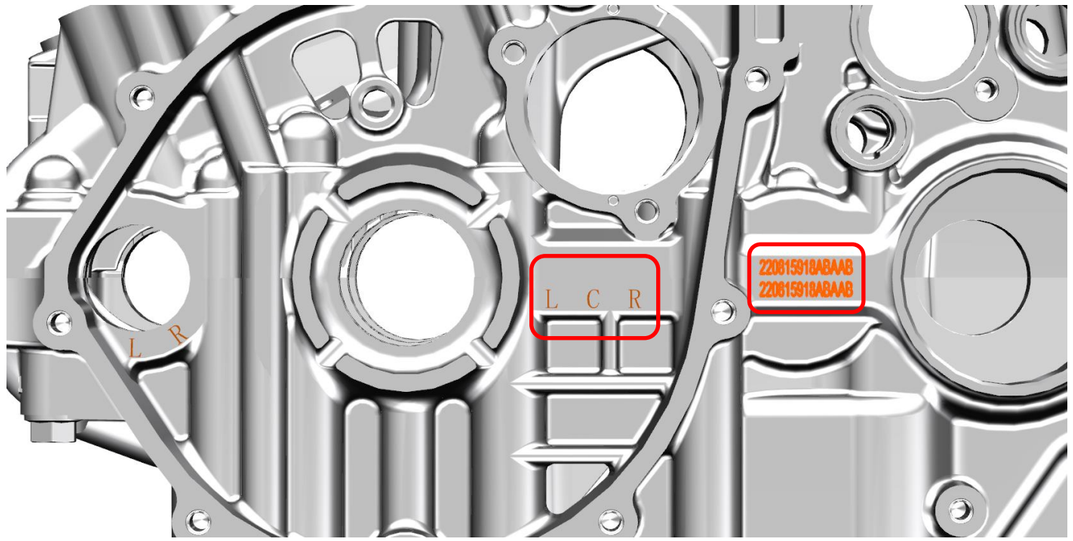

- The opening of the piston rings are as shown in left.
- Use new circlips every time when installing the piston pin, and the circlip opening should in the correct position as shown in below, the opening of the circlip should away from the piston cut.

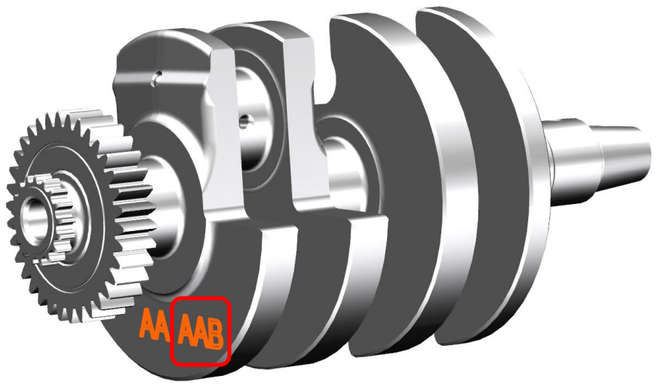




# 4. Engine

## 4.5 Crankshaft



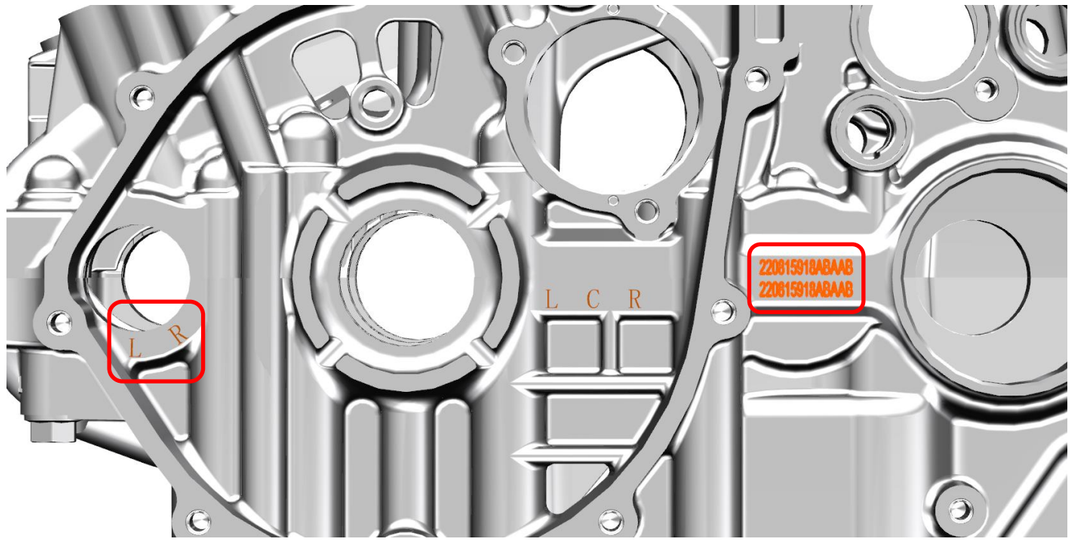



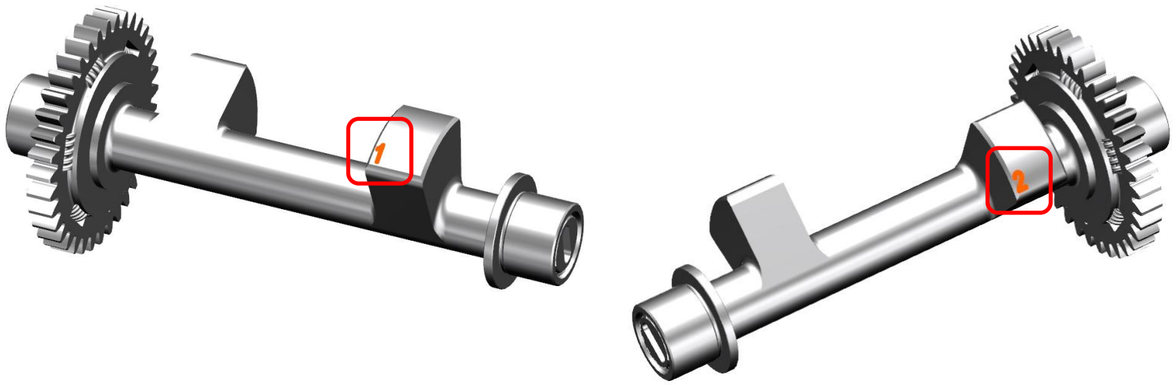

- The crankcase journals of forged crankshaft has two tolerance group marked by A and B.
- The main plain bearing has three colors by different thickness: red, blue and black.
- The crankshaft holes are marked by A and B which is printed on the crankcase.
- The matching method is as shwon in table.

| Crankcase | Crankshaft journal | Main plain bearing |
|---|---|---|
| A | A | Red |
| A | B | Black |
| B | A | Black |
| B | B | Blue |

# 4. Engine

## 4.5 Crankshaft



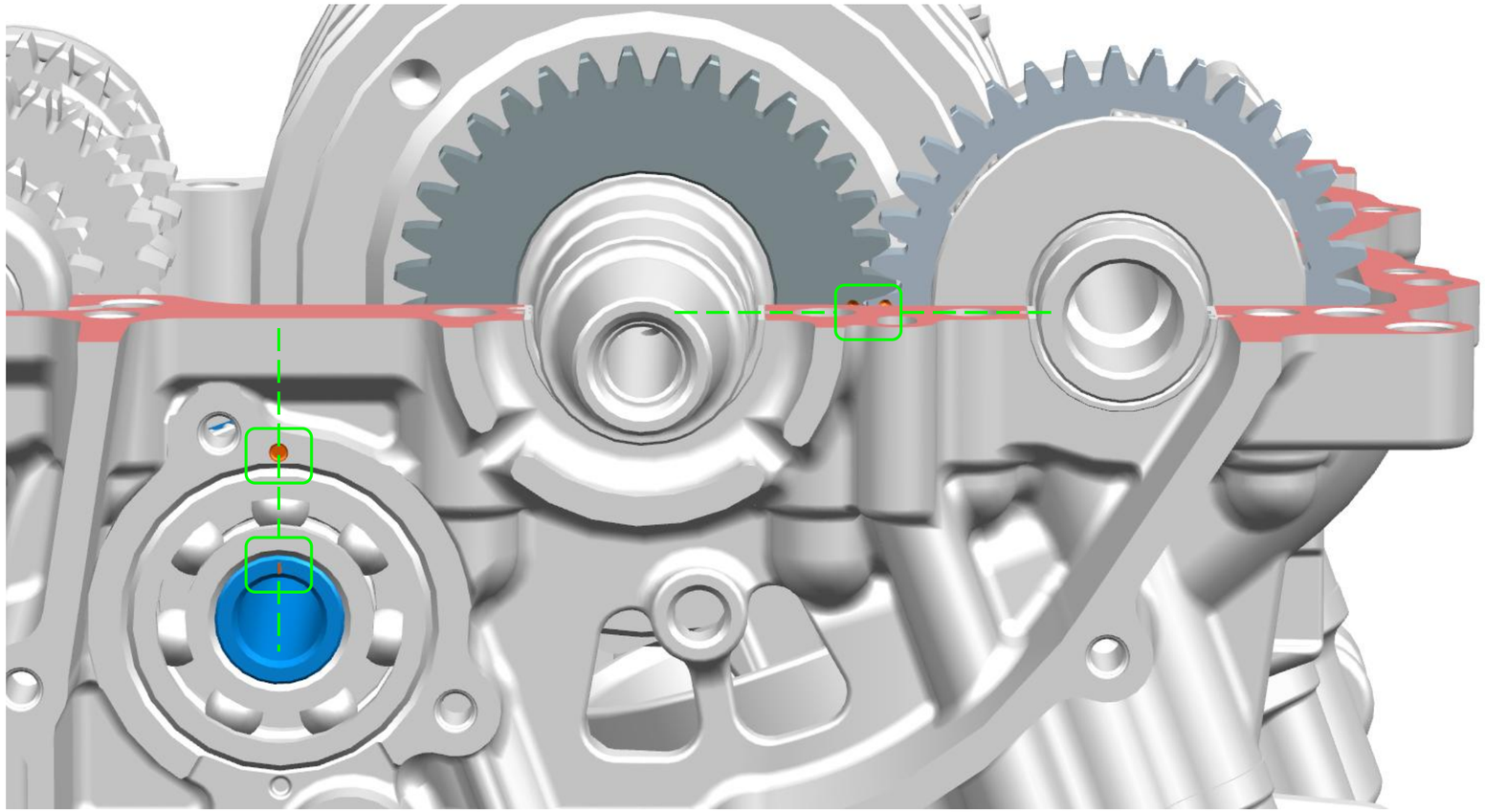




- The crankcase journals of balance shaft has two tolerance group marked by 1 and 2.
- The balancer plain bearing has three colors by different thickness: red, blue and black.
- The balance shaft holes are marked by A and B which is printed on the crankcase.
- The matching method is as shwon in table.

| Crankcase | Balancer journal | Balancer plain bearing |
|---|---|---|
| A | 1 | Black |
| A | 2 | Red |
| B | 1 | Blue |
| B | 2 | Black |

# 4. Engine

## 4.5 Crankshaft



Install the crankshaft and balance shafts by aligning the marks as shown in pic.

