

MOTOMORINI®

X-CAPE 650



WORKSHOP MANUAL

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Foreword

This manual has been specifically drawn up for the technicians of this field (Moto Morini's authorized assistance centre). This manual covers the pre-delivery intervention measures for motorcycles (mechanical and electrical inspection, check and repair of the various liquids, assembly of separate components, etc.) as well as all the checks, maintenance, repair and replacement operations of all parts.

To carry out the maintenance operations efficiently and avoid serious errors, carefully read this manual and understand the maintenance procedures entirely before use, then operate carefully in the clean area. If the use of special tools or equipment is specified as necessary, do not use temporary tools or equipment instead. The mechanical performance of the vehicle can only be ensured when the appropriate tools or equipment are used. The use of alternative tools may heavily threaten the safe operations. During the warranty period, it is advised to carry out all the ordinary maintenance and maintenance operations in compliance with this maintenance manual. If the owner of the vehicle carries out maintenance operations by himself or if the repairs are not performed according to the procedures described in this repair manual, we won't be responsible for the consequences.

To obtain a higher durability of the vehicle, respect what follows:

- Follow the periodic maintenance table in this maintenance manual.
- Pay attention to malfunctions and irregular maintenance;
- Use appropriate tools and Moto Morini's original spare parts;
- The special tools, callipers and testers described in this manual must be used; the original parts used as spare parts are listed in the parts catalogue.
- Strictly follow the maintenance procedures in this manual;
- Make sure to keep a complete register of maintenance and repair operations in a specific date and specify when the new parts must be replaced.

How to use this manual

In this manual, the introduction of the product is divided into its main systems. These systems constitute the chapters of this manual. The catalogue has shown all the systems of this product and can help you choose specific chapters of the system. And each chapter has its own subcategory. For instance: if you desire to find information on the ignition coil, use the catalogue to choose the chapter on electric systems, then find the section regarding the ignition coil in the catalogue in the first page of the chapter;

For a quick and reasonable reading, in the manual are used some symbols to highlight the need for attention and to read practical tips or simple information. Whenever you spot these symbols, follow their instructions! Make sure to follow the safe operating and maintenance methods.

Notice

Pay attention to the meaning of the symbols: their function is not to repeat technical concepts or safety warnings.

	Warning ! A dangerous situation which may cause serious personal injury or even death.
	Important Risk of damaging the motorcycle or its components.
	Engine at idle speed Some operations require the engine to work at idle speed only
Note	Some important topic.
	Remove voltage Disconnect the negative terminal of the battery before the operation
	Stop the engine Some operations require the engine to be turned off
	Ignition key inserted ("ON") pos.

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Chapter 1

General information



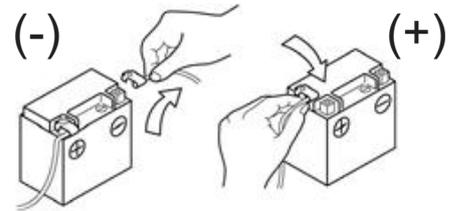
Precautions for disassembly and assembly

Please read the following precautions before starting the inspection, repair and disassembly of the motorcycle. To ease the corresponding operation, each chapter contains notes, illustrations, pictures, warnings and detailed instructions (if necessary). This section explains the matters requiring particular care during disassembly and reassembly of general components.

Please pay attention to the following contents

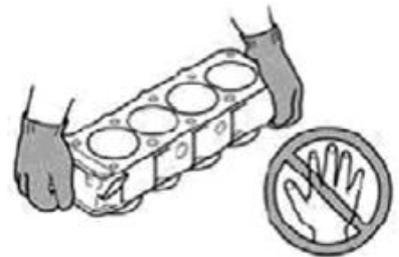
Battery mass

Before starting repair works of the motorcycle, disconnect the power cord from the battery to avoid accidental start-up of the engine. Disconnect the earth cable (-) first, then disconnect the positive pole (+). After completing the repair operations, connect the positive wire (+) to the positive terminal (+) of the battery first, then connect the negative wire (-) to the negative terminal.



Components handling

Wear gloves while handling large or heavy components to avoid possible injury caused by their sharp edges.



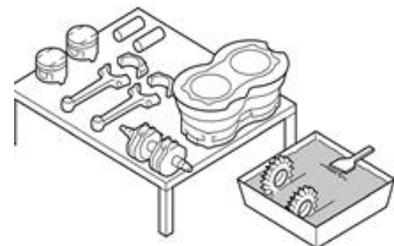
Clean the vehicle before disassembly

Accurately clean the vehicle before disassembly. Dust or other impurities entering the sealed area during disassembly of the vehicle may cause premature wear of the vehicle and reduce its performance.



Organising and cleaning disassembled components

Disassembled parts are easily confusable. Place the components in disassembly and assembly order and clean the parts orderly before assembly.



Store the disassembled parts

After cleaning all the components (including the packaged parts), store them in a clean area. Lay out a clean cloth or a plastic film on the components to avoid the accumulation of impurities before reassembly.



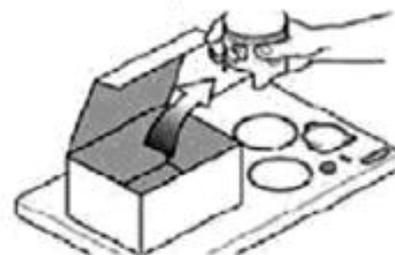
Check

The reuse of worn or damaged parts may cause serious accidents. Visually inspect the disassembled parts to check for the presence of corrosion, discoloration or other damages. For maintenance limits of the single parts, refer to the respective chapters of this manual. If damages or parts which exceed the maintenance limits are detected, replace the parts.



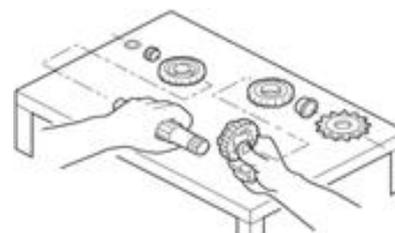
Replacement

Spare parts must be original and advised by Moto Morini. For disassembly it is necessary to use washers, O-rings, radial shaft seals, dust covers, seeger rings, split pins or new self locking nuts



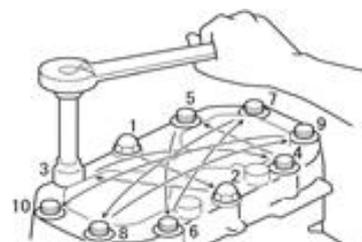
Assembly sequence

In most cases, the assembly sequence is opposite to the disassembly sequence, but if the assembly sequence is described in this manual for maintenance, follow the indicated procedures



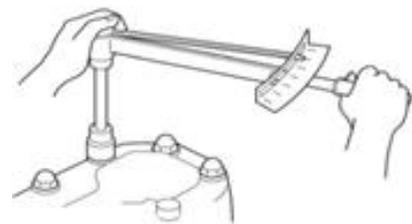
Tightening sequence

Tighten the screws or nuts one by one in the prescribed order to avoid tightening distortions or deformations on the component, which may cause malfunctions. Contrarily, when nuts or screws are loosened, loosen them by a quarter of a turn first, then remove them. If the described tightening sequence is not specified, always cross tighten them.



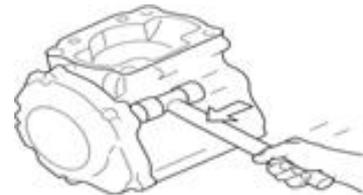
Tightening torque

The use of a wrong torque on bolts, nuts or screws may cause serious damages. Use a high-quality torque wrench to tighten at the specified torque.



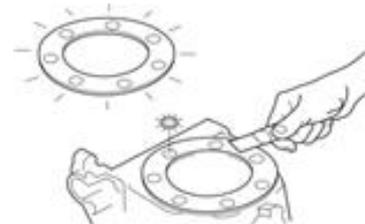
Use force moderately

The use of excessive force during disassembly may cause expensive damages difficult to repair. If necessary, use a percussion screwdriver to remove the screws tightened with thread locker. Whenever it is necessary to hit the components, use a plastic hammer.



Seals, O-rings

After disassembly, it is opportune to replace the seals and O-rings, since their hardening, shrinking or damaging reduce their sealing performance. Remove the old seal and accurately clean the sealing surface, so as to remove all possible glued material. Upon reassembly, install new seals and replace the old O-rings.



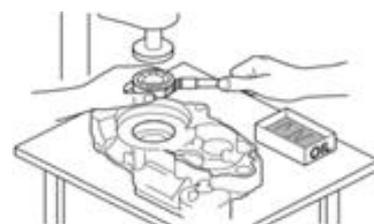
Liquid gasket, thread locker

For applications which need liquid gaskets or thread lockers, the surface must be clean and degreased. It is prohibited to apply an excessive quantity of product. An excessive application may block oil passage and cause serious damage.



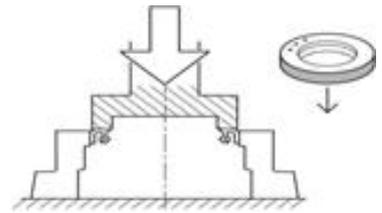
Pressure insertion

For objects which must be inserted through pressure in the correct positions (such as bearings or radial shaft seals), apply a small quantity of oil on the contact surface. Make sure to align correctly during installation.



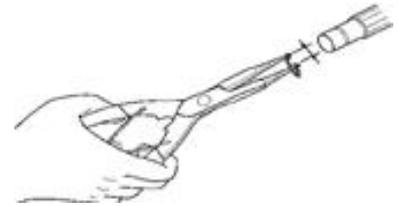
Radial shaft seals and dust covers

The radial shaft seals and the dust covers must not be disassembled unless necessary. When a radial shaft seal or dust cover is disassembled, it must be replaced with a new one. Assemble the radial shaft seal according to these instructions. Make sure the radial shaft seals are correctly aligned during installation.



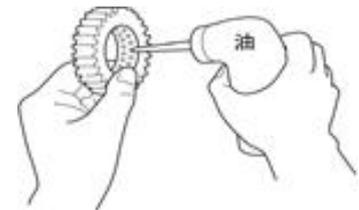
Seeger rings, split pins

Replace the seeger rings and the split pins once disassembled. Pay attention not to deform them during installation.



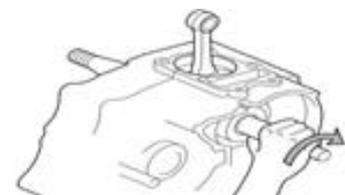
Lubricant

During assembly it is necessary to lubricate rotating or sliding parts to reduce wear during initial operation at a minimum. The lubrication points are indicated everywhere in this manual and specific oil or grease must be applied in compliance with the standards.



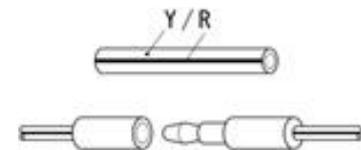
Direction of rotation of the engine

When the engine shaft is rotated manually, rotate it in the correct direction (clockwise from the exit end)



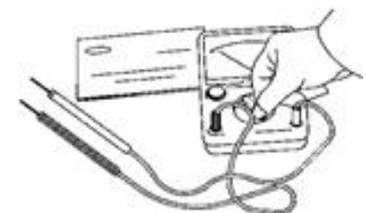
Electric cables

Unless differently indicated, the electric cables must be connected to cables of the same colour



Test equipment

Use a measurement device with enough accuracy to carry out precise measurements. Before using this tool, carefully read the manufacturer's instructions. Imprecise values may result in improper adjustments



Symbols conversion table

A	Ampere	km/h	Kilometre per hour
ABDC	After Bottom Dead Centre	L	Litre
AC	Alternating Current	mL	Millilitre
Ah	Ampere/hour	lb	Pound
ATDC	After Top Dead Centre	LCD	LCD
BBDC	Before Bottom Dead Centre	LED	LED
BDC	Bottom Dead Centre	m	Metre
BTDC	Before Top Dead Centre	min	Minute
°C	Centigrade degree	N	Neutral gear
Cm Hg	Cm Hg	oz	Ounce
DC	Direct Current	Pa	Pascal
EFI	Electric Fuel Injection	PS	Horsepower
ECU	Electronic Control Unit	psi	Pound per square inch
°F	Fahrenehit Degree	r	Revolutions
Ft	Foot	rpm	Revolutions per minute
G	Gram	TDC	Top Dead Centre
Gal	Gallon	TIR	Total Indicator Reading
H	Hour	V	Volt
HP	Horsepower	W	Watt
IC	Integrated Circuit	Ω	Ohm
in.	Inches	N.m	Newton meters
Qt	Quarter		

Advised oils and liquids

Moto Morini advises the exclusive and unique use of the products listed below, since they are indicated by the company as ideal for the correct operation of the engine and of the vehicle.

Coolant - G40

Engine oil - SHELL 10W40 API SN

Brakes fluid - DOT 4 BASF

Chapter 2

Coverings/Exhaust system



Service Info

General

- This section describes the removal and installation of coverings and exhaust system.
- While disassembling, mark and store fasteners correctly to ensure they are reinstalled in their original positions.
- When installing the coverings, make sure aligning the parts properly before tightening the fasteners.
- Be sure to replace the muffler graphite gasket with a new one after removing the exhaust system.
- When installing the exhaust system, install all fasteners loosely. Always tighten the exhaust fitting nuts before tightening the mounting bolts.
- Always check the exhaust system for leaks after installation.

Trouble shooting

Excessive exhaust noise

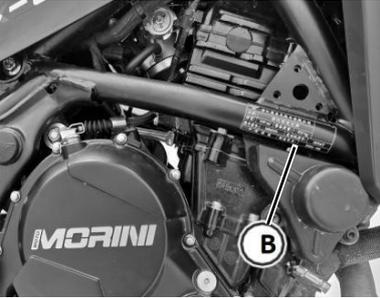
- Damaged exhaust system.
- Exhaust gas leak.

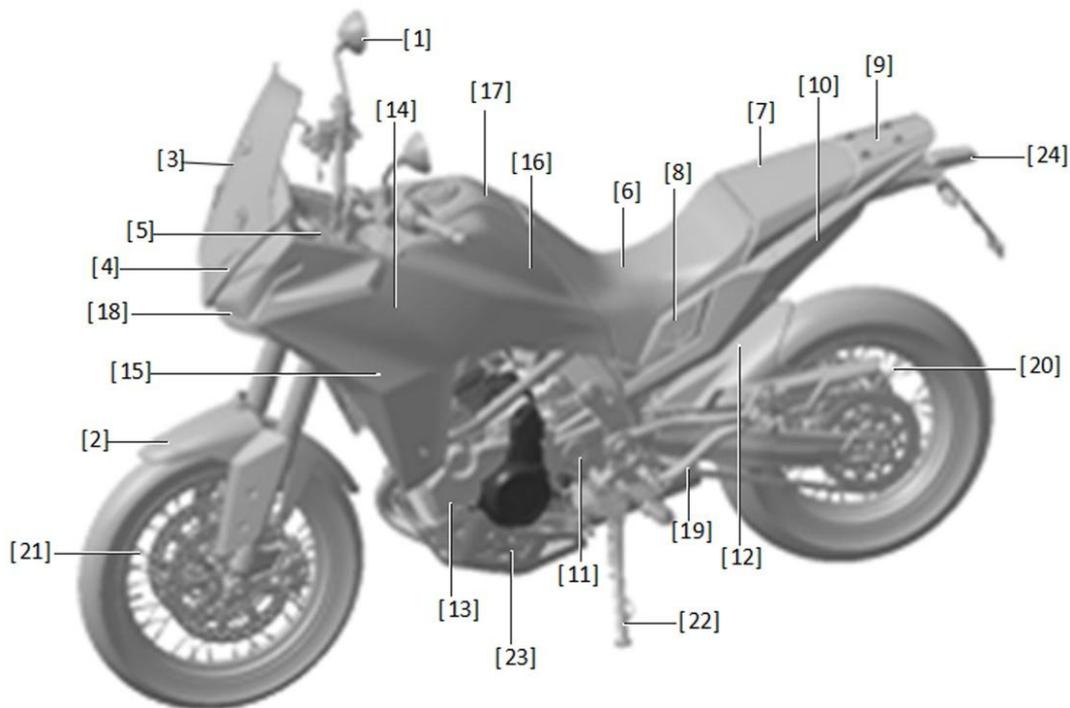
Under performing

- Deformation of the exhaust system.
- Exhaust gas leak.
- Clogged muffler.

Motorcycle identification code

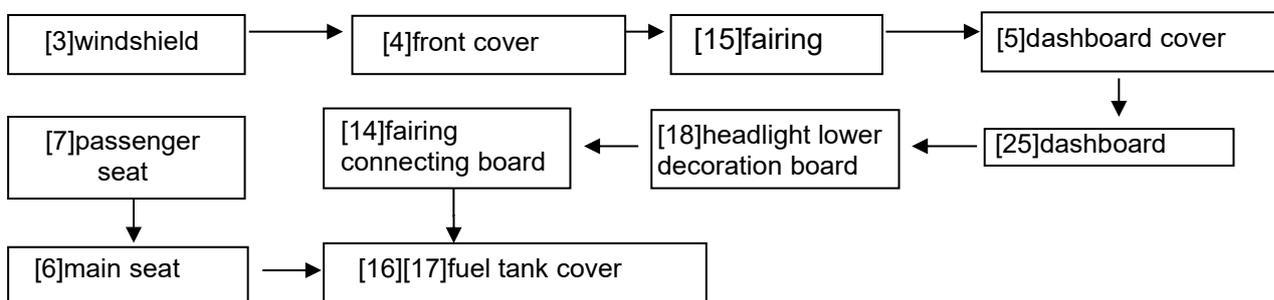
Check if the identification code of the vehicle information table is consistent with the one located on the vehicle;

A - Chassis number	
B - Information on the vehicle Notice The unauthorized tampering of the data will be punished by law. Do not remove the label with the type certification (B).	
C - Engine number	

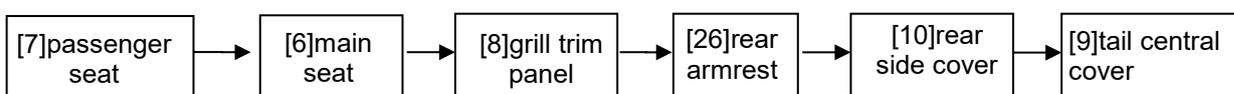


1、Rear view Mirror	2、Front fender	3、windshield
4、Front cover	5、dashboard cover	6、main seat
7、passenger seat	8、grill trim panel	9、tail central cover
10、rear side cover	11、engine left rear cover	12、rear fender
13、water reservoir	14、fairing connecting board	15、fairing
16、fuel tank side cover	17、fuel tank upper cover	18、headlight lower decoration board
19、footrest assy	20、rear rim	21、front rim
22、side stand	23、aluminium belly pan	24、rear fender tail

Sequence diagram of disassemblbe route of front body components:



Sequence diagram of disassemblbe route of rear body components:



Rear view mirror

removal and installation

- ①. Slide the anti-dust boot[A] from lock nut[B];
 - ②. release [B], then take off rear view mirror;
- The installation sequence is the reverse of the removal sequence.

Rear view mirror-coupling torque: 20 N·m



Windshield

removal and installation

①. Remove the 3 windshield fixing bolts [A], and remove the windshield and the pressure block;



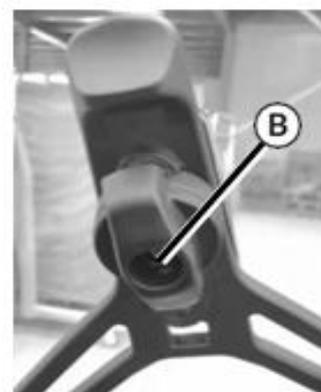
②. Remove the 4 windshield bracket fixing bolts [C], remove the parts;



Windshield Bracket Bolts – Coupling Torque:
6 N.m

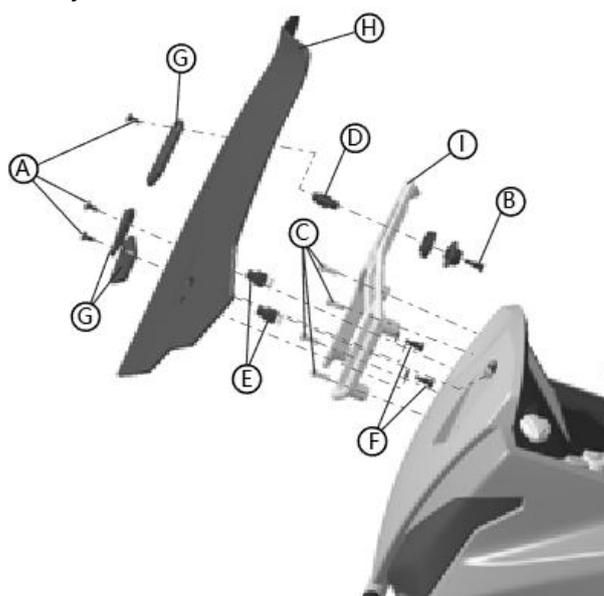
Adjustment knob:

Turn the adjustment knob counterclockwise, slightly press the upper part of the windshield and slide it, adjust it to the proper position, and then turn the adjustment knob [B] back to the original position.



○Notice

Since the assembly of adjustment knob is a tight fit, if it cannot be rotated, loosen the adjustment knob fixing bolt [B] and adjust it;



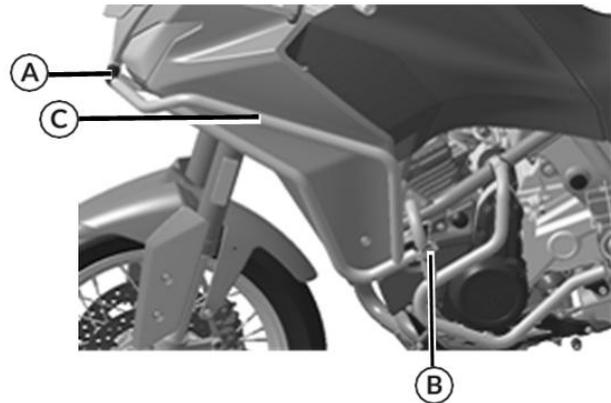
Front bumper combination

removal and installation

left side /right side front bumper components

- ①.release bolt[A];
- ②.release bolt[B];
- ③.remove bumper[C];

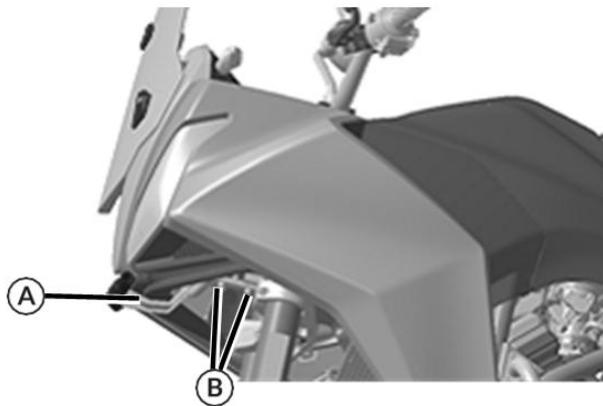
The installation sequence is the reverse of the removal sequence.



Head of front bumper components

- ①.release 2 bolts[B];
- ②.remove head of front bumper components[A];

The installation sequence is the reverse of the removal sequence.



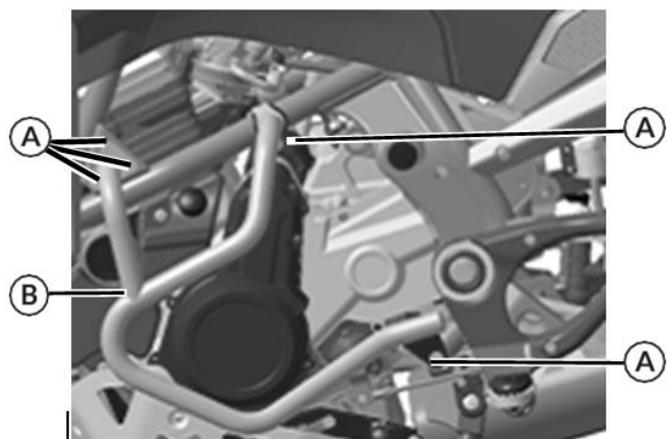
Rear bumper combination

removal and installation

left side /right side rear bumper components

- ①.release 5bolts [A];
- ②.remove rear bumper components[B];

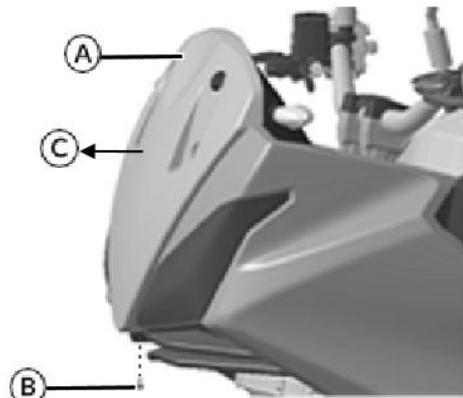
The installation sequence is the reverse of the removal sequence.



Front body parts components

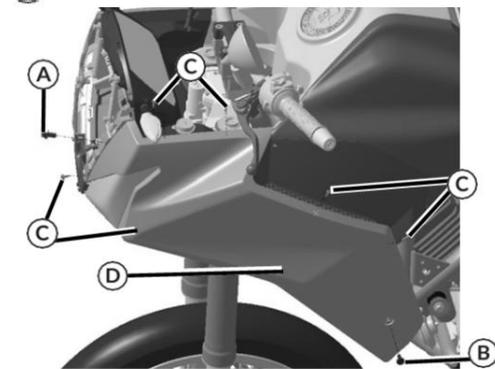
removal and installation
front cover

- ①.remove front bumper components ;
(See Front Bumper combination Removal/Installation – Head of front bumper components on page 28);
- ②.remove windshield; (See Windshield Removal/Installation on page 27);
- ③.release the bolt [B];
- ④. remove the front cover [A] in the direction [C] firmly;
The installation sequence is the reverse of the removal sequence.



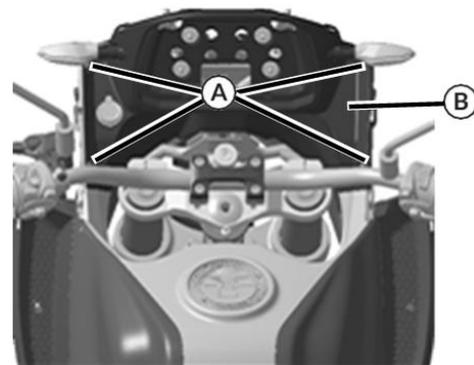
Left/right fairing

- ①.release bolt[A];
- ②.release bolt[B];
- ③.release 6 bolts[C];
- ④.remove fairing to the side firmly;
The installation sequence is the reverse of the removal sequence.



