CFMOTO

700CL-X

Contents

Contents

1. Introduction

Twilight blue

Coal grey

The 700CL-X is the first bike that CFMOTO aims at classical bike market. The appearance of this bike is a new design which is different with previous CFMOTO family. But what CFMOTO want to do is far more than only exterior difference, besides the classical element, CFMOTO aims at the lighter weight, easier riding and new technology.

The engine is optimized based on 283MT engine and the chassis was redesigned for lighter weight, easier riding and classical outline. With the control of new BOCSH E-throttle system, the 700CL-X is not just a classical bike, it also provides a lighter and sportier riding experience.

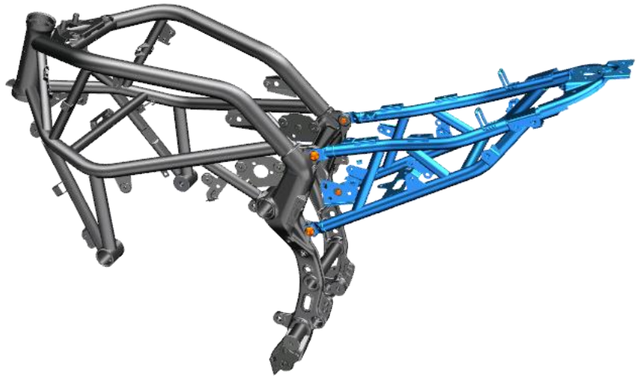
2. Technical data

Chassis	
Length x Width x Height	2107mm×887mm×1200mm
Wheelbase	1435mm
Min. Ground Clearance	160mm
Front Rake	24°
Curb Weight	196kg
Fuel Capacity	13L
Chain	DID 114-link 520 O-ring Chain
Front Brake	Single brake discs with radially mounted 4-piston calipers
	Front brake disc diameter: 320mm
Rear Brake	Disc brake with twin-piston floating brake caliper
	Rear brake disc diameter: 260mm
Shock Absorber	Upside down telescopic absorber with full adjustable
	Preload and rebound damping adjustable monoshock
Steering Angle	70°
Tires	Front: MT 60 RS 110/80 R18
	Rear: MT 60 RS 180/55 R17
Tire Pressure	250kPa
	280kPa
Color(s) Available	Twilight blue
	Coal grey
Battery	12V11.2Ah

Engine	
Model	283MU
Type	Parallel twin cylinder, liquid cooled, 4-stroke
Vlave train	Chain drive DOHC 8 valves
Displacement	693ml
Bore ×Stroke	83mm×64mm
Maximum Power	55kw/8500rpm
Maximum Torque	68N·m/6500rpm
Compression Ratio	11.6:1
Fuel Supply	EFI
Ignition	BOSCH ME17 ECU
Transmission	6-gear constant mesh transmission
Cold Valve Clearance	IN: 0.08~0.13mm
	EX: 0.23~0.28mm
Spark Plug	NGK CR8EI 0.7~0.9mm
Idle Speed	1450±145r/min
Engine Oil	SAE10W-40 API SJ JASO MA2 or higher
Engine Oil Capacity	Oil change: 2.2L
	Overhaul: 2.6L

3. Chassis

3.1 Frame



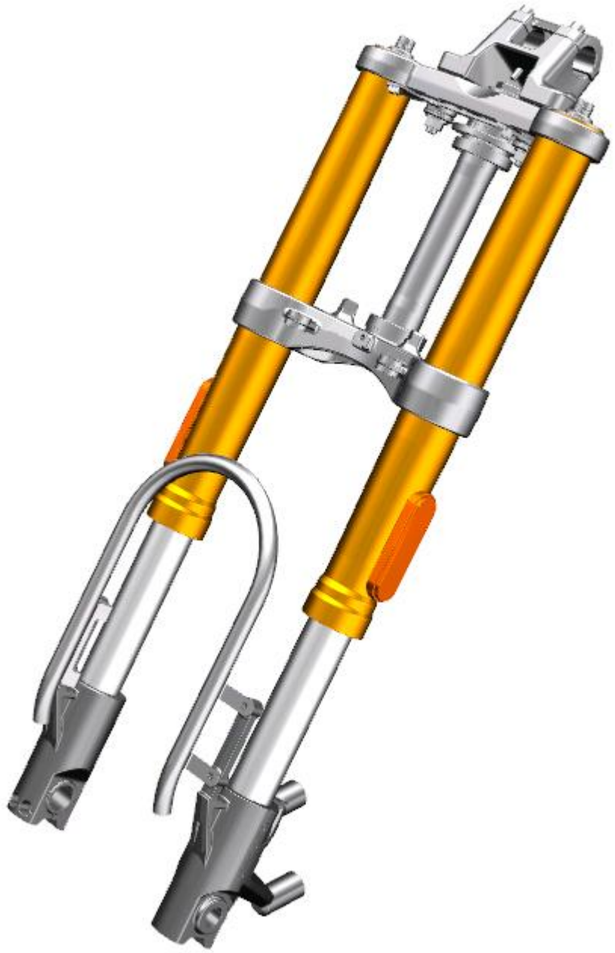
- The 700CL-X uses newly designed frame which made by high-strength chromium-molybdenum alloy steel. That allows the frame tube has a thinner thickness to reduce the weight. Finally the frame weighs only about 16.5kg;
- The subframe use a kind of individual strcuture, which was fixed on the frame by 4 bolts;
- The gravity casting aluminium rear swing arm is only about 6.7kg.

3. Chassis

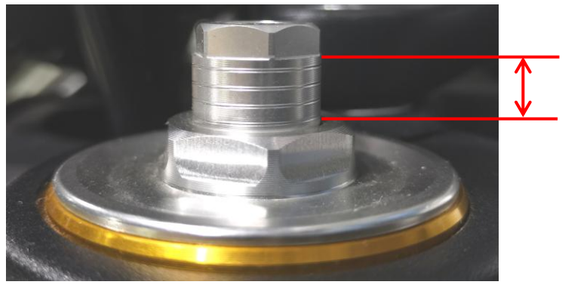
3.2 Suspension

Rebound damping screw

Compression damping screw



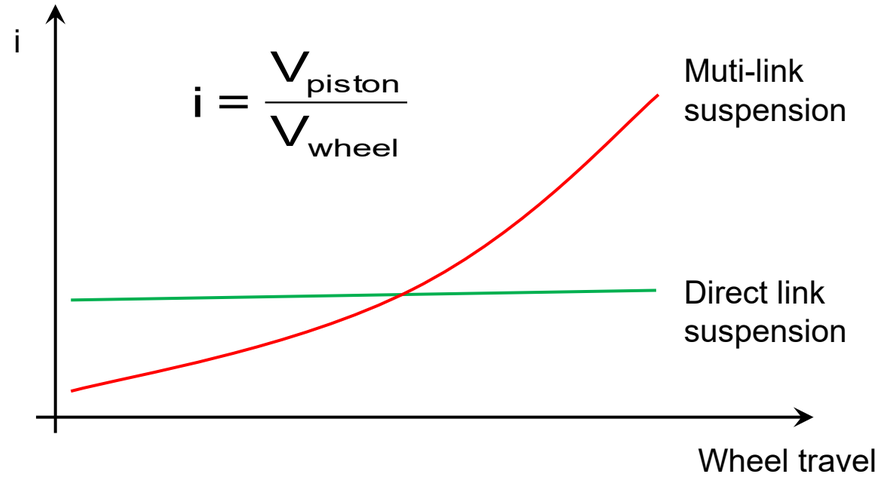
- The 24° front rake provides a more faster steering response for the rider;
- KYB 41mm upside down fork, wheel travel 150mm;
- The absorber with full adjustable: 8 clicks preload adjustable on both side;
- 21 clicks rebound damping adjustable on LH, and 21 clicks compression damping adjustable on RH.



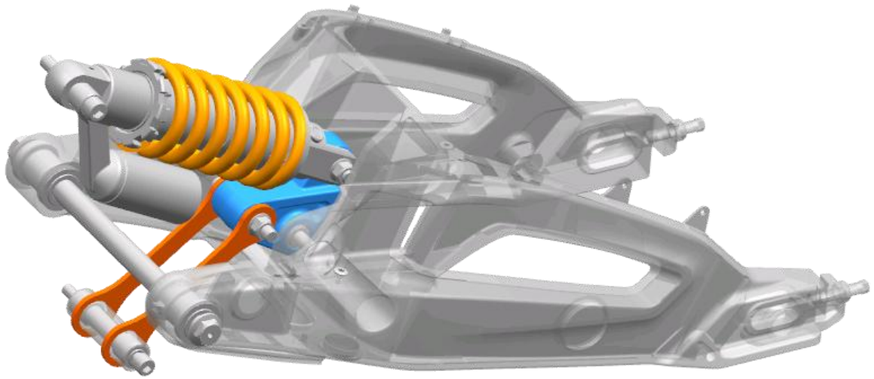
Preload adjusting knob

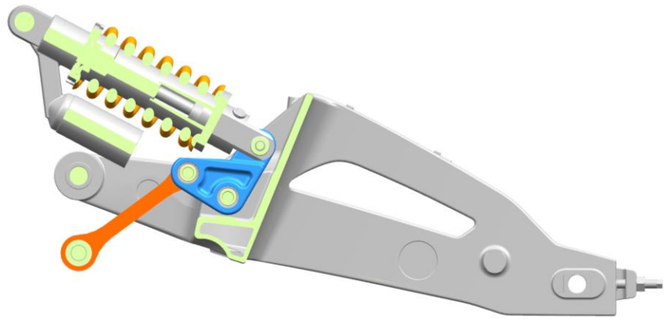
3. Chassis

3.2 Suspension



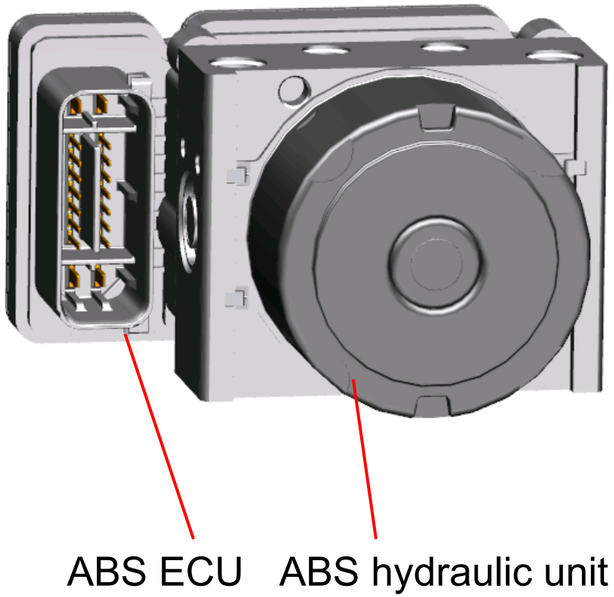
- New design multi-link structure has a progressive character. The damping increases gradually during the rear wheel compression;
- Single shock with linkage, rear wheel travel 150mm;
- Rebound damping is 20-clicks adjustable.
- The damping is softer in the initial stroke for comfort, with the stroke goes up, the stiffness increases.This structure will reduce the variation of seat height with load, let the suspension softer for comfort and stiffness in sport riding.

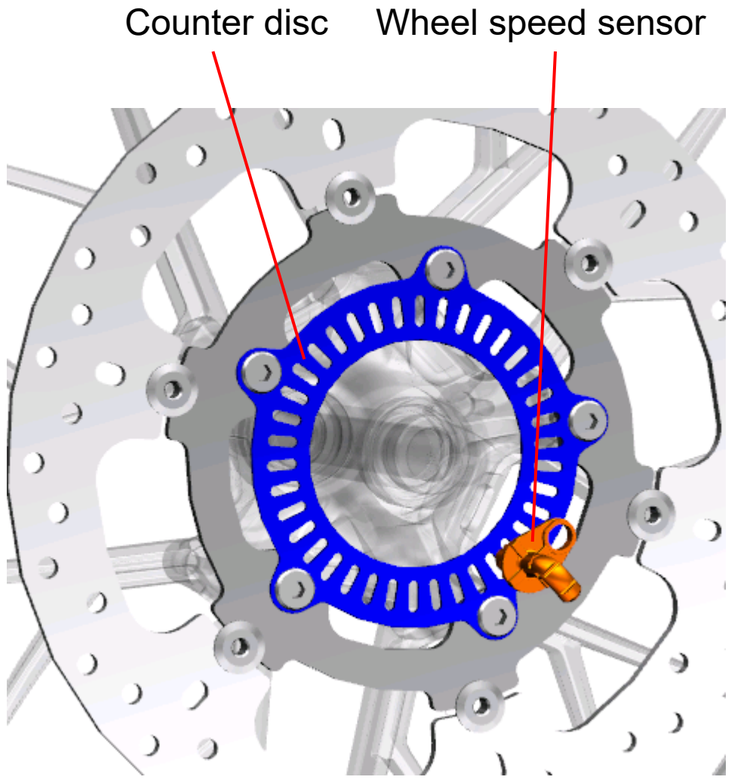




3. Chassis

3.3 Braking system



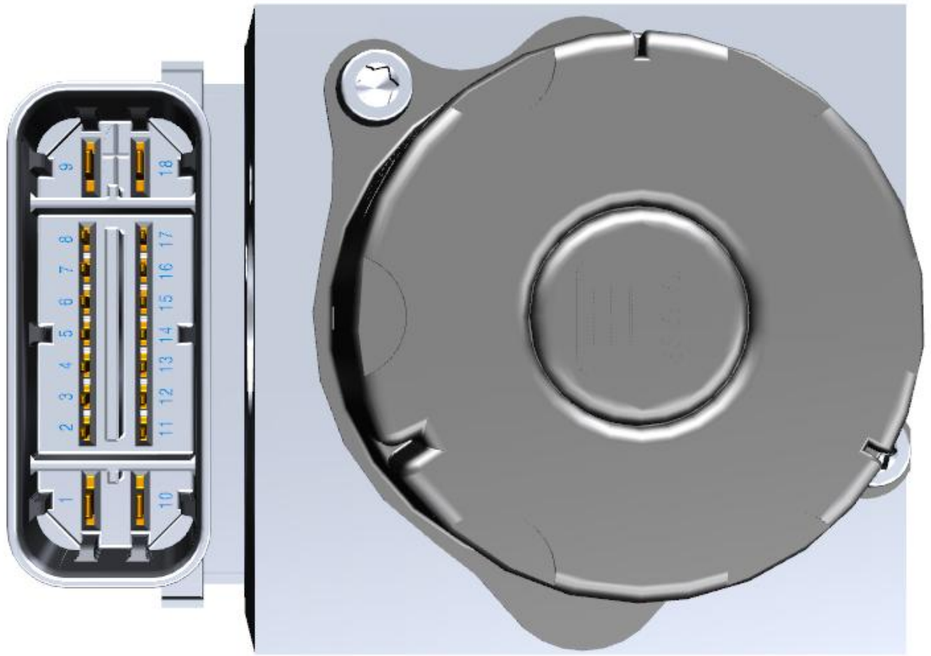


The one-piece Continental ABS ECU and ABS hydraulic unit on the CFMOTO 700CL-X is not repairable. Therefore it is very importance that the service schedule for brake fluid replacement is followed.