# 4. Engine

## 4.6 Connecting rod

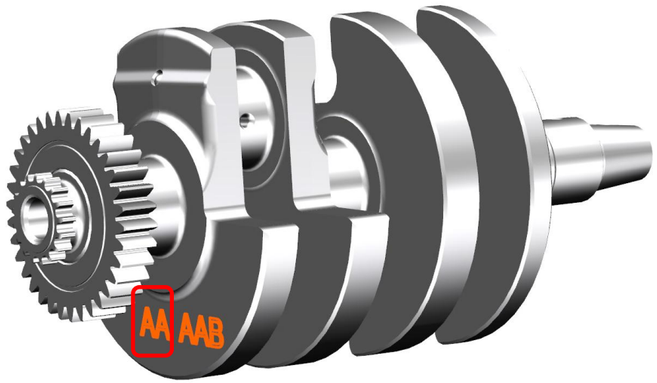




- There connecting rod weight is marked on the big end side wall, take 300g for example, the weight of the two rods should be same.
- Unlike the conventional connecting rod designs where a flat mating surface with dowel pins is used, the connecting rods used in the 450SR engine are forcedly torn off (cracked) during the production process. This makes the mating surface between the connecting rod cap and the connecting rod body rough, generating a unique pattern on each connecting rod. By not having dowel pins, the weight of the connecting rod is reduced, while reducing the rotational masses inside the engine. Rough surfaces ensure correct mating between the caps of the connecting rods and the bodies of the rods.
- Each of the connecting rod has a unique identify number on the rod body and rod cap, take 2625 for example in here, the two numbers should be on same value and need to be installed on the same side, double check before install the connecting rod. If the mating surfaces are tightened in the wrong direction, the complete connecting rod must be replaced!
- When a new connecting rod is installed, the mating surfaces must be cleaned with a wire brush to eliminate any metal residue produced during the cracking process. When installing the connecting rods, the mating surfaces must be free of oil to achieve a perfect fit between the two surfaces.

# 4. Engine

## 4.6 Connecting rod

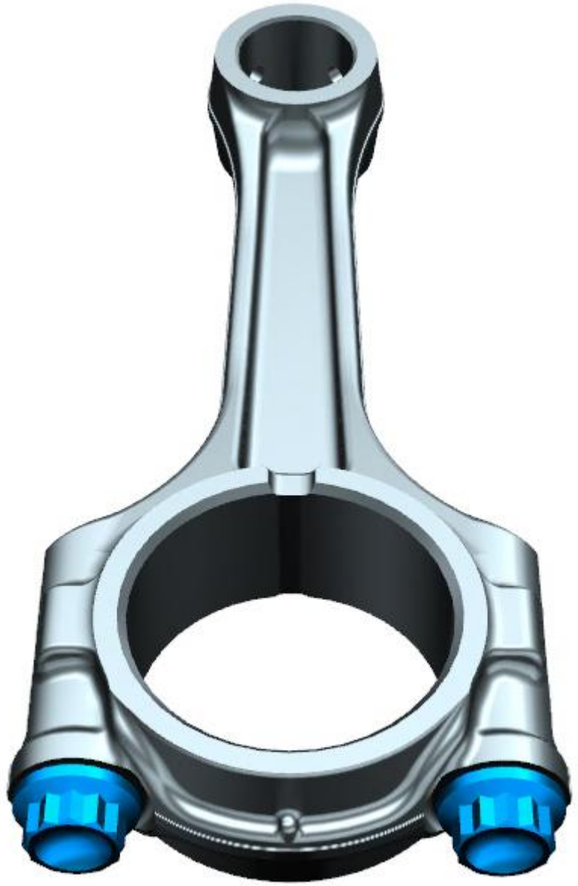




- The forged crankshaft has two tolerance group on connecting rod journals marked by A and B.
- The connecting rod has three groups according big end diameter tolerance marked by 1 and 2.
- The connecting rod bearing has three colors by different thickness: red, blue and black.
- The matching method is as shwon in table.

| Connecting rod | Crankshaft | Big end plain bearing |
|---|---|---|
| 1 | A | Red |
| 1 | B | Black |
| 2 | A | Black |
| 2 | B | Blue |

# 4. Engine

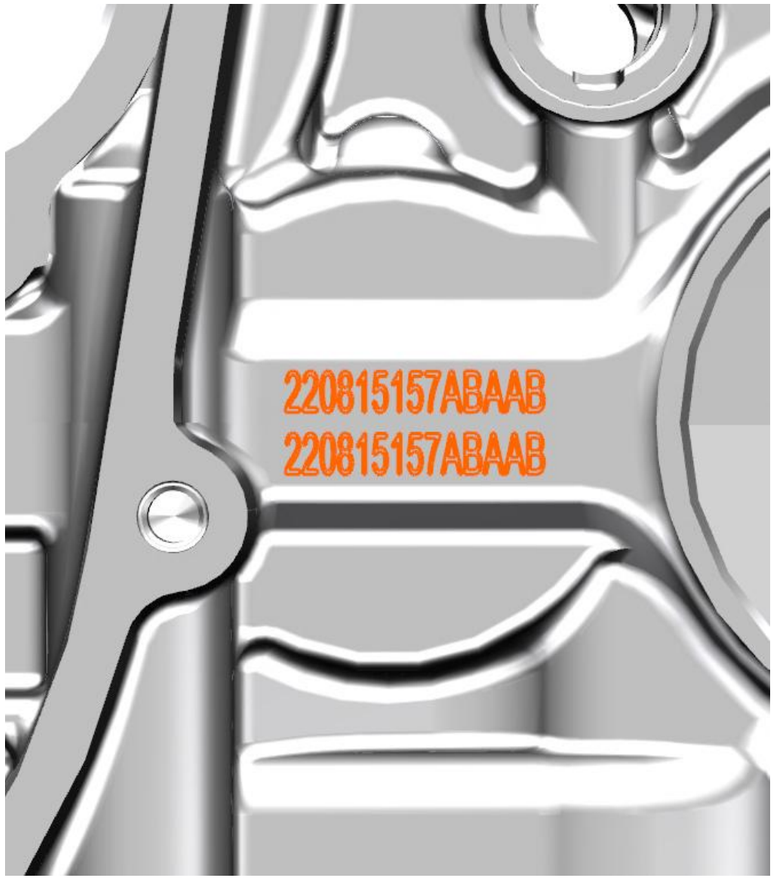
## 4.6 Connecting rod



- Lubricate the threads and flange of the connecting rod bolts by engine oil before installation to reduce the friction and make sure the bolt can be stretched to the correct load in desired torque.
- The M8x0.75 connecting rod bolts are suggested to be replaced with new ones every time the connecting rods are disassembled.
- The unique identify number on the connecting rod faces to the fornt of the engine.
- The bolts need to be tightened by: 20N·m + 100° .