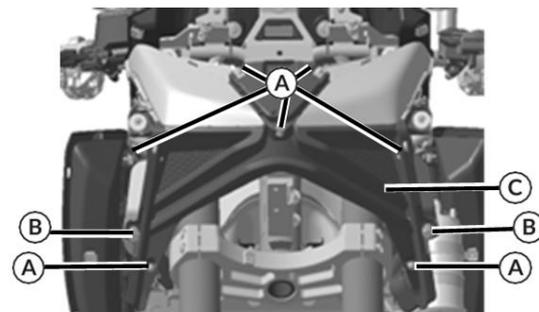
Dashboard apron

- ①.remove dashboard assy;
- ②.remove 4 bolts[A];
- ③.remove dashboard apron[B];
The installation sequence is the reverse of the removal sequence.



headlight lower decorative board

- ①.release 7 bolts[A];
- ②.release 2 bolts[B];
- ③.remove the lower decorative board[C];
The installation sequence is the reverse of the removal sequence.



Front body parts components

removal and installation

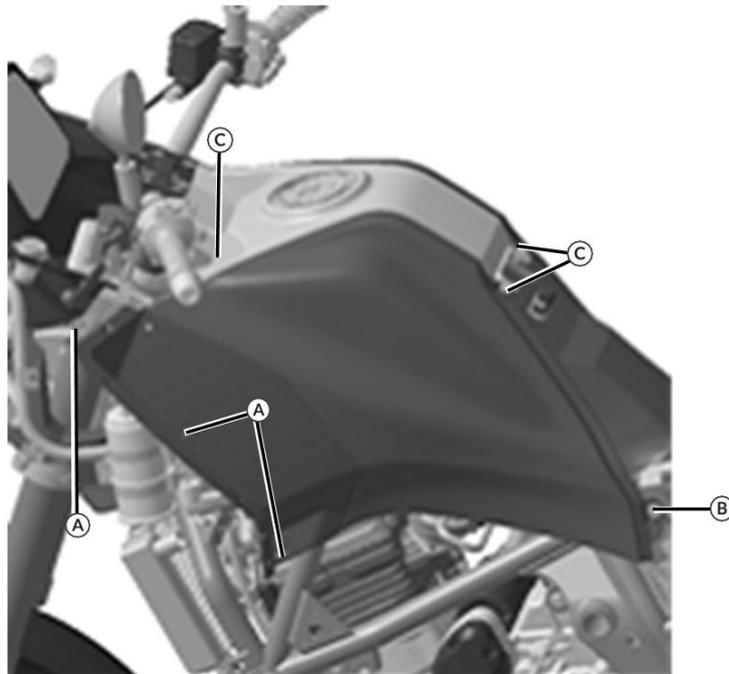
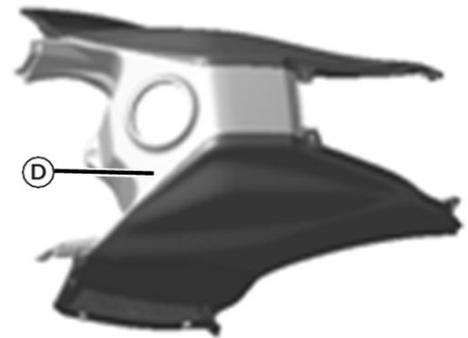
fuel tank cover

- ①.remove the main seat and passenger seat;
(see the Seats removal and installation on page 35);
- ②.remove windshield;
- ③.remove front cover;
- ④.remove left/right fairing;
- ⑤.release 6 bolts[A]; (left and right side)
- ⑥.release 2 bolts[B]; (left and right side)
- ⑦.release 3 bolts[C];
- ⑧.remove fuel tank cover[D]

The installation sequence is the reverse of the removal sequence.

○Notice:

Do not operate too hard, it is easy to damage the front cover buckle;

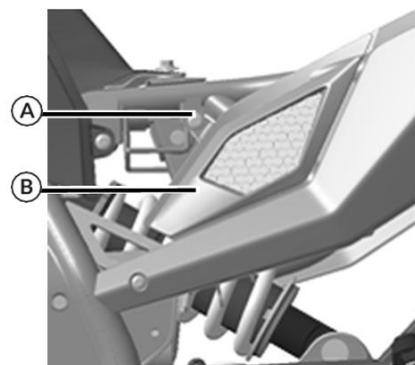


Rear body part components

removal and installation

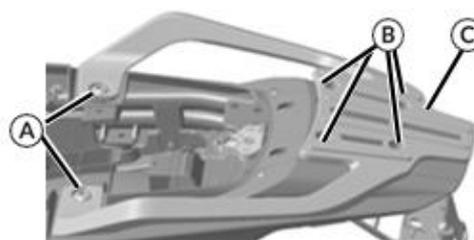
left/right side grille cover

- ①. remove the main seat and passenger seat;
(see the Seats removal and installation on page 35);
 - ②. release bolt[A];
 - ③. Firmly remove the grille cover [B] to the side;
- The installation sequence is the reverse of the removal sequence.



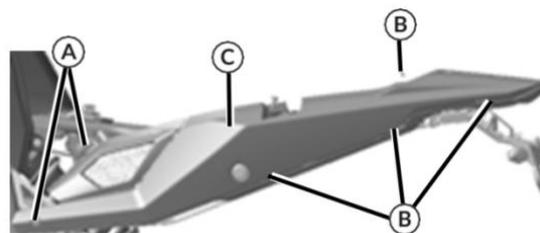
rear rack

- ①. Release 2 bolts [A];
 - ②. Release 4 bolts [B];
 - ③. Remove the rear rack[C];
- The installation sequence is the reverse of the removal sequence.



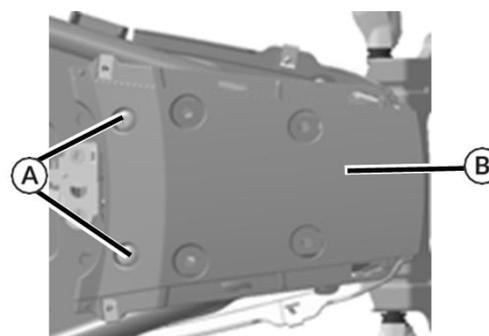
Left/right rear body cover

- ①. release 2 bolt[A];
 - ②. release 4 bolt[B];
 - ③. take off rear body cover[C] to side ;
- The installation sequence is the reverse of the removal sequence.



Tail center plate

- ①. release 2 bolt[A];
 - ②. take off tail center plate[B];
- The installation sequence is the reverse of the removal sequence.



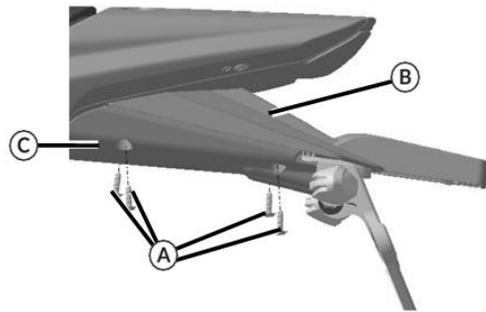
Rear body part component

removal and installation

lower tail cover of rear fender and rear fender tail

- ①.release 4bolt[A]; (left / right side)
- ②.remove lower tail cover of rear fender[C]and rear fender tail[B];

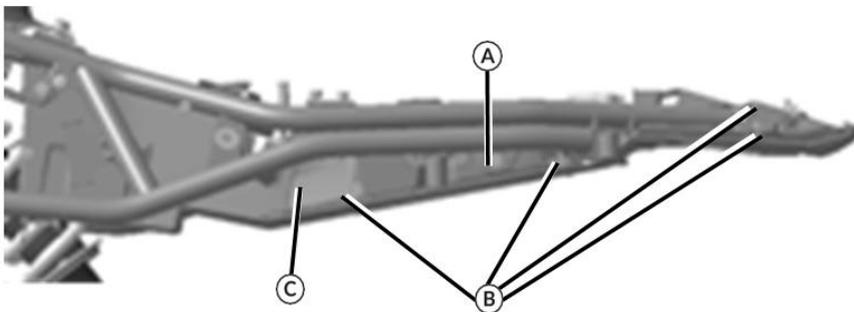
The installation sequence is the reverse of the removal sequence.



Rear inner fender

- ①.remove tail light bracket; (see removal and installation of tail light);
- ②.release 8bolts[B]; (left/right side)
- ③.release 2bolts[A]; (left/right side)
- ④.disconnect the relevant harness plug, remove the battery and other upper parts;
- ⑤. Remove rear inner fender[C];

The installation sequence is the reverse of the removal sequence.;



under body part components

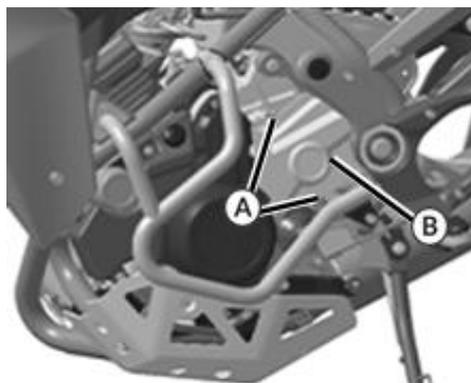
removal and installation

engine left rear cover

①.release 2bolts[A];

②.remove engine left rear cover[B];

The installation sequence is the reverse of the removal sequence;



Left/right bolt cover

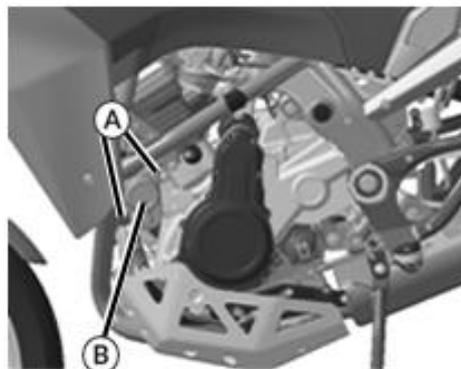
①.remove bumper assy;

②.remove water reservoir;

③.release 2 bolts[A];

④.remove bolt cover[B];

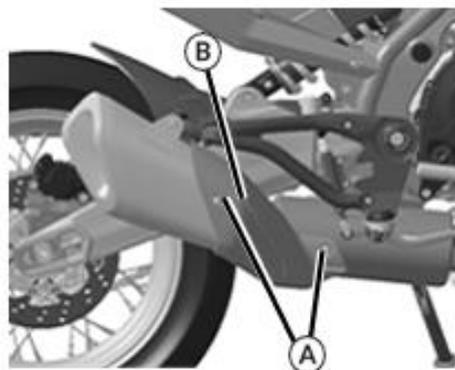
The installation sequence is the reverse of the removal sequence;



Muffler decoration cover

①.release 2bolts[A];

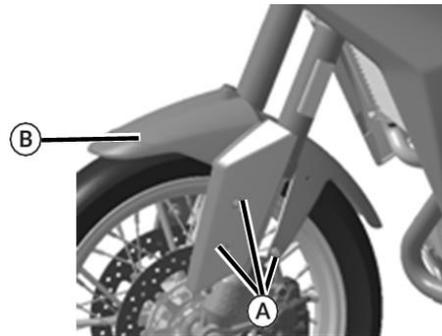
②.remove muffler decoration cover[B];



tire fender components

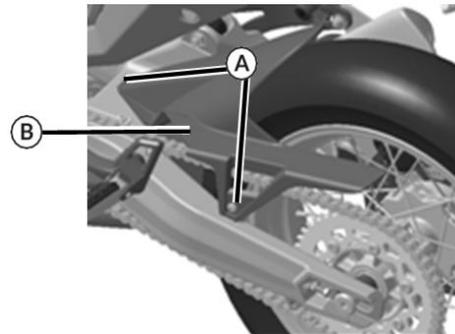
removal and installation
front tire fender

- ①.release 6bolts[A]; (left/right side)
- ②.remove front tire fender[B];



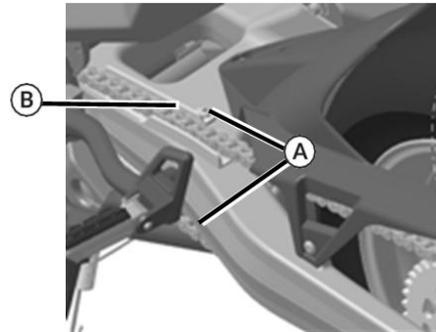
rear tire fender

- ①.release 3bolts[A]; (left/right side)
- ②.remove rear tire fender[B];



Chain guide guard

- ①.release 2 bolts[A];
- ②.remove chain guide guard [B];



seat assy

removal and installation
passenger seat

- ①. Insert the ignition key into the lock hole[A];
- ②. Turn the key and hold the passenger seat [B] and pull back to remove;



Main seat

- ①. Remove passenger seat;
- ②. release 2bolts[A];
- ③. hold two sides of rear part of main seat[B], pull in the direction of arrow [C] to remove;

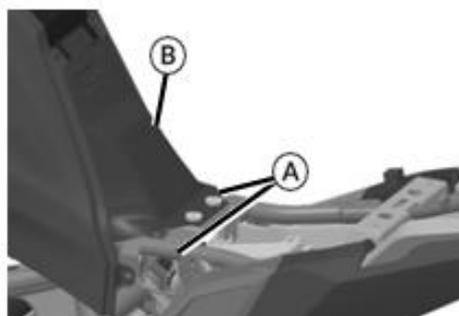


Installation of seat assy

- Insert the front hook of the main seat into the fuel tank bracket [B], and put the left and right hooks [A] into the frame bracket, make sure the front end of the main seat match the fuel tank edge snugly, and then tighten 2 bolts.

Passenger seat installation

Insert the hook at the front of the passenger seat under the frame bracket, insert the bayonet into the slot in the frame, and push down the rear end of the passenger seat until the seat lock makes a "click" sound.



○Notice

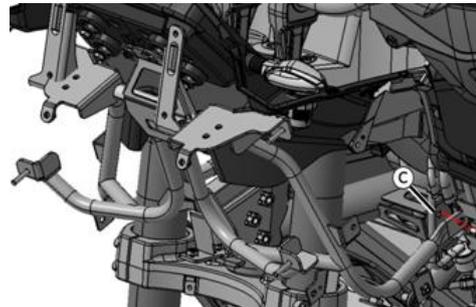
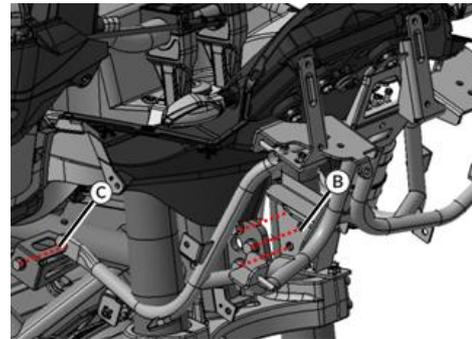
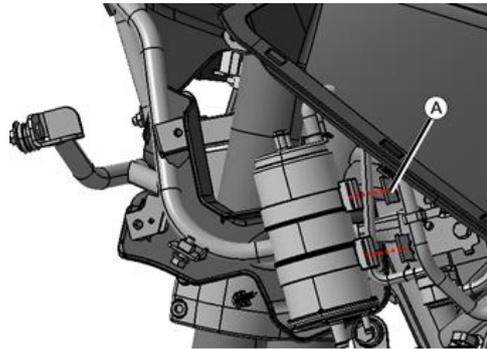
After installing the seats, shake the seats back and forth, left and right, and check whether it is installed properly.

Headlight bracket assy

removal and installation

- ①remove the windshield;
- ②remove windshield bracket;
- ③remove front cover;
- ④remove headlight lower decoration cover;
- ⑤remove left and right fairings;
- ⑥pull out wire harness of left/right turning signal;
- ⑦remove dashboard apron;
- ⑧pull out wire harness of dashboard;
- ⑨remove dashboard;
- ⑩pull out wire harness of headlight;
- (1)remove headlight;
- (12)remove canister rubber sleeve[A];
- (13)release left and right bolts[C];
bolt[C]-coupling torque: 20 N·m
- (14)release 3bolts[B];
bolt[B]-coupling torque: 20 N·m
- (15)remove headlight bracket;

The installation sequence is the reverse of the removal sequence;

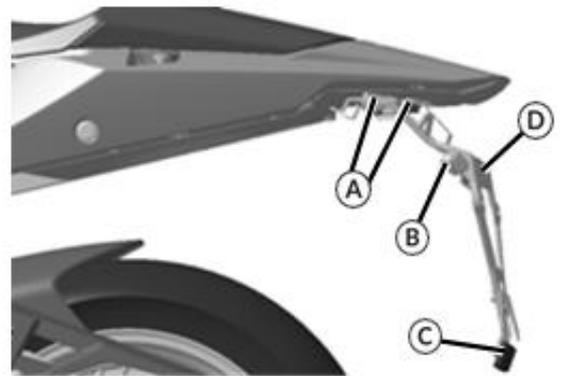


Tail light bracket

removal and installation
tail light bracket

- ①.remove passenger seat;
- ②.remove lower tail cover of rear fender and tail of rear fender;
- ③.remove left/right rear body cover and tail center cover;
- ④.disconnect left/right rear turning signal connector;
- ⑤.remove left/right rear turning signal;
- ⑥.remove rear reflector;
- ⑦.release 4 bolts[A];
- ⑧.remove tail light bracket;

The installation sequence is the reverse of the removal sequence;



side stand assy

removal and installation
side stand assy

- ①. Remove flameout switch[A];
- ②. Release bolt[C]and nut[B];
- ③. Remove side stand spring[D];
- ④. Remove side stand component[E];

Installation:

- ①. Apply a thin layer of MoS₂ grease evenly on the inner hole of the side stand shaft and the surface of the bolt [C];
- ②.Install side stand component and bolt [C],Tighten bolt [C] to specified torque bolt [C]-coupling torque: 40 Nm
- ③. Hold bolt [C],install nut [B] and tighten to specifiied torque.nut [B]-coupling torque :22 Nm
flameout switch nut [F]-coupling torque : 9 Nm
- ④.Install the spring;
- ⑤.Install flameout switch



Left footrest assy

removal and installation

left footrest assy

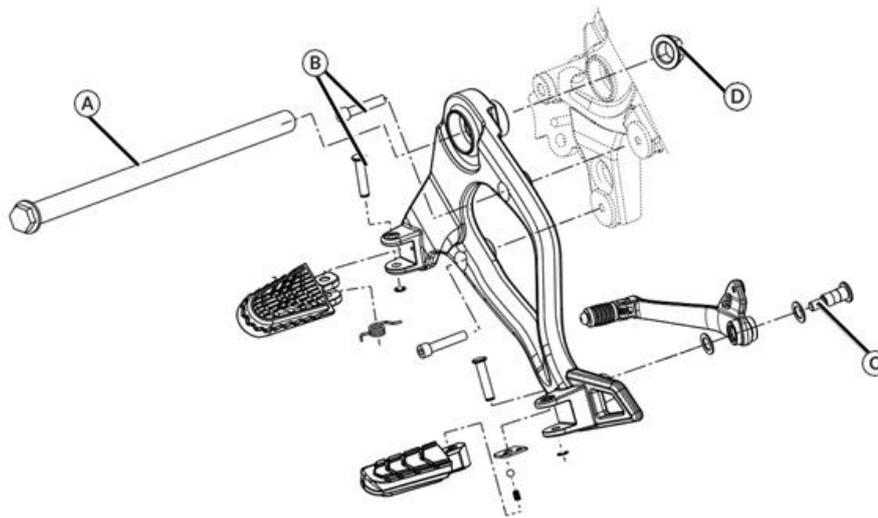
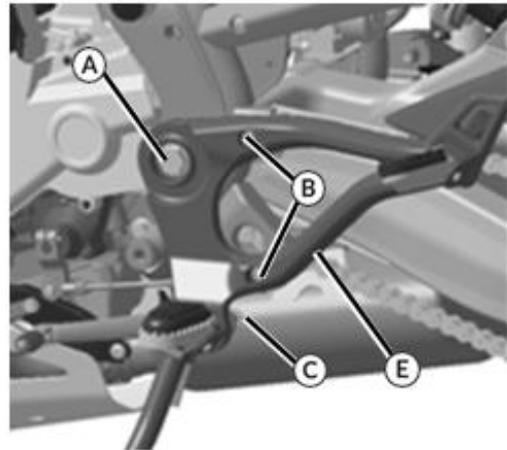
- ①. Release the adjusting rod fastening bolt [C];
- ②. release 2 bolts[B];
- ③. remove rear swing arm shaft[A] and lock nut[D];
- ④. remove left footrest assy[E];

Installation

The installation sequence is the reverse of the removal sequence;

lock nut[D]-coupling torque: 120 N·m

mounting bolt[B]-coupling torque: 18 N·m



Right footrest assy

removal and installation
right footrest assy

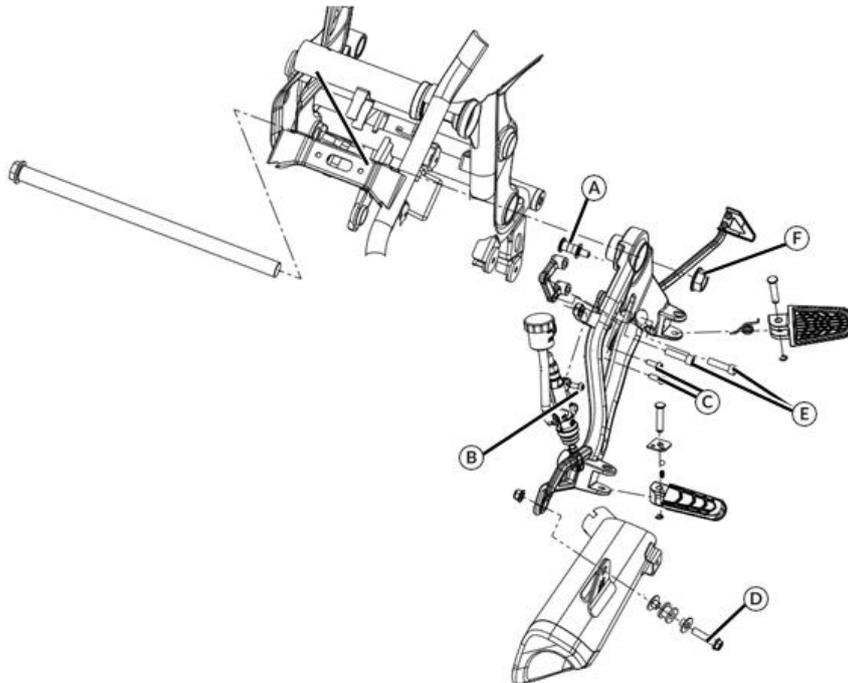
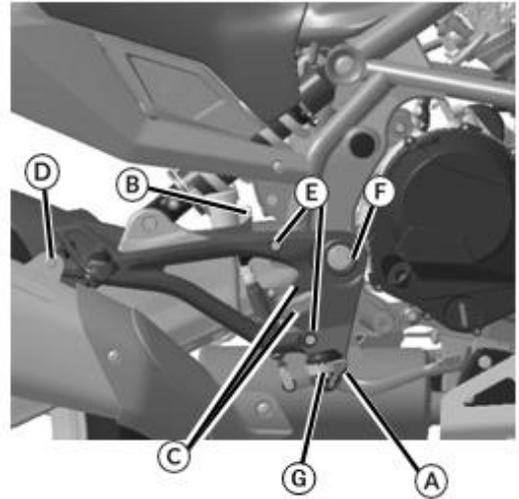
- ①. Remove the spring;
- ②. Loosen the bolt [E], the rear swing arm lock nut [F];
- ③. Release the bolts [B], [D], [C];
- ④. Remove the brake spring mounting pin [A];
- ⑤. Release the bolt [E] and the lock nut [F] of the rear swing arm;
- ⑥. Remove the right footrest bracket assembly [G];

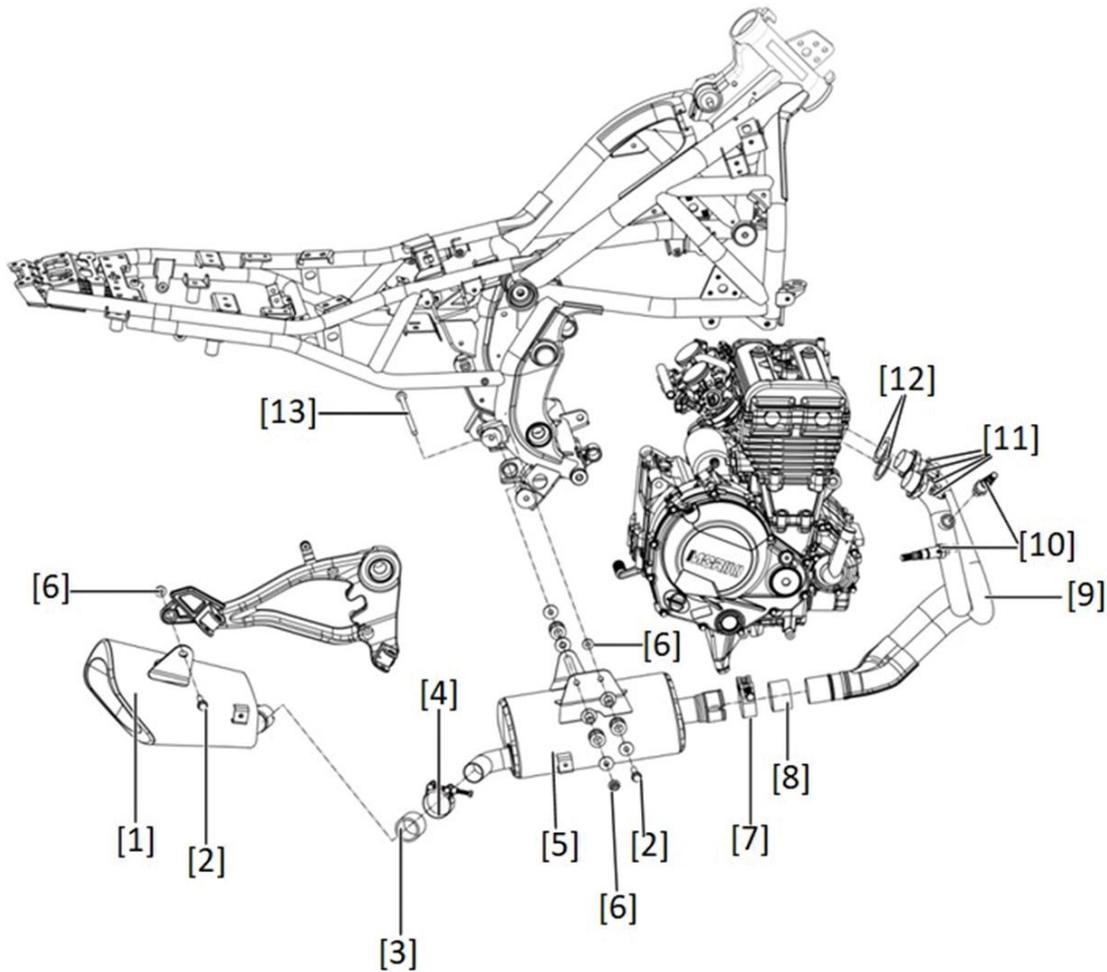
The installation sequence is the reverse of the removal sequence;

coupling torque:

lock nut[D]: 120 N·m

mounting bolt[B]: 18 N·m



Exhaust Muffler assy


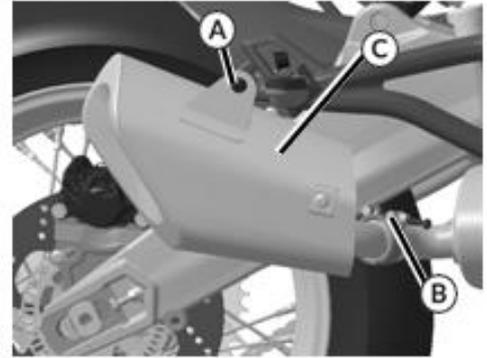
1、muffler tail pipe	2、Hexagon flange bolts	3、rear end graphite bushing
4、rear end clamp	5、muffler middle pipe	6、hexagon flange lock nut
7、front end clamp	8、front end graphite bushing	9、exhaust pipe
10、oxygen sensor	11、hexagon nut	12、exhaust sealing ring
13、hexagon flange bolt		