Besides the ABS ECU and ABS hydraulic unit, the ABS system consists of wheel speed sensors and counter discs on both the front and the rear wheel that measure rotational speed. They feed their information back to the ABS ECU. 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

3.3 Braking system

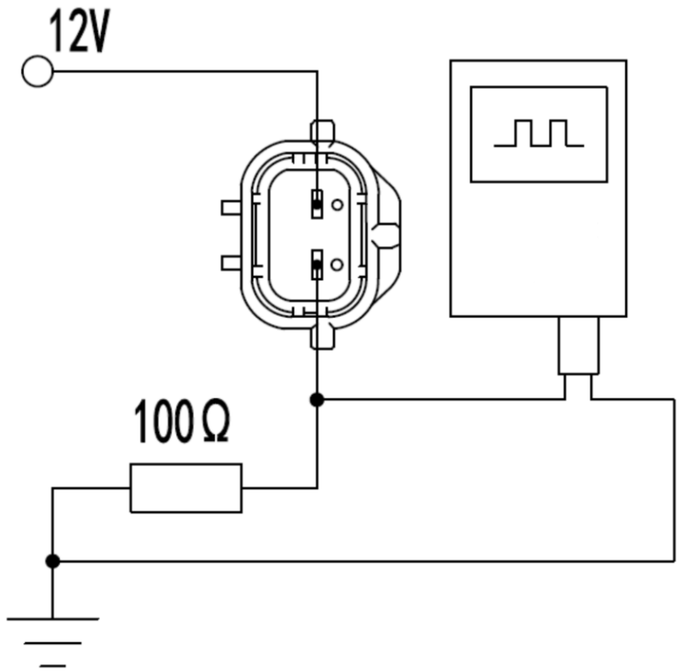


Pin	Function
1	Vacant
2	Can H
3	ABS indicator
4	Key switch
5	OBD
6	Rear wheel speed sensor
7	Vacant
8	Front wheel speed sensor
9	Vacant

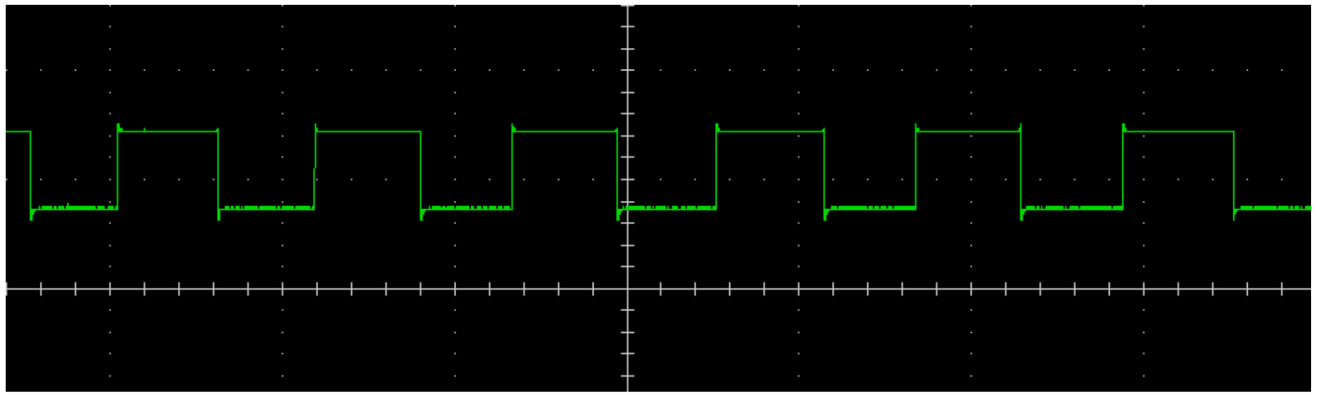
Pin	Function
10	Ground
11	Can L
12	Vacant
13	Speed display
14	Vacant
15	Rear wheel speed sensor
16	Vacant
17	Front wheel speed sensor
18	Battery power

3. Chassis

3.3 Braking system

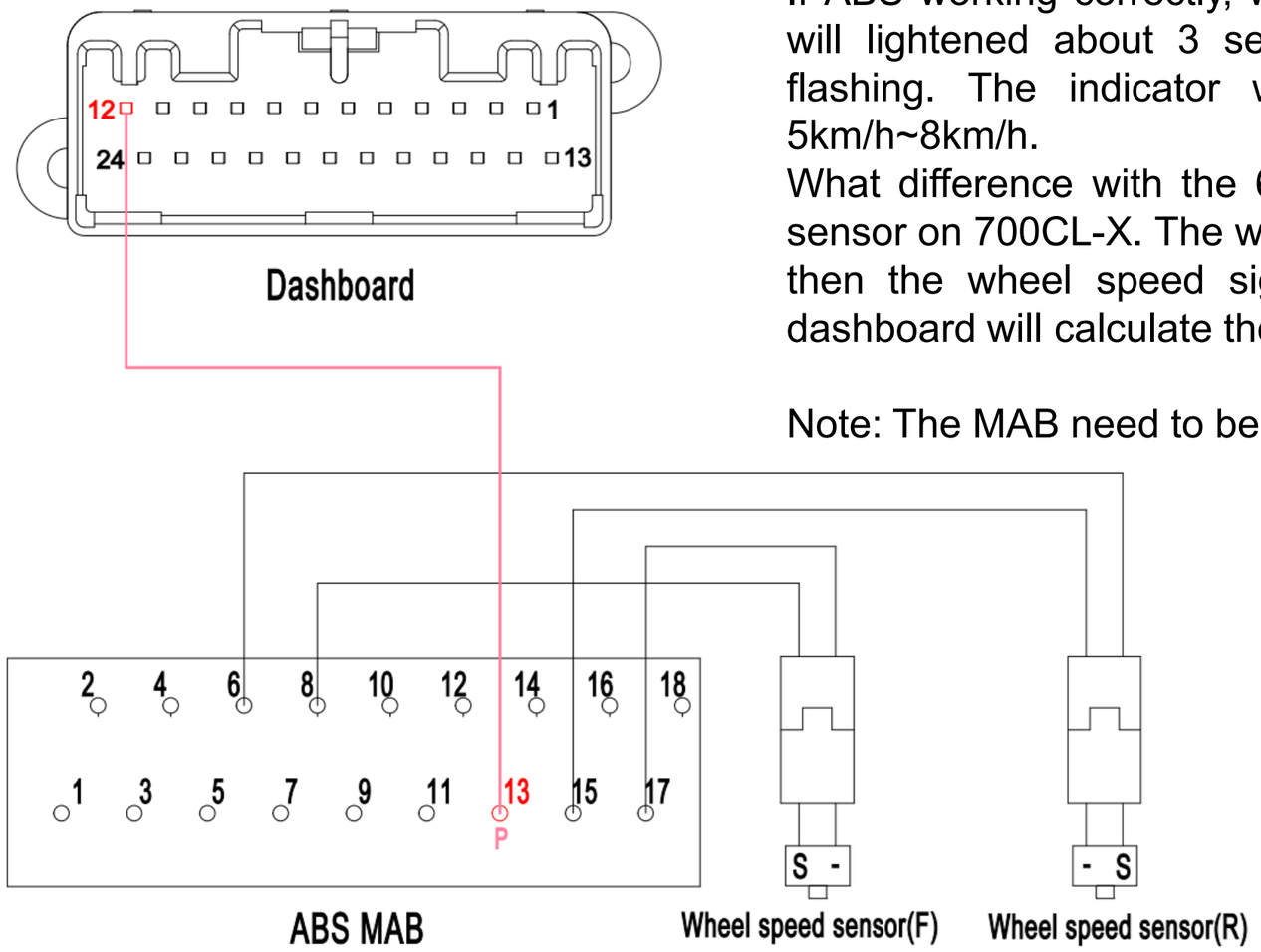


The core element of the wheel speed sensor is a Hall element, but what different with other Hall element sensors (TPS, for example)is that the sensor here only has 2 terminals instead of 3 terminals.
The test method of the wheel speed sensor on motorcycle is as shown in diagram. Turn the wheel after connect the 100Ω resistance 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

3.3 Braking system



If ABS working correctly, when the key switch is turned on, the ABS indicator will lightened about 3 seconds during dashboard POST, then it will keep flashing. The indicator will turned off until the motorcycle speed upto 5km/h~8km/h.

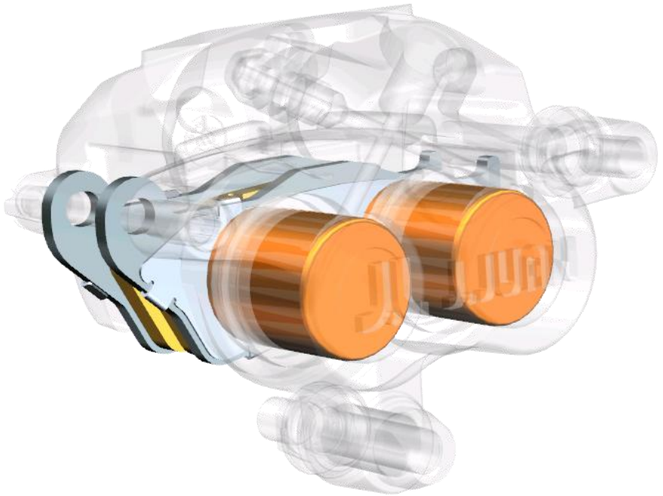
What difference with the 650NK or MT is that there is no motorcycle speed sensor on 700CL-X. The wheel speed sensor pick up the signal from the wheel, then the wheel speed signal is delivered to the dashboard via MAB, the dashboard will calculate the motorcycle speed according to the wheel speed.

Note: The MAB need to be actived by DSCAN if a new MAB is installed.

3. Chassis

3.3 Braking system

- The radially front caliper has 4 pistons which diameter is 30mm×2 on bottom and 34mm×2 on top, the brake dics will through the smaller pistons firstly then via the bigger piston, as in the red arrow direction, that generates a self-energizing effect to enhance the braking pressure on the sintered metal braking pad to provide a better braking experience.
- The rear caliper is also different with 650NK or MT, 700CL-X uses two pistions floating caliper on the rear brake which diameter is 25mm×2. Plus, the brake pad is designed with a pair of slient blade on the back of it to reduce the braking noise.
- Use DOT4 brake fluid only from a sealed container.



3. Chassis

3.4 Tires

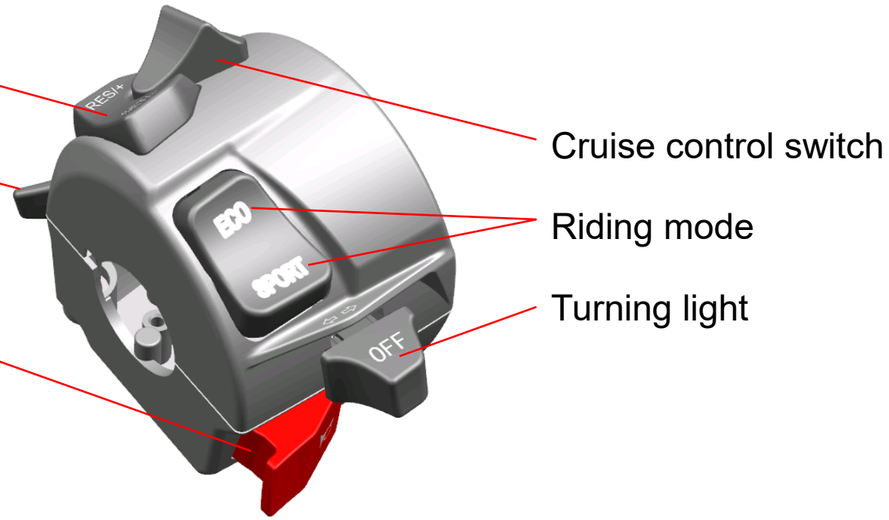
To meet with the retro style, the 700CL-X adopted Pirelli MT60 RS tires which not only has excellent performance on road but also balance the uses on off road.

- Optimized tread pattern design for street use also on wet.
- Cornering grip pleasure provided by the specific compound.
- Radial carcass with steel belt at 0° for stability on braking and great support in inclination.
- Multi-radius profile for great handling and speed in changes of direction, easy and pleasant steering.

Tires	
Front:	Pirelli MT 60RS 110/80 R18 M/C
Rear:	Pirelli MT 60RS 180/55 R17 M/C
Tire pressure	
Front:	250kPa
Rear:	280kPa

3. Chassis

3.5 Handle switch



As the 700CL-X is the first bike adopted E-throttle, MCU and CAN bus, so handle switch of 700CL-X is a new designed switch that different with any previous CFMOTO model. Different with other previous CFMOTO model that the handlebar switches control the relay, in 700CL-X, the switch signals are delivered to the MCU to control the motorcycle.

3. Chassis

3.6 Radiator

The 700CL-X is the first CFMOTO bike that uses curved radiator which will maxmize the heat-sinking capability in a narrower radiator width.
If the coolant signal lost or communication failure, the fun will keep running.
Fan delay running: If the coolant temperature up to 98℃ after engine stopped, the fan will continue running 20s.

4. Engine

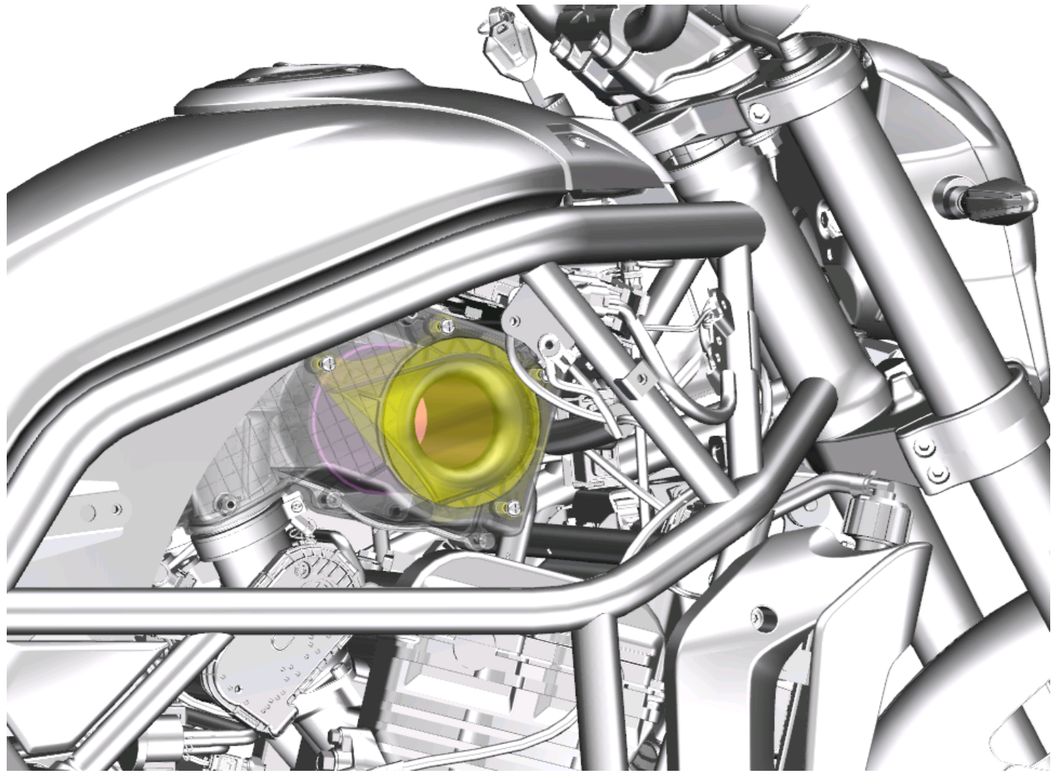
4.1 Introduction

Based on the reliability, durability and easier repair/maintenance of 283MT engine, the 283MU engine on 700CL-X made several evolutions for retro style, higher performance and better emission:

- “X” element design on the side cover of the engine.
- Matte black plastic powder surface treatment.
- CNC milling on the engine side cover and cylinder head.
- E-throttle.
- Φ42mm throttle diameter.
- Cracked connecting rod.
- Forged piston.
- Secondary air system.
- Sliper clutch(CFSC) to avoid rear wheel hopping and locking up.

4. Engine

4.2 Intake & Exhuast

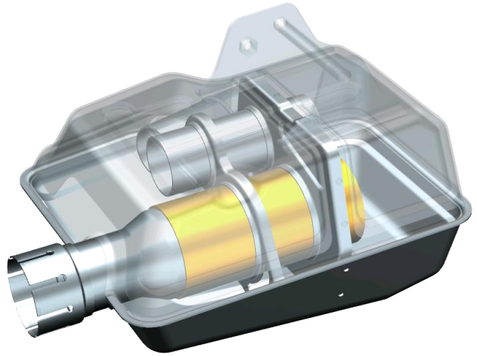


The air filter box is located just under the fuel tank, different with the sponge filter used on the 283MT engine, the air is filtered through a paper filter. The clean air then enters the 42mm BOSCH E-throttle bodies where it is mixed with atomized fuel from the injectors.
In 283MT engine, the fuel tank need to be removed before draw out the sponge filter. But on the 283MU engine, the filter can be drawn out from the right side of the bike after remove the RH panel, don’t need to remove the fuel tank anymore, easier to maintenance.

4. Engine

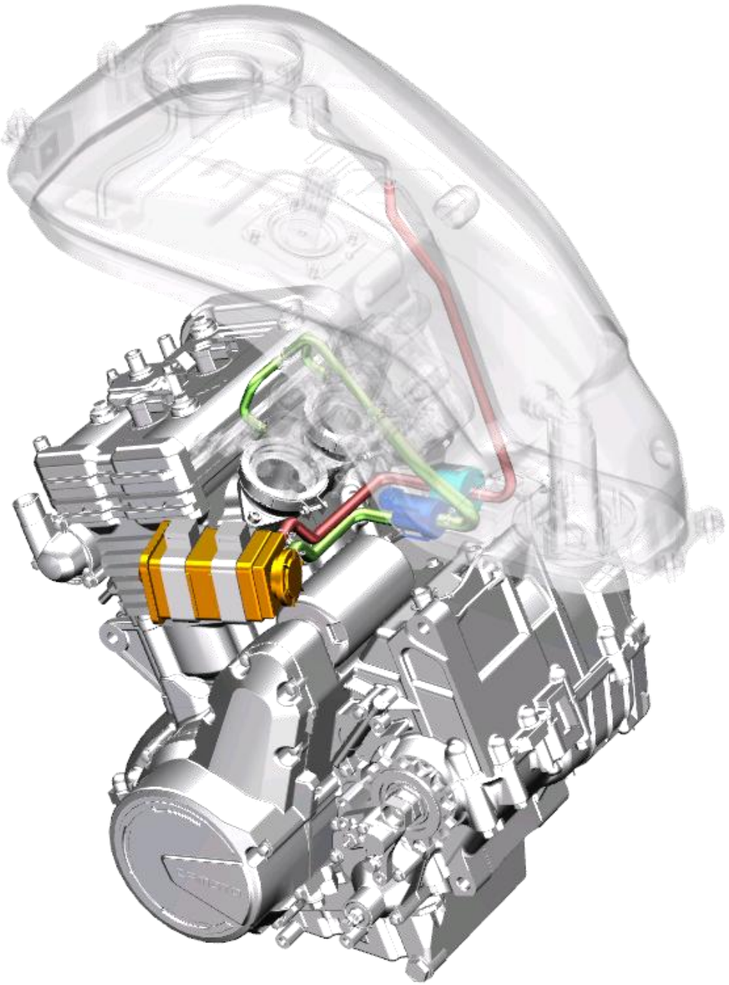
4.2 Intake & Exhuast

The muffler was redesigned both on appearance for retro style and inside structure for better proformance and emission. The catalyst is located in the bottom muffler between the e pipe and tail muffler.