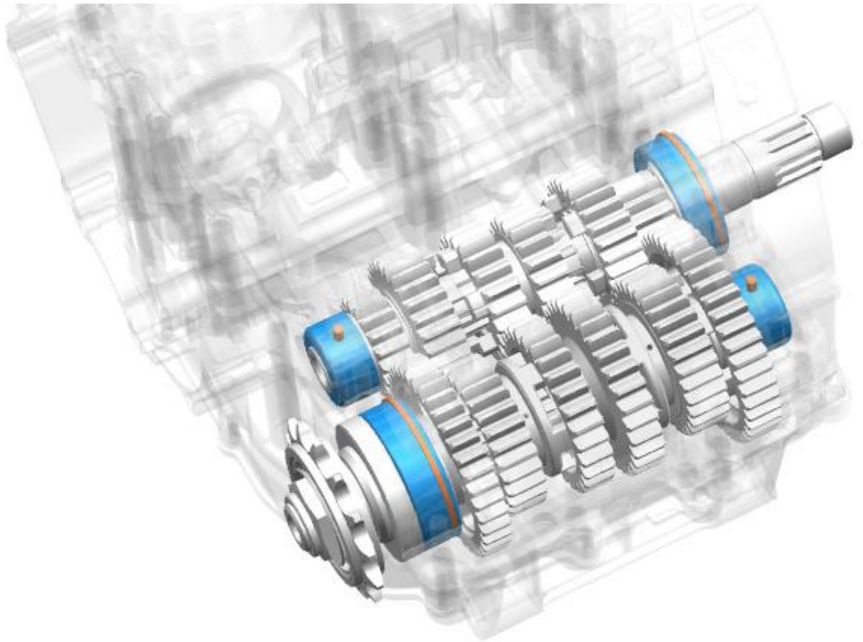
# 4. Engine

## 4.7 Crankcase



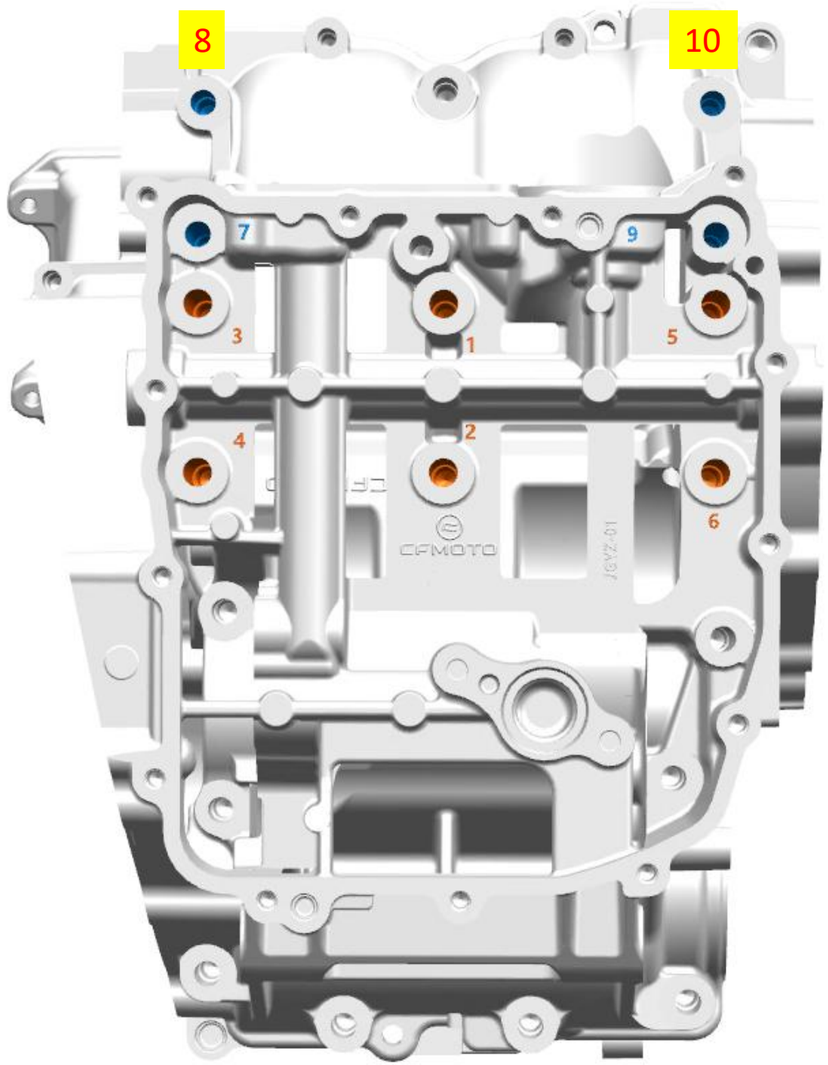

The crankshaft and balancer shaft holes are drilled after the upper and lower crankcase are jointed to ensure the cylindricity, that means each pair of the crankcases is unique, they are marked by a set of unique numbers in the front of the sprocket, and need to be changed together.

Note: there are retainers and dowel pins to lock the transmission shaft bearings, pay attention on the direction when install the bearings.



# 4. Engine

## 4.7 Crankcase

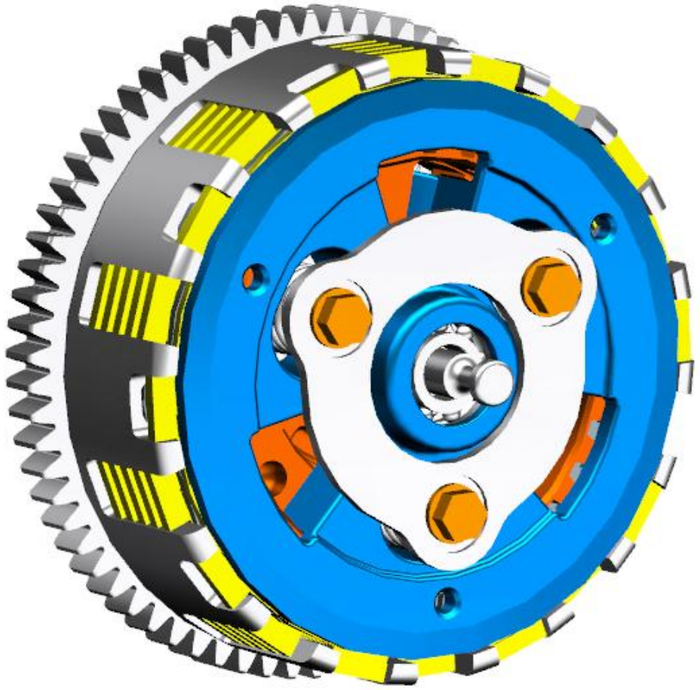


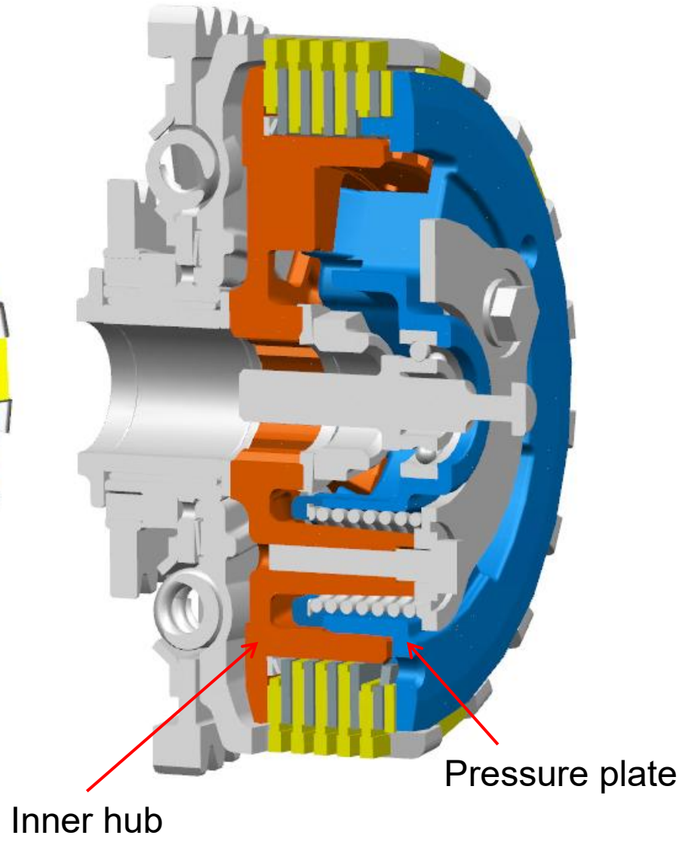

The 10 blots on the lower crankcase as shown in pic are very pivotal as the No. 1 to 6(orange highlight) are to lock the crankshaft and No.7 to 10(blue highlight)  are to lock the balancer shaft. Therefore it is very important to follow the procudure and torque requirement during dismantlement and installation.

| No. | Specification | Torque |
|---|---|---|
| 1~6 | M9×108 | 1st: 8N·m |
| | | 2nd: 20N·m |
| | | Finally: 35N·m |
| 7 and 9 | M8×105 | 1st: 8N·m |
| | | 2nd: 20N·m |
| | | Finally: 27N·m |
| 8 and 10 | M8×55 | 1st: 8N·m |
| | | 2nd: 20N·m |
| | | Finally: 27N·m |

# 4. Engine

## 4.8 Clutch

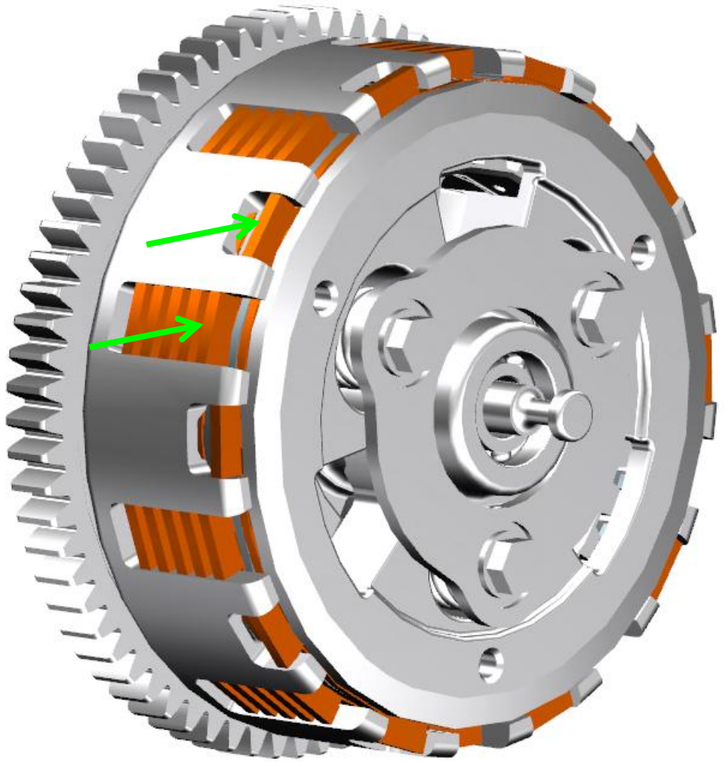




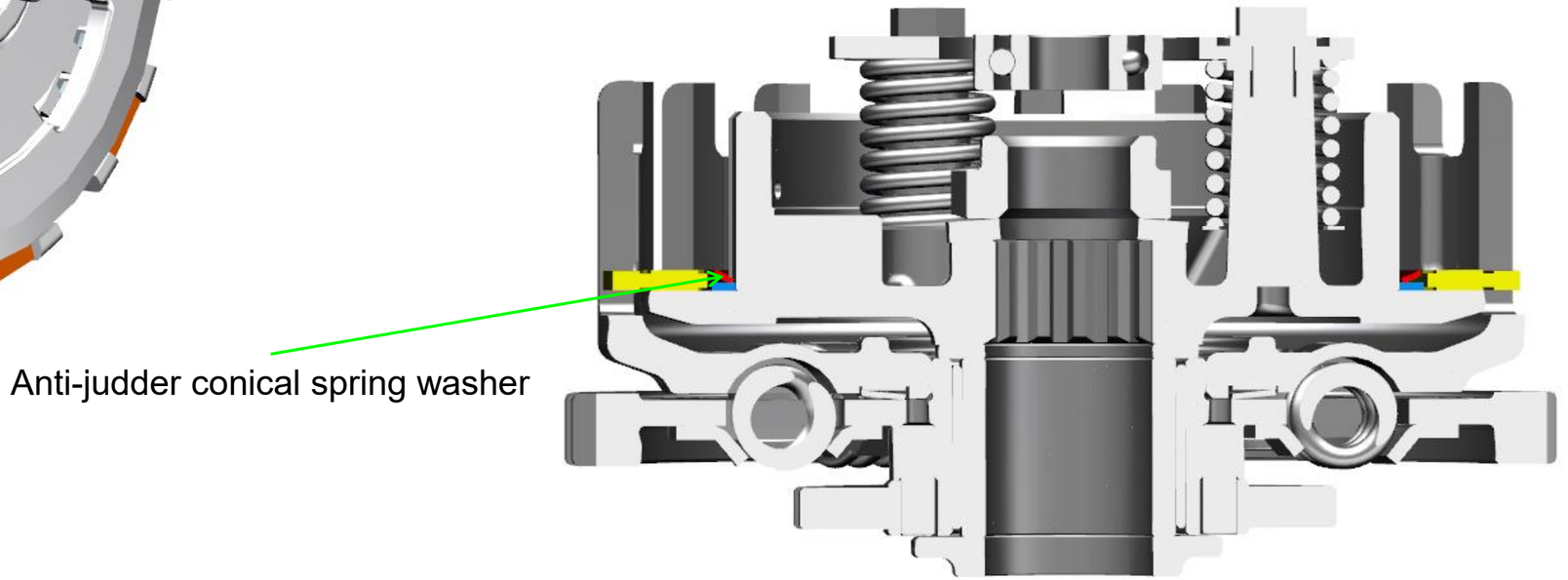

The 450SR is equipped with a slipper clutch. Under acceleration, the assist ramps pull the pressure plate towards the inner hub working in conjunction with the three clutch springs to compress the clutch plates and discs. This function allows to use lighter spring force which provides a lighter clutch feel.
Under excessive engine braking, which can occur as a result of excessive downshifts, the slipper ramps push the pressure plate away from the clutch hub. This relieves pressure on the clutch plates allowing them to slip which helps to reduce back-torque and keeps the rear tire from hopping and locking up.