Exhaust muffler assy

removal and installation

Muffler tail pipe component

- ①.remove muffler decoration cover;
- ②.release clamp bolt[E];
- ③.release bolt[A];
- ④.hold muffler tail pipe[C] firmly and pull back, remove muffler tail pipe assy, rear end graphite bushing[D] and rear end clamp[B].



installation

- ①.Put the new rear graphite bushing[D] into the connecting end of the muffler tail pipe in advance;

- ③. Install the mounting bolts [A] together with the clamp joint bolts [E] and nuts, and then fully tighten all the fasteners;

Coupling torque:

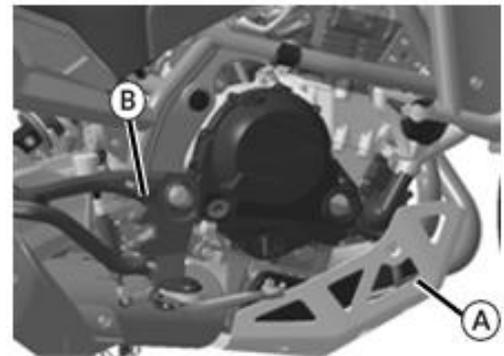
Clamp joint bolt [E]: 18 N.m

Muffler tail pipe mounting bolt [A]: 18 N.m



Muffler middle pipe assy

- ①.Remove plastic or aluminum alloy belly pan[A];
- ②.Remove the right footrest bracket assy[B];
- ③. Remove the muffler tail pipe assy;
- ④. Loosen the clamp joint bolt [C] at the front end of the muffler;
- ⑤. Remove 2 fastening bolts [D];
- ⑥. Remove the middle pipe of the muffler, the muffler fastening rubber ring, the fastening bushing, the gasket, the front graphite bushing[F] and the front clamp;



Installation

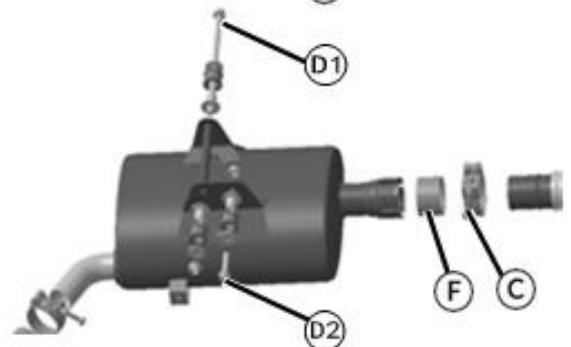
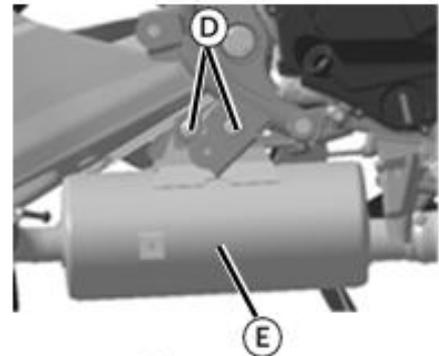
- ①.Put the new front graphite bushing[F] into the front connecting end of the middle pipe of the muffler in advance;

- ③. Install the mounting bolts together with the clamp joint bolts [E] and nuts, and then fully tighten all the fasteners;

Coupling torque:

Clamp joint bolt [C]: 18 N.m;

Mounting bolts in the muffler middle pipe[D1.D2]: 18 N.m;



Exhaust muffler assy

Removal and installation

Exhaust pipe assy

- ①.remove plastic or aluminum belly pan;
- ②. Disconnect 2 oxygen sensor harness[A];
- ③. Release 4 hexagon nuts[B]and exhaust sealing ring[E];
- ④.loosen front end clamp joint bolt[D];
- ⑤.Hold the exhaust pipe firmly and push and pull it forward, Remove the exhaust pipe assy[F], the front graphite bushing[C] and the front clamp;

Installation:

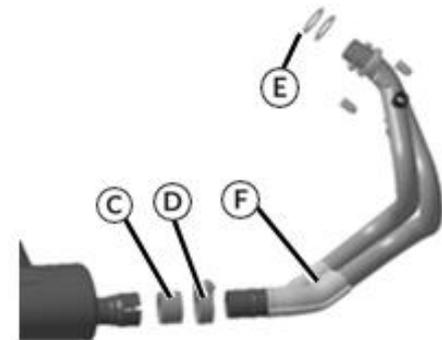
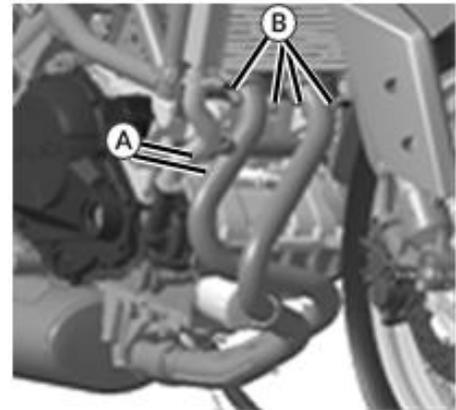
- ①.Put the new front graphite bushing[C] into the front connecting end of the muffler middle pipe in advance;
- ②. Insert the rear end of the exhaust pipe into the graphite bushing of the muffler middle pipe;
- ③. Tighten the clamp joint bolt [D];
- ④. Hold the exhaust pipe and install the hexagon nut [B] at the same time.

and tighten to the specified torque.

Coupling torque:

Clamp joint bolt [D]: 18 N.m

Hexagon nut [B]: 18 N.m



Warning:

To avoid serious burns, be sure to wait until the engine and muffler are completely cool before operating;

important hint:

1. Disassembly is easy to cause damage to the graphite bushing, please use a good graphite bushing;
2. Before the vehicle is used, the muffler needs to be checked for air leakage;

Chapter 3

Maintenance



Regular maintenance program

Make sure that your motorcycle is kept in good operating condition by carrying out a regular maintenance according to the maintenance program in the table below.

The first inspection is essential and it must not be overlooked.

1) Regular inspections

Regular replacement items	period	* Total mileage display Km/miles						
	every	1000 600	6000 3700	12000 7400	18000 11100	24000 14800	30000 18500	36000 22200
Air filter element-cleaning				●		●		●
Valve clearance-check	42000 km 25900 mi							
Throttle system (clearance, flexible return)-check	1year	●		●		●		
Idle speed-check		●		●		●		●
Fuel leak (fuel pipe)-check	1year	●		●		●		●
Fuel pipe damage-check	1year			●		●		●
Fuel pipe installation-check	1year	●		●		●		●
Throttle valve body-cleaning.				●		●		●
Coolant volume-check.		●		●		●		●
Coolant leak-check.	1year	●		●		●		●
Damage to radiator and pipeline-check.	1year	●		●		●		●
Radiator and pipeline installation-check.	1year	●		●		●		●
Intake system damage-check				●		●		●
Clutch and drive chain								
Clutch operation (clearance, engagement, disengagement)-check		●		●		●		●
Transmission chain lubrication-inspection#	600 km 100 mi							
Transmission chain tightness-check#	1000 km 600 mi							
Wear of transmission chain-inspection#				●		●		●
Wear condition of transmission chain guard-check				●		●		●
Rim and tire, crown wheel flexible coupling bearing								
Tire pressure-check		●		●		●		●
Rim/tyre damage-check				●		●		●
Tire surface wear and abnormal wear-check				●		●		●
Crown wheel flexible coupling check	1year			●		●		●
Pedal-Lubrication		●		●		●		●
Sprocket seat bearing-check				●		●		●
Braking System								
Brake fluid leakage-check	1year	●	●	●	●	●	●	
Damage to the brake fluid pipe-check	1year	●	●	●	●	●	●	
Brake pad wear-inspection#			●	●	●	●	●	
Brake fluid pipeline installation-check	1year	●	●	●	●	●	●	●
Brake fluid volume-check	6 months	●	●	●	●	●	●	●

Regular replacement items	period ↓ every	* Total mileage display Km/miles						
		Whichever comes first →						
		1000 600	6000 3700	12000 7400	18000 11100	24000 14800	30000 18500	36000 22200
Brake control (braking force, clearance, flexible action)-check	1year	●	●	●	●	●	●	●
Brake light switch operation-check		●	●	●	●	●	●	●
Damping								
Front fork/rear suspension (regular suspension check)				●		●		●
Front fork/rear suspension hydraulic oil leakage check	1year			●		●		●
Control system								
Steering clearance-check	1year	●		●		●		●
Steering Bearing-Lubrication	2 years					●		
Electrical system								
Light and switch operation-check	1year			●		●		●
Headlight-check	1year			●		●		●
Temple flameout switch operation-check	1year			●		●		●
Engine flameout switch operation-check	1year			●		●		●
Chassis								
Chassis Parts-Lubrication				●		●		●
Bolt and nut torque-check		●		●		●		●

#: High frequency maintenance when working in adverse conditions (dusty, wet, muddy, high speed or frequent starting/ stops).

2) Regular spare parts

Regular replacement items	period	Whichever comes first ↓ every	total mileage display X 1000KM				
			1	12	24	36	48
Air filter element#				●	●	●	●
■ Engine oil#	6 months		Every 3000km/First 500km				
■ Oil filter	6 months		Every 6000km				
Fuel pipe							●
■ Coolant						●	
■ Radiator, pipeline						●	
■ Brake fluid line							●
■ Brake fluid (front/rear)					●		●
■ Brake pump rubber seal							●
■ Spark plug				●	●	●	●
■ Sprocket seat buffer block				●	●	●	●

Regular replacement items	period	Whichever comes first ↓ every	total mileage display (KM /miles)				
			1000 600	12000 7400	24000 14800	36000 22200	48000 29600
Air filter element#				●	●	●	●
■ Engine oil#	6 months						
■ Oil filter	6 months						
Fuel pipe	4 years						●
■ Coolant	2 years					●	
■ Radiator, pipeline	2 years					●	
■ Brake fluid line	4 years						●
■ Brake fluid (front/rear)	2 years				●		●
■ Brake pump rubber seal	4 years						●
■ Spark plug				●	●	●	●
■ Sprocket seat buffer block				●	●	●	●

#: Provide high frequency service when operating in harsh conditions (dusty, wet, muddy, high speed or frequent startup/shutdown);

*: For higher odometer readings, repeat the check as frequently as specified here.

Regular inspections**Air Filter****Note:**

When you drive in dusty and wet areas, the filter inspection and the dust removal intervals must be more frequent than recommended.

You have to check the filter immediately after driving in the rain or in muddy roads.

 **Warning:**

If dirt or dust enter into the throttle body, they may clog it up and they can lead to an accident.



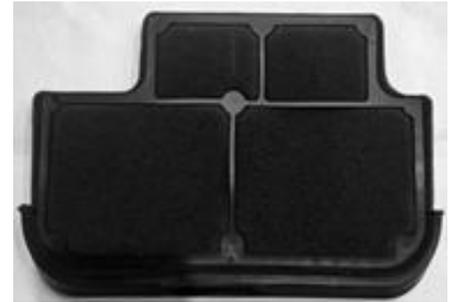
Important

1) Disassembly

Remove the fuel tank (see fuel tank removal in the feeding system). Afterwards remove the screw of the air filter.

2) Blowing

Check for cracks or splits by visual inspection. If there are any cracks or splits, replace the filter. Blow dust and foreign bodies out of the filter with the compressed air and replace it promptly when it is excessively dirty.



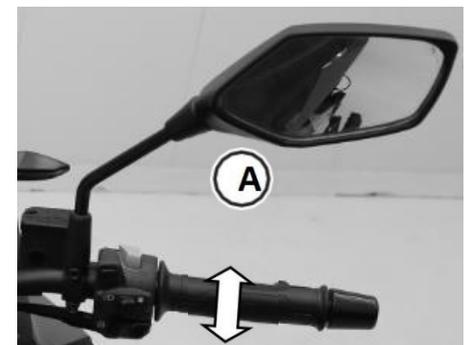
Throttle check

Check that the rotation from the closed to the fully-open position [A] is smooth and that the return is regular in all the steering positions; By releasing the throttle grip, it should quickly and completely go back.

Throttle Knob Free Play Check [A]

If the free play is incorrect, regulate the throttle cable as follows:

- 1) Loosen the adjusting locknut[B],[C] at the top end of the throttle cable.
- 2) Turn the throttle until the throttle grip reaches the correct stroke.
 Idle stroke: ± 3 mm
 Nut coupling torque: 6.0N·m



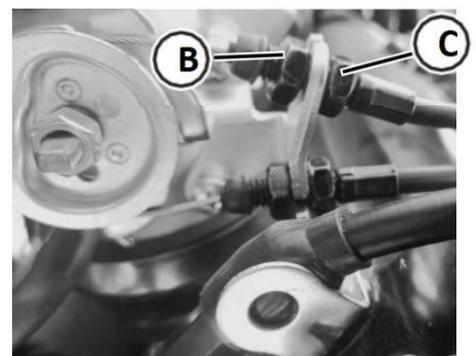
Idle speed check

Start the engine and warm it up completely.

Standard idle speed: 1500 \pm 150r/min

Warning

An improper adjustment of the throttle cable, an incorrect connection or the operation with a damaged cable may lead to unsafe riding conditions.



Fuel line inspection

1) Fuel leaks, damage, installation

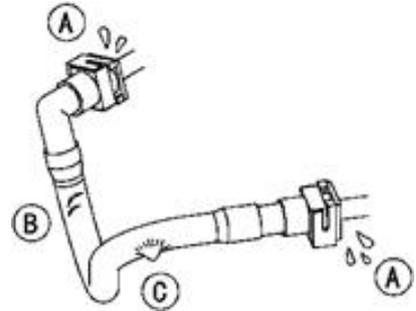
Motorcycle fuel lines require no maintenance during their useful life. However, if the motorbike is not used correctly, high pressure in the fuel line may lead to fuel leaks [A] and to the break of the line.

Remove the fuel tank (see Removing the Fuel Tank in the Feeding System section) and inspect the fuel line.

Note

Replace the fuel line in case of wear, cracks [B] and bulges [C].

If the hose is bent or twisted, the hose fitting [A] and the fuel hose [B] must be replaced.



2) Pipe fittings check

The hose is firmly secured by pressing and pulling [A] the hose fitting [B] back and forth more than twice and by ensuring that the fitting is in place. If it is not secured correctly replace the fuel hose.



Warning:

Ensure that the fuel lines are installed correctly, otherwise fuel leaks may occur. This can cause a fire or even an explosion, which can lead to serious burns.

Cooling system

1) Coolant level check

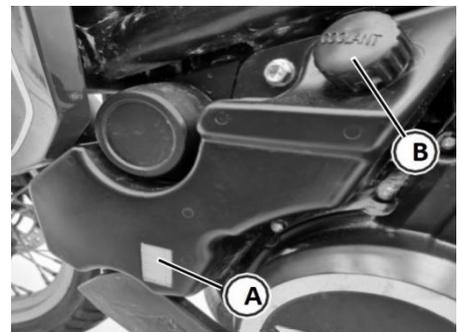
Park the motorcycle longitudinally perpendicular to the ground and check the coolant level of the expansion tank [A] (do not open the side supports). If the level of coolant [A] is below the "L" notch, remove the tank cap [B] and fill the tank with coolant up to the "F" notch [A].

Scale "F" - Maximum level

Scale "L" - Minimum Level

Note

The coolant level (room temperature) must be checked after the engine has cooled down.



Important

When adding the coolant, use a specific coolant. If the coolant is diluted with water, it will corrode the aluminium parts of the engine. In case of emergency, only distilled water can be added. If coolant needs to be added frequently or if the coolant in the expansion tank has completely run out, this indicates that there may be leaks in the cooling system and the cooling system must be checked. Coolant can corrode the surface of painted parts, so clean the surface of the chassis, of the engine, of the wheels or other painted parts as soon as it is spilled.

2) Radiator hoses check

High pressure in radiator hoses can lead to coolant leaks or to hose rupture.

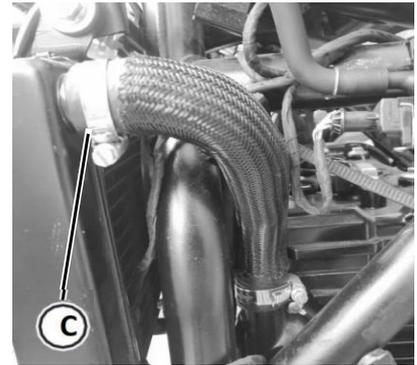
Visually inspect the hose for signs of deterioration, tighten the hose and observe the condition (the hose must not be hard or brittle, nor soft or swollen).

Replace worn, cracked or swollen hoses.

Check that the hoses are well connected and that the clamps are well tight.

Hose clamps locking tie wraps [C].

Tightening torque: 4.0 N m



Cylinder head

1) Valve clearance check and adjustment

1) Remove the cylinder head cover (see removing the cylinder head cover in the cylinder head cover chapter).

Note

Inspection and adjustment of valve clearances must be carried out after the engine has cooled down.

- 2) Unscrew the inspection hole covers [A] and [B] on the right hand crankcase.
- 3) Check the valve clearance when the piston is at top dead end.
- 4) Turn the crankshaft clockwise with a spanner [A] until the mark "1/T" on the plate and the notch [B] on the edge of the top inspection hole are aligned.

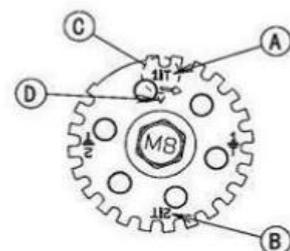
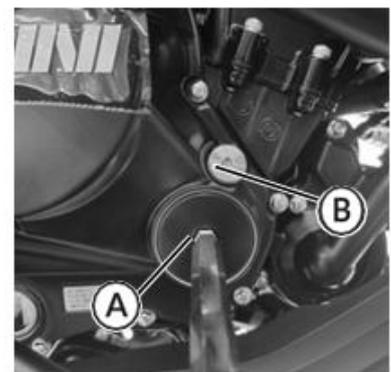
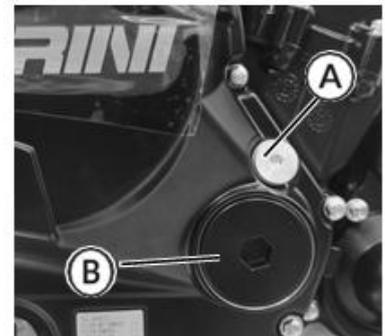
The mark "1/T" corresponds to the cylinder 1 and the mark "2/T" to the cylinder 2.

1/T = Marking of cylinder 1 [A].

2/T = Marking of cylinder 2 [B].

[C] = Upper synchronisation hole

[D] = Direction of rotation marking



2) Use a feeler gauge [A] to measure clearance of the valve between the cam and the spring valve cup

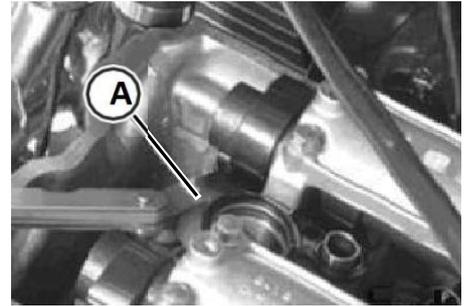
Standard valve clearance values :

Exhaust valve: 0,22 to 0,28 mm

Intake valve: 0.08 to 0.13 mm

Note

Each cylinder has two exhaust valves and two intake valves.



Valve clearance

A) Valve clearance measurement position

- Cylinder in compression, piston top dead end

Note

Use this method to check the valve clearance only, the measurement at other positions may be inaccurate.

- If the valve clearance is not within the specified range, adjust the valve clearance.

To adjust the valve clearance, remove the timing belt tensioner, the camshaft and the valve tappets.

Replace the spring valve cups with others of different thickness.

Note

- Mark and adjust the position of the valve so that it can be restored to its original position after re-installation.
- If there's no clearance, select a lower thickness of the spring valve cups and measure valve clearance.

To select a new spring valve cup so as that valve clearance falls within the specified interval, refer to the valve clearance adjustment table.

Apply a thin layer of molybdenum disulfide grease on the spring valve cups.

Install the camshaft. Make sure that the camshaft is installed correctly. (See camshaft installation in the cylinder head chapter).

Re-measure the valve clearance. Perform further adjustment if necessary.