4. Engine

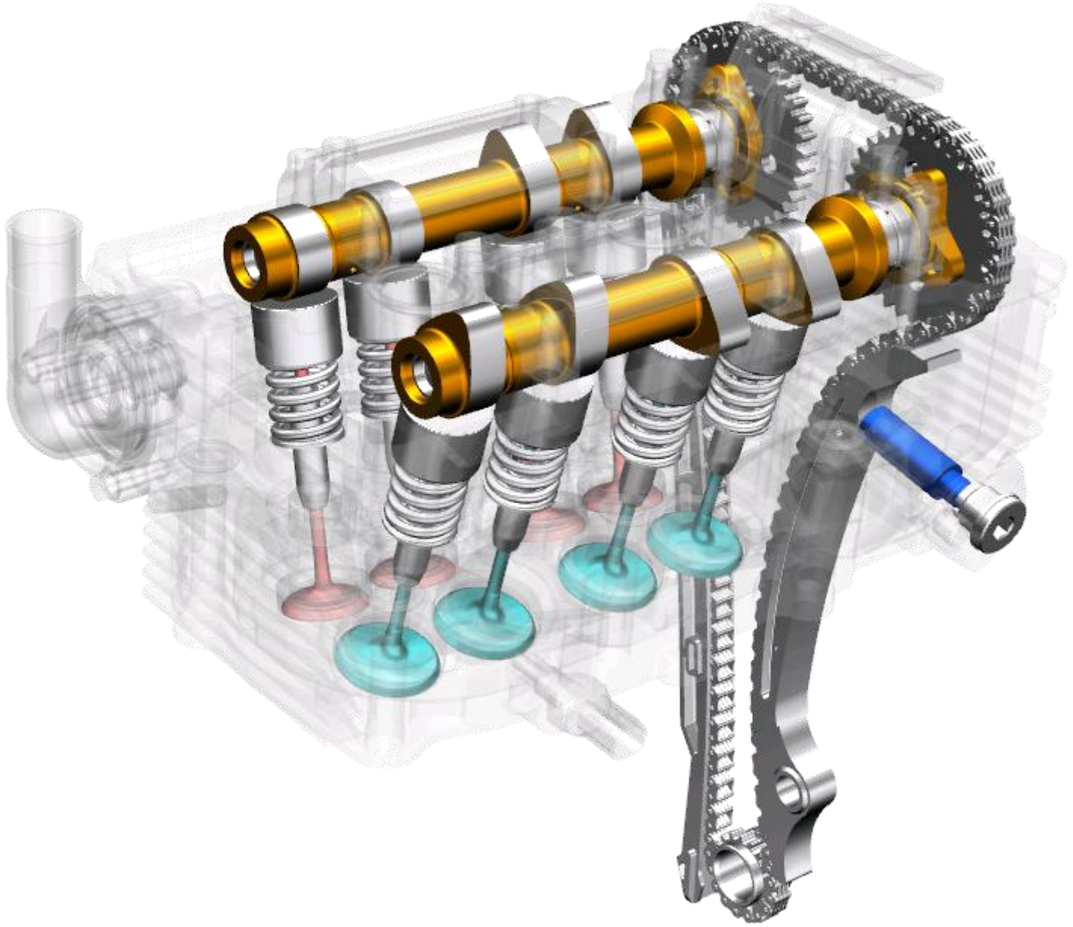
4.2 Intake & Exhuast



In order to comply with emission standards in EU, US and other regions, an activated carbon canister is fitted to the motorcycle. Evaporative emissions from the fuel tank are adsorbed by the canister and under certain running conditions the emissions are drawn into the throttle body to be burnt.
What different with the 283MT is that there is a canister magneto valve(strong blue highlight) between the canister and E-throttle body on 283MU engine to promise the air-fuel ratio more accurate.

4. Engine

4.3 Cylinder head

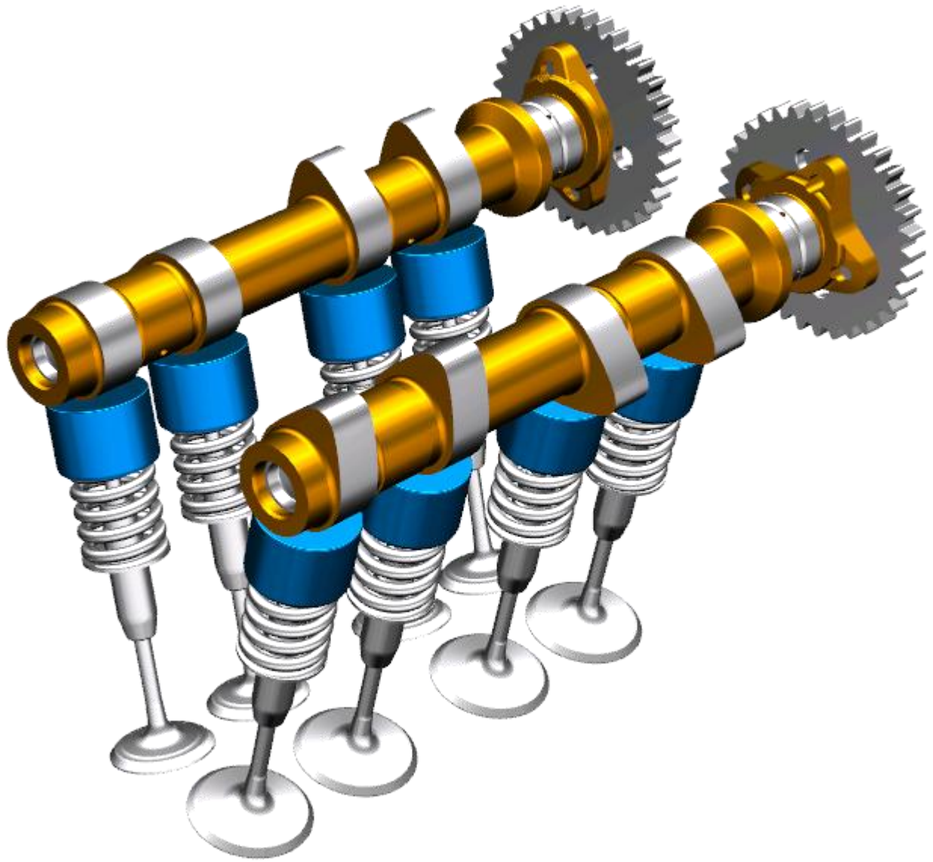


- The DOHC is drived by 5×4 timing chain which is tensioned by a hydraulic tensioner , and the valves are drived by camshaft via tappets instead of finger followers.
- Valve clearance(when engine is cold):
  IN: 0.08~0.13mm
  EX: 0.23~0.28mm
- Torque:

Bolt	Qty	Torque(N·m)	Remark
M10	6	New: 25→54	Lubricate the thread and washers with lubricant that mixed with engine oil and MoS_2 by 10:1
		Old: 25→49	
M6	2	12	

4. Engine

4.3 Cylinder head



- Valve clearance(when engine is cold):
  IN: 0.08~0.13mm(Median is 0.10 and 0.11)
  EX: 0.23~0.28mm(Median is 0.25 and 0.26)
- 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 valve clearance is 0.15mm, and the present tappet thickness is 3.78mm, then the desired tappet thickness is 0.15-0.11+3.78=3.82(odd number-odd number), but if the present valve clearance is 0.14mm, and the present tappet thickness is still 3.78mm, then the desired tappet thickness is 0.14-0.10+3.78=3.82(even number-even number), the 382 tappet is required to adjust the clearance to the correct range.

4. Engine

4.3 Cylinder head

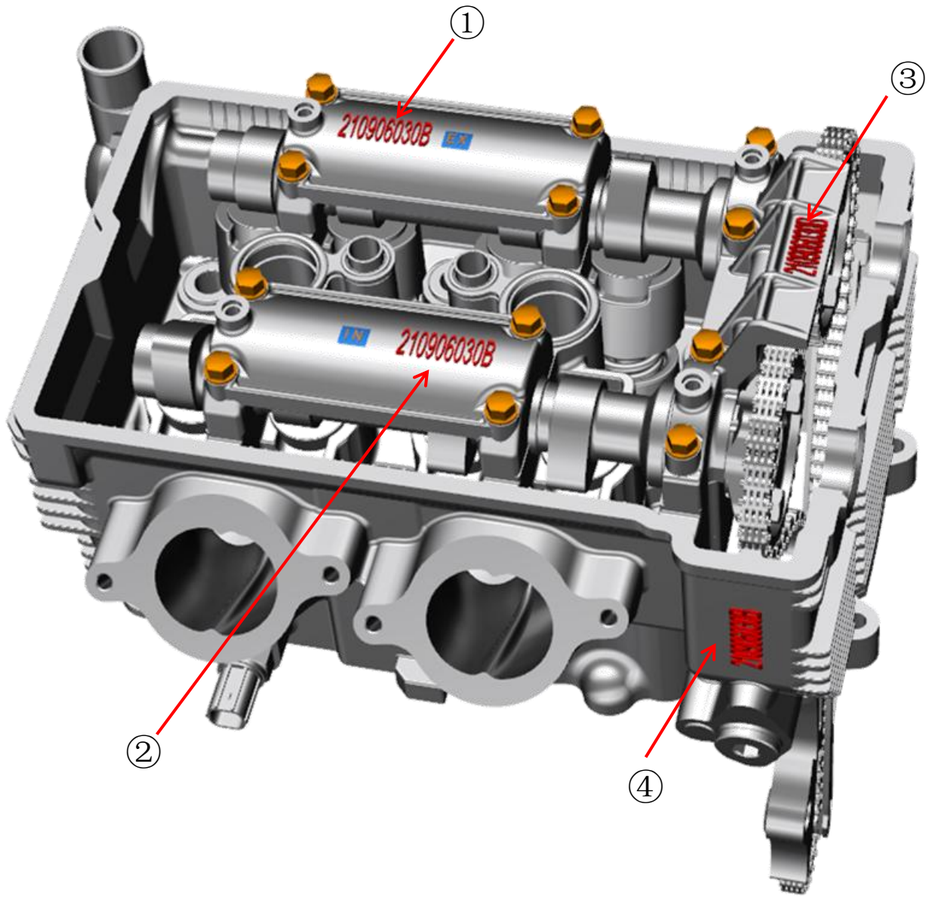
For better durability and higher performance, the tappets are treated by carbonitriding process, which will increase the hardness and reduce the friction.

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 material on the end of valve(orange highlight) is made by Stellite No.6 alloy to reduce friction, enhance its wear resistance and corrosion resistance especially in high temperature.

4. Engine

4.3 Cylinder head

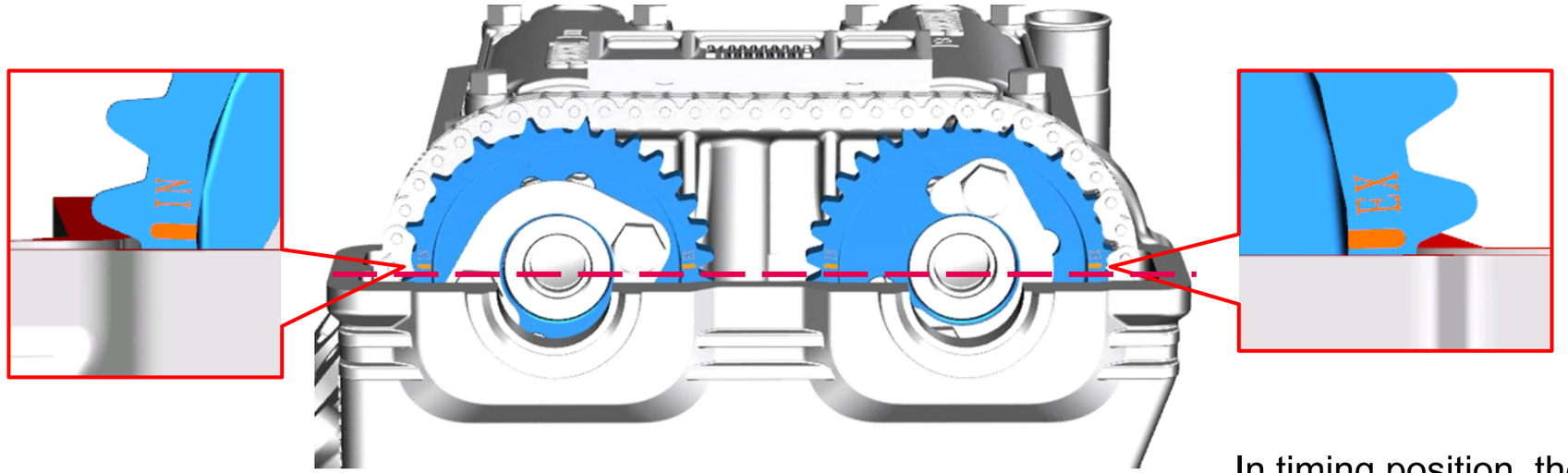


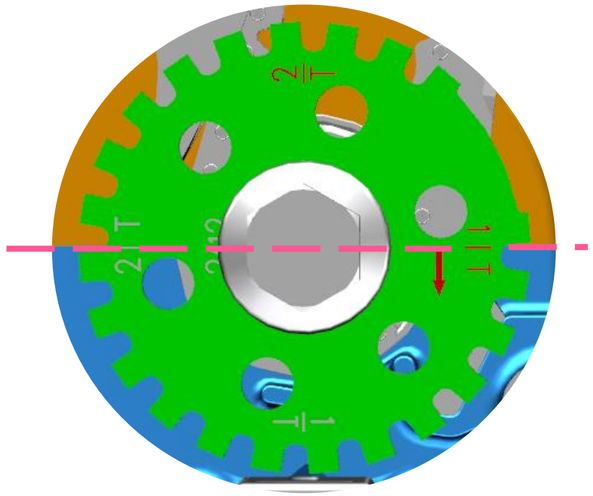
- The 12 bolts need to be tightened to the desire torque by three times:
  1st: 5 N·m
  2nd: 8 N·m
  3rd: 12 N·m

Note: As the camshaft holes are drilled after the camshaft covers installed to the cylinder head to ensure the cylindricity, so the three piece camshaft covers and the cylinder head are marked by a set of unique numbers(①②③④) and need to be changed together.

4. Engine

4.3 Cylinder head





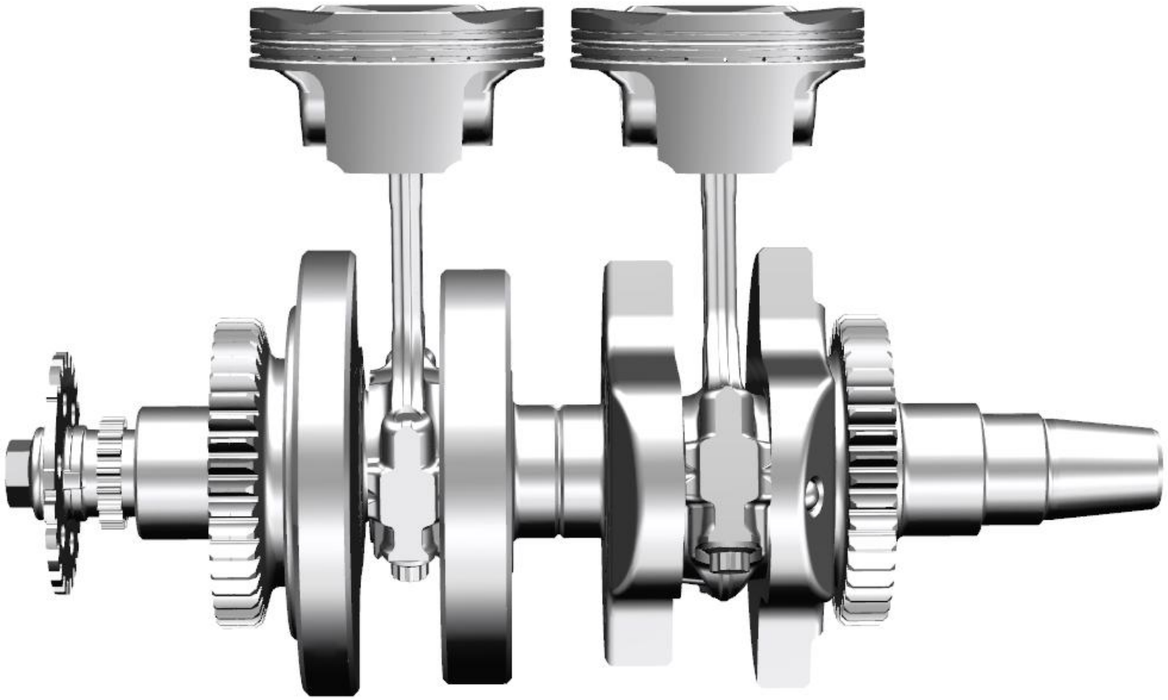
In timing position, all the valves are closed and the two pistons are in the same horizontal.

In timing position, the mark “IN” and “EX” on the camshaft should towards to the intake and exhaust side respectively and parallel with the cylinder head top surface, meanwhile the mark ⏦|⊢ on the crankshaft shoule align with the slot mark of the timing view on the clutch cover.

If the engine under overhaul and the clutch cover has not been installed yet, the crankshaft timing position can be identified when the slot on the “1|T↓” mark align with the top and bottom cankcase faying srface(the boundary between the orange and blue as shown in pic).

4. Engine

4.3 Cylinder head

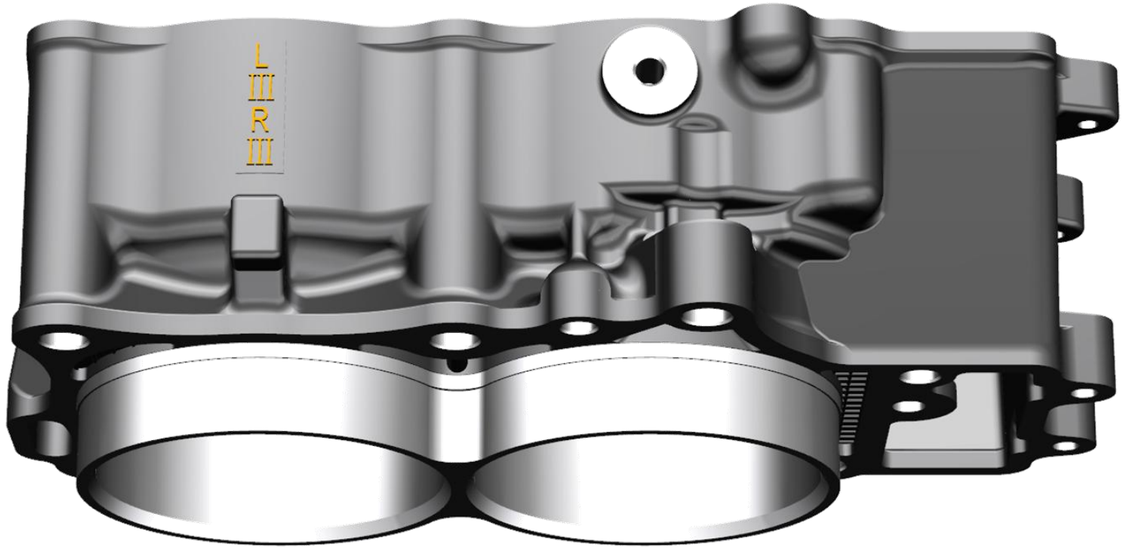


In timing position, all the valves are closed and the two pistons are in the same horizontal.