# 4. Engine

## 4.8 Clutch

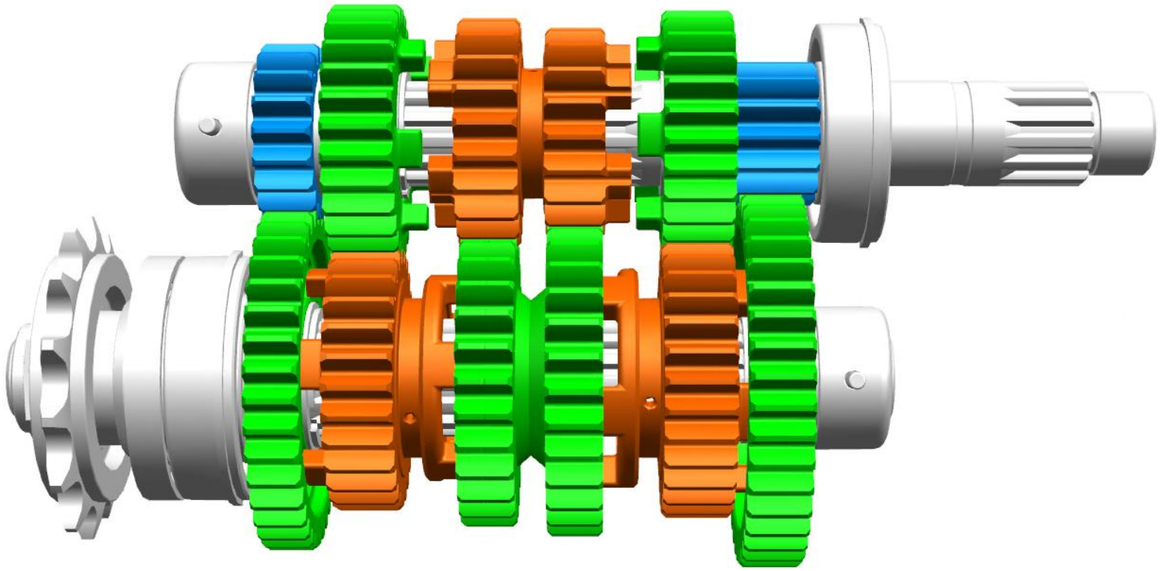


Note:
The multi-plate oil-bath clutch consists of five steel plates and six friction plates. The first friction plate in the stack has a larger internal diameter to contain the anti-judder conical springs which work against the clutch springs to allow the clutch to slip more during the engagement reducing the surge and providing a smoother clutch operation.
Note:
The last friction plate in the stack must be offset from the rest of the plates.
Take care of the direction of the anti-judder conical spring washer.



# 4. Engine

## 4.9 Transmission



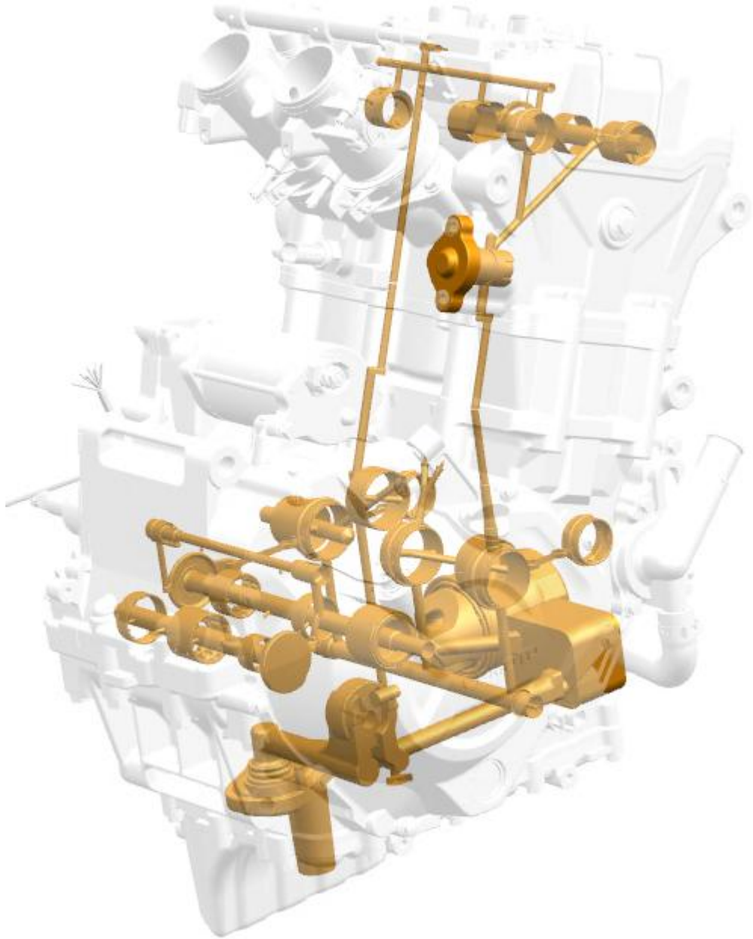
The six-speeds constant mesh sequential gearbox is composed of two shafts: The input shaft connected to the engine through the clutch, and the output shaft ending with the sprocket.

On these shafts are positioned twelve gears(six for each shaft since the transmission is six-speed) that are divided into six non-sliding idler gears(green), two non-sliding fixed gears(blue), and three sliding fixed rotational gears(orange).

The sliding fixed rotationally gears are moved by the shift forks, in turn driven by the shift drum, to select the desired gear. When a fork moves the gears to the right or left, it engages with the adjacent gear through gear dogs.

# 4. Engine

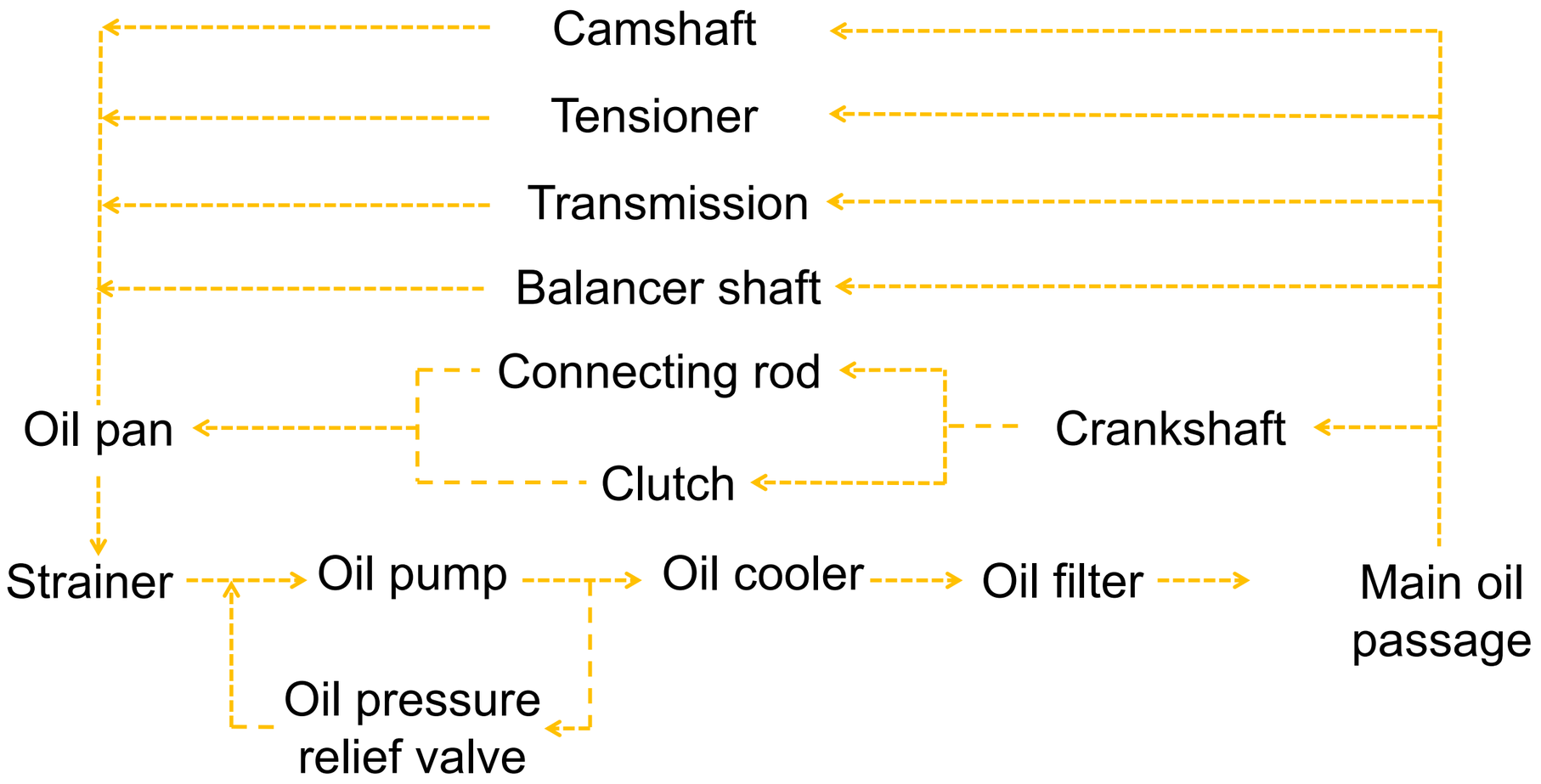
## 4.10 Oil passage



- Oil capacity:
  Change oil with filter: 2.3L
  Engine overhaul: 2.8L
- Oil pressure:
  90℃ oil temperature at idling rpm: 0.8~1.2bar
- Oil grade:
  SAE 10W-40 API SJ JASO MA2 or higher