Intake valve clearance adjustment diagram

Marker	Current tappet thickness																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358	360	362	364	366	368	370	372	374	376	378	380	382	384	386	388	390	392	394	396	398	400	402	404	406	408	410	412	414	416	418	420	422	424	426	428	430	432	434	436	438	440	442	444	446	448	450	452	454	456	458	460	462	464	466	468	470	472	474	476	478	480	482	484	486	488	490	492	494	496	498	500	502	504	506	508	510	512	514	516	518	520	522	524	526	528	530	532	534	536	538	540	542	544	546	548	550	552	554	556	558	560	562	564	566	568	570	572	574	576	578	580	582	584	586	588	590	592	594	596	598	600	602	604	606	608	610	612	614	616	618	620	622	624	626	628	630	632	634	636	638	640	642	644	646	648	650	652	654	656	658	660	662	664	666	668	670	672	674	676	678	680	682	684	686	688	690	692	694	696	698	700	702	704	706	708	710	712	714	716	718	720	722	724	726	728	730	732	734	736	738	740	742	744	746	748	750	752	754	756	758	760	762	764	766	768	770	772	774	776	778	780	782	784	786	788	790	792	794	796	798	800	802	804	806	808	810	812	814	816	818	820	822	824	826	828	830	832	834	836	838	840	842	844	846	848	850	852	854	856	858	860	862	864	866	868	870	872	874	876	878	880	882	884	886	888	890	892	894	896	898	900	902	904	906	908	910	912	914	916	918	920	922	924	926	928	930	932	934	936	938	940	942	944	946	948	950	952	954	956	958	960	962	964	966	968	970	972	974	976	978	980	982	984	986	988	990	992	994	996	998	1000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Thickness	3.20	3.22	3.24	3.26	3.28	3.3	3.32	3.34	3.36	3.38	3.4	3.42	3.44	3.46	3.48	3.5	3.52	3.54	3.56	3.58	3.6	3.62	3.64	3.66	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18	4.2	4.22	4.24	4.26	4.28	4.3	4.32	4.34	4.36	4.38	4.4	4.42	4.44	4.46	4.48	4.5	4.52	4.54	4.56	4.58	4.6	4.62	4.64	4.66	4.68	4.7	4.72	4.74	4.76	4.78	4.8	4.82	4.84	4.86	4.88	4.9	4.92	4.94	4.96	4.98	5	5.02	5.04	5.06	5.08	5.1	5.12	5.14	5.16	5.18	5.2	5.22	5.24	5.26	5.28	5.3	5.32	5.34	5.36	5.38	5.4	5.42	5.44	5.46	5.48	5.5	5.52	5.54	5.56	5.58	5.6	5.62	5.64	5.66	5.68	5.7	5.72	5.74	5.76	5.78	5.8	5.82	5.84	5.86	5.88	5.9	5.92	5.94	5.96	5.98	6	6.02	6.04	6.06	6.08	6.1	6.12	6.14	6.16	6.18	6.2	6.22	6.24	6.26	6.28	6.3	6.32	6.34	6.36	6.38	6.4	6.42	6.44	6.46	6.48	6.5	6.52	6.54	6.56	6.58	6.6	6.62	6.64	6.66	6.68	6.7	6.72	6.74	6.76	6.78	6.8	6.82	6.84	6.86	6.88	6.9	6.92	6.94	6.96	6.98	7	7.02	7.04	7.06	7.08	7.1	7.12	7.14	7.16	7.18	7.2	7.22	7.24	7.26	7.28	7.3	7.32	7.34	7.36	7.38	7.4	7.42	7.44	7.46	7.48	7.5	7.52	7.54	7.56	7.58	7.6	7.62	7.64	7.66	7.68	7.7	7.72	7.74	7.76	7.78	7.8	7.82	7.84	7.86	7.88	7.9	7.92	7.94	7.96	7.98	8	8.02	8.04	8.06	8.08	8.1	8.12	8.14	8.16	8.18	8.2	8.22	8.24	8.26	8.28	8.3	8.32	8.34	8.36	8.38	8.4	8.42	8.44	8.46	8.48	8.5	8.52	8.54	8.56	8.58	8.6	8.62	8.64	8.66	8.68	8.7	8.72	8.74	8.76	8.78	8.8	8.82	8.84	8.86	8.88	8.9	8.92	8.94	8.96	8.98	9	9.02	9.04	9.06	9.08	9.1	9.12	9.14	9.16	9.18	9.2	9.22	9.24	9.26	9.28	9.3	9.32	9.34	9.36	9.38	9.4	9.42	9.44	9.46	9.48	9.5	9.52	9.54	9.56	9.58	9.6	9.62	9.64	9.66	9.68	9.7	9.72	9.74	9.76	9.78	9.8	9.82	9.84	9.86	9.88	9.9	9.92	9.94	9.96	9.98	10	10.02	10.04	10.06	10.08	10.1	10.12	10.14	10.16	10.18	10.2	10.22	10.24	10.26	10.28	10.3	10.32	10.34	10.36	10.38	10.4	10.42	10.44	10.46	10.48	10.5	10.52	10.54	10.56	10.58	10.6	10.62	10.64	10.66	10.68	10.7	10.72	10.74	10.76	10.78	10.8	10.82	10.84	10.86	10.88	10.9	10.92	10.94	10.96	10.98	11	11.02	11.04	11.06	11.08	11.1	11.12	11.14	11.16	11.18	11.2	11.22	11.24	11.26	11.28	11.3	11.32	11.34	11.36	11.38	11.4	11.42	11.44	11.46	11.48	11.5	11.52	11.54	11.56	11.58	11.6	11.62	11.64	11.66	11.68	11.7	11.72	11.74	11.76	11.78	11.8	11.82	11.84	11.86	11.88	11.9	11.92	11.94	11.96	11.98	12	12.02	12.04	12.06	12.08	12.1	12.12	12.14	12.16	12.18	12.2	12.22	12.24	12.26	12.28	12.3	12.32	12.34	12.36	12.38	12.4	12.42	12.44	12.46	12.48	12.5	12.52	12.54	12.56	12.58	12.6	12.62	12.64	12.66	12.68	12.7	12.72	12.74	12.76	12.78	12.8	12.82	12.84	12.86	12.88	12.9	12.92	12.94	12.96	12.98	13	13.02	13.04	13.06	13.08	13.1	13.12	13.14	13.16	13.18	13.2	13.22	13.24	13.26	13.28	13.3	13.32	13.34	13.36	13.38	13.4	13.42	13.44	13.46	13.48	13.5	13.52	13.54	13.56	13.58	13.6	13.62	13.64	13.66	13.68	13.7	13.72	13.74	13.76	13.78	13.8	13.82	13.84	13.86	13.88	13.9	13.92	13.94	13.96	13.98	14	14.02	14.04	14.06	14.08	14.1	14.12	14.14	14.16	14.18	14.2	14.22	14.24	14.26	14.28	14.3	14.32	14.34	14.36	14.38	14.4	14.42	14.44	14.46	14.48	14.5	14.52	14.54	14.56	14.58	14.6	14.62	14.64	14.66	14.68	14.7	14.72	14.74	14.76	14.78	14.8	14.82	14.84	14.86	14.88	14.9	14.92	14.94	14.96	14.98	15	15.02	15.04	15.06	15.08	15.1	15.12	15.14	15.16	15.18	15.2	15.22	15.24	15.26	15.28	15.3	15.32	15.34	15.36	15.38	15.4	15.42	15.44	15.46	15.48	15.5	15.52	15.54	15.56	15.58	15.6	15.62	15.64	15.66	15.68	15.7	15.72	15.74	15.76	15.78	15.8	15.82	15.84	15.86	15.88	15.9	15.92	15.94	15.96	15.98	16	16.02	16.04	16.06	16.08	16.1	16.12	16.14	16.16	16.18	16.2	16.22	16.24	16.26	16.28	16.3	16.32	16.34	16.36	16.38	16.4	16.42	16.44	16.46	16.48	16.5	16.52	16.54	16.56	16.58	16.6	16.62	16.64	16.66	16.68	16.7	16.72	16.74	16.76	16.78	16.8	16.82	16.84	16.86	16.88	16.9	16.92	16.94	16.96	16.98	17	17.02	17.04	17.06	17.08	17.1	17.12	17.14	17.16	17.18	17.2	17.22	17.24	17.26	17.28	17.3	17.32	17.34	17.36	17.38	17.4	17.42	17.44	17.46	17.48	17.5	17.52	17.54	17.56	17.58	17.6	17.62	17.64	17.66	17.68	17.7	17.72	17.74	17.76	17.78	17.8	17.82	17.84	17.86	17.88	17.9	17.92	17.94	17.96	17.98	18	18.02	18.04	18.06	18.08	18.1	18.12	18.14	18.16	18.18	18.2	18.22	18.24	18.26	18.28	18.3	18.32	18.34	18.36	18.38	18.4	18.42	18.44	18.46	18.48	18.5	18.52	18.54	18.56	18.58	18.6	18.62	18.64	18.66	18.68	18.7	18.72	18.74	18.76	18.78	18.8	18.82	18.84	18.86	18.88	18.9	18.92	18.94	18.96	18.98	19	19.02	19.04	19.06	19.08	19.1	19.12	19.14	19.16	19.18	19.2	19.22	19.24	19.26	19.28	19.3	19.32	19.34	19.36	19.38	19.4	19.42	19.44	19.46	19.48	19.5	19.52	19.54	19.56	19.58	19.6	19.62	19.64	19.66	19.68	19.7	19.72	19.74	19.76	19.78	19.8	19.82	19.84	19.86	19.88	19.9	19.92	19.94	19.96	19.98	20	20.02	20.04	20.06	20.08	20.1	20.12	20.14	20.16	20.18	20.2	20.22	20.24	20.26	20.28	20.3	20.32	20.34	20.36	20.38	20.4	20.42	20.44	20.46	20.48	20.5	20.52	20.54	20.56	20.58	20.6	20.62	20.64	20.66	20.68	20.7	20.72	20.74	20.76	20.78	20.8	20.82	20.84	20.86	20.88	20.9	20.92	20.94	20.96	20.98	21	21.02	21.04	21.06	21.08	21.1	21.12	21.14	21.16	21.18	21.2	21.22	21.24	21.26	21.28	21.3	21.32	21.34	21.36	21.38	21.4	21.42	21.44	21.46	21.48	21.5	21.52	21.54	21.56	21.58	21.6	21.62	21.64	21.66	21.68	21.7	21.72	21.74	21.76	21.78	21.8	21.82	21.84	21.86	21.88	21.9	21.92	21.94	21.96	21.98	22	22.02	22.04	22.06	22.08	22.1	22.12	22.14	22.16	22.18	22.2	22.22	22.24	22.26	22.28	22.3	22.32	22.34	22.36	22.38	22.4	22.42	22.44	22.46	22.48	22.5	22.52	22.54	22.56	22.58	22.6	22.62	22.64	22.66	22.68	22.7	22.72	22.74	22.76	22.78	22.8	22.82	22.84	22.86	22.88	22.9	22.92	22.94	22.96	22.98	23	23.02	23.04	23.06	23.08	23.1	23.12	23.14	23.16	23.18	23.2	

Marker	368	370	372	374	376	378	380	382	384	386	388	390	392	394	396	398	400	402	404	406	408	410	412	414	416	418		
Thickness	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.74	3.76	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18		
from Ja 0 ¹⁰ 0,01	3.58	3.6	3.62	3.64	3.66	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08		
0,02 a 0,03	3.6	3.62	3.64	3.66	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1		
0,04 a 0,05	3.62	3.64	3.66	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12		
0,06 a 0,07	3.64	3.66	3.68	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14		
0,08 a 0,13	Adequate space, no need to replace																											
0,14 a 0,15	3.7	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18			
0,16 a 0,17	3.72	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18				
0,18 a 0,19	3.74	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18					
0,20 a 0,21	3.76	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18						
0,22 a 0,23	3.78	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18							
0,24 a 0,25	3.8	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18								
0,26 a 0,27	3.82	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18									
0,28 a 0,29	3.84	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18										
0,30 a 0,31	3.86	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18											
0,32 a 0,33	3.88	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18												
0,34 a 0,35	3.9	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18													
0,36 a 0,37	3.92	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18														
0,38 a 0,39	3.94	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18															
0,40 a 0,41	3.96	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18																
0,42 a 0,43	3.98	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18																	
0,44 a 0,45	4	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18																		
0,46 a 0,47	4.02	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18																			
0,48 a 0,49	4.04	4.06	4.08	4.1	4.12	4.14	4.16	4.18																				
0,50 a 0,51	4.06	4.08	4.1	4.12	4.14	4.16	4.18																					
0,52 a 0,53	4.08	4.1	4.12	4.14	4.16	4.18																						
0,54 a 0,55	4.1	4.12	4.14	4.16	4.18																							
0,56 a 0,57	4.12	4.14	4.16	4.18																								
0,58 a 0,59	4.14	4.16	4.18																									
0,60 a 0,61	4.16	4.18																										
0,62 a 0,63	4.18																											

- 1) Measure the clearance (when the engine is cold).
- 2) Check size of the mounted valve spring cup.
 For instance: the spring valve cup with spacer is 3,50 mm
 Measurement clearance of 0.25 mm
 Replace the 3,50 mm mounted cup with a new one of 3,62 mm.
 If necessary, re-measure the valve clearance and readjust.

Clutch

1) Clutch operation check

- 1) Pull the clutch lever until the clutch starts to engage.
- 2) Measure the distance between the clutch lever and the bracket [A].
If the distance is too great, the clutch may not be fully disengaged.
If the distance is too small, the clutch may not engage sufficiently.
Both of the above conditions will occur and require adjustment.



Warning:

In order to avoid serious burns, do not touch the engine or exhaust pipe when adjusting the clutch.

2) Clutch lever free play

Standard: from 2 to 3mm

- 1) Loosen the ring nut (B) until the 5 to 6 mm thread is visible.
- 2) Pull the dust cap out (C) into the clutch cable.
- 3) Loosen the clutch cable lock nut(D);
- 4) Turn the adjusting nut (E) to the correct position.
- 5) Tighten the lock nut(D).



Important

Ensure that the end of the cable on the clutch lever is inside the clutch lever adjuster to prevent the clutch cable from disengaging. After adjustment, tighten the lock nut, start the engine and check that the clutch is fully disengaged or engaged.

Wheel/tires inspection

1) Tyre pressure check

Tyre type: tubeless

Tyre Size:

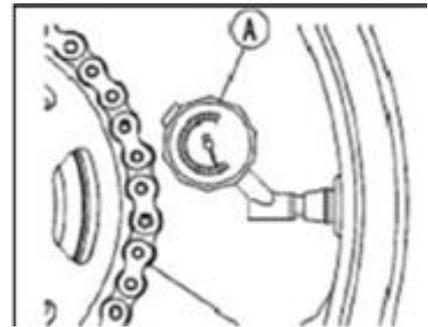
- Front: 110/80R19 M/C(59H)TL

- Rear: 170/70 R17M/C(69V)TL

- Compatibility with “R” class minimum speed rating.
- Front minimum load rating“43”.
- Rear minimum load rating“61”.

- 1) Remove the tyre valve cap.
- 2) With cold tyres, measure the air pressure with a pressure gauge[A].
- 3) Refit the valve cap.

If necessary, adjust the air pressure of the tyre according to specifications (when cold).



	Front pressure	Rear pressure
Rider	2.4	2.5
Passenger	2.4	2.9

2) Wheel/tyre damage inspection

- 1) Remove any embedded stones or other foreign inclusions from the tyre surface.
- 2) Visually inspect the tyres for cracks, cuts and replace if necessary.
- 3) Visually inspect the rim for cracks, cuts and dents.
If damage is found, the rim must be replaced.

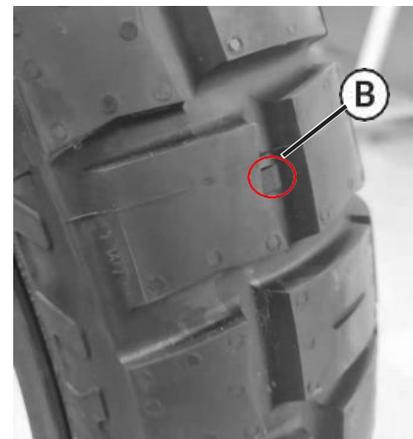
Important

Swelling indicates internal damage and the need to replace the tyre.

Warning:

As the tread wears down, tyres become more prone to punctures and damage. The generally accepted measure is when the tyre tread is in the last 10% of its useful life (i.e. 90% wear). Safety hazards can occur when the tyre surface is worn to the point of tread wear.

The tyre tread wear indicator (B) is an important criterion for replacing a tyre when the mark (B) is reached. (See removing and assembling tyres in the wheels/tyres chapter)



Warning:

In order to drive safe and in a stable way, use the recommended standard tyres and rims and inflate the tyres to the standard pressure.

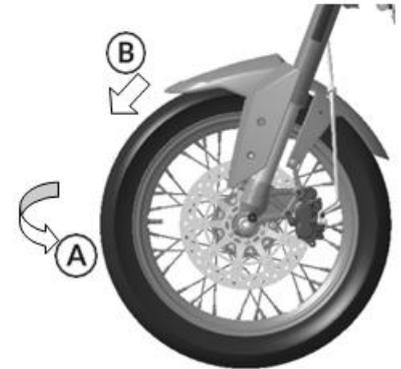
Note

Many countries have their own minimum tread depths and it is important to observe them.

Wheel bearing inspection

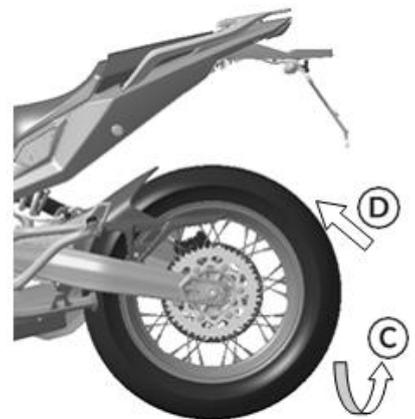
1) Front wheel

- 1) Lift the front wheel off the ground (see chapter wheels/tyres removing the front wheel).
- 2) Turn the handlebars to the left and to the right.
- 3) Check that the front wheel bearings are not damaged by pushing and pulling the wheel [A].
- 4) Gently and quickly turn the front wheel [B] to check for regular wheel rotation and noise before turning. If noise is detected, remove the front wheel and check the wheel bearings. (See the wheels/tyres chapter for removing the front wheel and inspecting the wheel bearings).



2) Rear wheel

- 1) Support the rear wheel of the motorbike from the ground (see the wheels/tyres chapter for removing the rear wheel).
- 2) Check if the rear wheel bearing is damaged by pushing and pulling the wheel [C];
- 3) Gently and quickly rotate the rear wheel [D] to check that the wheel turns smoothly and that there is no noise during rotation.
- 4) If noise is detected, remove the rear wheel and check the wheel bearings and the rear axle. (See the Wheels/Tyres chapter for removing the front wheel and inspecting the wheel bearings). (See main gearbox chapter for coupling inspection).



Transmission chain

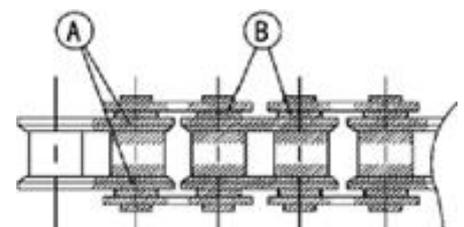
1) Inspection of the transmission chain lubrication

If the chain is dirty, clean the chain before lubrication. If no special lubricant is specified, use a lubricant such as SAE 90. This is because heavier oil will remain in the chain longer and it will provide better lubrication.

Important

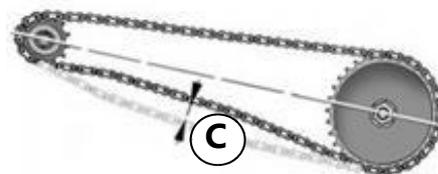
To avoid damage to the O-ring and to avoid the loss of lubricant, follow the following rules: Use only paraffin or diesel oil to clean the O-ring of the drive chain. Any other cleaning solvents such as petrol or trichloroethylene will cause damage and swelling of the O-ring. Dry the chain with compressed air immediately after cleaning.

- (1) Apply lubricant to all sides of the rollers, this will allow the oil to penetrate inside the roller. (B) Apply the oil to the O-ring until the O-ring is completely covered with oil.
- (2) Wipe off excess lubricant.
 - Oiled section [A]
 - O-ring seal [B]



2) Transmission chain tension check

- Check the chain tension without resting the motorbike on the side stand.
- Clean the chain if it is dirty and lubricate it if it seems dry.
- Check wheels alignment (see wheel alignment check);
- Rotate the rear wheel to find the tightest chain position.
- Measure the free play [C] in the central part between the front sprocket and the sprocket.
- Adjust the chain if the free play exceeds the standard.

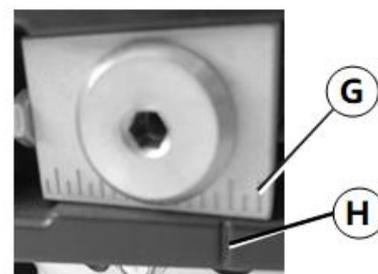
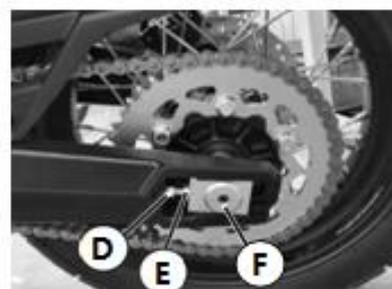


A. Chain free play

Standard: 25~30mm

B. Adjusting the chain free play

- 1) Lift the rear wheel off the ground (see chapter Tires and rims - removing the rear wheel).
 - 2) Loosen the rear wheel axle pin [F] and the lock nut (D) on both sides.
 - 3) Adjust the adjusting screws (E) on both sides according to the loosening in the chain, then push the rear wheel forward or backward to adjust until the chain reaches the correct free play; if the chain is too loose, unscrew the adjusting screws (E) and push smoothly the wheel back; if the chain is too tight, do the opposite.
 - 4) Tighten the lock nuts on both sides(D).
 - 5) Tighten the rear axle[F].
- Tightening torque of the rear pin screw: 120 Nm.
Apply copper grease to the thread and under the head.



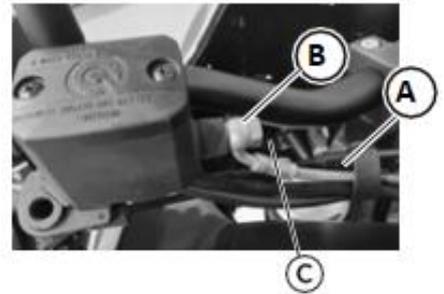
Warning:

1. If the rear wheel axle nut is not tightened and fixed or the cotter pin is not installed correctly, it will cause unsafe driving.
2. The distance in the forward direction of the left and right chain adjuster(the chain adjuster(G) and the frame scale standard line (H)) should be consistent on both sides. The misalignment of the wheels will cause abnormal wear of the sprocket and chain and may lead to unsafe driving;

Braking system

1) Brake fluid leak check (brake hoses and pipes).

Check for brake fluid leaks on all the brake hoses [A], on the fittings [B], copper washer [C], by pressing the brake lever or pedal. If you discover a brake fluid leak anywhere, replace the defective component.



2) Brake pipes and brake line damage check

- Check the brake pipes and the fittings for damage, cracks, or signs of leakage.

Note

If not properly maintained, high pressure in the brake line can cause fluid leakage [A] or hose rupture [B]. When inspecting the brake hoses, bend and twist the rubber hoses. If you find cracks [B], bulges [C], or leaks, replace the hoses and tubing.



Tighten all the fitting screws securely:

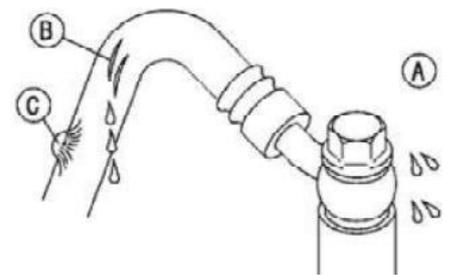
Hose connector screws - tightening torque: 35 Nm

Pipe fitting screws on ABS module - tightening torque: 25 Nm

Screws of the pipe connections on the brake pump - tightening torque: 25 Nm

Check the brake pipes

If the brake pipe is not correct, adjust it according to the cables and hoses section in the accessories chapter.



3) Brake operation check

Test the motorbike on dry roads to check the operation of the front and rear brakes. If braking performance is poor, check the brake system.



Warning:

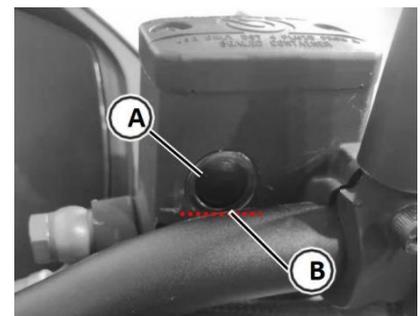
Pay attention to surrounding traffic to ensure safety when carrying out the check.

4) Brake fluid level check

Front brake

Check through the porthole [A] that the brake fluid level in the front brake fluid reservoir is not on the lower level [B].

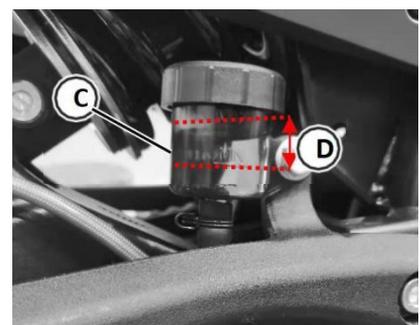
Front Brake:



Rear brake

Check that the amount of brake fluid in the rear brake fluid reservoir [C] is between the upper (max) and lower (min) scales [D];

Rear Brake:



Note

When checking the brake fluid level, maintain the horizontal level by turning the handlebars. If the brake fluid level is below the lower marking, fill up with the fluid until the level reaches the upper marking.

**Important**

If the type and brand of the brake fluid in the reservoir cannot be identified and the fluid must be topped up, the brake fluid must be replaced completely. After replacing the brake fluid, use only the same type and brand.

Recommended brake fluid

Grade: DOT4

Volume: 400 ML

5) Brake pad wear check

Standard value of brake pad thickness per caliper.

Front: 4,5 mm

Rear: 5.0mm

Brake pads have indentations in the friction material that indicate whether the pads require replacement; the indentations are visible when the pads are still in good condition.

The minimum thickness of the brake pad friction material is 1 mm.

**Warning:**

If one brake pad becomes excessively worn, both the pads must be replaced, by always using the original brake pads.

6) Brake light switch operation check

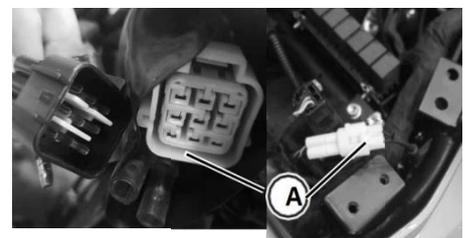
Turn the ignition key to ON;

The brake light switches on when you pull the brake lever or when you press the pedal.

If it does not illuminate, check the connector [A]

If not oxidized, check or replace the following items.

- 1) Battery (see checking the charge status in the electrical system chapter)
- 2) Brake light (see removal of rear light/brake light in the electrical systems chapter)
- 3) Main fuse 20A and tail light 10A (see checking fuses in the electrical system chapter)
- 4) Front brake light switch [A] (see switch check in the chapter one electrical systems)
- 5) Rear brake light switch (See switch check in the Electrical systems chapter).
- 6) Wiring harness (see wiring check in the electrical system chapter)

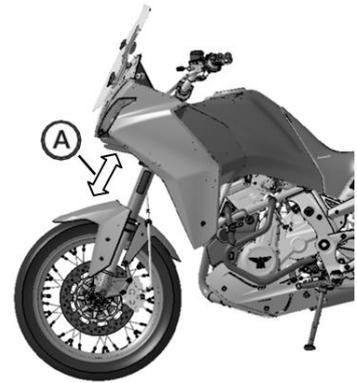
**7) Wiring**

(See wiring check in the Electric systems chapter)

Suspension setting

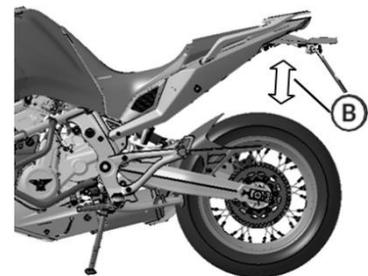
1) Front suspensions operation check

Shake the fork [A] up and down sharply 4-5 times and check that it moves smoothly. If the movement is not smooth or if there is any noise, check that the forks are not leaking oil or that they are assembled correctly. (See changing the fork oil in the Suspension chapter)



2) Rear suspension operation check

Shake the tail up and down [B] sharply 4 or 5 times and check that the movement is regular.



3) Front suspensions oil leakage inspection

Visually check the fork for oil leaks [C], if necessary, replace or fix the defective parts.



4) Rear suspension oil leakage inspection

Visual inspection of the rear suspension [D] for oil leakage. Shock absorber must be replaced in case of oil leakage.



Steering system

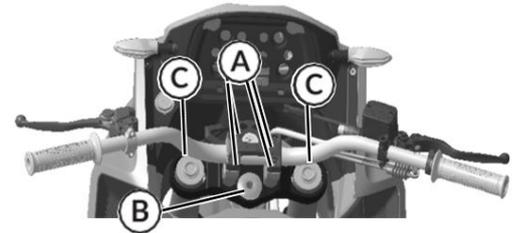
1) Steering system clearance check

- Lift the front wheel off the ground. (See wheels/tyres chapter - removing the front wheel)
- Position the front wheel so that it is aligned with the motorbike and gently tap each end of the handlebar alternately, to ensure that the steering is flexible and fluid.
- Check that the steering rotation is not blocked, or too tight. The rotation should be smooth.
- Push and pull the front forks to feel the tightness of the steering.
- If the steering feels loose, check the tightness of the steering bearings.



Warning:

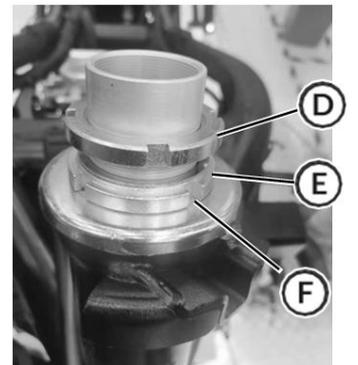
You should consider that cables and wiring will have some effect on the movement of the steering. Make sure that cables and wiring are correctly installed and arranged. For the steering to be flexible, the bearings must be in good condition and properly lubricated.