4. Engine

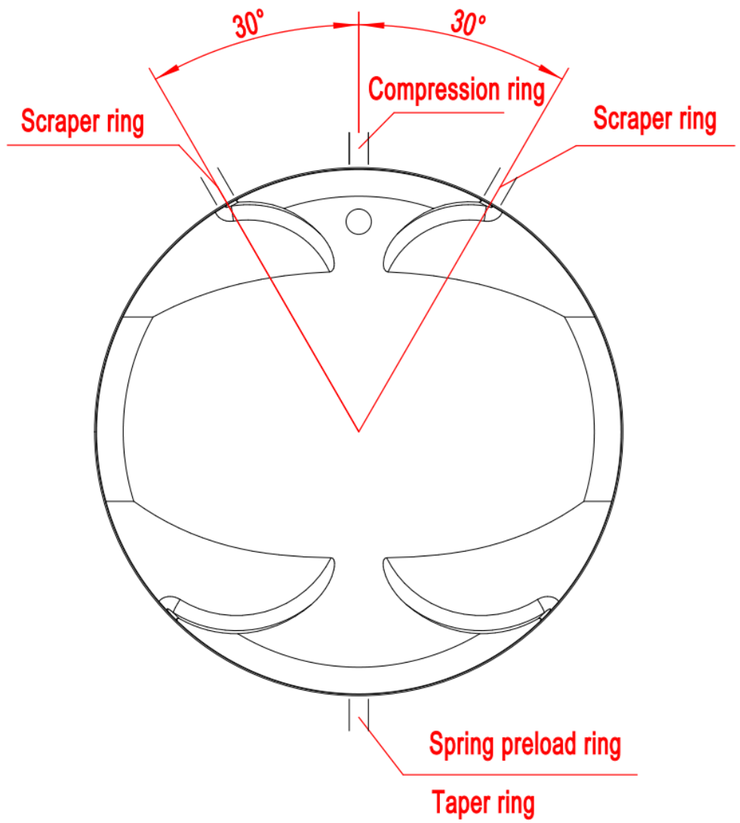
4.4 Piston

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

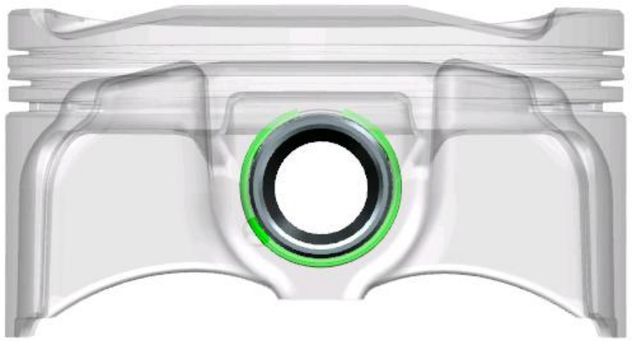


4. Engine

4.4 Piston

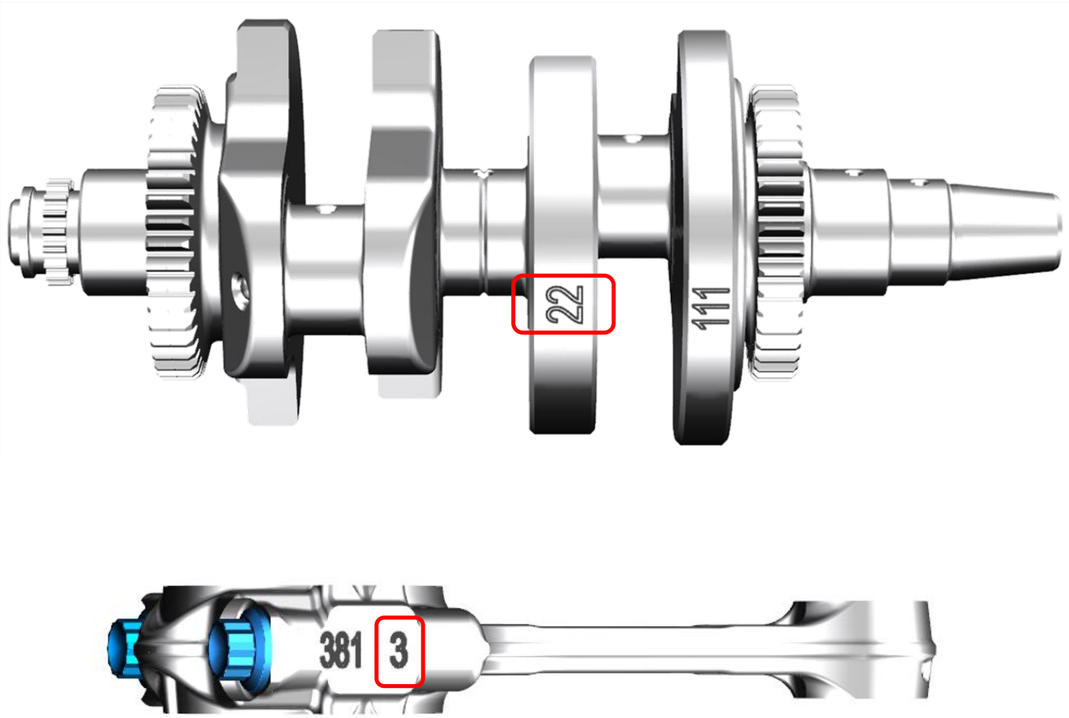


- The opening of the piston rings are as shown in left.
- Use new circlips every time when installing the piston pin, and the circlip opening should in the correct position as shown in below, the opening of the circlip should away from the piston cut at least 30°.



4. Engine

4.5 Crankshaft



- The forged crankshaft has three tolerance group on connecting rod journals: 1, 2 and 3.
- The connecting rod has three groups according big end diameter tolerance: Group 1,2 and 3.
- The connecting rod bearing has five colors by different thickness: Black, blue, green,yellow and red.
- The matching method is as shwon in table.

Crankshaft journal	Connecting rod	Connecting rod plain bearing
1	1	Black
1	2	Blue
2	1	
1	3	Green
2	2	
3	1	
3	2	Yellow
2	3	
3	3	Red

4. Engine

4.6 Connecting rod

- There connecting rod weight is marked on the big end side wall, take 381g for example, the weight difference of the two rods in a same engine should ≤ 2g.
- Unlike the conventional connecting rod designs used in other CFMOTO models where a flat mating surface with dowel pins is used, the connecting rods used in the 283MU 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 1481 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.

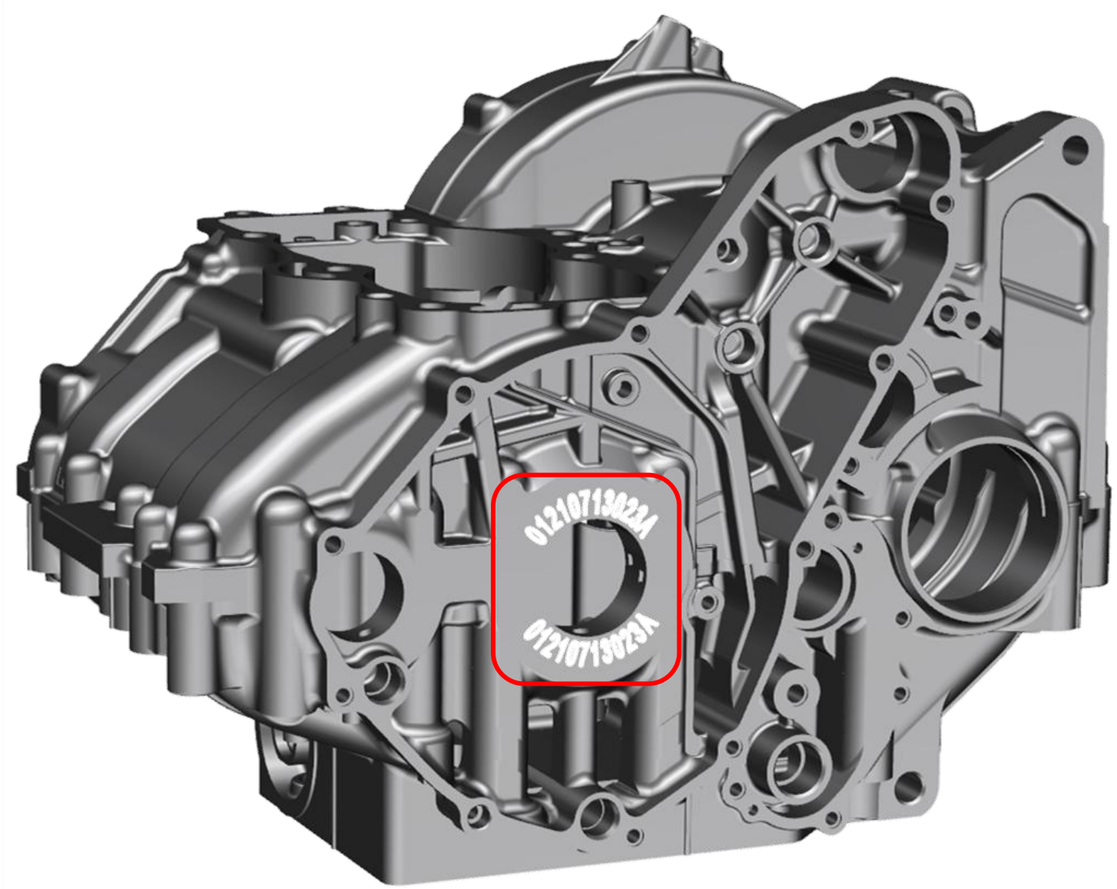
4. Engine

4.6 Connecting rod

- 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 rods face to the fornt of the engine.
- The bolts need to be tightened by: 20N·m + 60° +60° +60° .

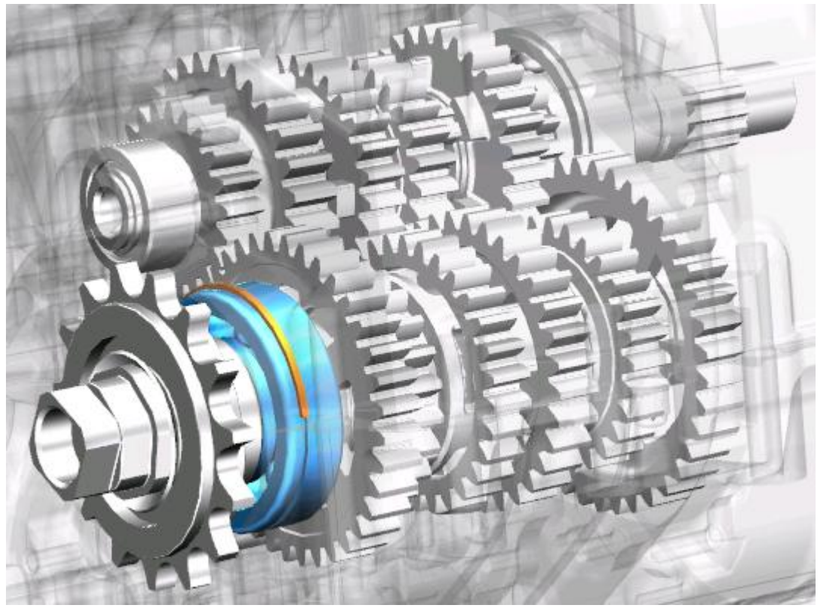
4. Engine

4.7 Crankcase



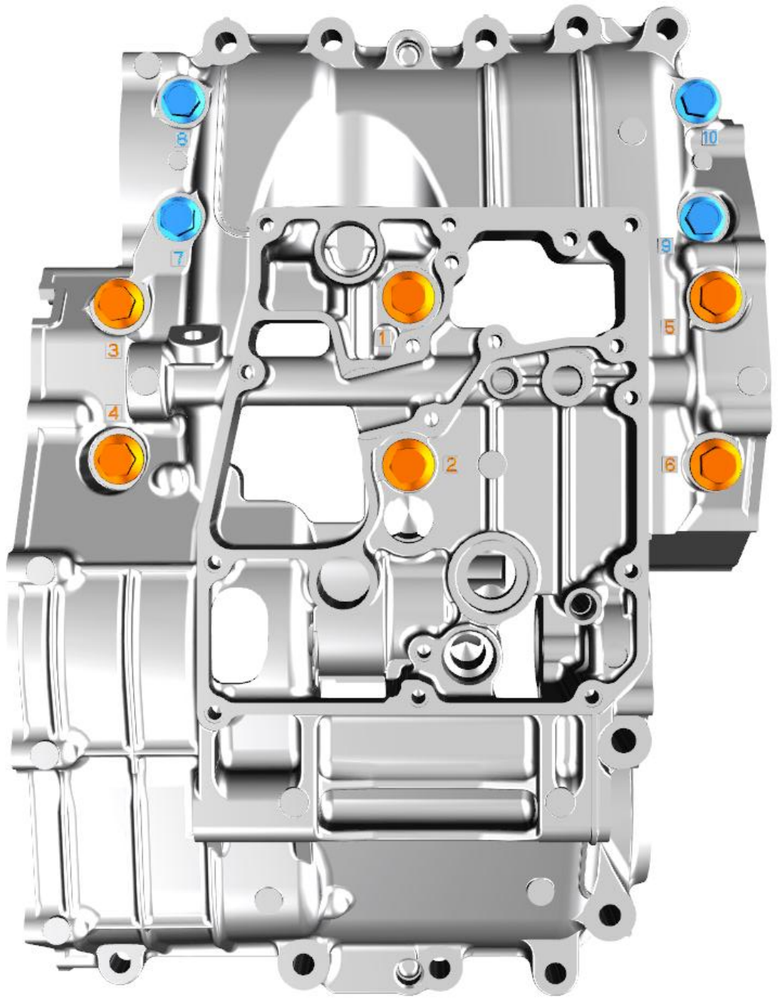
The crankshaft and balancer shaft holes are drilled after the upper and lower crankcase are jointed to ensure the cylindricity, that means each pair of the crankcases is unique, they are marked by a set of unique numbers around the left side main bearing hole, and need to be changed together.

Note: there is a groove to lock the output shaft bearing, pay attention on the direction when install the bearing.



4. Engine

4.7 Crankcase

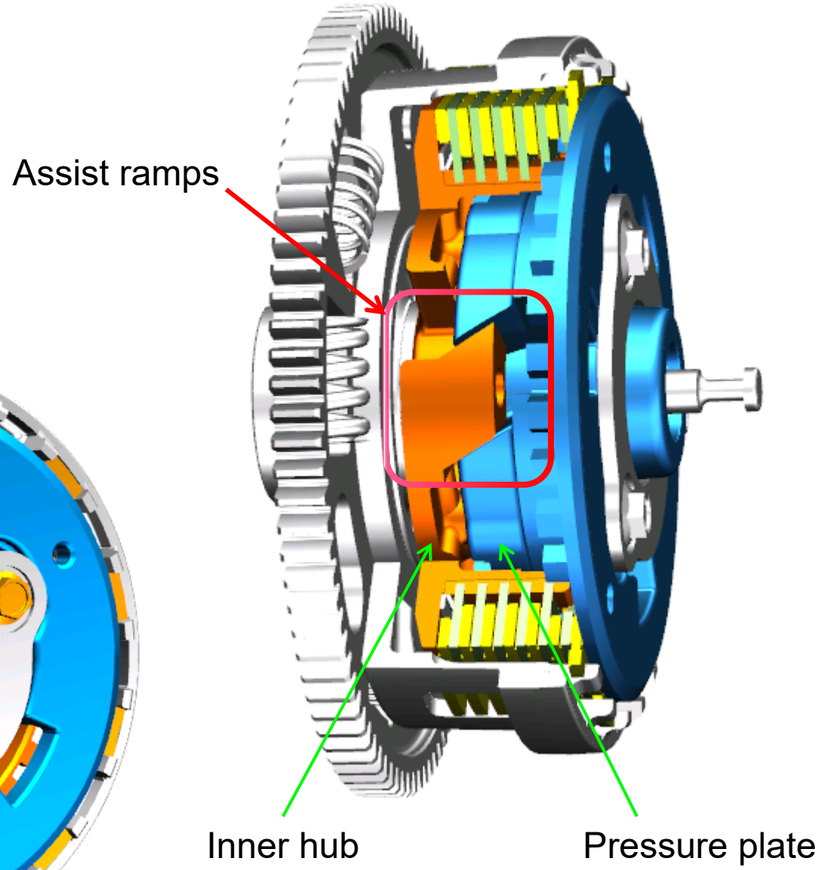


The 10 blots on the lower crankcase as shown in pic are very pivotal as the No. 1 to 6(orange highlight) are to lock the crankshaft and No.7 to 10(blue highlight) are to lock the balancer shaft. Therefore it is very important to follow the procudure and torque requirement during dismantlement and installation.