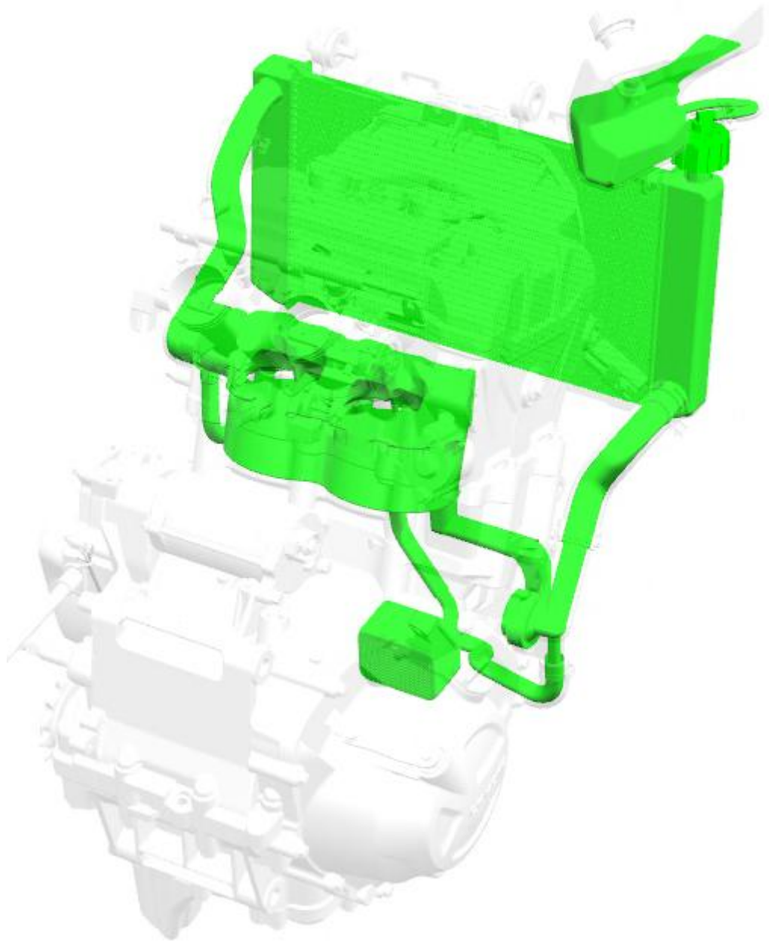
# 4. Engine

## 4.10 Oil passage

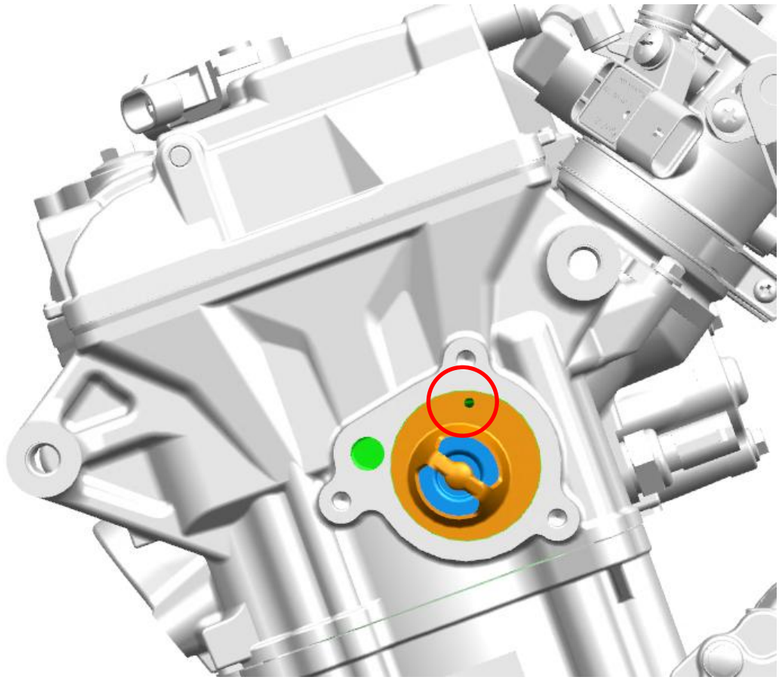


# 4. Engine

## 4.11 Coolant passage

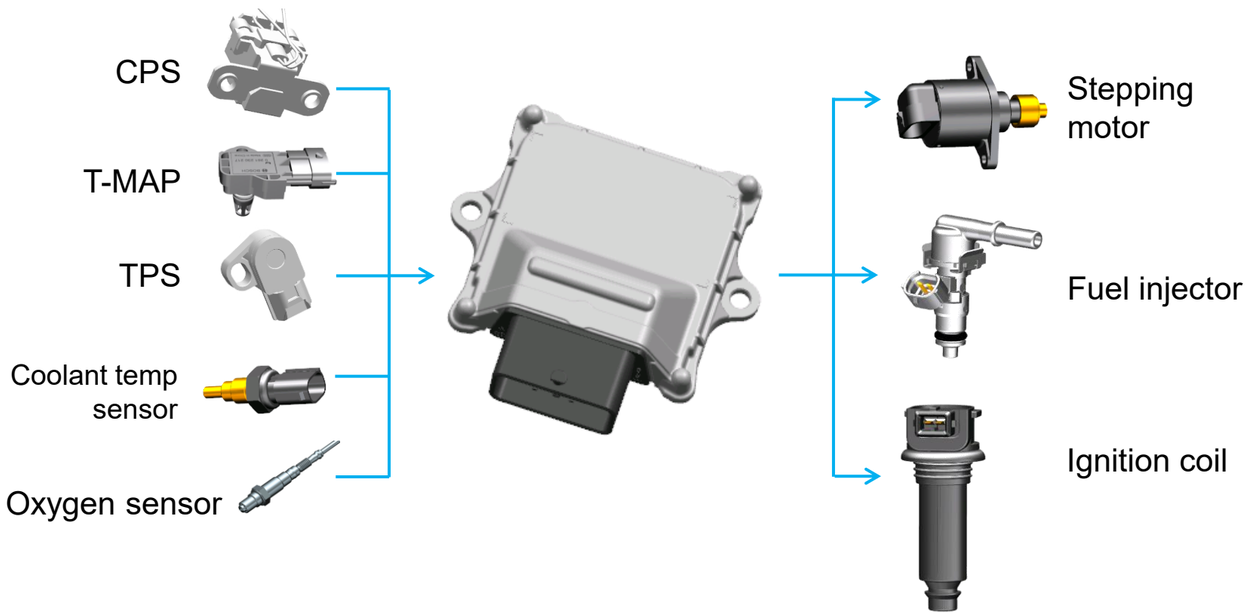


- Thermostat starts to open at 82±2℃, and fully open at 95℃.
- Cooling fan control logic: ECU reads the coolant temperature via coolant temp sensor and activates fan relay to start the fan when the temp upto the desire value.
- Make sure the hole on the thermostat should on the top spot.



# 5. Electronic system

## 5.1 ECU




The ECU of the 450SR is Bosch MSE 6.0 ECU that located under the front seat. The ECU processes the information from the sensors, allowing it to control all system functions such as fuel supply and ignition to ensure a perfect combustion in the engine.

The EFI system overview is as shown in left.