2) Steering system clearance adjustment

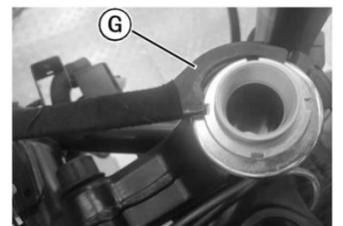
A -Removal

- Remove top plate screws [A] and remove handlebar assembly; (See Handlebar removal in the Steering chapter)
- Remove the steering plate central nut[B];
- Loosen the top plate stem fixing screws on both sides of the fork[C];
- Disconnect the ignition switch plug;
- Remove steering upper connecting board assy
- Release steering column lock nut[D]
- Remove tooth lock washer [E];
- Release steering column lock nut[F];



B - Steering adjustment

- Special tool: Wrench for steering column locking ring nut[G]
- If the steering is too tight, loosen the ring nut slightly[F]
- If the steering is too loose, slightly tighten the lock ring nut [F]
lock nut[F]-coupling torque: 10 N·m
lock nut[D]-coupling torque: 60 N·m



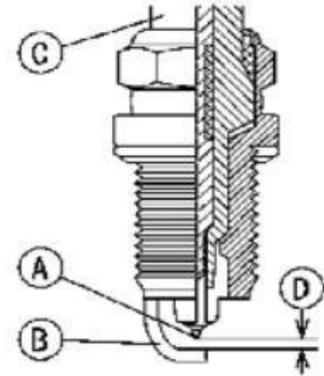
D - Lubrication of the steering column bearings

- Remove the upper steering plate (see Removing the upper steering plate and the bearing in the Steering chapter);
- Clean the upper and lower ball bearings in the cage using a specific degreaser and clean the upper and lower seat;
- Clean the seats of the upper and lower bearings checking that they are not worn; replace them if necessary;
- The upper and lower ball bearings [F] are pressed into their seats and greased, followed by a thin layer of grease on the upper and lower outer rings;
- Install the top plate of the steering column (see bearing installation in the Steering chapter);
- Adjust the steering (see Steering travel adjustment)
- Install the washers and tighten the steering column ring nuts;

Electric systems

1) Condition of the spark plug check

- Remove the spark plugs (see Replacing spark plugs)
- Visual inspection of the spark plug: replace the spark plug if the middle electrode [A] and side electrodes [B] are corroded or damaged, or if the insulator [C] is broken. Replace the spark plugs if they are dirty or have accumulated carbon residue.
Measure the distance with a feeler gauge [D]
Correct distance: from 0,7 to 0,9 mm
If the gap is not correct, replace the spark plug.



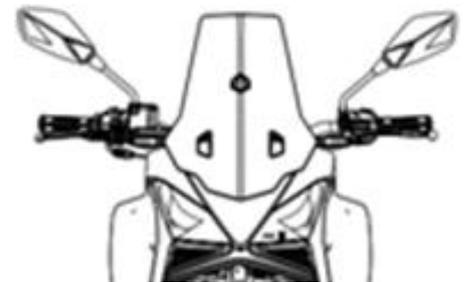
Use standard spark plugs or their equivalent

Spark plugs:CR8EI

2) Lights and switches operation check

A -instrumentation

Turn the ignition key to switch on the dashboard and, using the table below, check that the following lights are correctly switched on:



Engine warning light	Bright
ABS indicator	Bright
Fog light indicator	None
Daytime running light indicator	Bright
Fuel level indicator	Bright
Neutral gear indicator (N)	Bright
EFI fault indicator	None
Oil pressure indicator	Bright



If the light does not turn on, check or replace the following items:

- Battery (see Charge status check in the Electric Systems chapter)
- Bulbs (see Wiring diagram in the Electric Systems chapter) LCD instrument panel
- Instrumentation(see Combined electronic instrumentation check in the Electric systems chapter)
- Neutral indicator (LED) instrumentation (see Combined electronic instrumentation check in the Electric Systems chapter)
- EFI Indicator light control unit (LED) (see Combined electronic instrumentation check in the Electrical system chapter)
- ECU control unit((see ECU power supply check in the Power supply system (EFI) Chapter)
- Main fuse 20A and tail light fuse 10° (see Fuses check in the Electric system chapter)
- Ignition switch (see switch check in the Electric system chapter)
- Neutral switch (see Switch check in the Electric system chapter)



- Wiring (see Wiring check in the Electric system chapter)

Warning:

By turning off the ignition switch, all lights should turn off; if the lights do not turn off, replace the ignition switch.

B - Parking light

By turning on the dashboard [A] the parking light turns on [B].
When starting the motorbike, the parking light and the plate light should turn on.

If the light does not turn on, check or replace the following items:

- Ignition switch or right hand grip switch or control cable (see Switch check in the Electric system chapter)

C - Direction indicators

Insert the direction indicators switch [D] (left or right position)

- Depending on the switch position, the left or right direction indicator [E] (front and rear) should flash.

The direction indicator light [F] should start to flash. If the light does not flash, check or replace the following items:

- Direction indicator body correct operation
- 5A fuse of the direction indicator (see the Electric system fuse check chapter)
- Handlebar switch (see switch check in the Electric system chapter)
- Flasher (see flasher inspection in the electric system chapter)
- Cable (see Wiring inspection in the Electric system chapter)

Turn off the direction indicators:

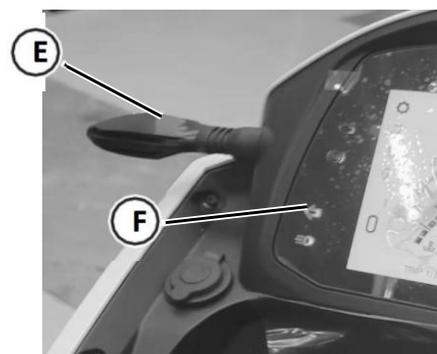
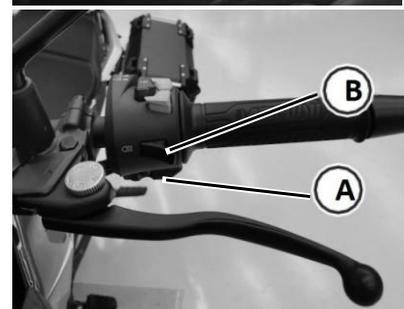
The direction indicators light and the bright indicator [F] should turn off. If the light does not turn off, check or replace the following items:

- Direction indicators switch (see switch check in the Electric system section)
- Flasher (see the Electric system section for the flasher check)

D - Lights

Low beam

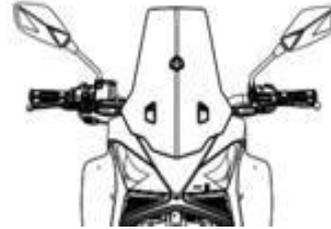
- Press the switch [C] to turn on the low beam
- Start the engine.
- The low beam light should turn on. If the low beam light does not turn on, check or replace the following items.
- Headlight body correct operation
- Headlight relay fuse 10A (see Fuses check in the Electric system chapter)
- Commutator switch (see switches inspection in the electric system chapter) on the respective contacts on the corresponding relay
- Headlight relays (see high beam and low beam relay circuit check in the Electric system chapter)



- Wiring (see the Electric system wiring check Chapter)

High beam

- Press the switch [C] to turn on high beam
- Low beam [A] and high beam [B] should be on.
- The high beam indicator [C] should be on.
- If the high beam headlights and/or the high beam indicator [C] do not turn on, check or replace the following items.
- Correct operation of the headlight body
- Changeover switch (see Switch check in the Electric system chapter)



Shut down the engine with the engine stop switch

- Low and high beam headlights should remain on.
- If the headlight and high beam indicators (indicator lights) shut down, check or replace the following items:
- Headlight relay (see the Electric system chapter for the high and low beam relay circuit check).



Turn the ignition key OFF

- The headlight and high beam indicators(indicator lights)should turn off.
- If they do not turn out, check or replace the following items:
- Headlight relay (see the Electric system chapter for the high and low beam relay circuit check)

Front light beam check

Horizontal adjustment

- If the headlight beam points to one side instead of forward, adjust the horizontal position of the front light.

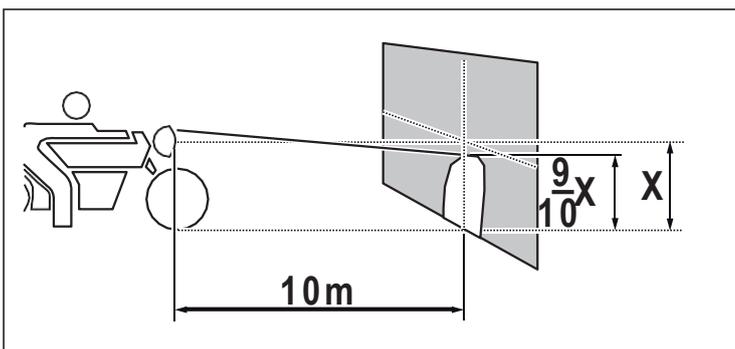
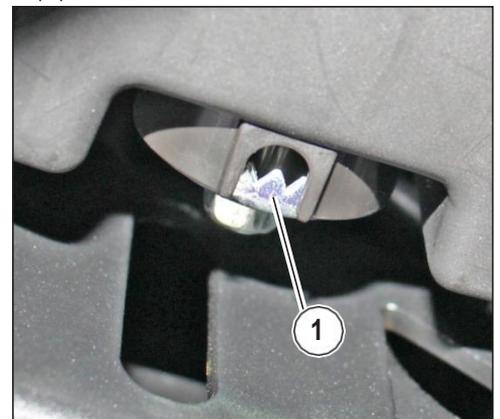
Adjusting the height of the front headlamp

To check if the headlamp angle is correct, with the tires inflated to the correct pressure and someone sitting on the seat, position the motorcycle perfectly perpendicular to its longitudinal axis.

Place the bike facing a wall or screen, 10 m away from it. On the wall/screen mark a horizontal line corresponding to the height of the center of the lamp and a vertical line aligned with the longitudinal axis of the vehicle. Carry out the check in twilight if possible.

When you switch on the high beam the upper cutoff point between the dark zone and the lit zone must be at a height not greater than 9/10ths of the height of the center of the bulb from the ground.

To adjust the beam, operate using a screwdriver on the ring nut (1) located under the light.



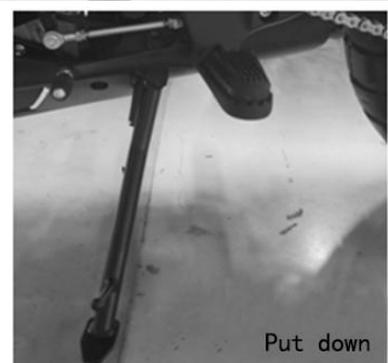
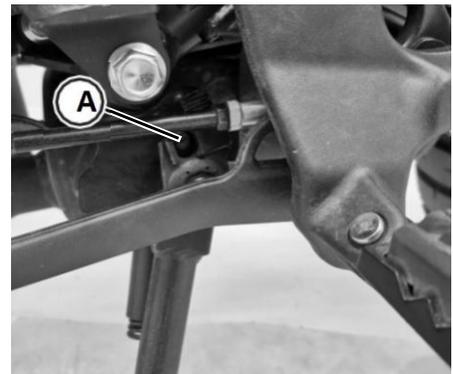
Engine stop switch on the side stand

Side stand	Gear	Clutch lever	Engine start	Engine operation
Raised	Neutral	Released	Normal start	Continuous operation
Raised	Neutral	Pulled	Normal start	Continuous operation
Raised	Engaged	Released	It cannot be started	Stand still
Raised	Engaged	Pulled	Normal start	Continuous operation
Lowered	Neutral	Released	Normal start	Continuous operation
Lowered	Neutral	Pulled	Normal start	Continuous operation
Lowered	Engaged	Released	It cannot be started	Stand still
Lowered	Non-idle	Pulled	It cannot be started	Stand still

If the engine does not operate despite the regular operation of the side stand switch, check or replace the following items.

- Battery (see the charge status check in the Electric system section)
- 20A main fuse (see Fuse check in the Electric system section)
- Fuel pump relay fuse 15A(see fuses check in the Electric system section)
- Ignition switch (see switch check in the Electric system section)
- Side stand switch (see switch check in the Electric system section)
- Engine stop switch (see switch check in the Electric system section)
- Starter button (see switch check in the Electric system section)
- Neutral switch (see switch check in the Electric system section)
- Ignition relay (see Starter system check in the Electric system section)
- Relay box (see Relay circuit check in the Electric system chapter)
- Auxiliary starting circuit relay (see Starting circuit check in the Electric system chapter)
- Cable (see wiring check in the Electric system chapter)

**If all components are in good condition,replace the ECU control unit.
Engine stop switch**



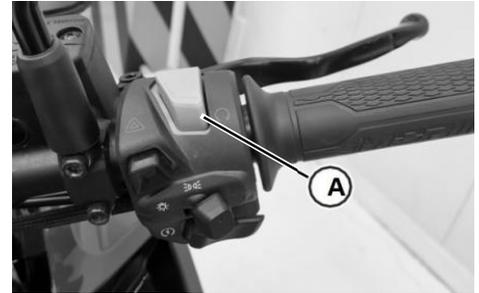
Operation Check

Check 1

- 1) Turn the ignition switch
- 2) Move the gear level to neutral
- 3) Set the engine stop switch to the OFF [A] position.
- 4) Press the start button.
- 5) The engine should not start.

If the engine starts, check or replace the following items:

- Ignition switch (see switch check in the Electrical system section).



Check 2

- 1) Turn the ignition switch.
- 2) Move the gear lever to neutral.
- 3) Set the engine stop switch to the ON position.
- 4) Press the start button and start the engine.
- 5) Set the engine stop switch to the OFF position.
- 6) The engine should stop immediately.

If the engine does not stop, check or replace the following items:

- Engine stop switch (see Check switch in the Electric system chapter)
- If the engine stop switch is in good condition, replace the ECU control unit (see removal/installation of ECU control unit in the Feeding System (EFI) section).

Chassis components lubrication

- Before lubricating the components, clean any rust spots with an anti-rust product and remove any grease, oil, dust or dirt.
- Lubricate the following points with the specified lubricant.



Warning:

Lubricate the components every time the vehicle is used in wet or rainy conditions, or after washing with high-pressure water.

1) Lubricant grease use points:

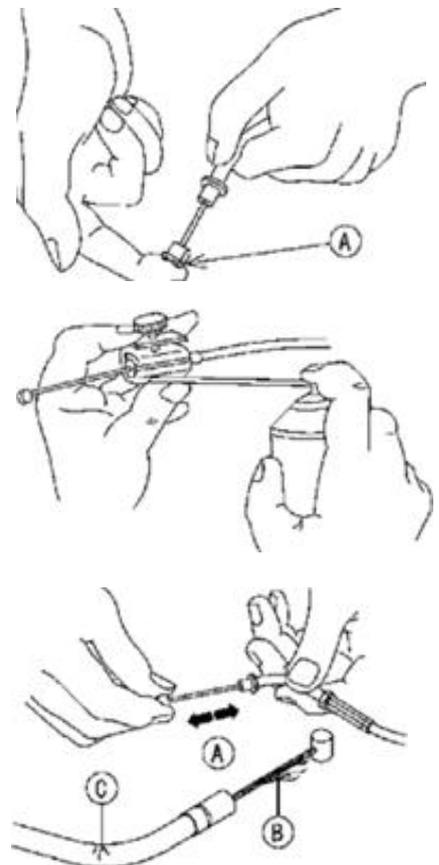
- Brake lever pins
- Brake pedal pin
- Clutch lever pin
- Rear brake pin,
- Side stand pins

2) Lubricant oil use points

- Upper and lower ends of the clutch cable [A].
- Upper and lower ends of the throttle cable

3) Cables: Anti-rust lubricant

- Clutch cable
- Accelerator cable
- Oil will penetrate the cable and sheath.



Note

Cables can be lubricated with commercially available spray lubricants. Disconnect the ends of the cable and the cable should slide freely within the sheath [A].

If the cable does not move freely after lubrication, if the cable is worn [B] or if the sheath is kinked [C], replace it.

Screws, nuts and clamping device check

Check the tightness of the listed screws and nuts. Also check that all cotter pins are in good condition.

Note

When the engine is cold (room temperature), check the tightness of the engine mounts.

If the elements are loose, re-tighten them to the specified torque in accordance with the specified tightening sequence. See the tightening specifications in the relevant section. If there are no specifications in the relevant section, refer to the standard torque table.

For all tightening, loosen 1/2 turn before re-tightening to the specified torque.

1) Engine

- Clutch lever pin nut
- Engine assembly screws and nuts
- Exhaust pipe fixing nuts
- Muffler fixing screws

2) Wheels

- Front axle pin
- Front axle screws
- Rear axle pin nut
- Rear axle pin nut cotter pin

3) Brakes

- Brake lever pin nut
- Brake pedal screw
- Brake lever cotter pin
- Caliper screws
- Front master cylinder screws
- Rear master cylinder screws

4) Suspension

- Front fork screws
- Screws and nuts of the rear suspension
- Rear swing arm nut

5) Steering

- Steering plate screws
- Handlebar screws

6) Other

- Footrest screws
- Front mudguard screws
- Single support screws

Spare parts

Air Cleaner Element replacement

See Cleaning the air cleaner element

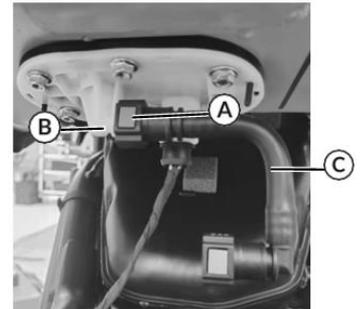
Fuel line replacement

Important

When removing and installing the fuel line fitting, do not apply excessive force to the pump fitting and to the delivery pipe on the throttle body assembly, as this may cause damage to the components.

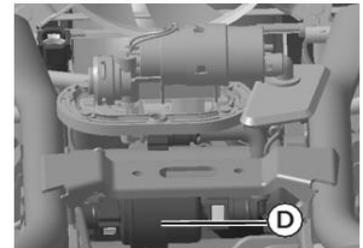
1) Disassembly

- Remove passenger seat, main seat (see seat system removal);
- Remove windshield assy (see windshield removal);
- Remove front cover, left/right faring, fuel tank guard (see outer cover removal);
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System);
- Press the buttons [A] on both sides of the A[C] connector of the fuel outlet pipe assembly by hand, then pull out the fuel pump[B] in parallel, and pull out the other end from the fuel filter[D] interface in parallel;



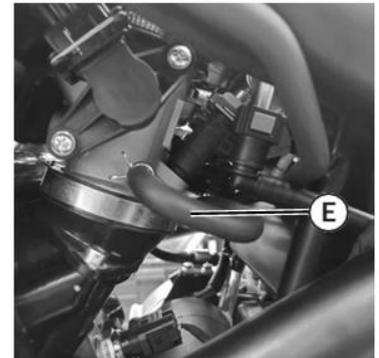
Warning:

Every single fuel leak must be cleaned up promptly.
 Carry out the work away from sources of heat and naked flames.
 When the fuel line is disconnected, fuel leaks out of the pipe and tubing.
 Plug the hose connection with a clean rag to prevent leakage.



2) New fuel lines installation

- Insert the fuel line fitting [A] into the fuel pump fitting [B].
- Press and pull the fuel line fitting back and forth several times and make sure the fitting is secure. If the fitting detaches, re-install the fuel line again.
- Arrange fuel lines (see cables, wires, and hoses in the Accessories section).
- Install the removed parts
- Start the engine and check the fuel line for leaks.



Warning:

Make sure that the fuel line is assembled correctly, otherwise fuel leakage may occur.

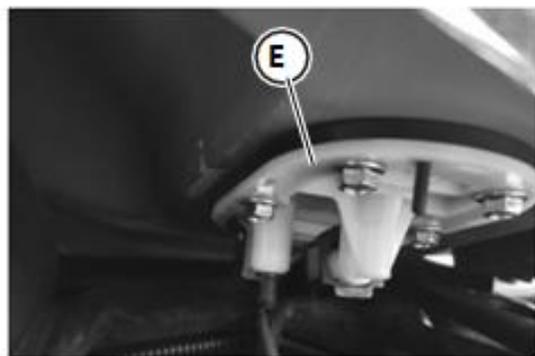
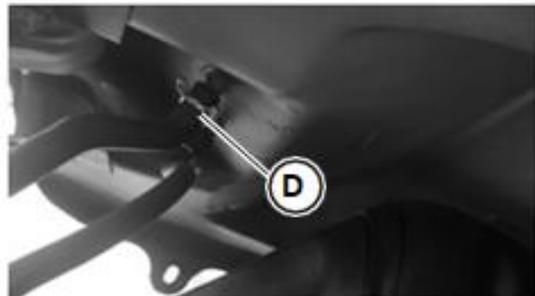
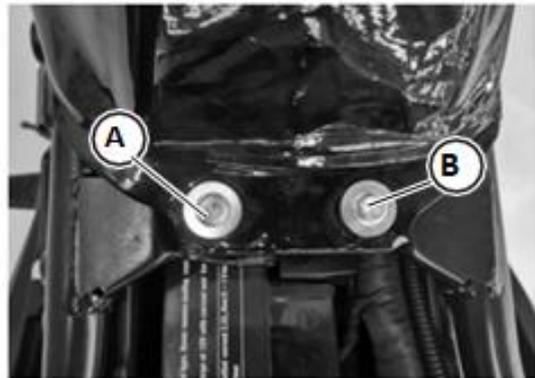
Fuel tank removal

Remove the main seat and passenger seat;
 Remove windshield; (refer to windshield removal/installation)
 Remove the front cover, left/right fairing and fuel tank guard assembly;
 (Refer to front body assembly removal/installation)
 Remove the bolts [A] [B];
 Fuel tank - coupling torque: 9 N m

Loosen the fuel sensor connector [D];
 Loosen the fuel pump connector [E];
 Remove the high pressure oil pipe;
 Gently pull out the fuel tank [C] backwards;

Fuel tank installation

The installation method should be operated in reverse order;



Coolant replacement



Warning:

When the engine is hot, do not remove the radiator cap or attempt to change the coolant in order to avoid burns. Allow the engine to cool before proceeding.



Warning:

When tyres become contaminated with coolant, there is a risk of them becoming oily and slippery and causing an accident. If coolant gets on the chassis, on the engine or on other painted parts, clean or wash off immediately.

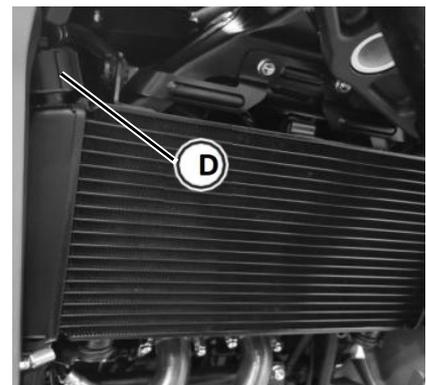
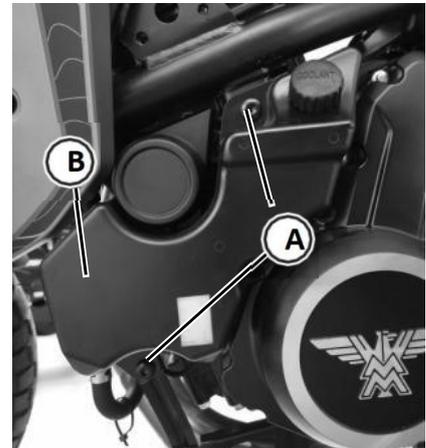
Coolant is harmful to the body and it can be extremely hazardous and fatal if swallowed.

A) Coolant removal

- Remove the right-hand cover(see Cover removal in the Chassis chapter)
- Remove the lower plate (see Removing the lower plate in the Chassis chapter)
- Remove the screws of the expansion tank cover[A].
- Remove expansion tank[B]
- Place the expansion tank horizontally.
- Place a container under the pump discharge screw and then remove it [C].
- Remove the radiator cap[D].Coolant will escape from the radiator and from the engine.
- Turn the expansion tank[B]upside down,remove the cap and pour the coolant into a suitable container.
- Tighten the drain screws, making sure to replace the washers.

Expansion tank cover screw - tightening torque: 6,0Nm

Expansion tank fixing screw - tightening torque: 9,0Nm



B) Adding coolant

For the coolant to be used, see: Chapter 1 - oils and fluids section

Capacity: 1.6L

Fill the radiator with coolant [D].

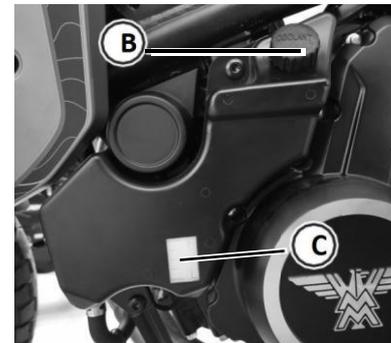
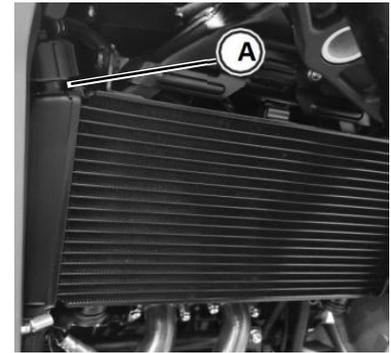


Important

Pour the coolant slowly so as not to create air bubbles in the engine and radiator.

Check the cooling system for leaks. Tap the radiator hoses to remove any air bubbles inside and top up.

- Fill the secondary tank with coolant up to the "F" level(full)visible on the indicator [C] and close the cap [B] .
- Start the engine and warm it up completely until the radiator fan starts,then, at that point, stop the engine. After the engine has cooled down, check the coolant level in the expansion tank. If the coolant level is below the "L" level, add coolant up to the "F" mark.



Warning:

Do not add coolant above the "F" mark.

Engine oil replacement

- After warming up the engine, place the motorbike in an upright position;

Warning:
Pay attention, hot oil.

- Unscrew the oil filler cap[A];
- Place a collection container under the engine;
- Drain the oil by unscrewing the oil drain screw[B]. Oil will also flow out of the oil filter after removing it. (See Oil Filter replacement).
- Replace the oil drain screw washer with a new one[C].
- Tighten the oil drain screw

Oil drain screw - tightening torque: 25Nm

Fill with the specified type and quantity of oil

Recommended engine oil: 15W40-SN fully synthetic

Capacity

- 2.0L (if the oil filter is not replaced)
- 2.2L (if the oil filter is replaced)
- 2.6L (if the engine is completely dry)

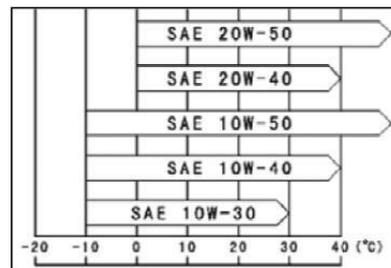
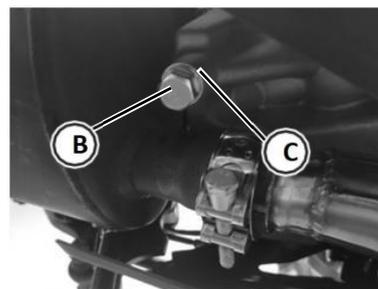
Note

Although SAE 15W-40 oil is recommended in most cases, it may be necessary to change the oil viscosity to suit the climatic conditions of different regions.