No.	Specification	Torque	Remark
1, 2, 5 and 6	M9×113	1st: 20N·m	Crankshaft (Lubricate the thread and washers with lubricant that mixed with engine oil and MoS_2 by 10:1)
		2nd: 35N·m	
		Finally: 44N·m	
3 and 4	M9×83	1st: 20N·m	
		2nd: 35N·m	
		Finally: 44N·m	
7 and 9	M8×73	1st: 20N·m	Balancer shaft (Lubricate the thread and flange with lubricant that mixed with engine oil and MoS_2 by 10:1)
		Finally: 35N·m	
8 and 10	M8×60	1st: 20N·m	
		Finally: 35N·m	

4. Engine

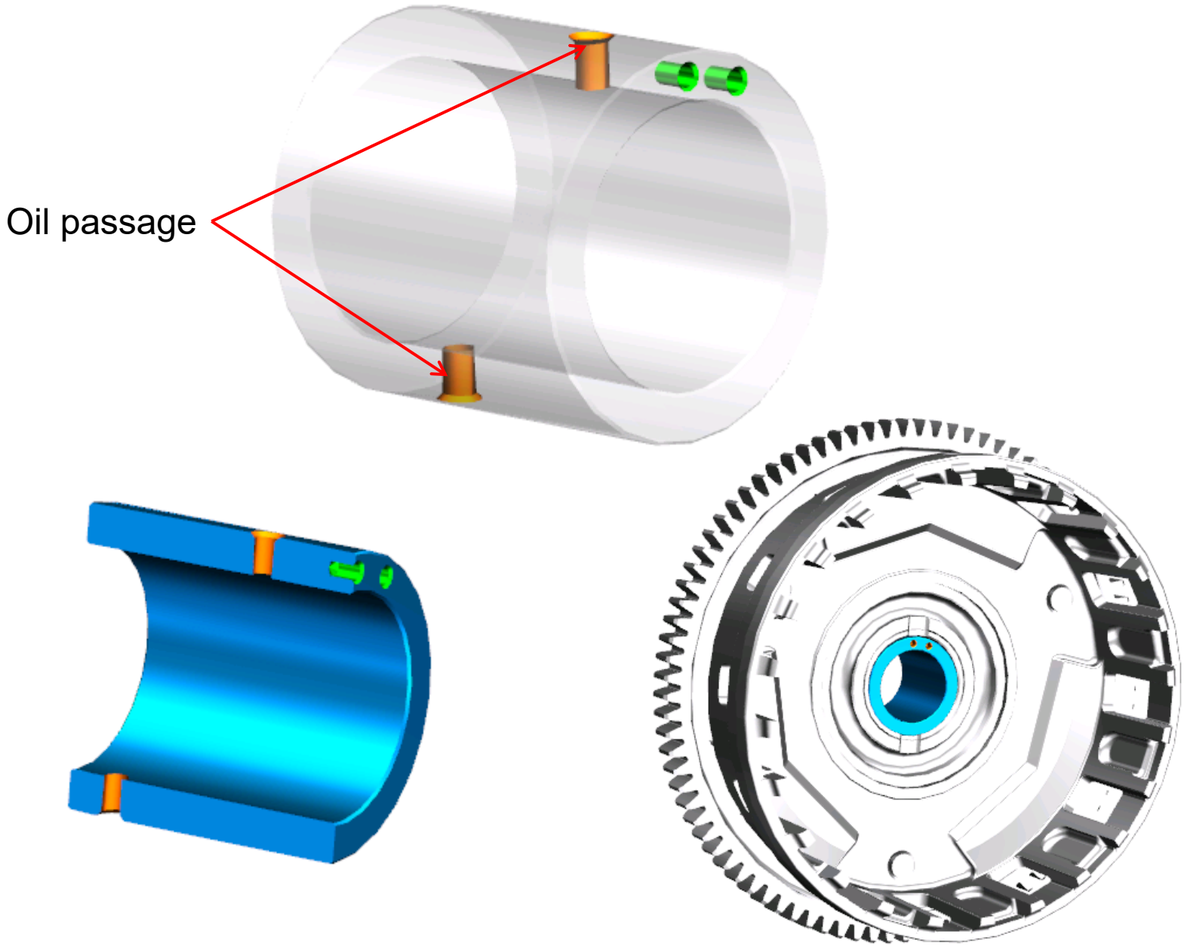
4.8 Clutch



The 700CL-X 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

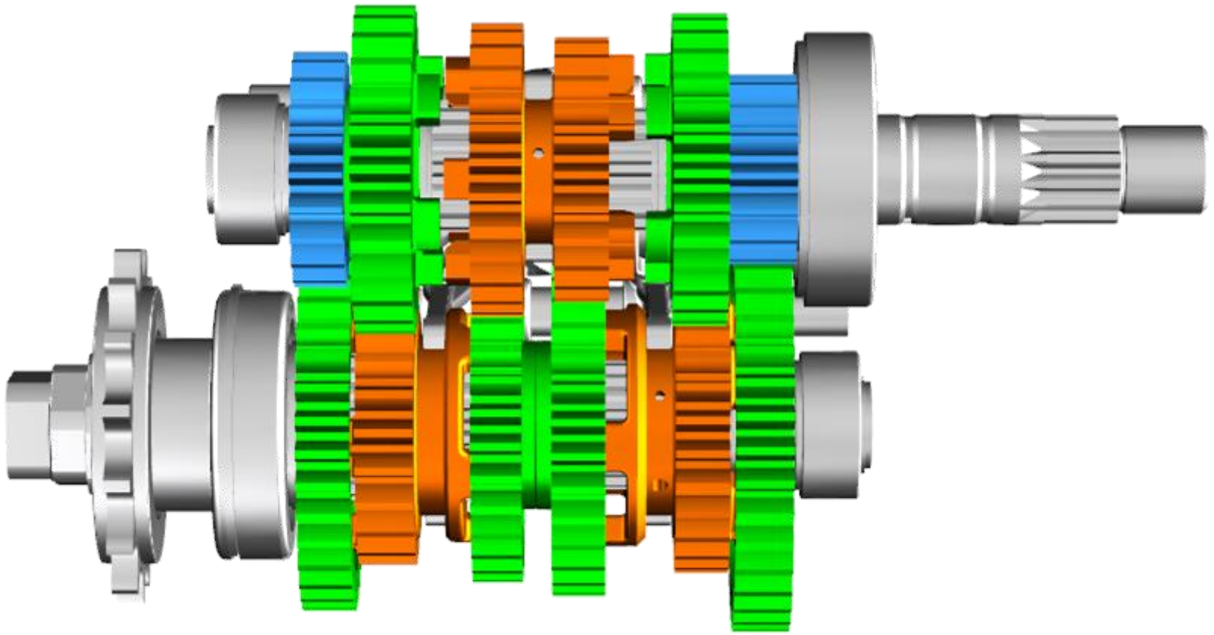


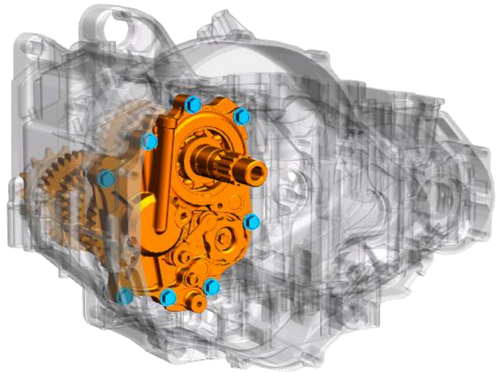
Note:
There are two holes on one of the end in the sleeve that was installed between the clutch and the transmission input shaft, which is designed to remove the sleeve by a circlip plier.

The sleeve should be installed with the holes face outside. On the other hand, there are two oil passages in the sleeve to lubricate the clutch and they are not symmetrical, a serious damaged may occurs if the sleeve was installed into a wrong direction.

4. Engine

4.9 Transmission





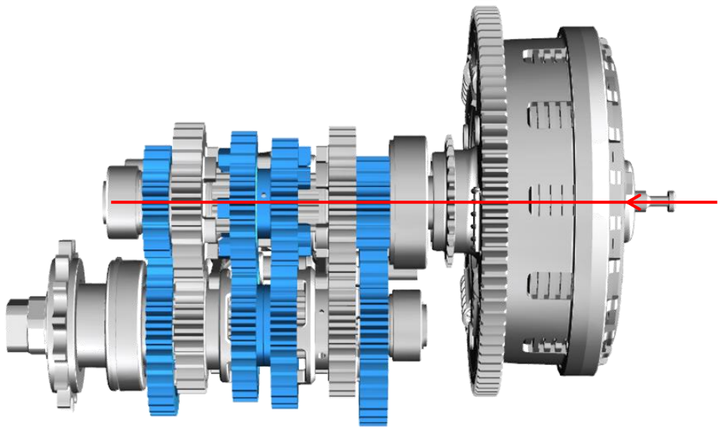
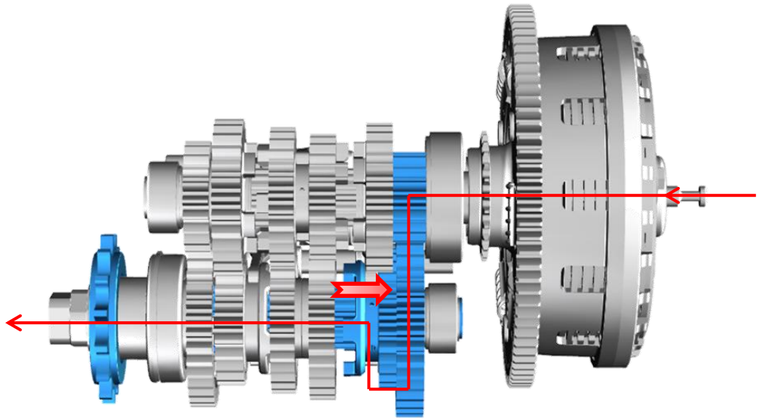
The six-speeds constant mesh sequential gearbox, which designed as a cassette type to make it can be drawn out compeletly for easier maintenance, is composed of two shafts: The input shaft connected to the engine through the clutch, and the output shaft ending with the sprocket.

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.

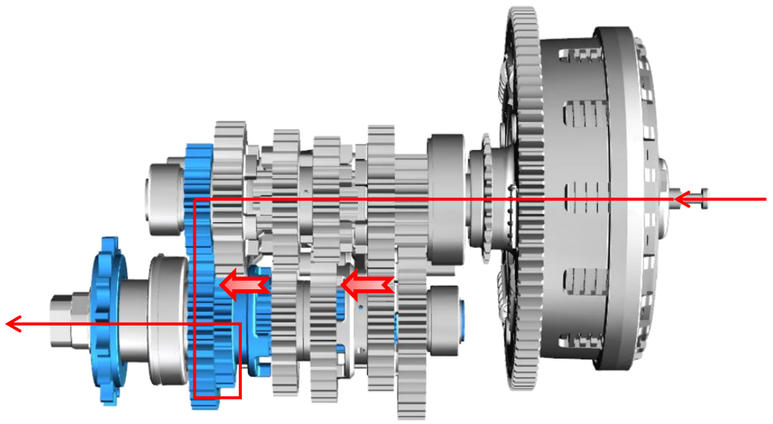
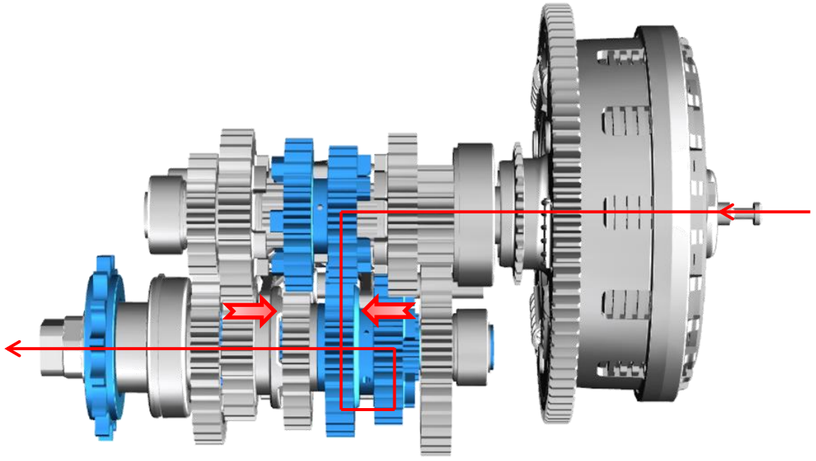
4. Engine

4.9 Transmission

	**N gear** In N gear, the input shaft and output shaft spin independently of each other.
	**1st gear** In 1st gear, the sliding fixed rotational gear is moved to right as shown in pic. The power-flow enters from the first non-sliding fixed gear on the input shaft, and then transferred to the first non-sliding idler gear on the output shaft, through to the dogs on the sliding fixed rotation gear, then via the sliding gear splines to the output shaft.

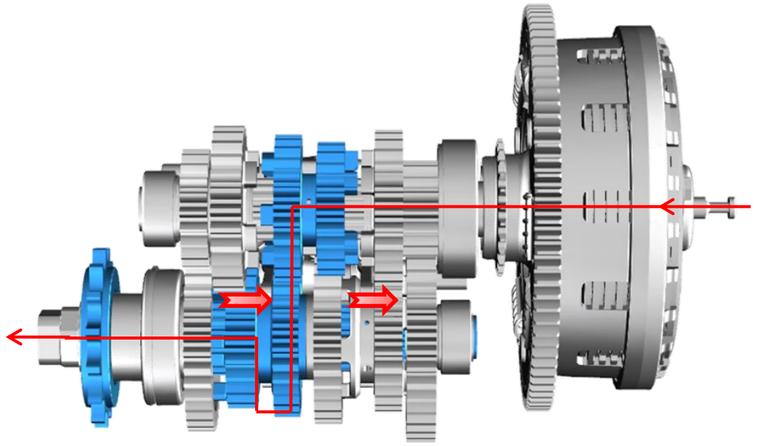
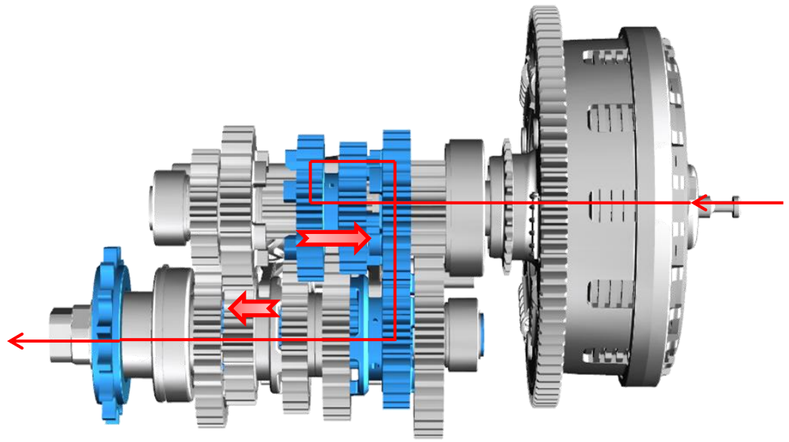
4. Engine

4.9 Transmission

	2nd gear In 2nd gear, the sliding fixed rotational gears are moved to left as shown in pic, meanwhile the 1st gear is released. The power-flow enters from the second non-sliding fixed gear on the input shaft, then transferred to the second non-sliding idler gear on the output shaft, through to the dogs on the sliding fixed rotation gear, then via the sliding gear splines to the output shaft.
	3rd gear In 3rd gear, the sliding fixed rotational gear is moved to left as shown in pic, meanwhile the 2nd gear is released. The power-flow enters from the third sliding fixed rotational gear on the input shaft, and then transferred to the third non-sliding idler gear on the output shaft, through to the dogs on the sliding fixed rotation gear, then via the sliding gear splines to the output shaft.

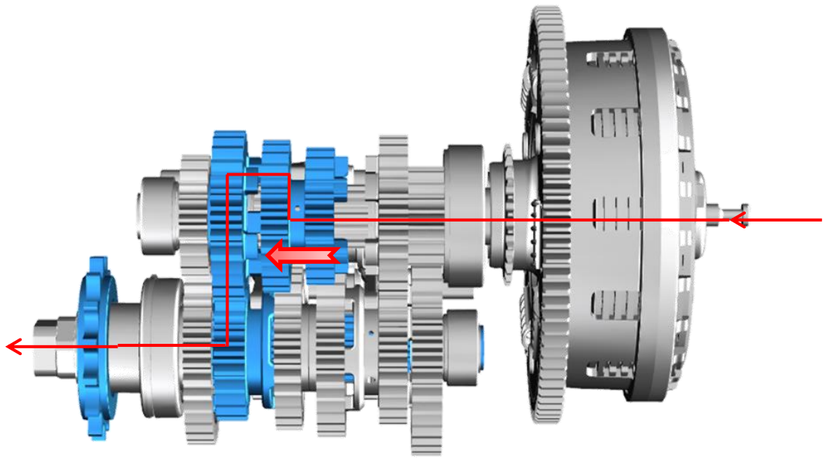
4. Engine

4.9 Transmission

	4th gear In 4th gear, the sliding fixed rotational gears are moved to right as shown in pic, meanwhile the 3rd gear is released. The power-flow enters from the fourth sliding fixed rotational gear on the input shaft, then transferred to the fourth non-sliding idler gear on the output shaft, through to the dogs on the sliding fixed rotation gear, then via the sliding gear splines to the output shaft.
	5th gear In 5th gear, the sliding fixed rotational gears are moved to right as shown in pic, meanwhile the 4th gear is released. The power-flow enters from the fifth sliding fixed rotational gear on the input shaft, and transferred to the fifth non-sliding idler gear on the input shaft by gear dogs, then transferred to the fifth sliding fixed rotational gear on the output shaft, then via the sliding gear splines to the output shaft.