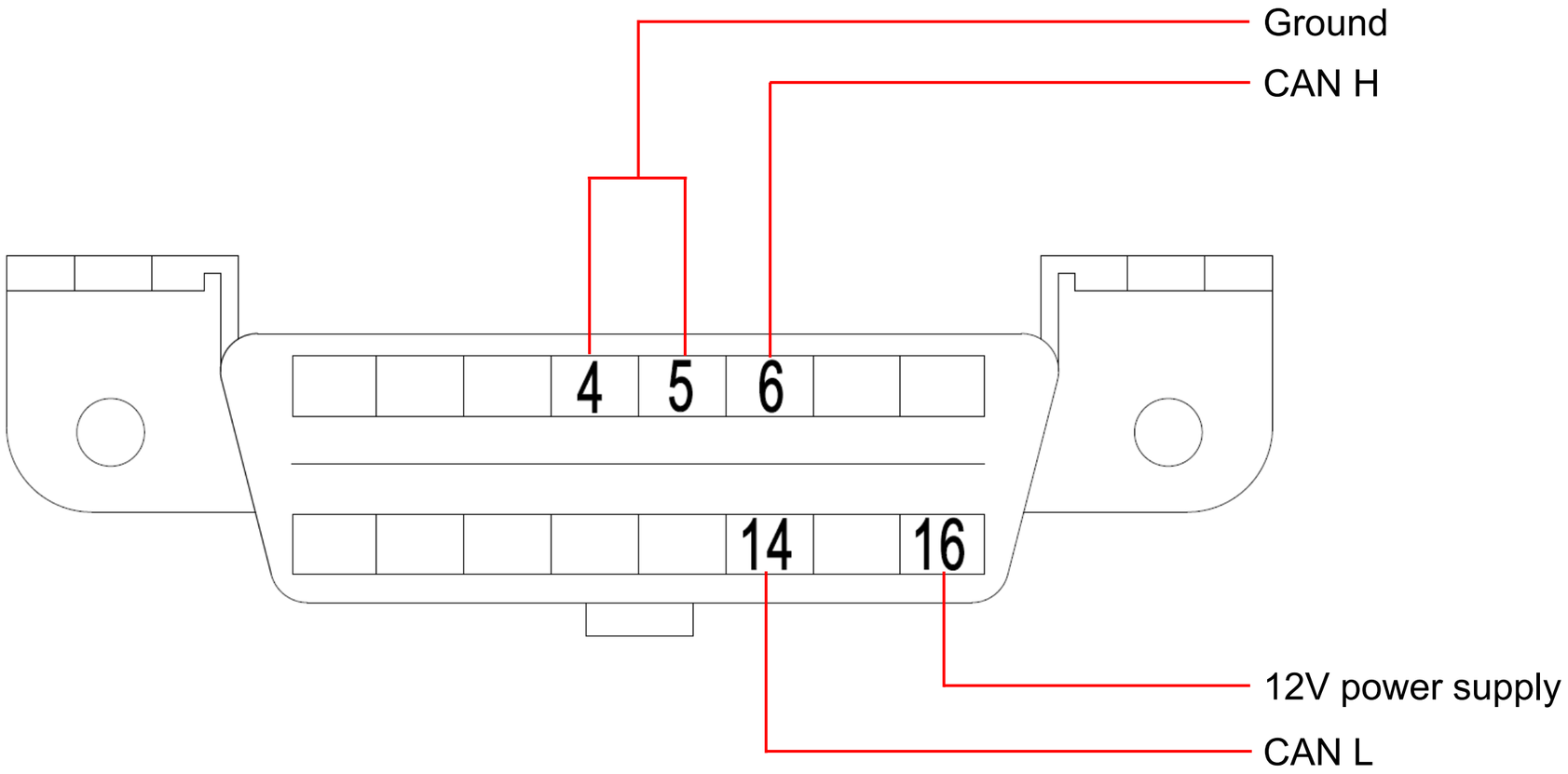
# 5. Electronic system

## 5.1 ECU

| PIN | | Function | PIN | | Function | PIN | | Function |
|---|---|---|---|---|---|---|---|---|
| 1 | M1 | Oxygen sensor heating 2 | 17 | B1 | Stepping motor D | 33 | F3 | Battery power supply |
| 2 | L1 | Oxygen sensor heating 1 | 18 | A1 | Steppng motor C | 34 | E3 | K-line |
| 3 | M2 | Ignition control 1 | 19 | K2 | Oxygen sensor signal 1 | 35 | D3 | N gear |
| 4 | L2 | SAS valve | 20 | J2 | Oxygen sensor signal 2 | 36 | C3 | Ignition diagnostic 1 |
| 5 | M3 | Ignition ground | 21 | H2 | Ignition diagnostic 2 | 37 | B3 | Clutch switch |
| 6 | L3 | Canister valve | 22 | G2 | Empty | 38 | A3 | Roll over sensor |
| 7 | M4 | Ignition control 2 | 23 | F2 | Side stand switch | 39 | K4 | Mode switch |
| 8 | L4 | Key-on power supply | 24 | E2 | Empty | 40 | J4 | RPM output |
| 9 | K1 | Air intake pressure signal | 25 | D2 | Empty | 41 | H4 | Speed sensor signal |
| 10 | J1 | Sensors ground 1 | 26 | C2 | Starting auxiliary relay | 42 | G4 | CPS B |
| 11 | H1 | Air intake temp signal | 27 | B2 | Stepping motor A | 43 | F4 | CPS A |
| 12 | G1 | TPS signal | 28 | A2 | Stepping motor B | 44 | E4 | Headlight relay |
| 13 | F1 | Coolant temp signal | 29 | K3 | MIL | 45 | D4 | Fan relay |
| 14 | E1 | Main relay control | 30 | J3 | 5V power output | 46 | C4 | Fuel pump relay |
| 15 | D1 | CAN L | 31 | H3 | Empty | 47 | B4 | Fuel injector control 2 |
| 16 | C1 | CAN H | 32 | G3 | Kill switch | 48 | A4 | Fuel injector control 1 |

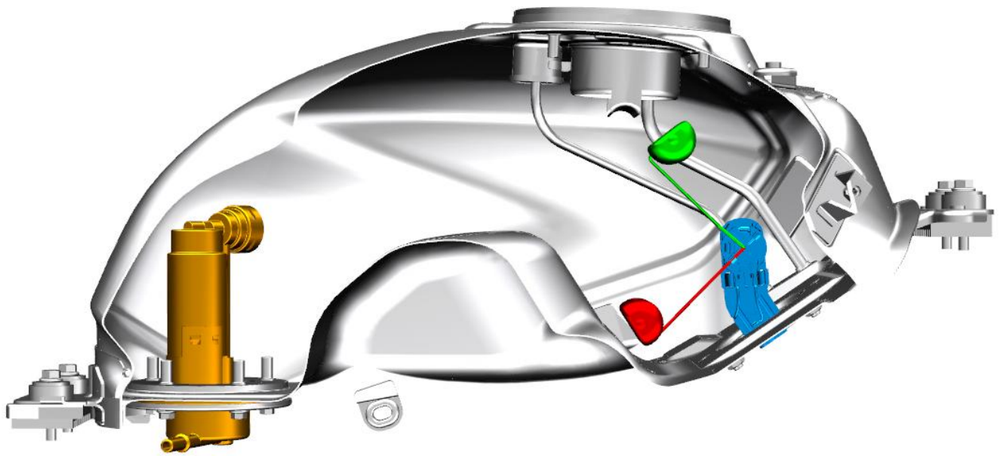
# 5. Electronic system

## 5.2 OBD



# 5. Electronic system

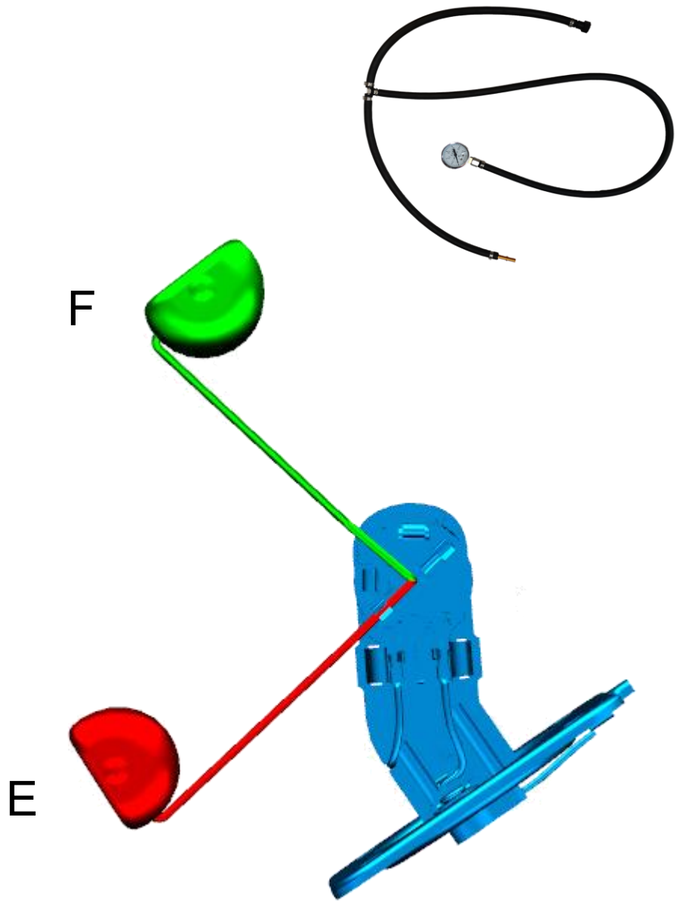
## 5.3 Fuel tank



The 450SR use 14L steel fuel tank with fuel pump and fuel level sensor inside of it.
The electric fuel pump is used to pump fuel from the fuel tank to the injectors. Fuel pressure must be within specifications so the injectors can deliver the correct amount of fuel into the engine for the engine to run correctly. A decompression valve is used to make sure the fuel is delivered in correct pressure, the excessive pressure will be released back to fuel tank as soon as it upto 4.0bar. Too low pressure will starve the engine, causing it to run lean, misfire, hesitate or stall. Too much fuel pressure can cause the engine to run rough, increased fuel consumption and increased emissions.
The in-tank location helps muffle the buzzing noise produced by the electric pump motor, and immersing the pump in fuel helps lubricate and cool the pump motor. This type of pump is not a positive-displacement pump, so it produces no pulsations, runs very smoothly and quietly.

# 5. Electronic system

## 5.3 Fuel tank




A fuel pressure gauge 0GR0-000000-922-100 is required to test the fuel pressure.
The fuel level sensor is made by thick-film resistor. Compare with last generation that made by winding resistance wire, the thick-film resistor fuel level sensor is more accurate and stable during detect the fuel level.

The resistance from full(F) to empty(E) flows smoothly from 10Ω to 450Ω, which can be tested by a digital multimeter.

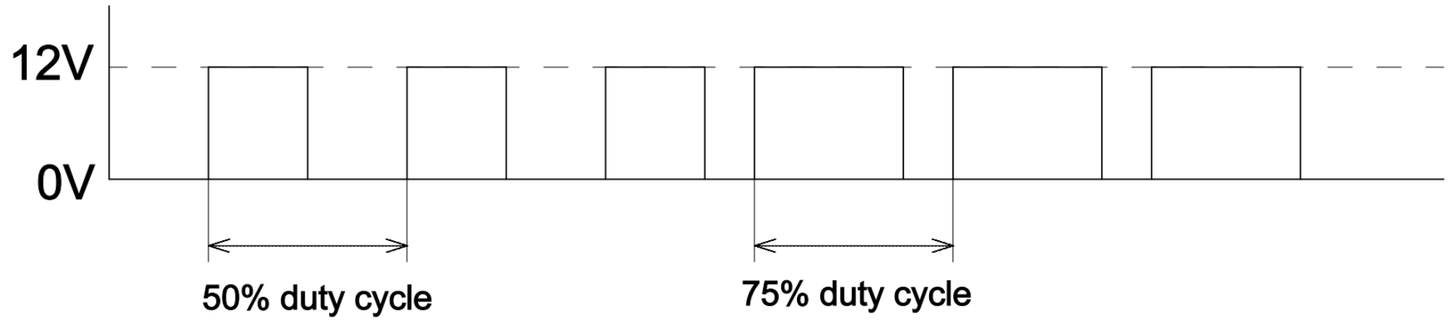
# 5. Electronic system

## 5.4 Fuel injector

The fuel injector is a solenoid valve basically, which controlled by PWM signal sent out from ECU. The signal pulse width can be read in the datastream.

The injector is powered by the key-on power supply from main relay, ground controlled by the ECU pin A4(injector 1) and pin B4(injector 2).

The resistanse between the two pins on the injector is about 12Ω(at 20℃), which can be tested by a digital multimeter to judge if a injector is abnormal.