Check the oil level (see the oil level in the engine lubrication system chapter).

Warning:

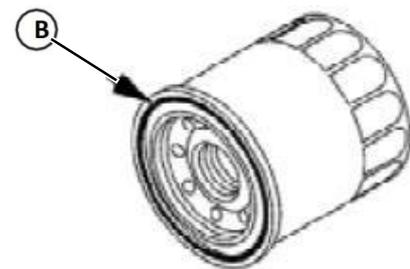
Waste engine oil is extremely harmful and damaging.
Do not disperse into the environment. Do not contaminate the soil or pour into drains, sewers or water systems. Do not ingest. Dispose of oil only at authorised recovery centres.



Oil filter replacement

Special tools: Oil filter spanner

- Drain the engine oil
- Remove the oil filter and replace it with a new one.
- Lubricate the seal [B] with engine oil before the assemblage
- Tighten the oil filter
- Oil filter - tightening torque: 17Nm
- Fill with the specified type and quantity of oil (see Engine oil change).



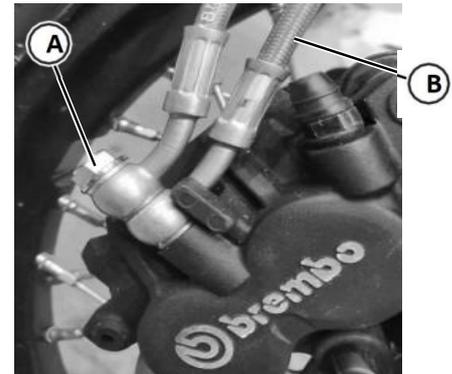
Brake hoses replacement



Important

Brake fluid can quickly damage painted plastic surfaces, clean up the leakage thoroughly and immediately.

- Remove the screws[A].
- When removing the brake hoses, make sure not to spill any more brake fluid on painted or plastic parts.
- When removing the brake hose [B], temporarily place the end of the hose up to minimize brake fluid spillage.
- Clean up any spilled brake fluid immediately.



Warning:

After assembling the new hoses, bleed the brake system as indicated in the "Brake fluid replacement" paragraph.

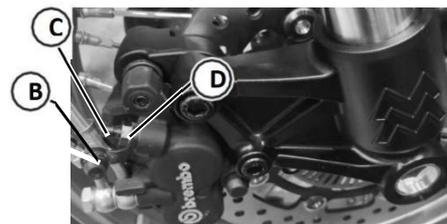
Brake fluid replacement

Note

Changing the rear brake fluid is the same procedure as changing the front brake fluid.

The procedure for changing the front brake fluid is as follows:

- Place the motorbike horizontally in an upright position
- Remove the oil reservoir cover [A] and the spacer.
- Remove the bleed valve rubber plug [B] from the caliper.
- Connect a clean plastic tube to the bleed valve[C], placing the other end in a container.
- Loosen the bleed valve nut[D].
- Fill the oil reservoir with new brake fluid.
- Repeat the filling with new brake fluid until the new brake fluid comes out of the pipe or until the colour of the fluid changes.
- Open the bleed valve[C].
- Pull the brake lever and keep it pulled.
- Close the bleed valve[C].
- Release the brake.



Warning:

During the replacement operations, the brake fluid level must be checked frequently and continuously topped up. If the brake fluid in the reservoir becomes depleted during the operation, the system will intake air from the master cylinder and bleeding will be necessary.

Re-assembly

Front brake: repeat the previous steps for the other calipers.

- Remove the plastic tube.
- Install the spacer and oil reservoir cover.
- Tighten.
- Install the oil reservoir cover
- Tighten the screws until they are firmly tightened.
- After replacing the brake fluid, check that the brakes are working and that there is no stalling or brake fluid leakage.

Front brake oil reservoir tightening torque: 1.0Nm

Exhaust valve tightening torque: 7.8Nm

Note

Air must be removed from the brake system.

Spark plugs replacement

1) Disassembly

- Remove ignition coils(see Removing the ignition coils in the Electric system chapter)
- Loosen the ignition coil lock plate using the wrench [B] and turn it.
- Removing the ignition coil
- Use spark plug spanner [A] to remove spark plug

2) Re-assembly

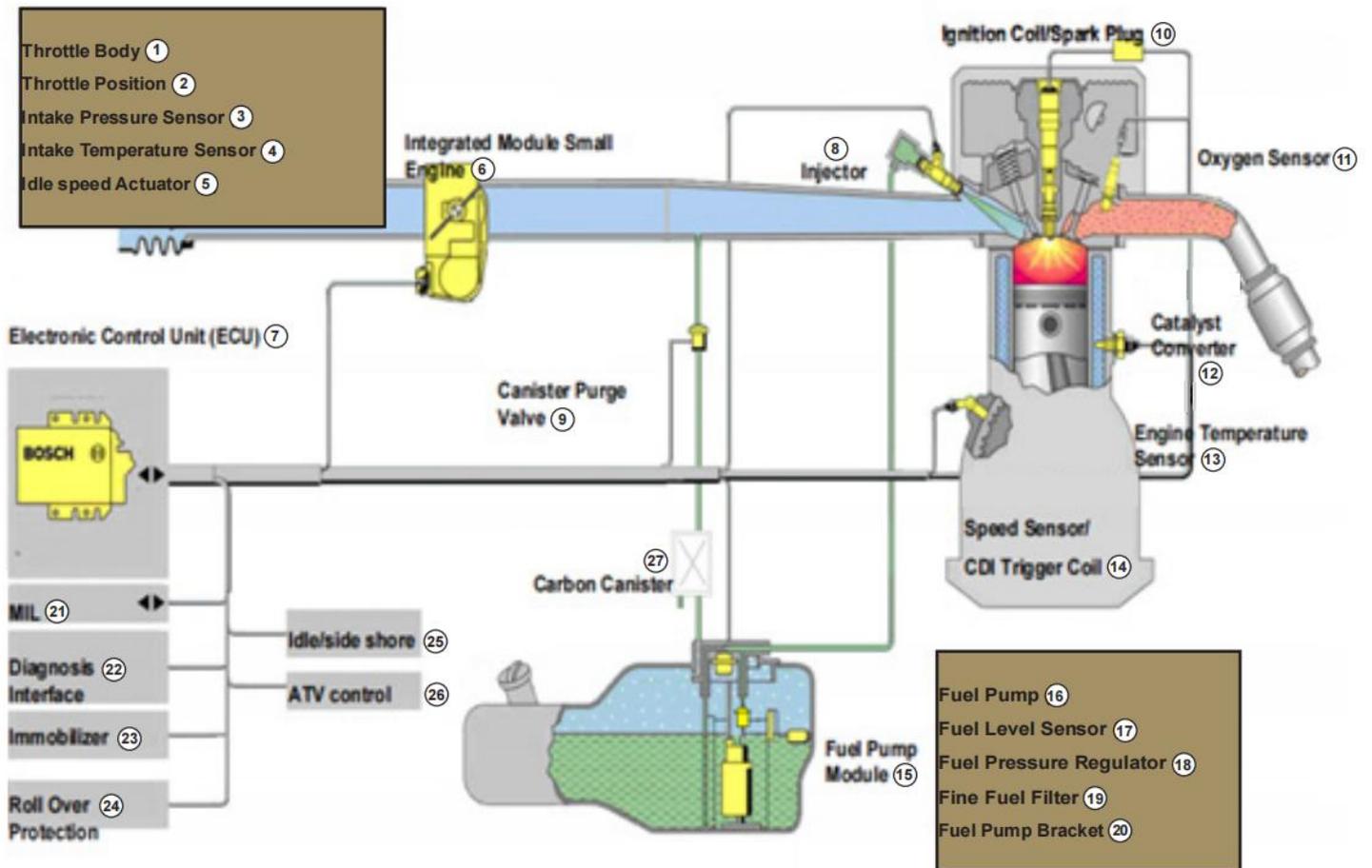
- Insert the spark plug into the spark plug socket and tighten it with the spark plug spanner.
- Spark plug specifications: CR8EI
- Spark plug tightening torque: 15Nm
- Ignition coil (see Ignition coil and spark plug cap assemblage in the Electric systems chapter)



Chapter 4

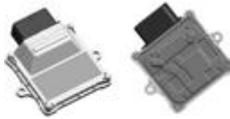
EFI system



EFI systems diagram


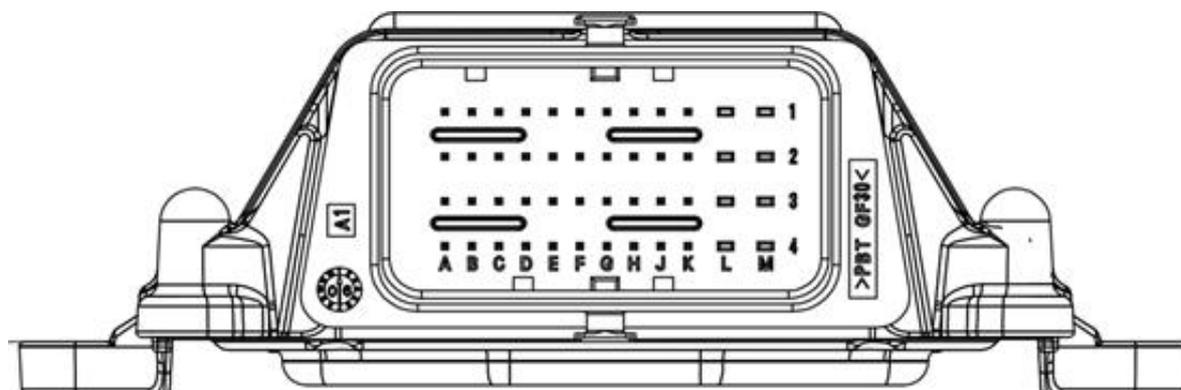
- 1 - Throttle Body
- 2 - Throttle Position
- 3 - Intake Pressure Sensor
- 4 - Intake Temperature Sensor
- 5 - Idle speed Actuator
- 6 - Integrated Module Small Engine
- 7 - Electronic Control ECU
- 8 - Injector
- 9 - Canister Purge Valve
- 10 - Ignition Coil/Spark Plug
- 11 - Oxygen Sensor
- 12 - Catalyst Converter
- 13 - Engine Temperature Sensor
- 14 - Speed Sensor/Cdi Trigger Coil
- 15 - Fuel Pump Module
- 16 - Fuel Pump
- 17 - Fuel Level Sensor
- 18 - Fuel Pressure Regulator
- 19 - Fine Fuel Filter
- 20 - Fuel Pump Bracket
- 21 - MIL
- 22 - Diagnosis Interface
- 23 - Immobilizer
- 24 - Roll Over Protection
- 25 - Idle/side Shore
- 26 - ATV control
- 27 - Carbon Canister

Base information

	Name	Installation requirements	Image	Observations
1	ECU Electronic Control Unit	The electronic control unit must be connected with M6 screws and tightened at a torque of $4Nm \pm 0,2 Nm$. The assembly surface must be flat to avoid that external strains on the control unit cause bending of the control board. The control unit operates correctly at temperatures included between $-30^{\circ}C$ and $60^{\circ}C$.		Different types of complete engines and vehicles use different calibration procedures. Their control units cannot be inter- changed and the corresponding control unit must be used.
2	Injectors	Apply a small quantity of lubricant to the bottom side of the O-ring and in the seat of the injector during installation. It is recommended to use light mineral oil ISO 10 or its equivalent. Prohibited: The immersion of the nozzle end into the lubricant may cause the clogging of the injection holes. Operating temperature: $- 40^{\circ}C - 70^{\circ}C$.		The selection is based on the effective requirements of the engine; X-CAPE uses injectors Bosch F01R00M13 9.
3	Throttle body	Must be installed so as to ensure waterproof- ness. Use specific products to clean the throttle body.		The throttle body is selected based on the type of engine and on engine displacement
4	Manifold	8 - 12 Nm tightening torque. Installation must be sealed hermetically.		
5	Oxygen sensor	Tightening torque: 40 Nm. Operating temperature interval: $350 - 850^{\circ}C$. Thread M18*15.		Oxygen sensor X-CAPE Bosch LSF4 type

	Name	Installation requirements	Image	Observations
6	High voltage group	The inductive sensors, especially the speed sensors of the VR type and the sensors of the camshaft, should be kept as far as possible. A minimum distance of 150 mm must be maintained between the high voltage wiring harness and the sensor of the VR type. Avoid contact of the high voltage wiring harness with the speed sensor cable, as a potential voltage up to 200V is present between the high voltage package group and the engine, which may interfere with the sensor signal.		
7	Fuel pump group	Operating voltage: from 10V to 14V. The fuel pump dry rotation (not immersed) may cause damages to the pump itself.		
8	Water Temperature sensor	Normal operating temperature interval: from -40 to 135°C. Required assembly torque: 12 Nm.		
9	Fuel filter	The direction of the fuel is indicated by the arrow stamped on the filter.		
10	Canister	Mount firmly, so that it does not move during the use of the motorcycle; connect the "TANK" end to the tank and the "PURGE" end to the connection pipe of the throttle body group; mount in vertical direction with the exhaust hole facing downward.		
11	Anti-tilt sensors	Mounted on the vehicle in the direction indicated by the "up" mark located on the sensor.		

Wiring diagram



ECU pin

Reference	Function	Reference	Function
M1	Cylinder 2 oxygen sensor heating	D2	
L1	Cylinder 1 oxygen sensor heating	C2	Ignition relay
M2	Ignition1	B2	Phase A of the stepper motor
L2		A2	Phase B of the stepper motor
M3	Ignition site	K3	MIL light indicator
L3	Fuel tank check valves	J3	5V1 output
M4	Ignition2	H3	
L4	Non-continuous feeding UBR1	G3	Ignition switch KL15
K1	Intake pressure sensor 1 (DS)	F3	Continuous feeding (UBD)
J1	Sensor1 mass	E3	K line
H1	Intake air temperature sensor (TANS)	D3	Neutral switch
G1	Butterfly valve position sensor (DKG)	C3	Diagnosis of ignition1
F1	Engine temperature sensor (TMOT)	B3	Clutch switches
E1	Main relay	A3	Exhaust switches
D1	Low CAN	K4	Comfort/sport mode switch
C1	High CAN	J4	Engine speed output
B1	Phase D of the stepper motor	H4	Speed sensors

Reference	Function	Reference	Function
A1	Phase C of the stepper motor	G4	Wheel B speed sensor (DGB)
K2	Oxygen1 sensor signal	F4	Wheel A speed sensor (DGA)
J2	Oxygen2 sensor signal	E4	Headlights relay
H2	Diagnosis of ignition2	D4	Cooling fan relay
G2		C4	Oil pump relay
F2	Lateral support switch	B4	Oil2 spraying
E2		A4	Oil1 spraying

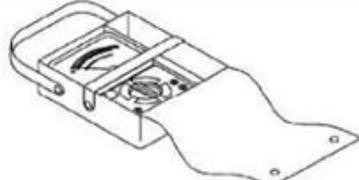
Individual sensors connectors

Oxygen sensor	Injectors	High voltage connectors	Stepper motors inactive
<p>Second cylinder First cylinder</p>	<p>Second cylinder First cylinder</p>	<p>Second cylinder First cylinder</p>	<p>B1 A1 A2 B2</p>
Intake temperature/pressure sensor	Butterfly valve position sensor	Water temperature sensor	Fuel tank control valves
<p>J1 H1 J3 K1</p>	<p>J1 J3 G1</p>	<p>J1 F1</p>	<p>L4 L3</p>
Tilt sensor	Kickstand switch	Fuel pump	
<p>J1 A3 Black/Yellow</p>	<p>F2 Mass</p>	<p>Fuel pump</p>	<p>Fuel pump positive 12V L4 C4 Fuel pump relay</p>
Fan		Start	
<p>Fan positive 12V L4 D4 Fan relay</p>	<p>Fan positive Mass Fan</p>	<p>Relay ignition check 12V Start switch output 12V C2 Auxiliary ignition relay</p>	<p>Relay ignition check Mass Relay Black/purple left cable Red right cable Ignition relay</p>

EFI parameters table

Type	Standard
Electronic fuel injection systems	
Speed at idle	1450 5±10 rev/min (rpm)
Throttle assembly	
Type	Dual cable
Opening	Φ38 mm
ECU (electronic control unit):	
Production	UAES
Type	Digital accumulation type with integrated circuit for ignition and epoxy sealed
Available engine speed	100 ~11 000 rev/min (rpm)
Fuel pressure (high pressure line):	
Injection pressure	330 kPa
Fuel pumps:	
Type	Incorporated clutch pumps
Spill volume	60 ml or more / 3 seconds
Fuel injector:	
Type	F01R00M139
Type of injector	4-hole jet
Resistances	Approximately 12 Ω at 20 °C (68 °F)
Position sensor of the butterfly valve	Not adjustable and not removable
Input voltage	From 4,75 to 5,25 V DC on conductors Lg/Y and Gr/R
Output voltage with throttle at idle speed	From 0,34 to 0,64V DC on conductors Lg/Y and Br/R
Output voltage with throttle completely open	Higher or equal to 4 V DC for cables Lg /Y and Br/R
Intake air temperature sensor:	
Resistances	See the chapter on electric injection systems Intake temperature sensors
Output voltage in the electronic control unit of the ECU	Approximately 2,5 ~3,50 V at 20°C
Water temperature sensor:	
Resistances	See the chapter on Electric systems
Output voltage in the electronic control unit of the ECU	Approximately 2,5 a 3,5 V at 20°C
Speed sensor:	
Input voltage of the speed sensor	Approximately 9 ~11 V DC when the ignition switch is on
Output voltage of the speed sensor	Approximately 0,05 at 1 V DC when ignition is on and 0 km/h
Oscillation sensors	
Test methods	Resistance test methods
Detection angle	55-75° inclination on each side
Oxygen sensors	
Output voltage (high)	0,7V or more
Output voltage (low)	0.2V or less
Gas command and throttle cable Quantity of free travel of the gas command	2~3mm (0.08~0.12in)

Maintenance tools

Oil manometer	Pin adapter
	
Three-way fitting	Multimeter
	

Instructions for maintenance

OBD is the abbreviation of On-Board Diagnostic. When a malfunction of the EFI system occurs, the malfunction indicator light (MIL) lights up, remembering the user to repair or remove the malfunction in time. At the same time, the OBD system memorizes the information on the malfunction in its memory, which can be read in the form of fault codes through standard diagnostic tools and diagnostic interfaces. On the basis of the fault codes, the service personnel is able to quickly and accurately determine the nature and position of the malfunction.

Special note: Please use original components, normal operation of the EFI system cannot be ensured otherwise. Some EFI components are similar as regards shape and assembly dimensions, but they possess entirely different performance parameters.



Notes on the maintenance process (important elements, read carefully)

- 1) Always switch off the key block when the connector is dismantled to avoid the risk of damaging the electric components.
- 2) Feeding pressure of fuel of the EFI system is high (330KPa/3,3bar) and all the fuel pipes are resistant to high pressure; the fuel pipe also maintains a high pressure for a considerable period of time after the engine has stopped working; for this reason, the fuel pipes should not be dismantled during maintenance, and the fuel system should be discharged from pressure before dismantling the fuel pipes.
 - The vehicle must be in neutral gear.
 - Disconnect the fuel pump connector from the wiring harness of the vehicle.
 - Start the engine until it stops naturally; repeat engine start up 2 or 3 times to ensure that pressure discharge of the circuit is complete.
 - After completing the operation, the fuel pipe must not be removed and the wiring harness plug of the pump group must be reconnected after the pipe has been reassembled.
- 3) Do not energize the fuel pump after having removed it from the tank to avoid that electric sparks may cause a fire. Do not test the fuel pump dry or in water.
- 4) Idling speed adjustment is entirely borne by the EFI system program and does not require manual adjustment. The throttle body adjustment screw is set up at the factory and does not let the user change its initial position as desired.
- 5) This EFI system utilizes a 12V battery, do not use a different 12V battery as source of power.
- 6) Do not reverse the positive and negative terminals of the battery, since that may damage the ECU control unit, and do not put the positive terminal (+) of the battery directly on the ground.
- 7) Do not disconnect the battery connection or any other electrical connection while ignition is engaged or while the engine is running.
- 8) Do not switch on the ignition key when any electric component of the EFI system is disconnected to avoid that the ECU memorizes the error codes.

- 9) When the components of the EFI system are disconnected, switch off the ignition and disconnect the negative terminal (-) of the battery. Do not pull the wires, only the connectors. Ensure that all the equipment of the EFI system is connected safely before starting the engine instead.

Notes on the measures for maintenance operations

1. When the feeding system is disconnected, residual pressure on the feeding line may allow for fuel injection. Cover the pipe connection with a clean cloth to avoid injection of the fuel pipe.
2. Never activate ignition when the feeding system is disconnected. The fuel pump will work and fuel will splash out of the pipe otherwise.
3. Do not make the fuel pump work if there is not fuel in the tank.
4. Before removing the components of the feeding system, blow compressed air on the external surfaces of the components.
5. To prevent corrosion of the feeding system and the blockage of fuel, do not use antifreeze chemical substances in the fuel.
6. To maintain the correct air-fuel ratio, the EFI system must not show air intake leakage.

Repair of the EFI system components

Throttle maintenance

1) Removal of the butterfly valve position sensor



Warning

Do not remove nor adjust the throttle position sensor [A] since it has been adjusted and set accurately before leaving the factory.



Warning

Do not let the throttle body group fall, especially on hard surfaces. The impact caused by the fall may damage the throttle position sensor otherwise.

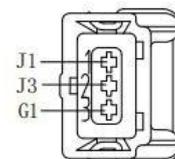
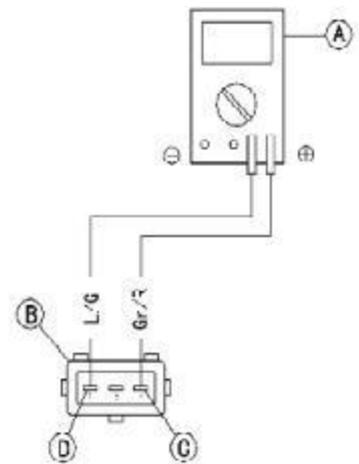
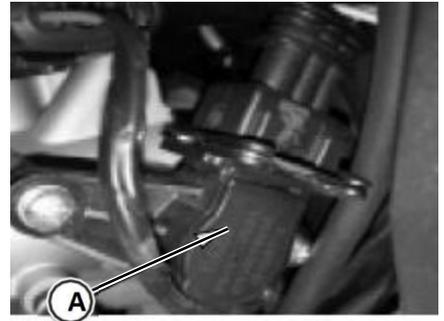
Throttle position sensor input voltage check



Warning

Ensure the battery is fully charged.

- Switch off the ignition key.
- Disconnect the connector of the throttle sensor and connect the wiring harness adapter[A].
- Connect a digital multimeter to the wiring harness adapter cable.
- Stop the engine and quantify the input voltage of the sensor.
- Switch on the ignition key.
- Connect the adapter
 - Multimeter (+) → grey/red (J3)
 - Multimeter (-) → light green/yellow(J1)



Standard: 4 . From 7.5 to 5 . 2.5 V	D C (connector disconnected) D C
Standard: 4 . From 0 to 4 . 5 V	(connector connected)

- Switch off the ignition key.
-
- If input voltage is correct, check output voltage of the sensor.
- If input voltage is lower than the standard, remove the ECU control unit and check the wiring harness connectors

Throttle repair

Check of line continuity of the input voltage section

- Switch off the ignition key.
- Connect the ECU connector and the throttle sensor connector.
- Test the continuity of each of the two 2 wires with a multimeter.

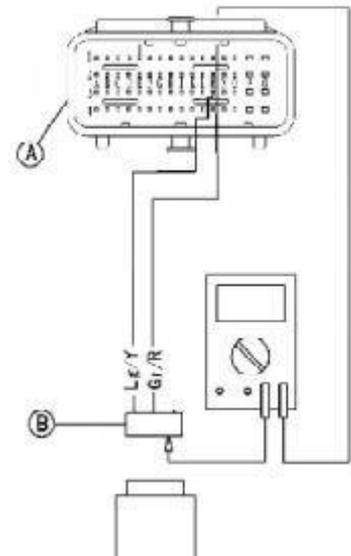
ECU connector [A] ↔ Throttle connector [B]

Grey/Red throttle connector ↔ ECU 30 (J3) pin

Light green/yellow throttle connector ↔ ECU 10 (J1) pin

Standard: 0 Ω

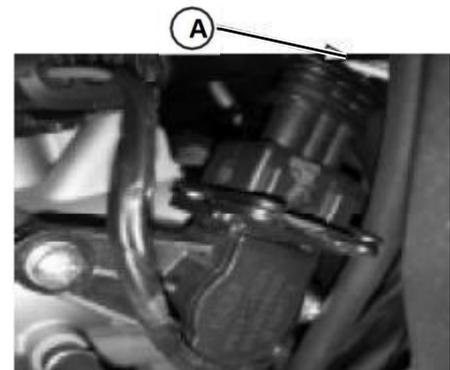
- If the wiring harness status is correct, check the earth and feeding of the ECU control unit (see ECU control unit feeding check).



Throttle position sensor output voltage check

As for the input voltage check, measure the output voltage of the throttle position sensor keeping in mind what follows.