4. Engine

4.9 Transmission



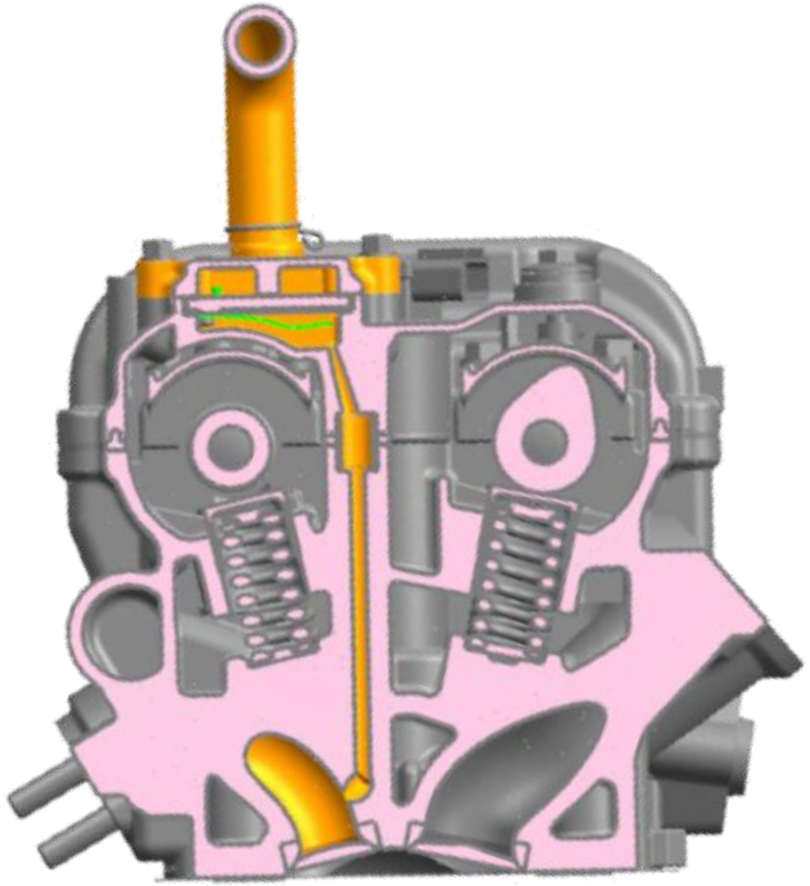
6th gear

In 6th gear, the sliding fixed rotational gear is moved to left as shown in pic.

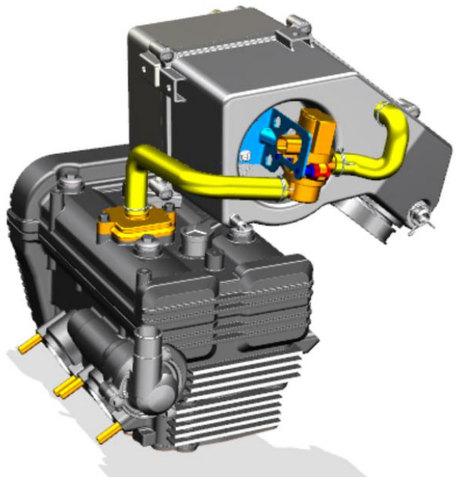
The power-flow enters from the sixth sliding fixed rotational gear on the input shaft, then transferred to the sixth non-sliding idler gear on the input shaft through the dogs on the gears, then transferred to the sixth sliding fixed rotational gear on the output shaft, then via the sliding gear splines to the output shaft.

4. Engine

4.10 Secondary air system

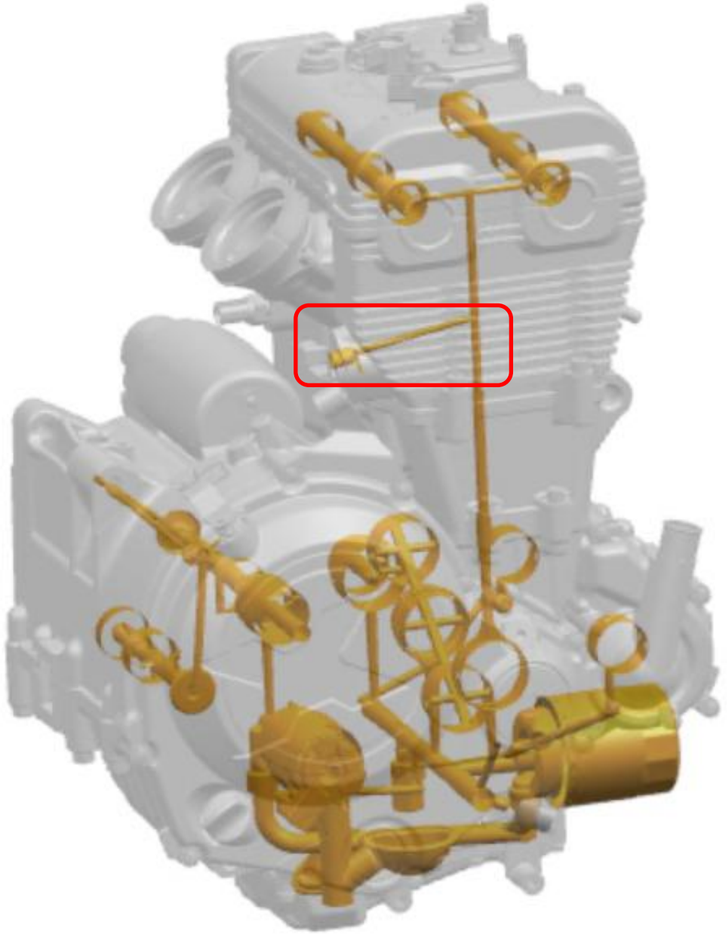


Another difference with 283MT engine is that there is SAS on the 283MU engine to reduce the emission of the harmful gas. The fresh air is sucked into the exhaust port through the air filter, SAS valve and cylinder head to take chemical reaction with high temp exhausted gas.



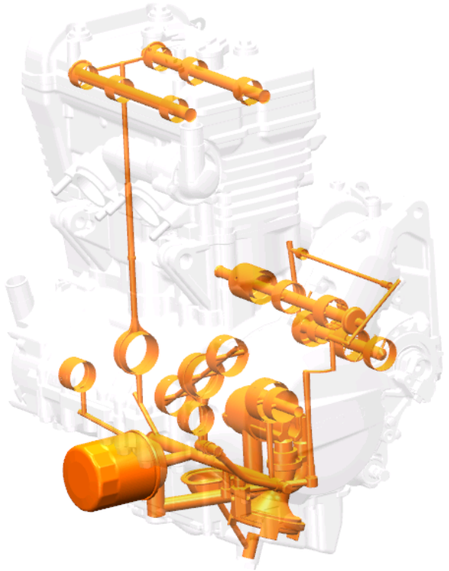
4. Engine

4.10 Oil passage



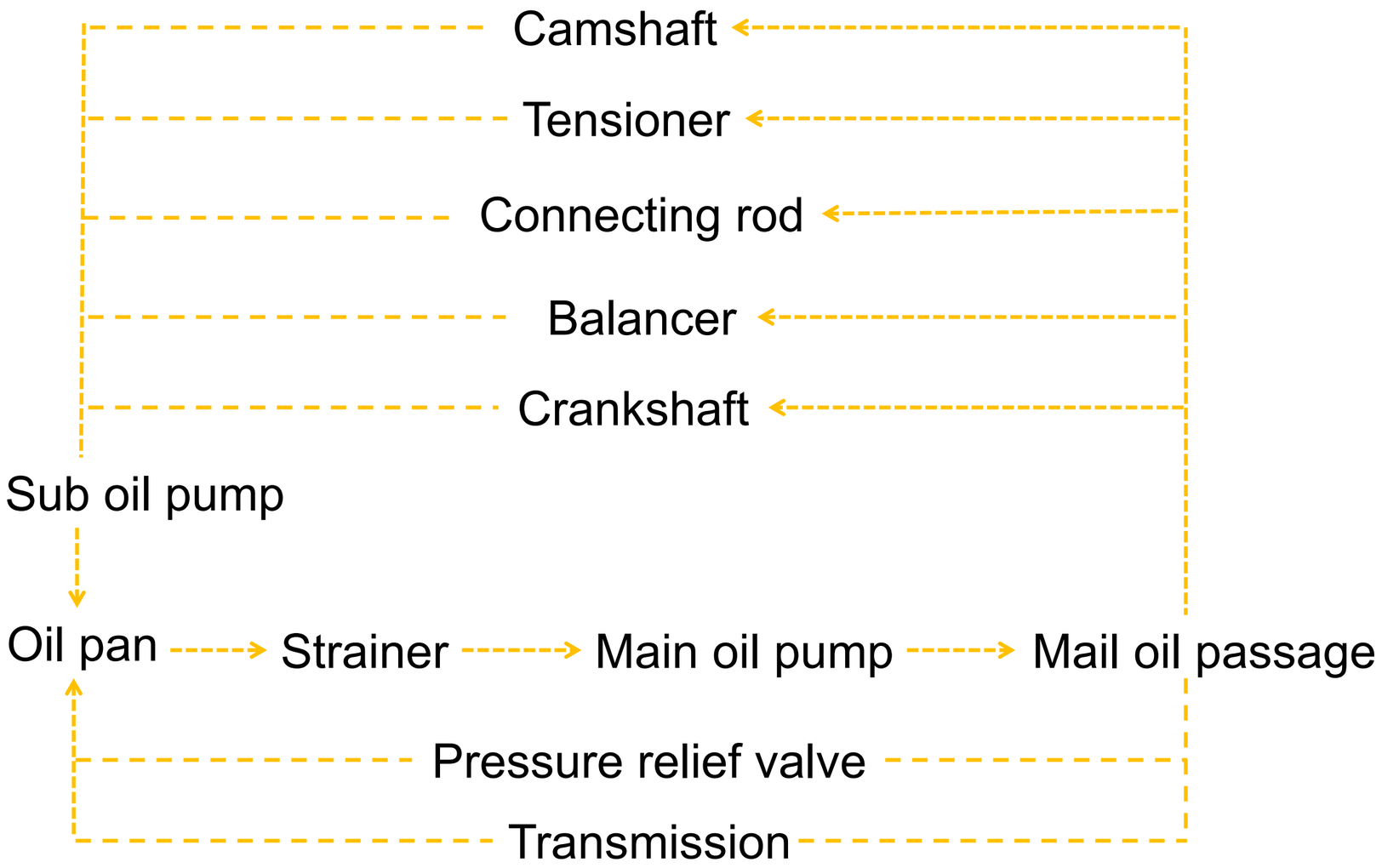
- Oil capacity:
  Change oil with filter: 2.2L
  Engine overhaul: 2.6L
- Oil pressure:
  90℃ oil temperature at 3000 rpm: 1~3bar
- Oil grade:
  SAE 10W-40 API SJ JASO MA2 or higher

The oil passage is same with the 283MT engine except the hydraulic tensionser.



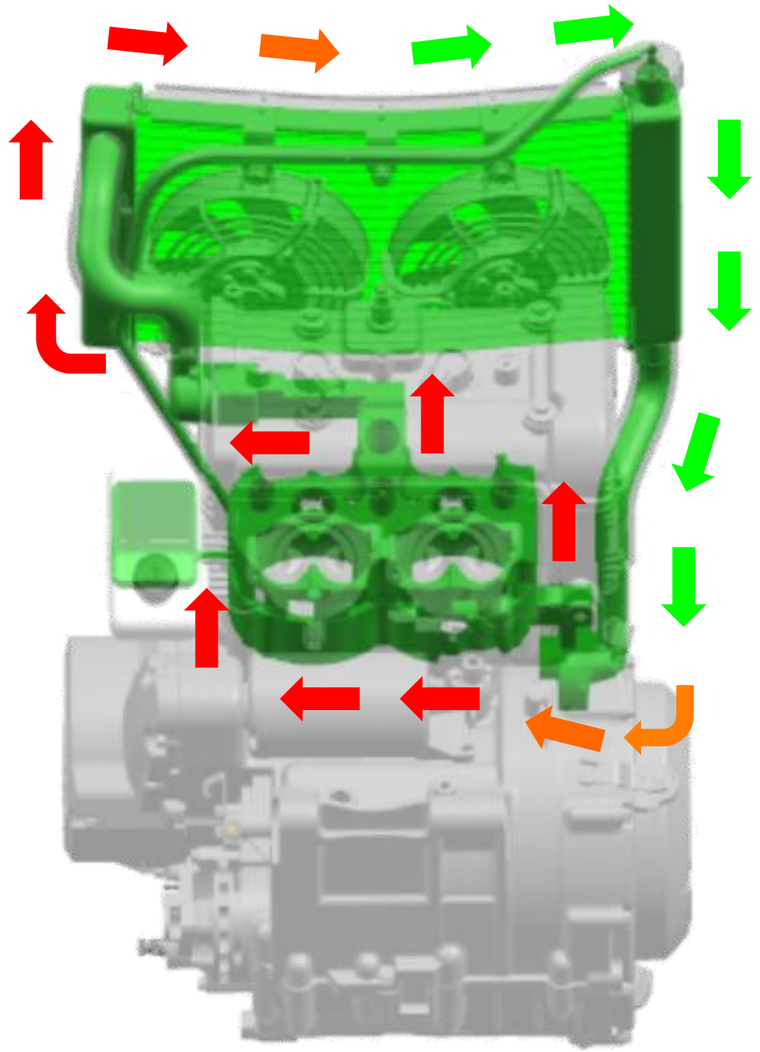
4. Engine

4.10 Oil passage

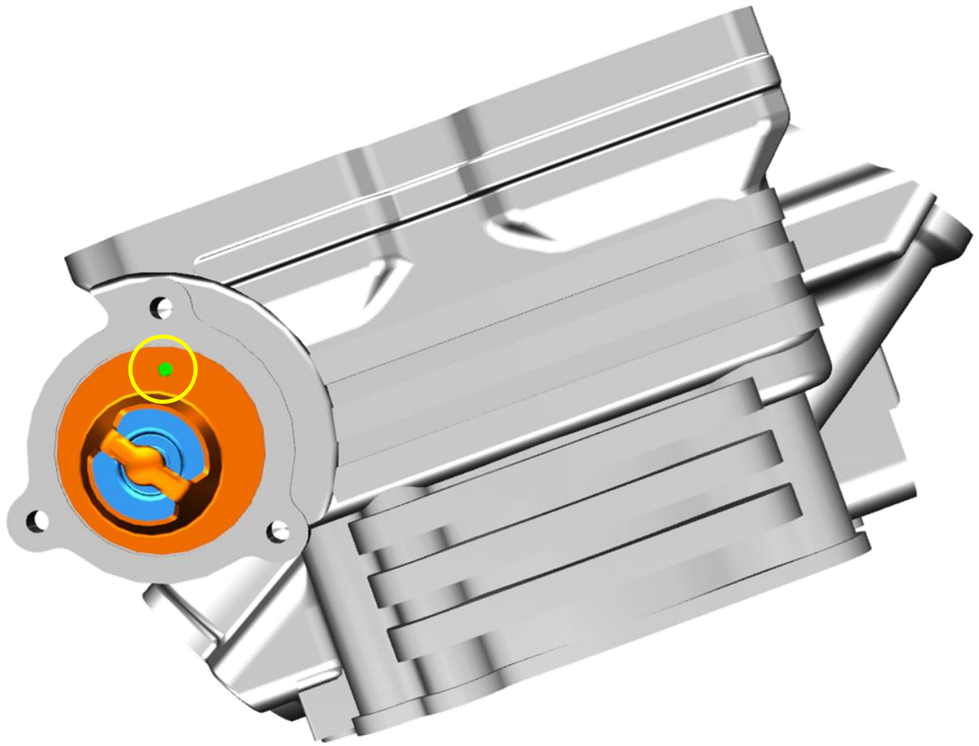


4. Engine

4.11 Coolant passage

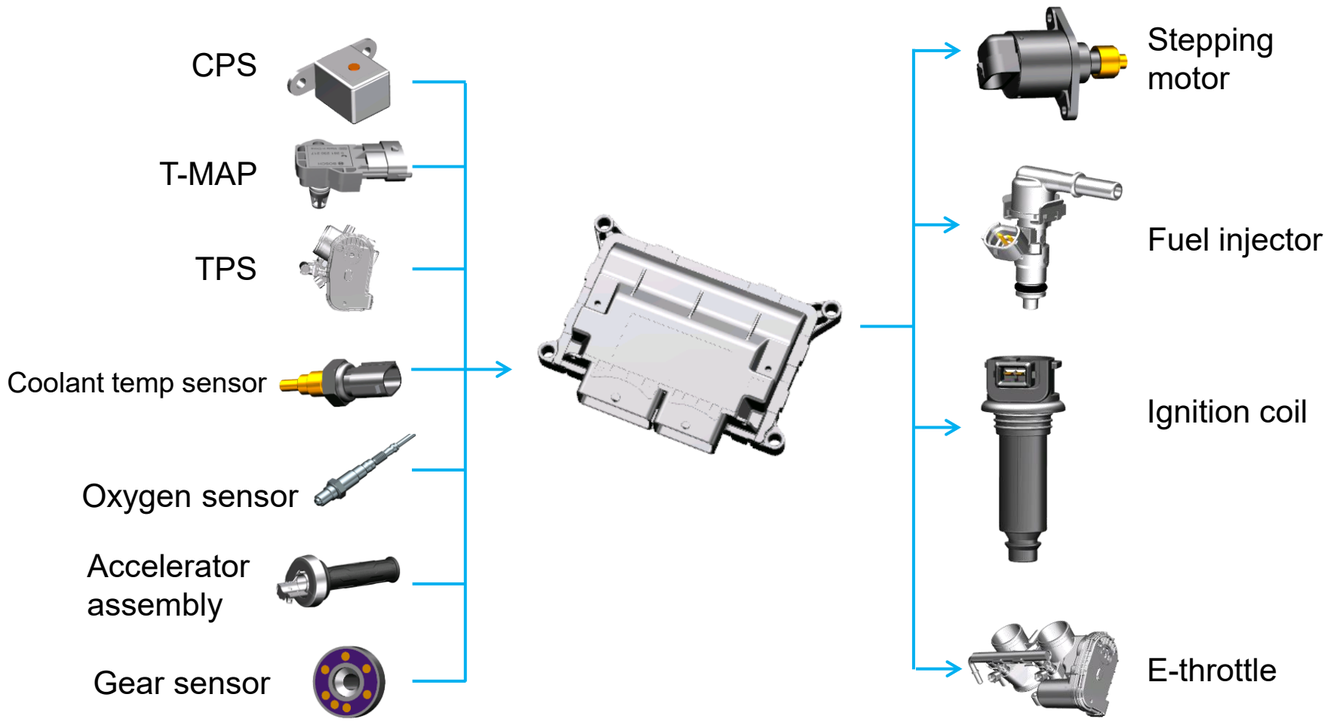


- Thermostat starts to open at 72±2℃, and fully open at 85℃.
- Cooling fan control logic: ECU reads the coolant temperature via coolant temp sensor and activates fan relay to start the fan when the temp upto the desire value.
- Make sure the hole on the thermostat should on the top spot.