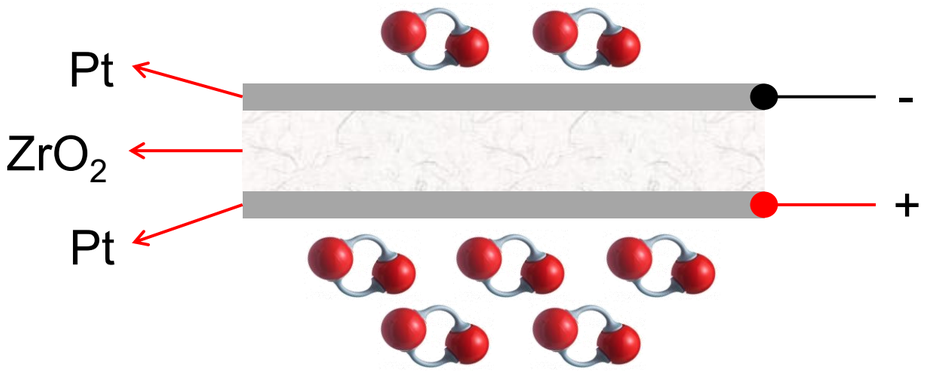
# 5. Electronic system

## 5.5 Oxygen sensor

After the combustion process, the resulting exhaust gas is measured by the ECU through an oxygen sensor. The oxygen sensors detect the exhaust oxygen quantity and generate different voltage signal in different oxygen concentration, ECU takes this signal and adjusts the mixture to keep the exhaust gases as close as possible to the perfect combustion. The remaining unburnt exhaust gas are converted to harmless gas by the catalyst in the muffler.

# 5. Electronic system

## 5.5 Oxygen sensor




The core parts of the oxygen sensor is a zirconium dioxide($ZrO_2$) tube with platinum electrode on both side as shown in pic, the inside of the $ZrO_2$ ventilate to the atmosphere while the outside is immersed by exhaust gas. After the oxygen sensor is heated to 350℃ or higher, the sensor will be actived.

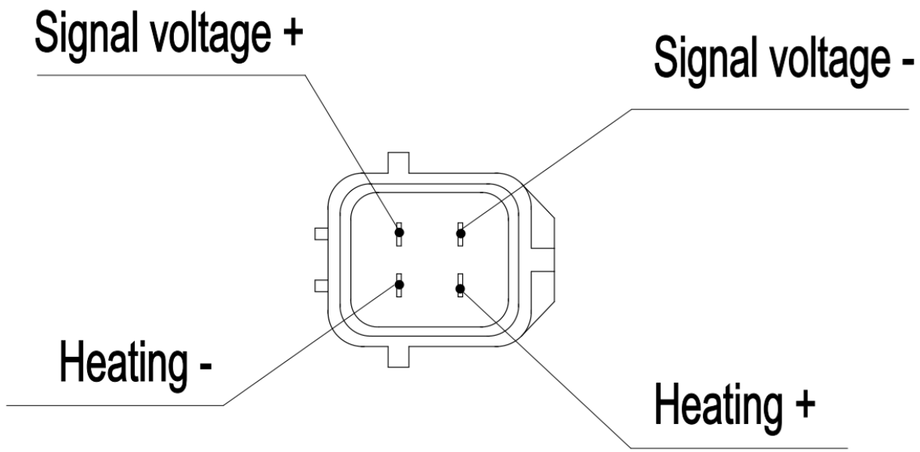
The output voltage will increase with the atmosphere and exhaust gas oxygen differences goes higher:

- λ＞1, $O_2$ sensor output voltage U＜0.1V;
- λ＜1, $O_2$ sensor output voltage will increase, $U_{max}$≈0.8V.

The voltage can be read in the datastream.

# 5. Electronic system

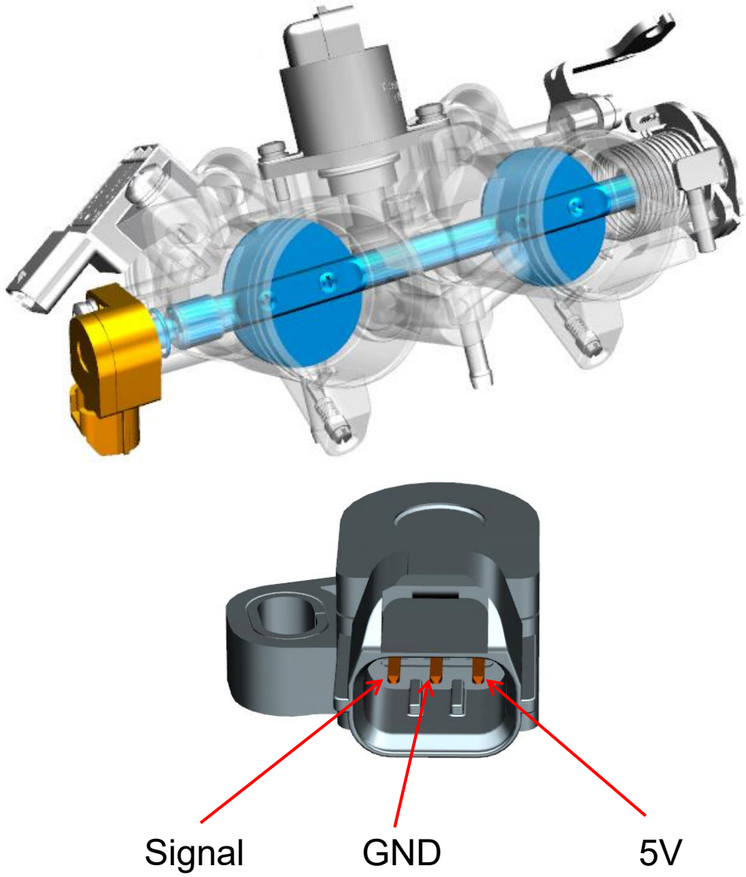
## 5.5 Oxygen sensor




Heating +: Powered by key-on power supply from main relay.
Heating -: Controlled by pin L1(bank 1) and M1(bank 2) in ECU.
Signal voltage +: Powered by pin J2(bank 1) and K2(bank 2) in ECU.
Signal voltage -: Grounded to the pin J1 in ECU.

# 5. Electronic system

## 5.6 TPS




The throttle with a contactless angular position sensor or TPS for butterfly position feedback, the signal of angle and opening speed are detected and sent to the ECU to determine the fuel injection quantity.

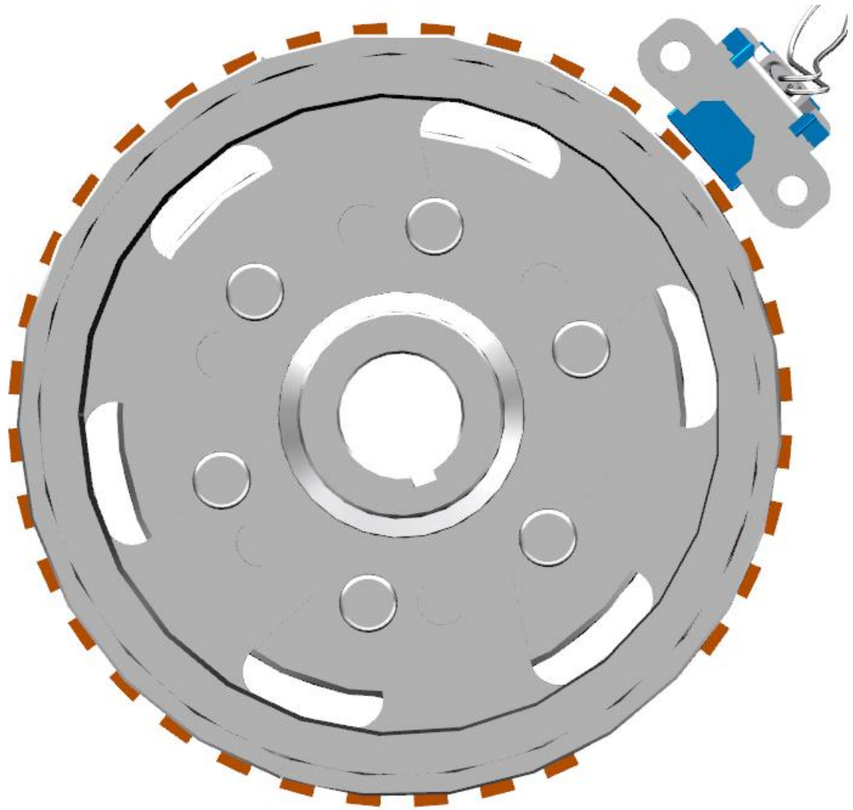
The core of the TPS is a Hall element, which includes three pins: 5V input, sensor ground and output.

- 5V: Powered by pin J3 in the ECU.
- GND: Grounded to the pin J1 in the ECU.
- OUT: Output to the pin G1 in the ECU.

The output voltage and the butterfly position can be read in the datastream.