- Disconnect the wiring harness adapter [A].
- Start the engine and fully heat it (water temperature higher than 80°C).
- Check idling speed to ensure that the throttle opening is correct and that the throttle idling speed adjustment screw has not been adjusted. Standard speed at idling speed: 1450±100 r/min
- If idling speed does not fall within the specified interval, check the throttle cable and the EFI system.
- Switch off the ignition switch.
- Measure the sensor output voltage with the engine not running and the connector connected.
- Switch on ignition



Output voltage of the throttle sensor connected to the adapter

Multimeter (+) → brown/red cable (sensor output)

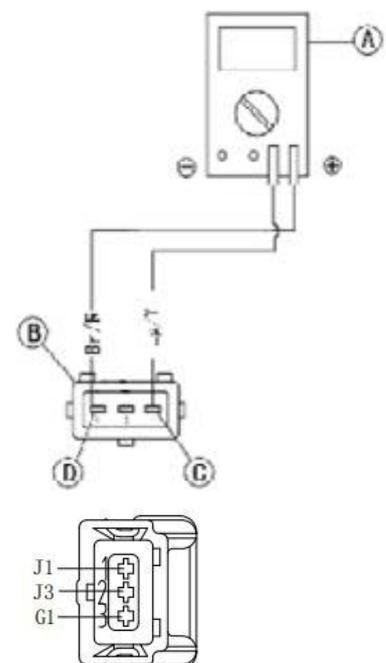
Multimeter (+) → light green/yellow cable (sensor earth)

Throttle idling speed opening: 0.3 4 at 0 . 64 V D C

Fully open throttle: ≥ 4 V DC

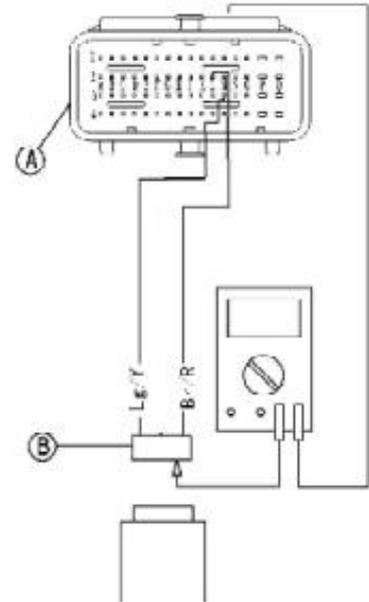
Standard.

- If the output voltage does not fall within the standard interval, check the throttle position sensor resistance.
- If the output voltage is correct, check the wiring harness continuity.



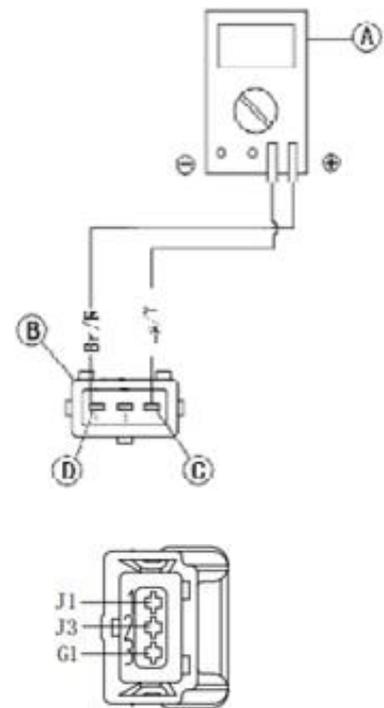
Wiring hardness of the output voltage section continuity check

- Switch off the ignition switch.
- Disconnect the ECU connector and the throttle sensor connector.
- Test continuity of each one of the 2 wires with a multimeter.
ECU connector [A] ↔ Throttle connector [B]
Brown/red throttle connector ↔ ECU 12 (G1) pin
Light green/yellow throttle connector ↔ ECU 10 (J1) pin
Standard: 0 Ω
- If the wiring hardness status is correct, check the earth power supply of the ECU control unit (see ECU control unit feeding check).



Throttle position sensor input resistance check

- Switch off the ignition switch.
- Disconnect the throttle position sensor connector.
- Connect the multimeter [A] to the throttle position sensor [B].
- Measure the throttle position sensor resistance.
Throttle sensor resistance
Connection: light green/yellow [C] ↔ brown/red wire [D] Standard : 1 . 1 ~ 1 . 4 k Ω (20 °C)
- If the value does not fall within the standard interval, replace the throttle body group.
- If the value falls with in the interval but the problem persists, replace the ECU control unit (see ECU control unit removal/installation)



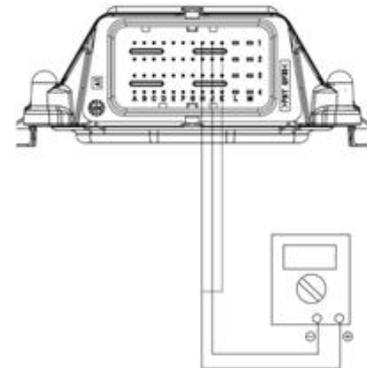
Repair of the inlet air pressure and temperature sensor

Note

Do not make the sensor fall, especially on hard surfaces.
The impact caused by the fall may damage it otherwise.

1) Intake air temperature, pressure sensor output voltage check

- Make sure the battery is fully charged.
- Output voltage changes depending on intake air temperature.
- Do not disconnect the ECU control unit connector.
- Connect a multimeter to the ECU connector using a pin adapter.
- Measure output voltage of the sensor when the engine is stationary and the connector is connected.
- Switch on the ignition key.



Multimeter (+) → white/brown wire (pin 11 of the ECU (H1))

Multimeter (-) → light green/yellow wire (pin10 ECU (J1))

Standard: output voltage at the intake air temperature of 20 °C.

Approximately 2,5 V at 3,5 V

Output voltage connection (dotted line)

Multimeter (+) → pink/black wire (pin9 ECU (K1))

Multimeter (-) → light green/yellow wire (pin10 ECU (J1))

Standard: output voltage at standard atmospheric pressure.

Approximately 4V at4.7V

- Switch off the ignition key.
- If the output voltage does not fall within the standard range, fuel tank and check the wiring hardness.
- If output voltage falls within the standard range, check the earth of the ECU control unit and power supply (see ECU control unit feeding check).
- If the wiring hardness is in good conditions, check the sensor resistance.

2) Check the resistance of the intake air temperature sensor

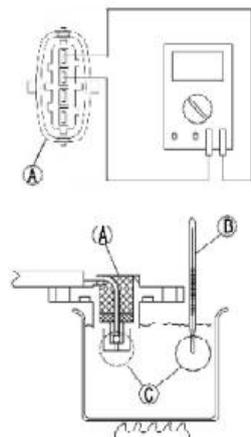
●Remove the intake air temperature sensor.

• The sensor [A] is suspended in the oil container and the thermistor position is submerged.

●The floating thermometer [B] and the thermistor position [C] are basically at the same depth.

○ Attention

- Sensors and thermometers must not touch the side walls or bottom of the container.
- Place the container at a heat source, and gradually increase the oil temperature while gently stirring the oil to heat it evenly.
- Use a multimeter to measure the resistance of the intake air temperature sensor.



Intake air temperature sensor resistance (see below)

Criteria.

2416~2583 Ω (20°C)

273. 2~285. 8 Ω (85°C)

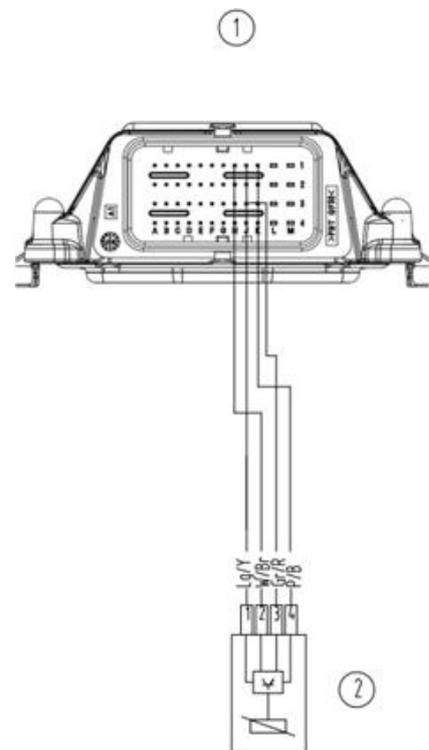
If the measured value does not fall within the interval, replace the sensor.

If the measured value falls within the interval, replace the ECU control unit.

Temperature (°C)	Resistance minimum value (OHM)	Standard resistance (OHM)	Maximum resistance (OHM)
-40±1	42661	48153	54224
-35±1	31810	35763	40118
-30±1	23970	26885	30015
-25±1	18258	20376	22695
-20±1	14039	15614	17333
-15±1	10895	12078	13365
-10±1	8529.5	9428.0	10399
-05±1	6733.5	7419.1	8161.4
0±1	5358.1	5886.7	6457.8
5±1	4295.9	4706.9	5149.8
10±1	3469.2	3791.1	4137.3
15±1	2820.9	3074.9	3347.5
20±1	2308.9	2510.6	3347.5
25±1	1904.0	2062.9	2235.6
30±1	1586.1	1715.4	1853.1
35±1	1326.3	1431.8	1544.1
40±1	1113.0	1199.6	1291.5
45±1	937.41	1008.6	1081.2
50±1	792.27	851.10	913.15
55±1	671.90	720.65	913.15
60±1	571.72	612.27	655.16
65±1	488.07	521.91	557.67
70±1	417.98	446.33	557.67
75±1	359.08	382.89	557.67
80±1	309.41	329.48	350.61
85±1	267.40	284.06	350.61
90±1	231.76	246.15	261.27
95±1	201.44	213.68	226.53
100±1	175.52	186.00	196.95
105±1	153.18	162.35	171.88
110±1	134.01	142.08	171.88
115±1	117.59	124.66	132.00
120±1	103.12	109.65	116.12
125±1	91.80	96.68	102.39
130±1	30.58	88.45	90.51
130±1	30.58	88.45	90.51

Intake air pressure and temperature sensor circuit

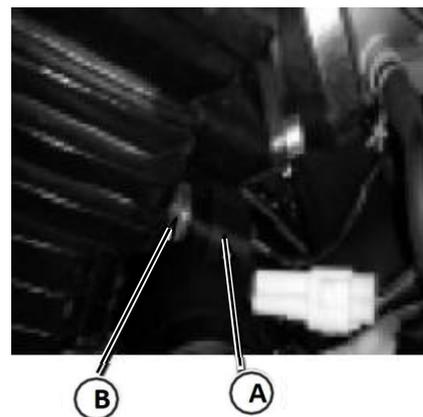
- 1 ECU control unit
- 2 Intake air pressure and temperature sensors



Removal/installation of the water temperature sensor

1) Removal of the water temperature sensor

- Unload the coolant (see Coolant change in the chapter on periodic maintenance).
- Disconnect the sensor connector [A] and unscrew the water temperature sensor [B].
- Tightening torque: 12Nm
- Replace the O-ring of the water temperature sensor with a new one and grease it.
- When the cooling system is filled, ensure that the circuit has been emptied of air (see coolant change in the regular maintenance chapter).



2) Water temperature sensor output voltage check

- Make sure the battery is fully charged.
- Remove the ECU control unit (see ECU control unit removal).
- Do not disconnect the connector.
- Connect the multimeter [A] to the ECU control unit connector[B].
- With the engine not running and the connector connected, measure the sensor output voltage.
- Switch on the ignition key.

Water temperature sensor output voltage:

Multimeter (+) → Pink/white wire (ECU pin 13 (F1))

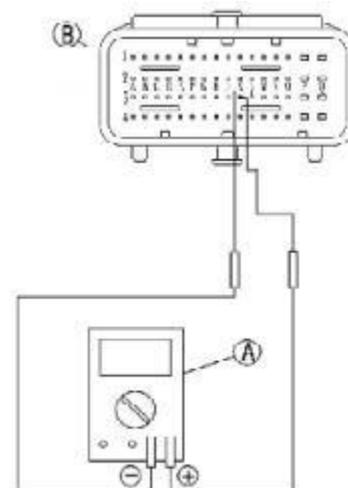
Multimeter (-) → light green/yellow wire (pin10 ECU (J1))

Standard : 2.5 at 3.5 V (20 °C)

Note

The output voltage varies depending on the coolant temperature in the engine.

- Switch off the ignition key.
- If the output voltage falls within the standard range, check the earth and feeding of the ECU control unit (see ECU control unit feeding check).
- If the output voltage does not fall within the standard range, check the wiring hardness. If the output voltage is 4,8 V, ECU control unit is OK.
- If the wiring hardness is in good conditions, check the resistance of the water temperature sensor.
- Apply silicone sealant to the gaskets of the connector to waterproof them.



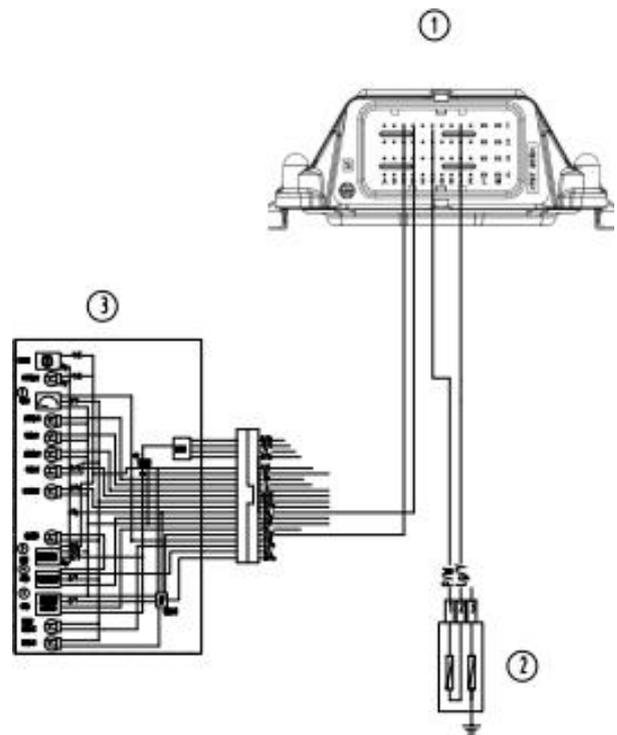
Water temperature sensor circuit

- 1) ECU control unit
- 2) Water temperature sensor
- 3) Tools group

Water temperature sensor resistance check

Remove the water temperature sensor (see the water temperature sensor Removal/installation).

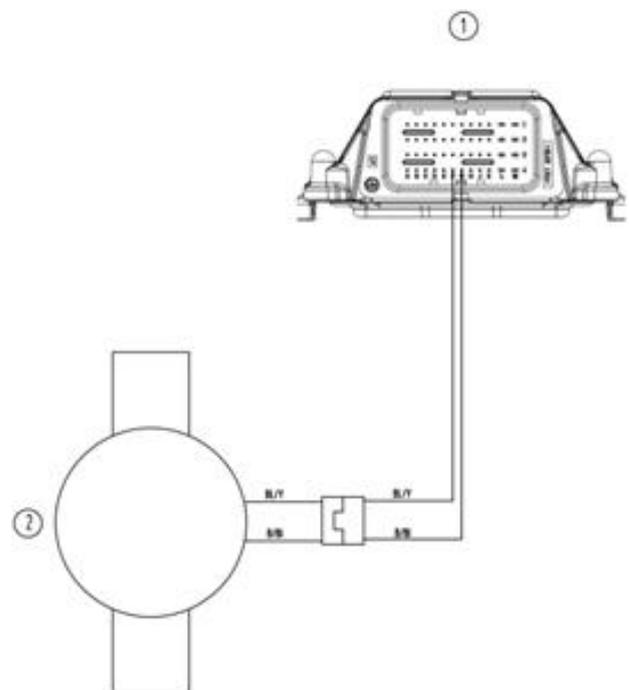
See the water temperature sensor check in the Electric system chapter.



Repair of the trigger

- 1) Trigger Removal /installation
See the trigger Removal / installation in the chapter on electric systems.
- 2) Trigger check
 - The trigger is not powered and does not signal when the engine is not running.
 - Make the engine operate manually and measure the peak voltage of the trigger (see Trigger check in the Electric system chapter) to check the sensor.
 - Check continuity of the wiring hardness according to the following diagram.

- 1) ECU
- 2) Trigger



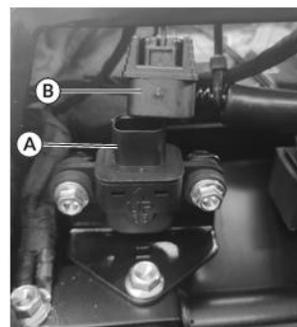
Removal of the fall sensor

Important

Do not let the sensor fall, especially on hard surfaces, it could get damaged otherwise.

1) Removal of the fall sensor

- Remove passenger seat (see seat assy removal/installation)
- Disconnect the connector [B] and remove the sensor [A]
- During re-installation, the sensor must be positioned in the indicated direction.

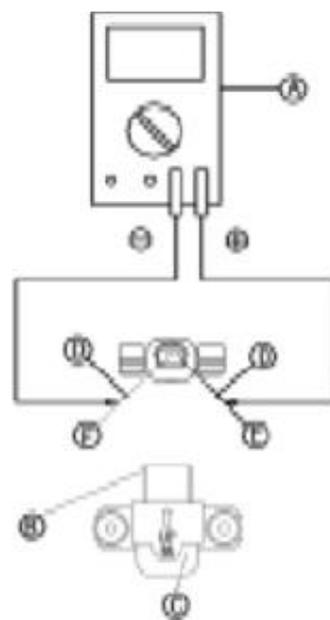
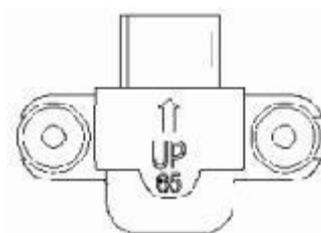


Warning

Incorrectly installed fall sensors may cause the sudden stall of the engine. In some cases, such as when direction of travel is changed by turning the handlebar or the motorcycle is inclined to make a turn, the rider may lose its balance, which may lead to an accident, injury or even death. Ensure that the fall sensor is supported in its position by its specific bracket.

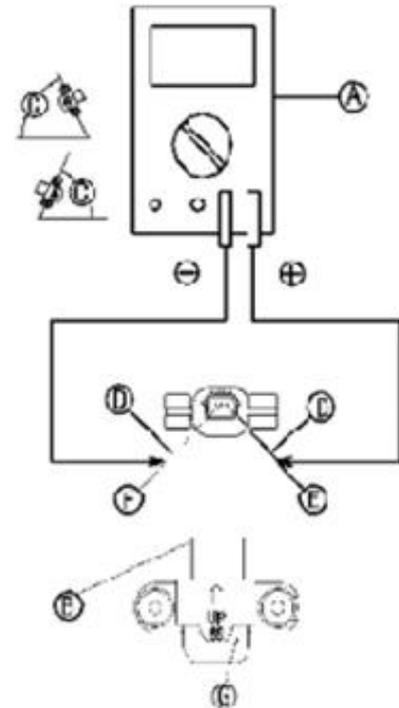
Voltage check when the fall sensor of the vehicle is not inclined

- Make sure the battery is fully charged.
- Connect the multimeter [A] to the fall sensor connector [C] [B] using the pin adapter of the kit [D].
- With the engine not running and the connector connected, measure output voltage of the sensor.
Turn on the ignition switch.
Fall sensor output voltage
Multimeter (+) → Grey/yellow wire [E]
Multimeter (-) → Light green/yellow wire [F]
- Turn the ignition key and measure supply voltage.
- Output voltage the fall sensor is not tilted:
Standard: 12V DC (battery voltage)
- Switch off the ignition key.
- If reading of the input voltage is lower than the standard, check the mass, feeding and wiring hardness short circuits of the ECU control unit.
- If the wiring hardness does not show any problem, replace the fall sensor.



Voltage check when the fall sensor of the vehicle is not tilted

- Remove the fall sensor[G](see Removal of the fall sensor of the vehicle).
 - Connect the multimeter [A] to the sensor connector [B] using the pin adapter[D].
- Output voltage of the fall sensor
 Multimeter (+) → grey/yellow cable [E]
 Multimeter (-) → light green/yellow cable [F]


Voltage check when the tilt sensor of the vehicle is not tilted

- Keep the sensor in vertical position.
 - Switch on the ignition key with the connector connected
 - Measure output voltage.
 - Tilt the sensor to the left or right 55-75 degrees or more [C] as shown on the right and measure output voltage.
- Output voltage of the sensor:
 Standard: from 0 to 0.5 V
 Sensor tilted to the right or to the left 55° - 75° or more

Note

If it is necessary to repeat the test, switch the ignition key off and back on.

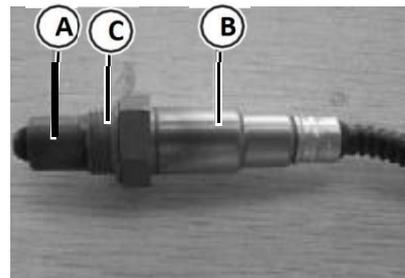
- If output voltage is correct, the wiring harness may be defective. Check the wiring harness.
- If the wiring harness is in good conditions, check the earth and feeding of the ECU control unit (check ECU control unit feeding).
- If output voltage does not fall within the specified range, replace the fall sensor.

Oxygen sensor

Removal / Assembly of the oxygen sensor

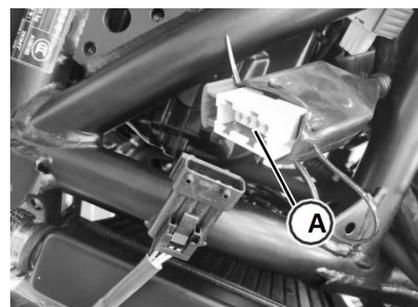
Important

- Do not let the sensor fall [B], especially on hard surfaces. The impact will damage the sensor otherwise.
- Do not touch part [A] of the sensor with your hands since that may reduce its performance.
- Apply an anti-sintering agent to part [C] of the sensor before every installation.



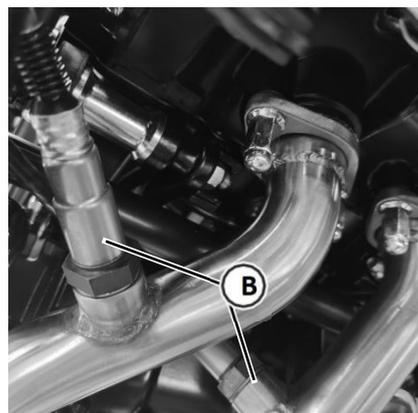
1) Removal of the oxygen sensor

- Remove windshield assy(see windshield removal)
 - Remove front cover, right fairing(see outer cover removal)
- Disconnect the connector [A] and remove the oxygen sensor [B].



2) Installation of the oxygen sensor

- Screw the sensor [B] and connect the connector [A].
Oxygen sensor[B]- coupling torque: 40 Nm

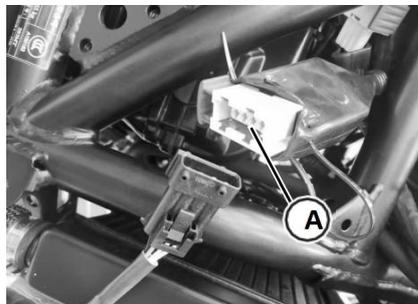


Important

The oxygen sensor needs to be installed correspondingly, and cannot be confused and exchanged. Please mark it when disassembling.

3) Output signal check

- Disconnect the connector [A] for a cylinder.
- Park the vehicle in neutral gear.
- Start the engine,heat it sufficiently and take engine speed above 8000 rev/min.
- Measure output voltage of the sensor using the multimeter [B] according to the diagram



Sensor output voltage:**Cylinder 1**

- Disconnect the connector of the oxygen sensor [A] on the cylinder.
- Check that the motorcycle is in neutral gear
- Start the engine, heat it and let it run at idling speed.

Multimeter (+) → pin 3 [C]

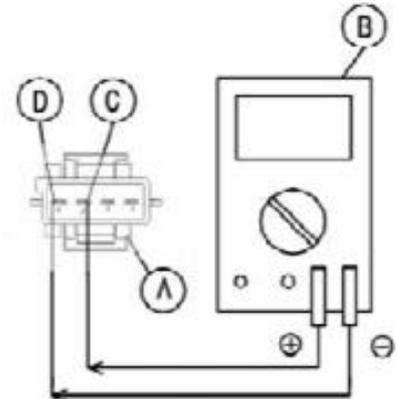
Multimeter (-) → pin 4 [D]

Cylinder 2

Multimeter (+) → pin 3 [C]

Multimeter (-) → pin 4 [D]

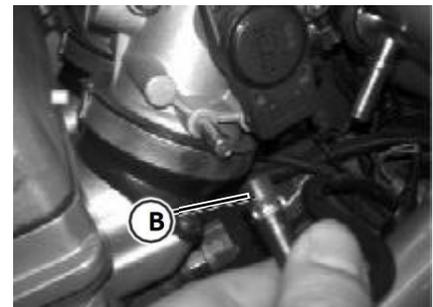
Standard: approximately 0,8 V



- Disconnect the oxygen sensor connector [A] of a cylinder;
- Shift to neutral gear;
- Start the engine and run at idle speed after warming up



- Remove the pipe corresponding to the cylinder [B].



- Measure output voltage of the sensor with the multimeter [B] as indicated in the figure.

Output voltage of the sensor.

Cylinder1

Multimeter (+) → pin 3 [C]

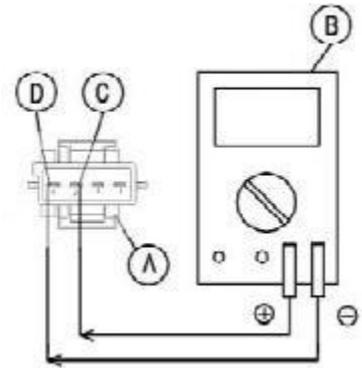
Multimeter (-) → pin 4 [D]

Cylinder2

Multimeter (+) → pin 3 [C]

Multimeter (-) → pin 4 [D]

Output voltage of the sensor: Standard: approximately 0 . 1 V



- Measure the heating resistance of the sensor with the multimeter [B] as shown in the figure.

Heating resistance of the sensor.

Cylinder1

Multimeter (+) → Pin 2 [C]

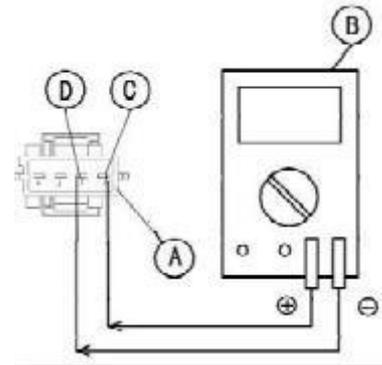
Multimeter (-) → 1 pin [D]

Cylinder2

Multimeter (+) → pin 2 [C]

Multimeter (-) → 1 pin [D]

Standard: approximately 1 ohm



Removal of the ignition coils

Removal / assembly of the ignition coil

Important

Do not let the ignition coil fall, especially on hard surfaces, the impact may damage it otherwise.