5. Electronic system

5.1 ECU



The ECU of the 650MT is Bosch MSE 6.0 ECU that located under the rear 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	Pin	Function
1	CAN H	17	CAN L	33	Null	49	Null
2	Null	18	K-line	34	Null	50	Null
3	Null	19	5V power output	35	Null	51	Null
4	Null	20	Battery power supply	36	APS 2 5V power supply	52	Null
5	Main relay control	21	Oxygen sensor 2 signal	37	APS 1 5V power supply	53	Null
6	Roll over sensor	22	Null	38	Null	54	Null
7	APS 1 GND	23	Brake switch	39	Null	55	Null
8	Null	24	Null	40	Null	56	Null
9	Cruise control	25	Braking light switch	41	Fuel pump relay	57	Null
10	Null	26	Null	42	Head light relay	58	Ignition switch
11	Null	27	Null	43	Oxygen sensor 2 signal GND	59	APS 2 GND
12	Air intake pressure sensor 2	28	Null	44	Clutch switch	60	Null
13	Ride mode	29	Side stand switch	45	APS 1	61	Null
14	Null	30	APS 2	46	Null	62	Null
15	Main relay power supply 1	31	Null	47	GND	63	ECU GND 2
16	Null	32	Null	48	Oxygen sensor 2 heating	64	ECU GND 1

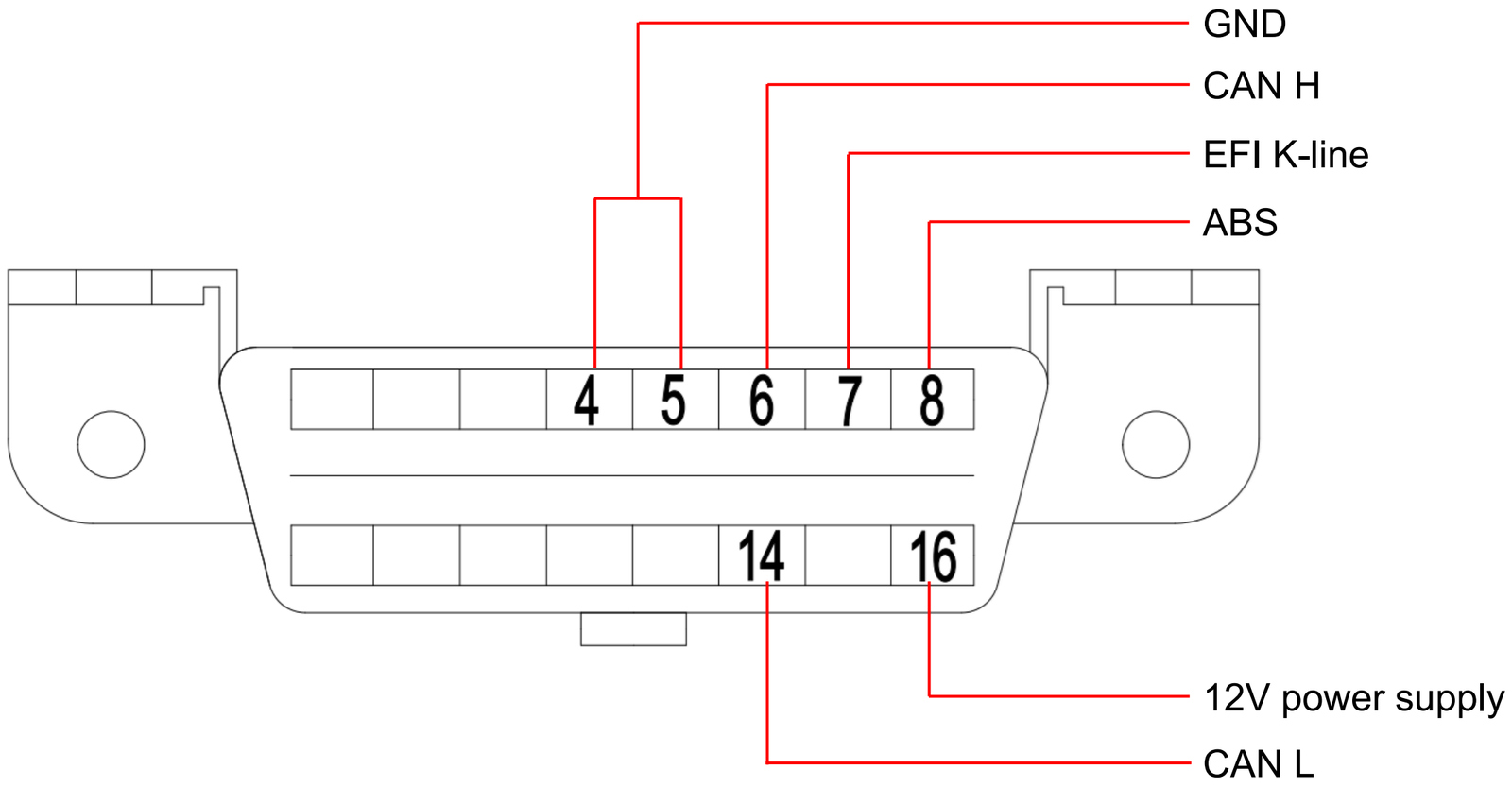
5. Electronic system

5.1 ECU

Pin	Function	Pin	Function	Pin	Function
65	Null	81	Null	97	CPS B
66	Null	82	MIL light	98	Null
67	Null	83	Null	99	Ignition coil 2
68	Fuel injector 1	84	Sensors GND	100	Ignition coil 1
69	Null	85	TMAP GND	101	Coolant temp. sensor
70	Null	86	TPS GND	102	Air intake temp. sensor 1
71	Secondary air valve control	87	Throttle actuator B-	103	Null
72	Fuel injector 2	88	Null	104	Oxygen sensor 1 signal
73	Oxygen sensor 1 heating	89	Null	105	Null
74	Null	90	Null	106	Null
75	Throttle actuator A	91	Air intake pressure sensor 1	107	TPS 5V power supply
76	Null	92	Null	108	Null
77	TPS 1	93	Null	109	TMAP 5V power supply
78	TPS 2	94	Canister control valve	110	Null
79	Null	95	Null	111	ECU ground 4
80	Oxygen sensor 1 signal GND	96	CPS A	112	ECU ground 3

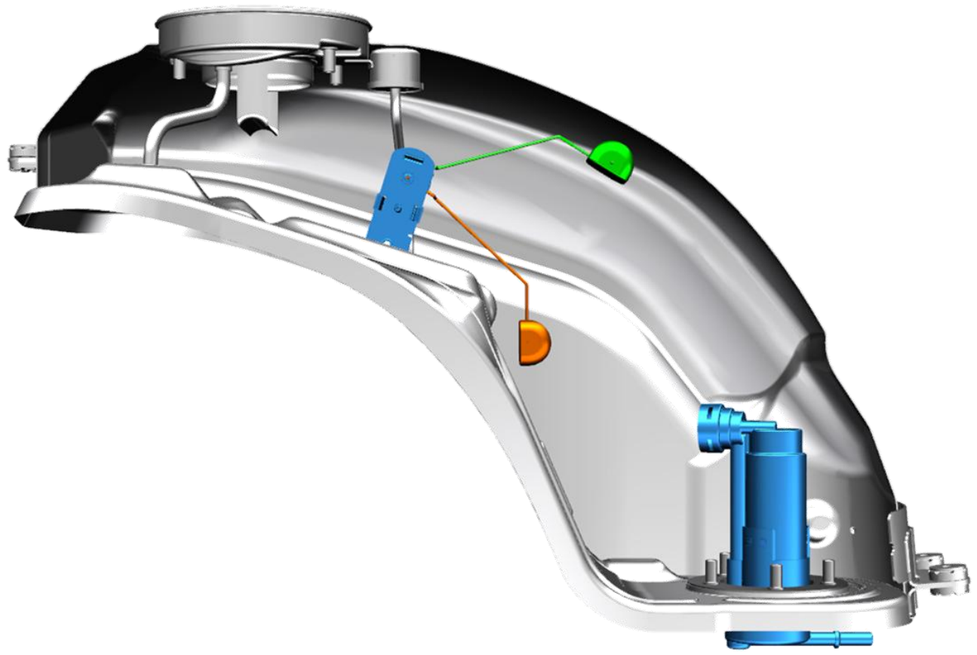
5. Electronic system

5.2 OBD



5. Electronic system

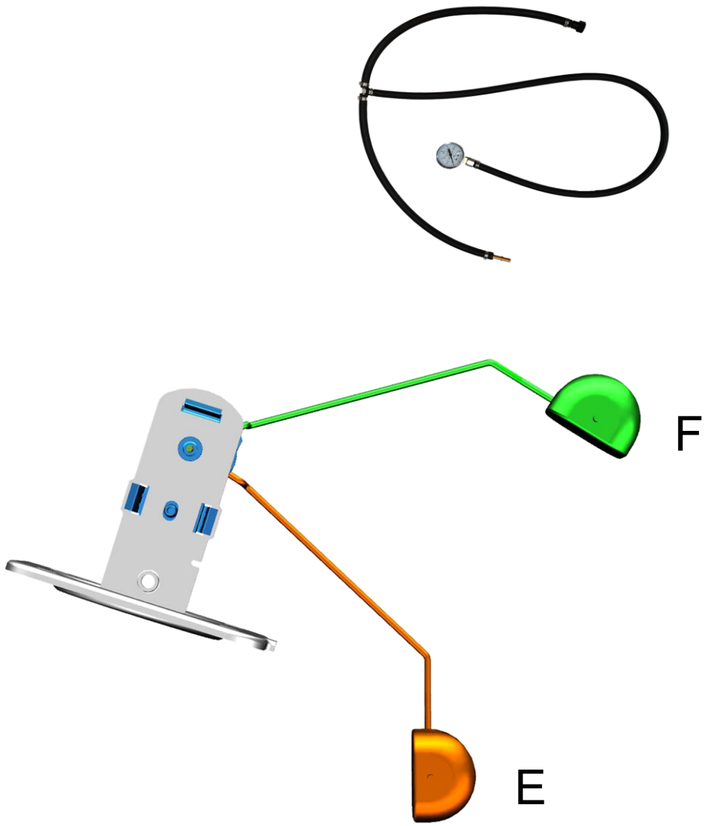
5.3 Fuel tank



The 700CL-X use 13L 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 3.3bar. 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 100Ω, which can be tested by a digital multimeter.

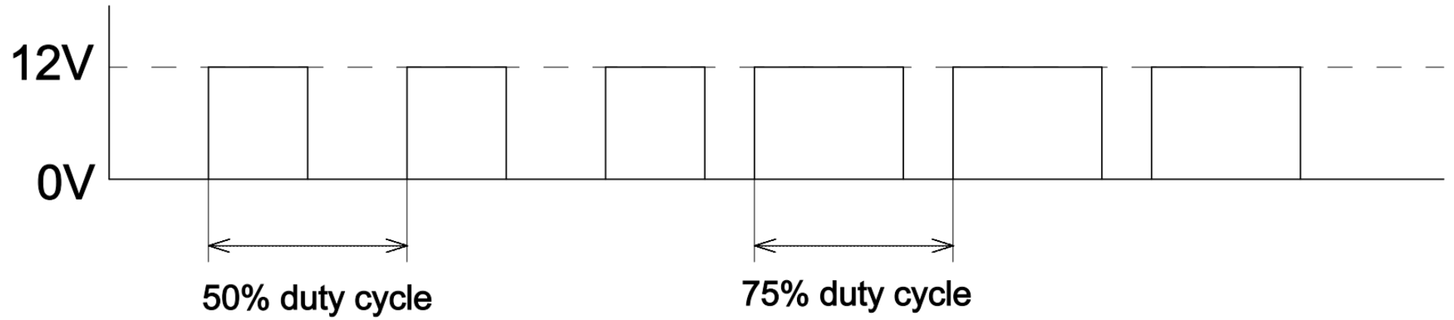
5. Electronic system

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 68(injector 1) and pin 72(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.



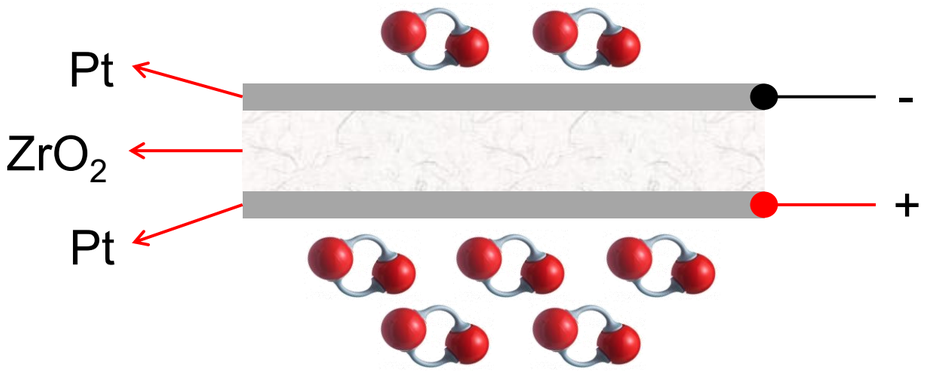
5. Electronic system

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.

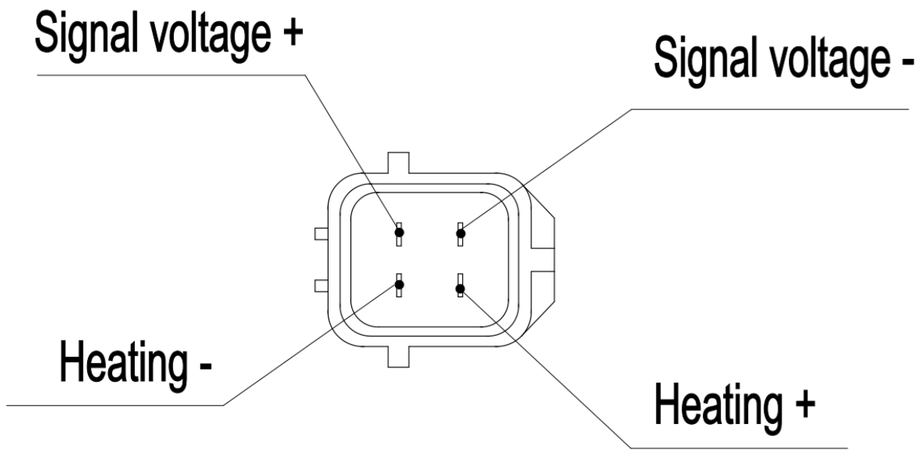
The output voltage will increase with the atmosphere and exhaust gas oxygen differences goes higher:

- 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

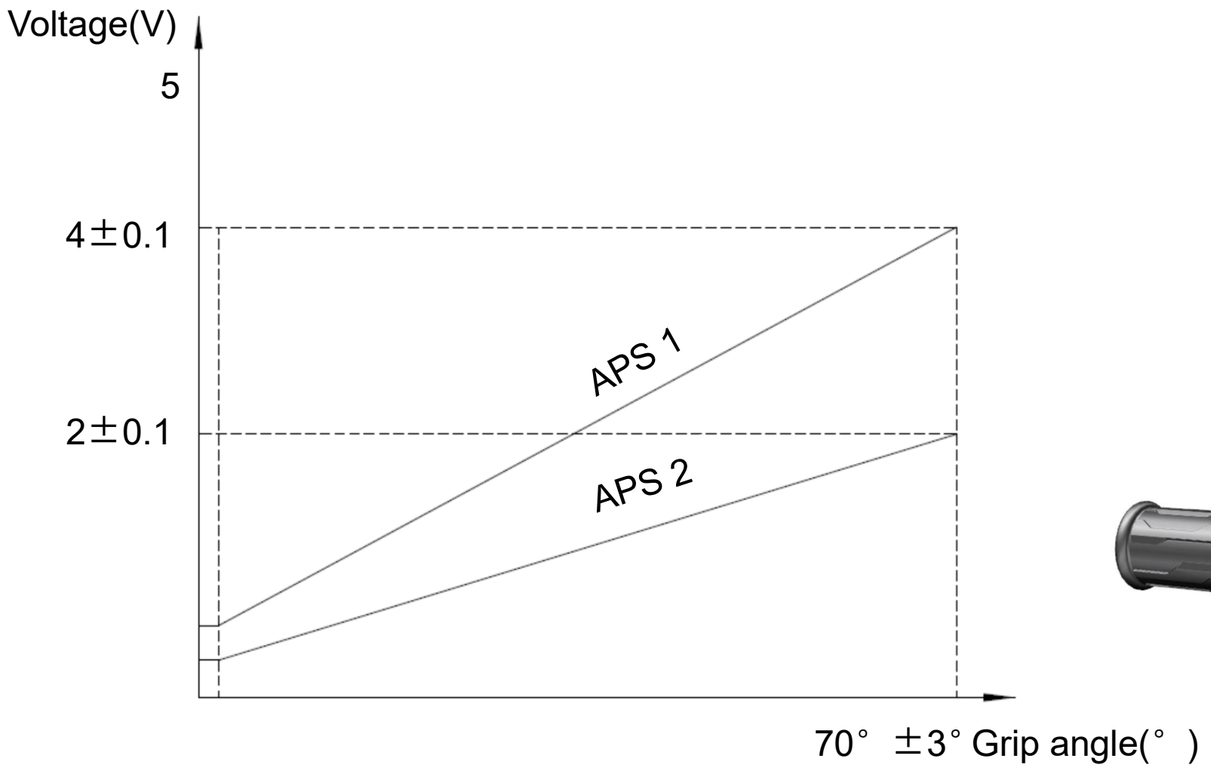
5.5 Oxygen sensor



Heating +: Powered by key-on power supply from fuses box.
Heating -: Controlled by pin 73(bank 1) and 48(bank 2) in ECU.
Signal voltage +: Powered by pin 104(bank 1) and 21(bank 2) in ECU.
Signal voltage -: Grounded to the pin 80(bank 1) and 43(bank 2) in ECU.