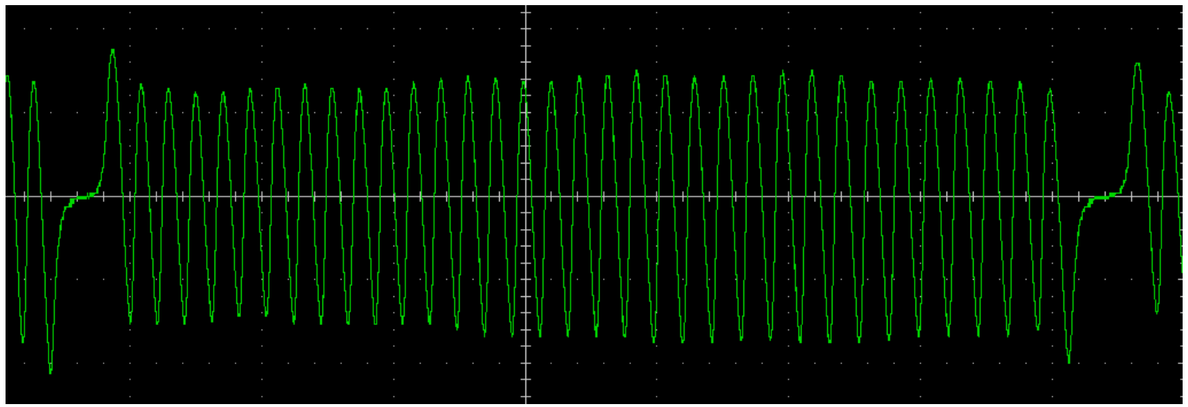
# 5. Electronic system

## 5.7 CPS



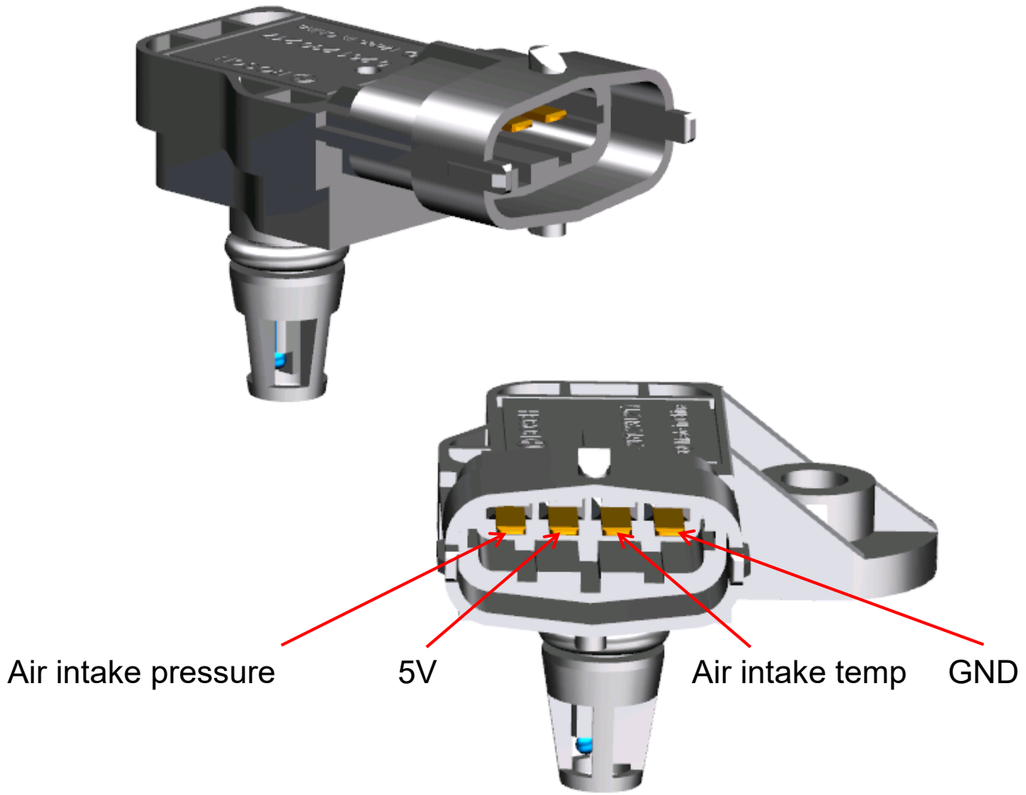
The ECU detect the crankshaft position and revolving speed by crankshaft position sensor(CPS), to control the timing of injection and ignition. The revolving speed signal also provided by the ECU to the dashboard to display the rpm.

Instead of the Hall element in the TPS, the core of the CPS is a magneto-electric elecment, that only needs two terminals.
The signal waveform is a kind of sinusoidal signal, take the oscilloscope screenshoot as reference.



# 5. Electronic system

## 5.8 TMAP

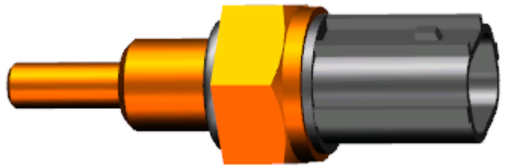


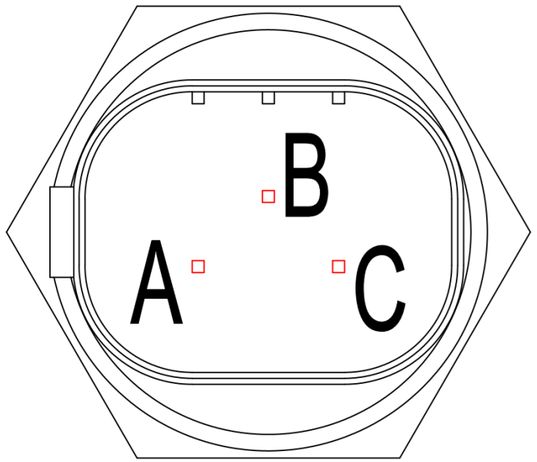

The TMAP sensor measures the air pressure and air temperature to calculate the exact air mass entering the engine cylinder, that makes the air-fuel ratio to be controlled with more precision.
The air temp and pressure can be read in the datastream.

- Pin 1: The GND is grounded to the pin J1 in the ECU.
- Pin 2: The air intake temperature signal is sent to the pin H1 in the ECU.
- Pin 3: The 5V power is supplied by the pin J3 of the ECU.
- Pin 4: The air intake pressure signal is sent to the pin K1 in the ECU.

# 5. Electronic system

## 5.9 Coolant temp sensor






A coolant temperature sensor is installed in the cooling circuit to improve cold-start behavior as well as better engine cooling protection. The fan is controlled by ECU according the temp signal sent from the sensor.

The coolant temp sensor, uses a NTC resistance as its core element, has 3 pins: A, B and C. A and C are connected into ECU while the pin B is vacant.

- The pin A is connected to the pin F1 in the ECU.
- The pin C is connected to the pin J1 in the ECU.

The coolant temp can be read in the datastream.

# 6. Maintenance

## 6.1 Break-in maintenance

The break-in period is the first 1000 kms, the maintenance items after this period are as follows:

| Engine | | |
|---|---|---|
| Engine oil and oil filter | 1000 | Replace |
| Idle | 1000 | Inspect |
| Coolant | 1000 | |
| Throttle system | 1000 | |
| **Electrical system** | | |
| Functions of electrical parts | 1000 | Inspect |
| Battery | 1000 | |
| Fuses and relays | 1000 | |
| **Brake system** | | |
| Brake discs | 1000 | Inspect |
| Brake pads | 1000 | |
| Brake fluid level | 1000 | |
| Brake lever | 1000 | Inspect for free travel |
| Brake hoses | 1000 | Inspect for damage and leakage |
| **Wheels** | | |
| Tire condition | 1000 | Inspect |
| Tire pressure | 1000 | |

| Suspension system | | |
|---|---|---|
| Rear shock absorber and front forks | 1000 | Inspect for leakage |
| **Cooling system** | | |
| Coolant level | 1000 | Inspect |
| Coolant | 1000 | |
| Radiator fan function | 1000 | |
| Coolant hoses | 1000 | |
| **Steering system** | | |
| Steering bearings | 1000 | Inspect |
| **Other parts** | | |
| Diagnosis connector | 1000 | Check by connecting the PDA |
| Mobile parts | 1000 | Lubricate, inspect for flexibility |
| Bolts and nuts | 1000 | Inspect for fastness |
| Cables and wires | 1000 | Inspect for damage, bending and routing |

# 6. Maintenance

## 6.2 Periodic maintenance

| Engine | | | |
|---|---|---|---|
| Engine oil and oil filter | 6M | 5000 | Replace |
| Clutch | - | 5000 | Inspect |
| Idle | - | 10000 | |
| Coolant | - | 5000 | |
| | 24M | 35000 | Replace |
| Throttle system | - | 5000 | Inspect |
| Throttle valve | - | 5000 | Clean |
| Air filter element | - | 5000 | Inspect |
| | 24M | 20000 | Replace |
| Spark plug | - | 10000 | |
| Valve clearance | | 40000 | Inspect |
| **Electrical system** | | | |
| Functions of electrical parts | 12M | 10000 | Inspect |
| Battery | 6M | 5000 | |
| Fuses and relays | 6M | 5000 | |
| Wires | 12M | 10000 | Inspect for damage, bending and routing |

| Brake system | | | |
|---|---|---|---|
| Front and rear brake system | 12M | 10000 | Inspect |
| | 24M | 20000 | |
| Brake discs | 12M | 10000 | |
| | 24M | 20000 | |
| Brake pads | 12M | 10000 | |
| | 24M | 20000 | |
| Brake fluid level | 12M | 10000 | |
| | - | 20000 | |
| Brake lever | 12M | 10000 | Inspect for free travel |
| | 24M | 20000 | |
| Brake hoses | 12M | 10000 | Inspect for damage and leakage |
| | 24M | 20000 | |
| Brake fluid | 24M | - | Replace |
| **Wheels** | | | |
| Tire condition | 12M | 10000 | Inspect |
| | 24M | 20000 | |
| Tire pressure | 12M | 10000 | |
| | 24M | 20000 | |
| Wheel bearings | - | 10000 | |
| | - | 30000 | |

# 6. Maintenance

## 6.2 Periodic maintenance

| Suspension system | | | |
|---|---|---|---|
| Suspension system | - | 5000 | Inspect |
| | - | 10000 | |
| | - | 15000 | |
| Rear shock absorber and front forks | 12M | 10000 | Inspect for leaking |
| | 24M | 20000 | |
| Swing arms | - | 10000 | Inspect |
| | - | 30000 | |
| **Cooling system** | | | |
| Coolant level | 12M | 10000 | Inspect |
| | 24M | 20000 | |
| Coolant | 12M | 10000 | |
| | 24M | 20000 | |
| Radiator fan function | 12M | 10000 | |
| | 24M | 20000 | |
| Coolant hoses | 12M | 10000 | |
| | 48M | 30000 | |
| **Frame system** | | | |
| Frame | - | 30000 | Inspect |

| Steering system | | | |
|---|---|---|---|
| Steering bearings | 12M | 10000 | Inspect |
| | 24M | 20000 | |
| **Chain** | | | |
| Chain and sprockets | 12M | 10000 | Inspect |
| | 24M | 20000 | |
| **Other parts** | | | |
| Diagnosis connector | 12M | 10000 | Check by connecting the PDA |
| | 24M | 20000 | |
| Mobile parts | 12M | 10000 | Lubricate, inspect for flexibility |
| | 48M | 30000 | |
| Bolts and nuts | 12M | 10000 | Inspect for fastness |
| | 48M | 30000 | |
| Cables and wires | 12M | 5000 | Inspect for damage, bending and routing |
| | 24M | 10000 | |
| Pipes, ducts, hoses and sleeves | 12M | 10000 | Inspect for cracks, sealing and routing |
| | 48M | 30000 | |


# determined, progressive, more fun.