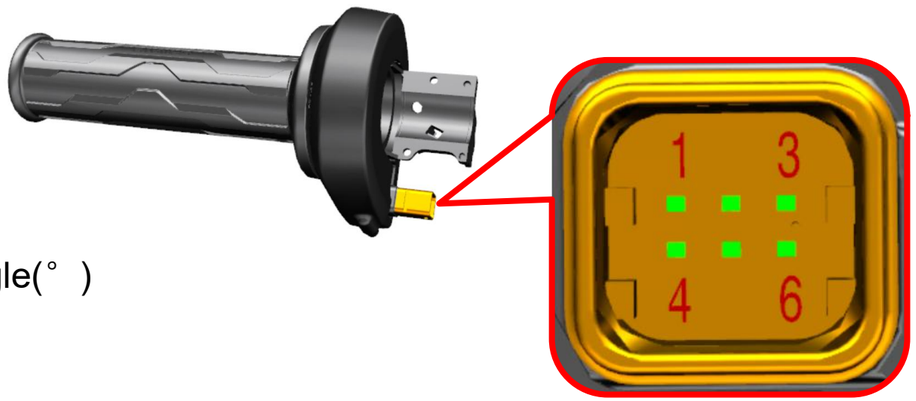
5. Electronic system

5.6 E-throttle



The accelerator grip has two acceleration position sensors, APS1 and APS2, with two different signal outputs, two separate power supplies and two separate grounds.

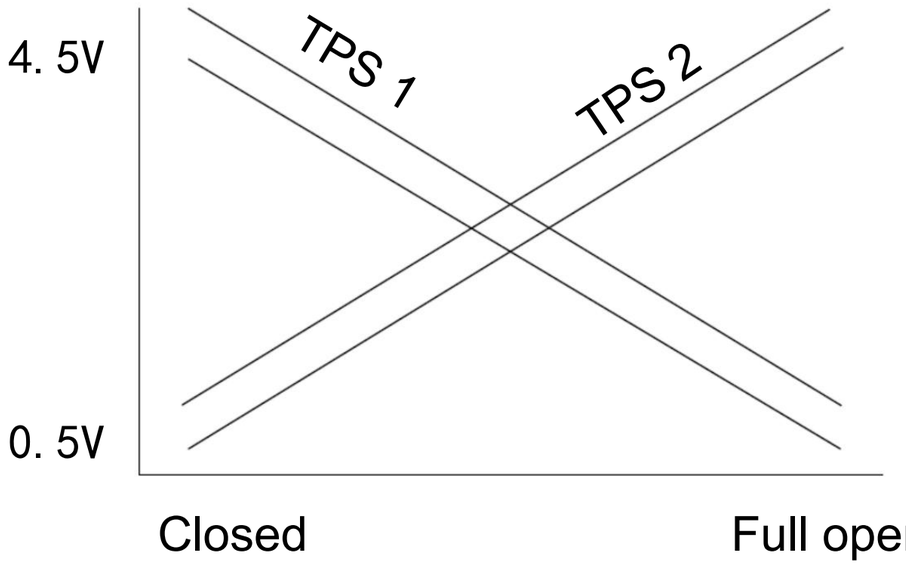
Both of the APS signals increase in voltage with the grip starts to open, but the APS2 signal voltage is half of the APS1voltage. These combined signals allow the ECU to calculate a mean voltage output from the two signals. This allows the throttle position to be calculated with greater accuracy than when only a single voltage output is taken into consideration.



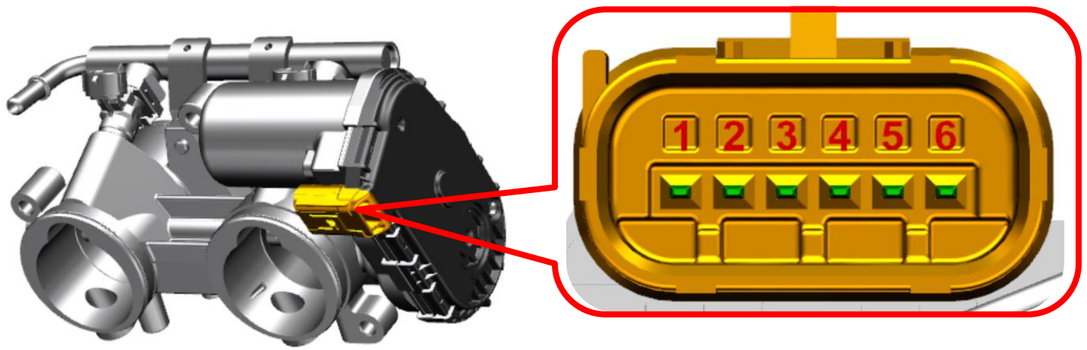
Pin	Function
1	Power 1
2	Signal 1
3	GND 1
4	Signal 2
5	GND 2
6	Power 2

5. Electronic system

5.6 E-throttle



Different with traditional throttle body, the E-throttle body use a DC actuating motor to drive the batterfly valve, which controls the acceleration.
The TPS sensor is integrate to the DC servomotor unit in E-throttle instead of a individual sensor. Meanwhile, as the batterfly valve can be controlled by ECU to adjust the idling directly, the stepping motor used in tradition throttle to control the idling is cancled too.
The TPS also has two signals but what different with the APS is that the TPS2 voltage increase with the batterfly open while the TPS1 voltage is decrease.



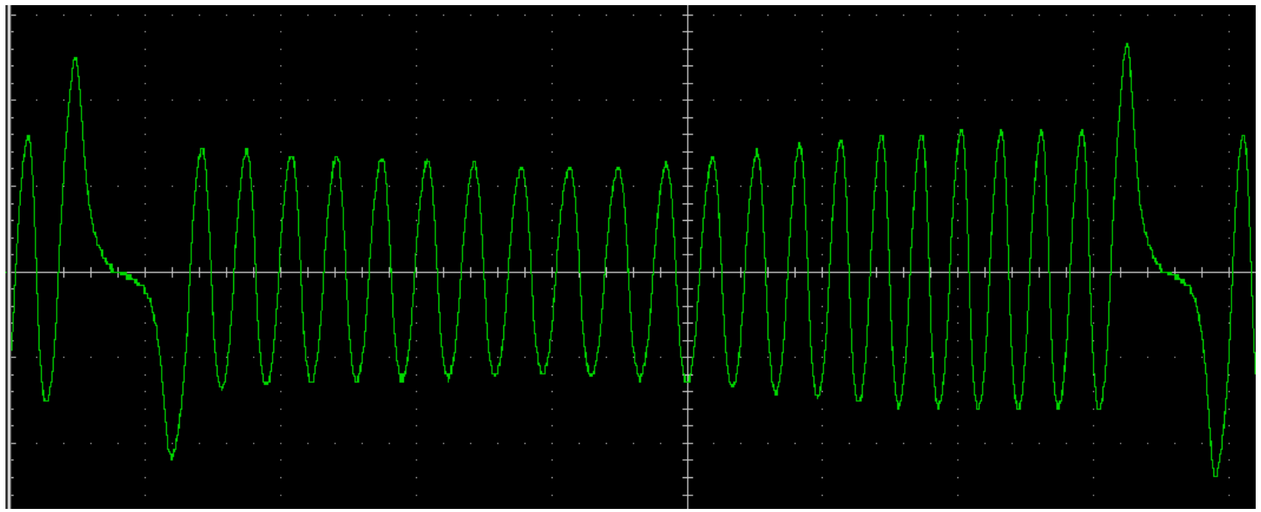
Pin	Function
1	Motor +
2	Motor -
3	Sensors CND
4	TPS 2
5	Sensors power
6	TPS 1

5. Electronic system

5.7 CPS

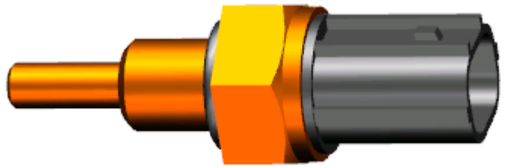
The ECU detect the crankshaft position and revolving speed by crankshaft position sensor(CPS), to control the timing of injection and ignition. The revolving speed signal also provided by the ECU to the dashboard to display the rpm.

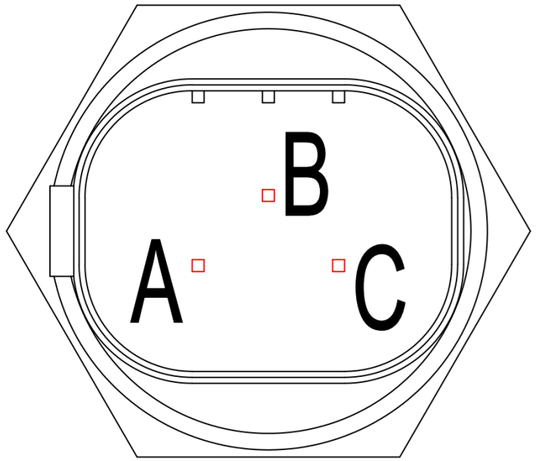
Instead of the Hall element in the TPS, the core of the CPS is a magneto-electric elecment, that only needs two terminals.
The signal waveform is a kind of sinusoidal signal, take the oscilloscope screenshoot as reference.



5. Electronic system

5.8 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.

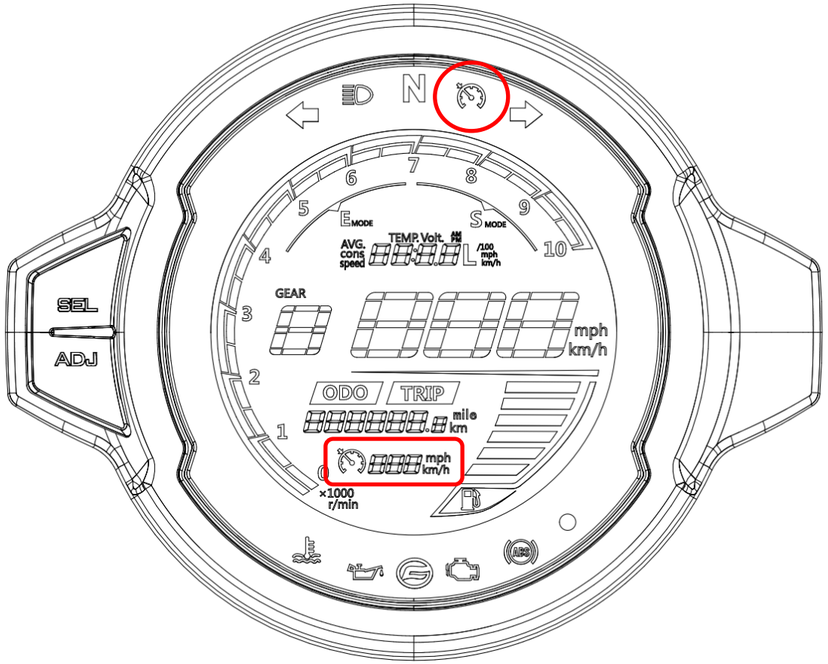
The coolant temp sensor, uses a NTC resistance as its core element, has 3 pins: A, B and C. A and C are connected into ECU while the pin B is vacant.

- The pin A is connected to the pin 84 in the ECU.
- The pin C is connected to the pin 101 in the ECU.

The coolant temp can be read in the datastream.

5. Electronic system

5.9 Dashboard



The 700CL-X is equipped with cruise control funtion, which icon is displayed on the dashboard. If the gear and speed can meet the cruise requirement, the icon will turns green when open the cruise switch on the LH handlebar, otherwise it goes yellow.

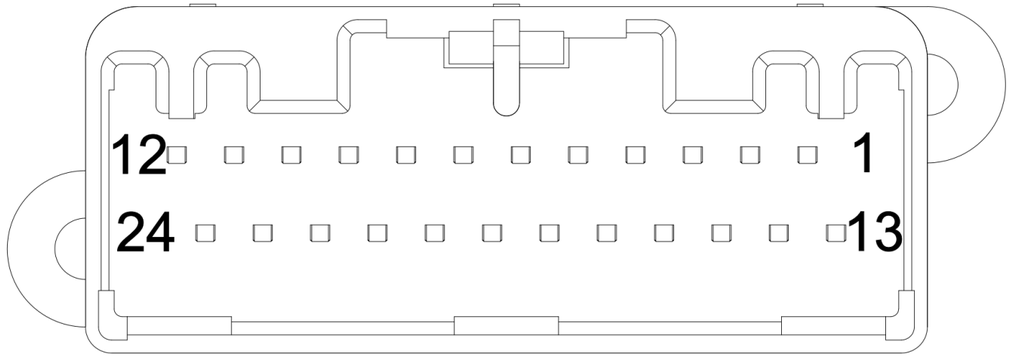
Cruise control condition:
Gear at 4th to 6th gear, speed at 40 to 130km/h.
Cruise speed control:
Use the cruise control switch to active the funtion. Use “RES+” or “SET-” to add or decrease cruise speed 2km/h per click, hold the key to add or decrease speed continuously.
Any braking, clutch or throttle operation will release the cruise control unless click the “RES+” to reset the the cruise as last seeting or use “SET-” to set the cruise at present speed.

5. Electronic system

5.9 Dashboard

PIN	FUNCTION
1	Battery power
2	GND
3	ACC
5	Fuel level
12	Speed
13	Gear
15	CAN H
16	CAN L
22	Oil pressure indicator
23	MIL
24	ABS indicator

The terminal function of the dashboard is as shown in the table. As the 700CL-X uses CAN bus instead of K-line, there is no terminal for K-line on the dashboard anymore.



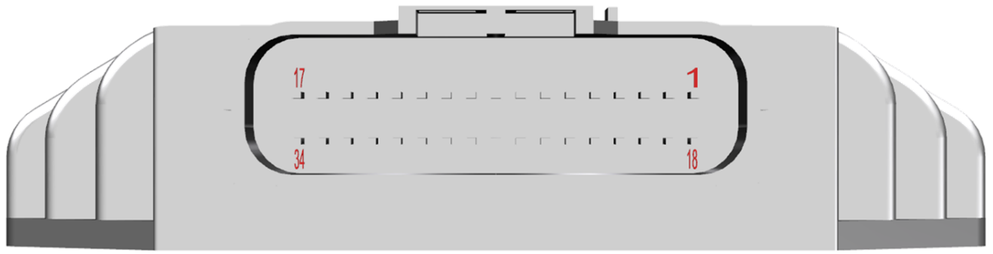
5. Electronic system

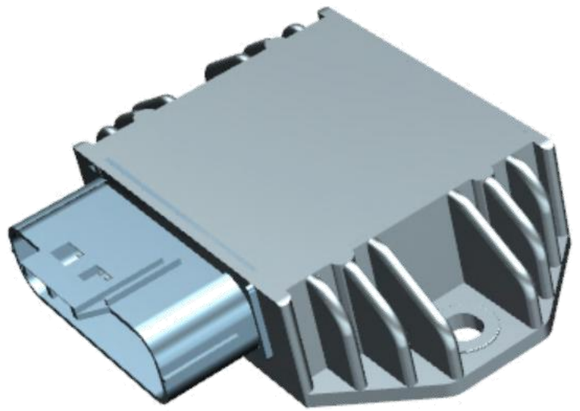
5.10 BCM

Pin	Function	Remark	Pin	Function	Remark
1	Battery +	POWER	18	/	/
2	Battery +	POWER	19	Key switch	IN
3	Start relay	OUT	20	Turning switch	IN
4	Horn	OUT	21	Kill switch	IN
5	Battery -	GND	22	Hazard switch	IN
6	Signal GND	GND	23	Ignition switch	IN
7	Position light	OUT	24	Horn switch	IN
8	Low beam	OUT	25	Light switch	IN
9	High beam	OUT	26	Right turning light switch	IN
10	Fan	OUT	27	Left turning light switch	IN
11	Rear position light	OUT	28	L/H beam switch	IN
12	Rear left turning light	OUT	29	ECO mode	IN
13	ECU power	OUT	30	SPORT mode	IN
14	Rear right turning light	OUT	31	/	/
15	Front right turning light	OUT	32	K-line	COM
16	Front left turning light	OUT	33	CAN H	COM
17	/	/	34	CAN L	COM

The 700CL-X is the first bike used the BCM(Body control mode) to realize the automatic control on headlight and turn signal lights.

- Simplified operation to concentrate the rider's focus on road.
- Less relay, auxiliary relays reduced from 6 pcs to 2 pcs.





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	-	10000	Inspect
Idle	-	10000	
Coolant	-	10000	
	24M	30000	Replace
Throttle system	-	10000	Inspect
Throttle valve	-	5000	Clean
Air filter element	-	10000	Inspect
	24M	-	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	15000	
Pipes, ducts, hoses and sleeves	12M	10000	Inspect for cracks, sealing and routing
	48M	30000	

determined, progressive, more fun.