Coil input voltage check:

- Switch off the ignition key.
- Remove the fuel tank.
- Remove the air filter.
- Remove ignition coil connector [A] [D]
- Connect a multimeter [B] according to the diagram.
- Measure input voltage of the primary winding of the ignition coil with engine not running and the connector connected.
- Switch on the ignition key

Input voltage of the ignition coil:

Multimeter (+) → white/black wire [C]

Multimeter (-) → Earth

Standard: approximately 12V DC

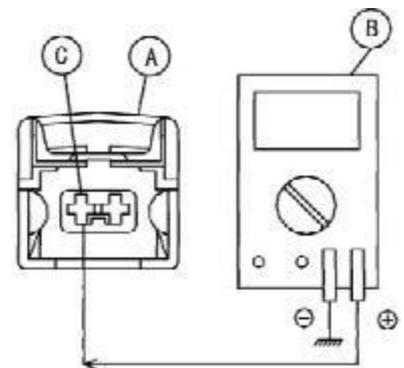
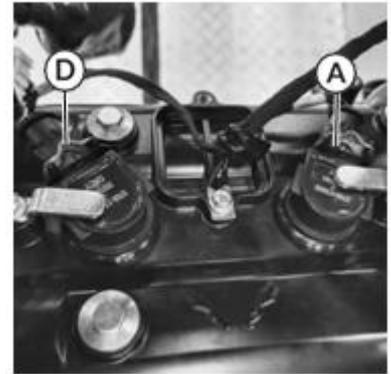
Cylinder 1 ignition coil.

Cylinder 2 ignition coil.

Multimeter (+) → white/black wire [C]

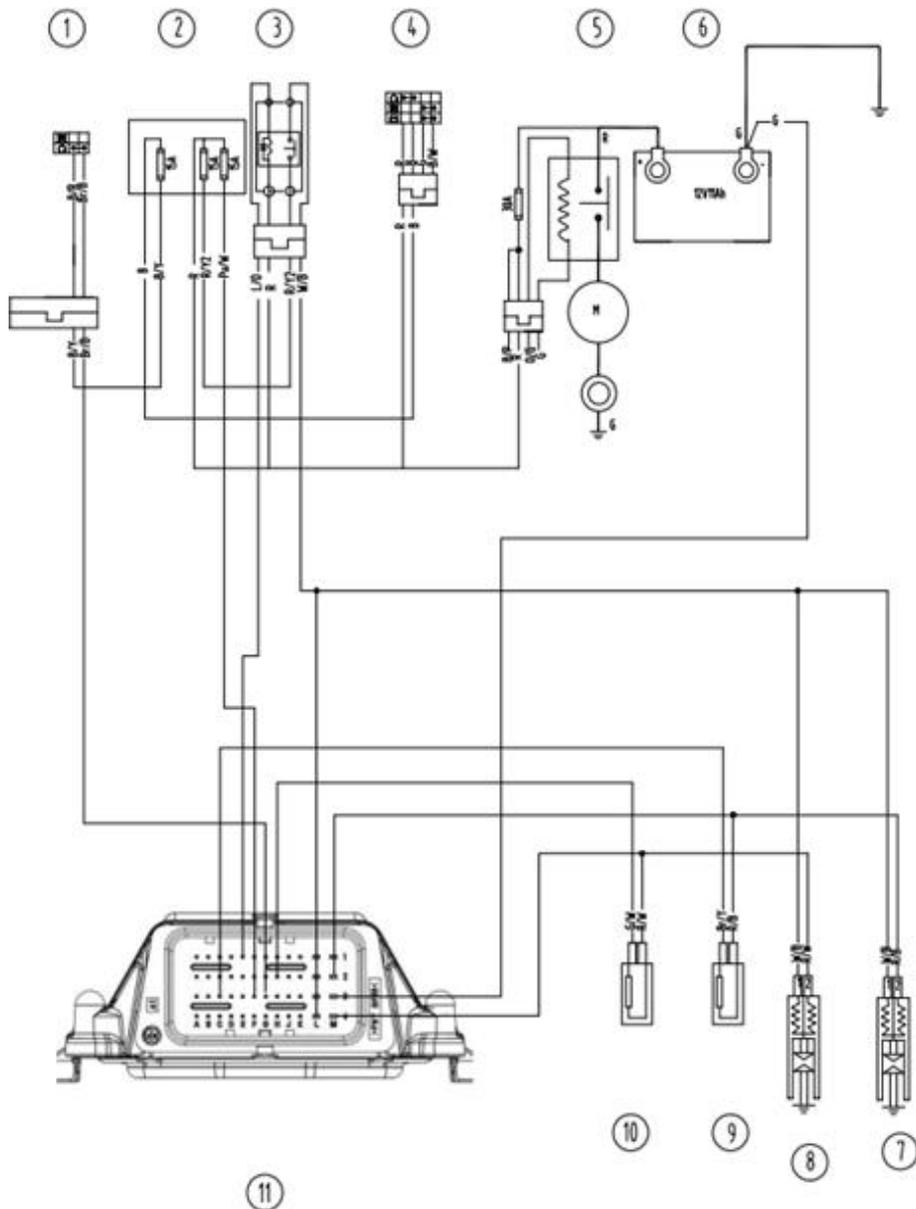
Multimeter (+) → earth wire

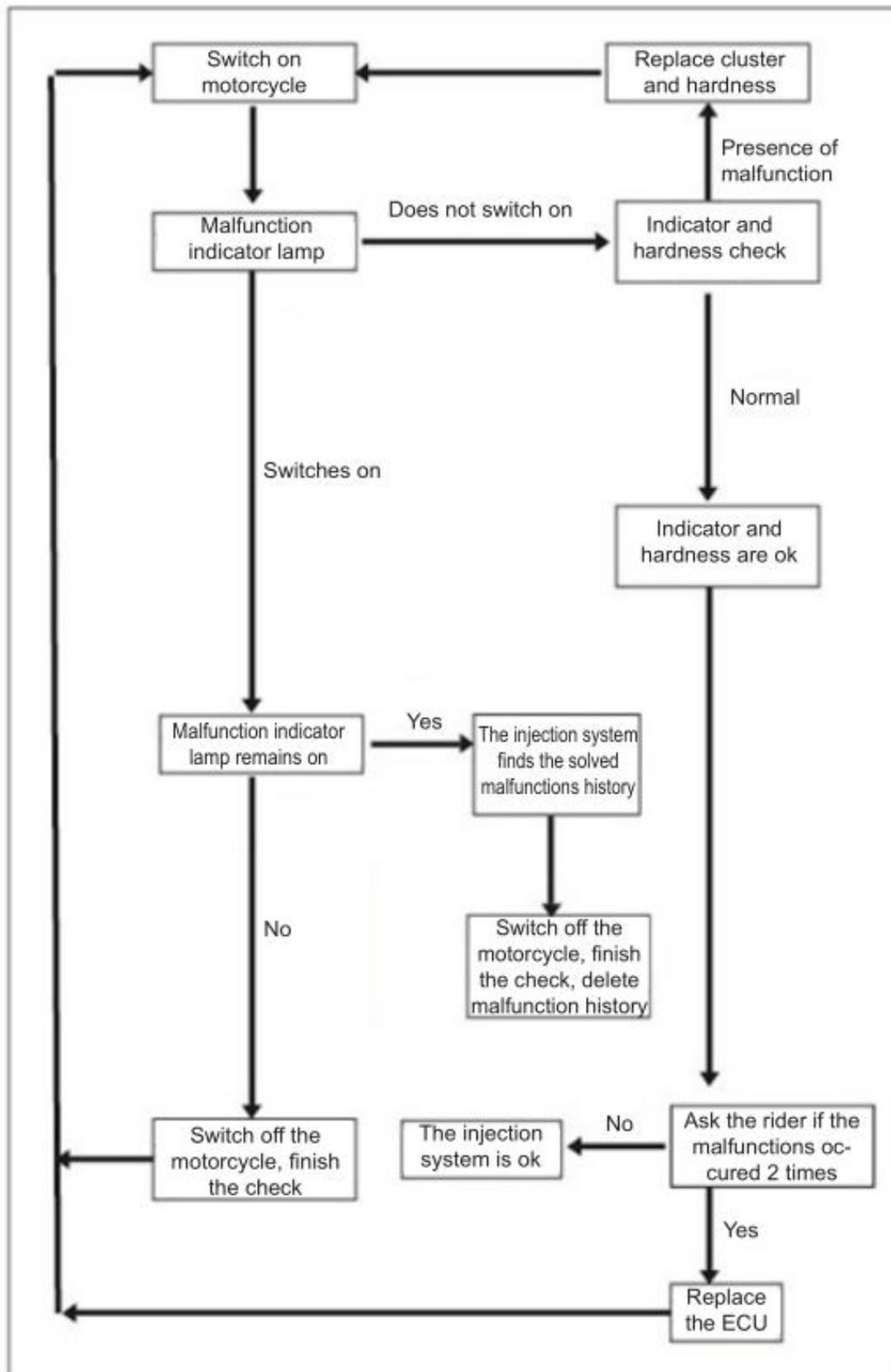
Standard: approximately 12 V D C



Ignition coil circuit connection diagram

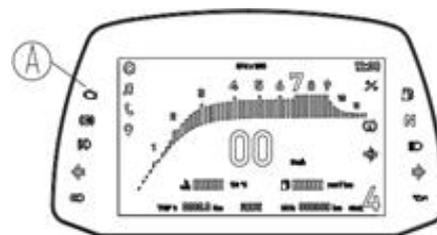
1. Shut-down switch
2. Fuse box
3. Main relay
4. Ignition locking switch
5. Ignition relay and main fuse
6. Battery
7. Cylinder 1 ignition coil
8. Cylinder 2 ignition coil
9. Ignition 1 diagnostic resistance
10. Ignition 2 diagnostic resistance
11. ECU



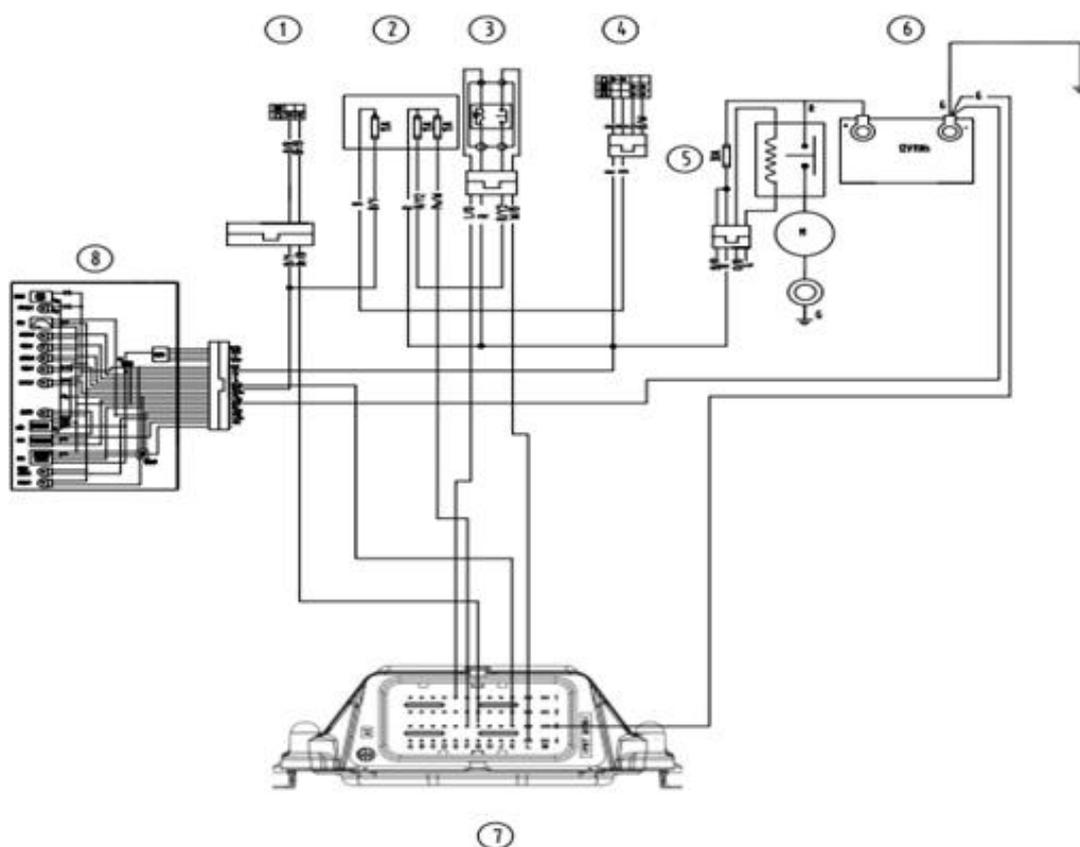
Malfunction indicator lamp check
1) Flow diagram for check of indicator lamp correct operation


2) Malfunction indicator lampcheck

- Remove the instrument cluster(see chapter16 Removal of the instrument cluster).
- Use the 4 auxiliary terminals to connect the battery to the instrument cluster to supply the malfunction indicator lamp[A].
- The battery [B] is at 12V.
Positive terminal of the battery (+) → pin 1 and 2 of the tool
Negative terminal of the battery (-) → pin 3 and 13 of the tool
- The malfunction indicator lamp should turn on when it is connected.
- If the malfunction lamp does not turn on,replace the instrument cluster.



3) Malfunction indicator lamp circuit diagram



- 1 - Shutdown switch
- 2 - Fuse box
- 3 - Main relay
- 4 - Ignition locking switch
- 5 - Main fuse
- 6 - Battery
- 7 - ECU
- 8 - Indicators

ECU operation check

Removal / Assembly of the ECU

Important

Do not let the ECU control unit fall, especially on hard surfaces. The impact caused by the fall may damage it otherwise.

1) Removal of the control unit

- Remove the passenger seat;
- Remove the fixing screw of the control unit [A] and remove the latter;
- Move the wiring harness rubber sheath[B];
- Press the connection stop [C] while the bracket [D] is rotated and extract ECU control unit connector[E].

2) Assembly of the ECU

Fix the ECU control unit and connect the connectors.

3) ECU control unit earth connection and feeding check

- Visually inspect the terminals of the ECU control unit connector[A]. If the connector is clogged by dirt or dust, blow compressed air to free it.
If the main wiring harness connector terminal is cracked, bent or damaged, replace the main wiring harness.
If the ECU control unit connector terminals are cracked, bent or damaged, replace the ECU control unit.

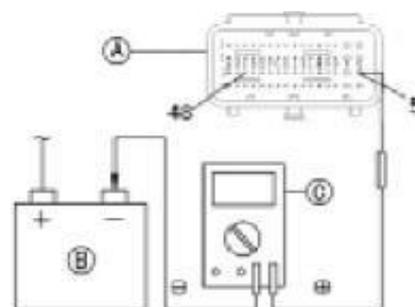
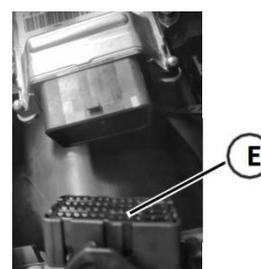
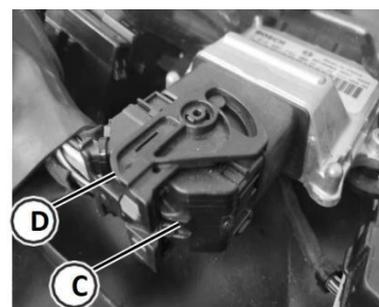
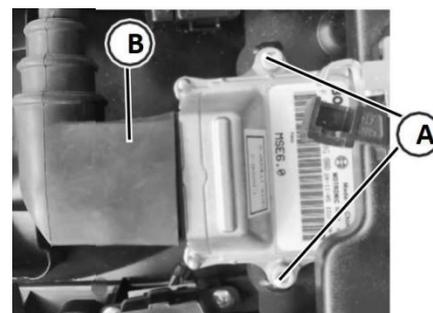
4) ECU control unit earth check

- With the connector of the ECU control unit [A] connected, switch off the ignition key and check the components below for continuity of the earth wire using a tester.

Tools: Battery [B] Tester [C]

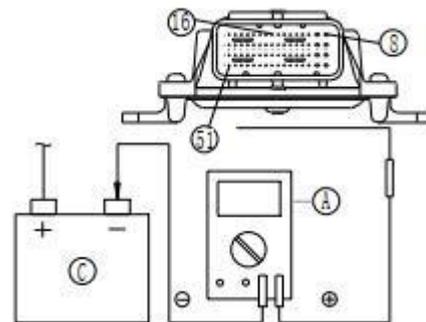
Terminal 5 (M3) \longleftrightarrow Battery (-): 0 Ω

If resistance is not correct, check the connector, the earth wire of the engine or the main wiring harness and repair or replace if necessary.



5) ECU control unit feeding check

- Check voltage feeding of the ECU control unit using a multimeter[A].
- Identify the terminals according to the number of terminals of the connector of the ECU control unit [B] in the diagram of this chapter.
Battery [C]



ECU control unit feeding check

Connections of the multimeter.

Terminal 33 (F3) ↔ between the terminals (-) of the battery

Terminal 8 (L4) ↔ between the terminals (-) of the battery

Terminal 32 (G3) ↔ between the terminals (-) of the battery

When the ignition switch is not on.

Terminal 33 (F3) and terminal of the battery (-): battery voltage

(General: $\geq 12V$)

When the ignition switch and the shutdown switch are active

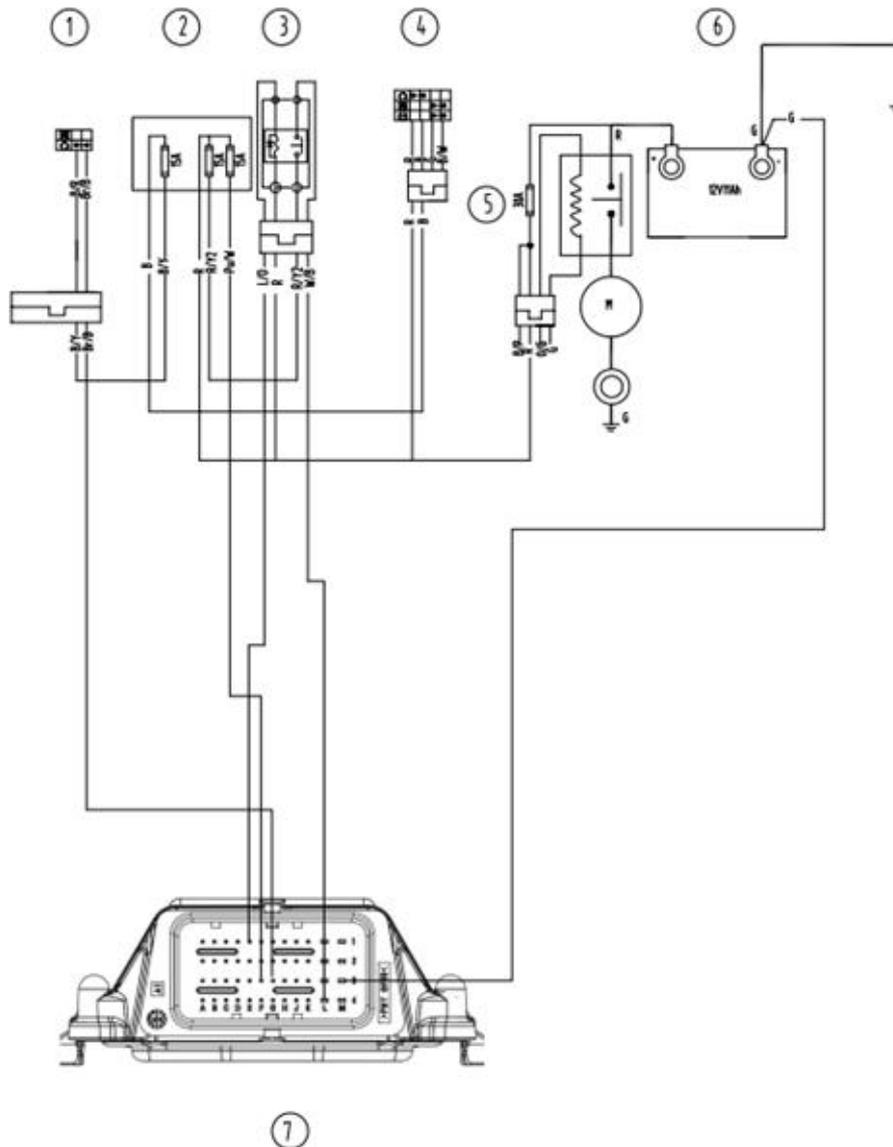
Terminals 8 (L4), 32 (G3) and battery terminal (-): $\geq 12 V$

If the multimeter does not read within the specified interval, check the following elements.

- Main fuse 30A (see Fuse check in the Electric system chapter)
- ECU control unit fuse 7,5A (see Fuse check in the Electric system chapter)
Feeding circuit, see connection diagram of the ECU circuit
- If the check has a good result, the ECU control unit is damaged.
- The ECU control unit cannot be inspected nor repair.

6) ECU circuit connection diagram

- 1 - Shutdown switch
- 2 - Fuse box
- 3 - Main relay
- 4 - Ignition locking switch
- 5 - Main fuse
- 6 - Battery
- 7 - ECU



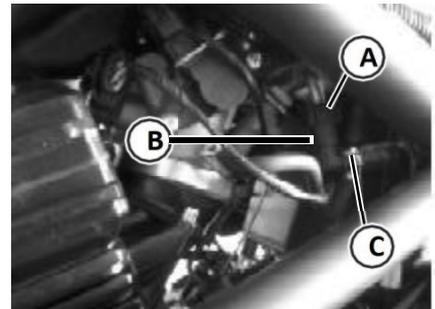
High pressure fuel line check

Note

- This check can determine which defect is causing the malfunction. This includes malfunctions of the EFI system, mechanical or electrical malfunctions.
- When a malfunction occurs while the motorcycle is running, the fuel pressure measurement will give higher chances of finding the cause of the malfunction.
- Make sure the battery is fully charged.

1) Measuring fuel pressure

- Remove the fuel tank.
- Make sure to wrap a piece of fabric around the fuel pipe connection and around the delivery pipe.
- Disconnect the quick coupling [B].
- Remove the fuel pipe [C].



Important

Prevent the leakage of fuel; any leaking fuel must be promptly removed. When the pipe is disconnected, fuel leaks from the pipe with the residual pressure. Cover the pipe connection with a clean cloth.

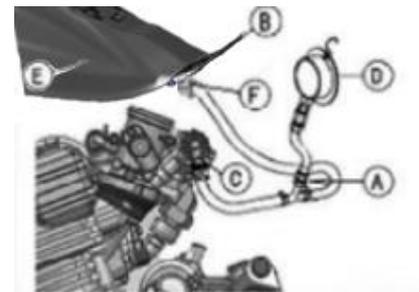
- Install the fuel pressure adapter [A] between the outlet pipe of the fuel pump [B] and the guide [C].

Warning:

Do not start the engine when the fuel pipe is not connected.

Tank [E], manometer [D], quick coupling [F]

- Firmly connect the quick coupling and make sure there is no leakage of fuel at every connection.
- Switch on the ignition key.
Start the fuel pump for 3 seconds, then stop it

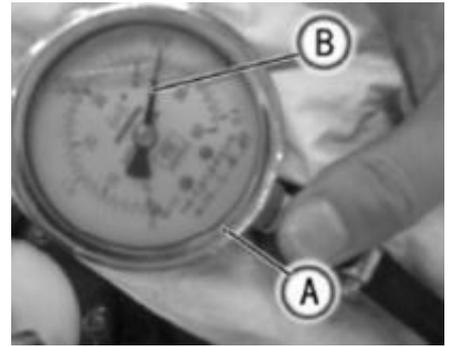


Important

Do not activate the fuel pump when there is no fuel in the tank

2) Fuel pressure check

- Measure fuel pressure with the engine not running.
With ignition on and the fuel pump activated.
Standard: 330 kP at (0.3.3 MP a) Check required
When the fuel pump stops to operate 3 seconds after switching on.
Standard: 265 kP at (0.265 MP a) to be confirmed
The system should maintain pressure for approximately 30 seconds.
During measurement, the needle [A] of the manometer [B] oscillates and the intermediate value of pressure is read according to the minimum and maximum indication.



If fuel pressure is normal, the fuel circulation system (fuel pump, pressure regulator, fuel pipes) is not defective. Check the EFI control system (injectors, ECU control unit for each sensor).

If fuel pressure is below the specified level, check the following:

- Leakage in the fuel pipe.
 - Operation of the fuel pump (check the sound of the fuel pump).
 - Fuel pump flow rate (see Fuel pump flow rate check).
-
- If fuel pressure is above the specified level, check the following:
 - Fuel pipe clogged.
 - Fuel injector clogged.
 - Fuel pump regulator damaged.

Fuel pump maintenance

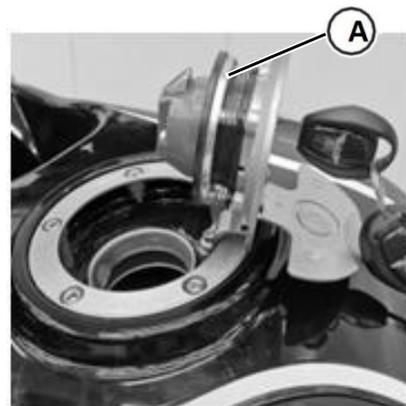
Note

Ensure the battery is fully charged.

Warning

Petrol is flammable and explosive under specific circumstances. Make sure to operate in a ventilated premise away from flames or sparks; this includes any type of ignition. Do not smoke. Shut down the ignition. Prepare for leakage of fuel; any possible leakage must be promptly removed.

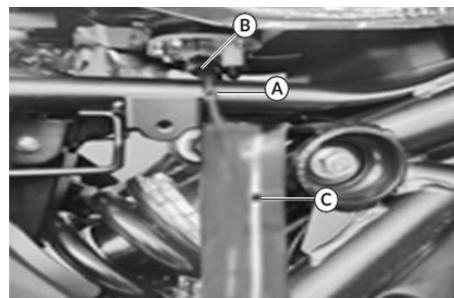
- 1) Switch off the ignition key.
- 2) Wait for the engine to cool down.
- 3) Prepare a plastic tube with an internal diameter of 7,5mm.
- 4) Remove the studs of the fuel tank (see Removal of the fuel tank).
- 5) Open the fuel tank cap [A] to reduce tank pressure.



Warning

Be ready to prevent fuel leakage; fuel leakage from any area must be removed immediately. When the fuel pipe is disconnected, fuel leaks from the pipe and from the fuel pump outlet due to residual pressure. Cover the pipe connection with a clean cloth to avoid fuel leakage.

- 6) Connect the plastic hose [A] to the fuel pump outlet pipe.
- 7) Secure the plastic hose using tie wraps[B].
- 8) Insert the other end of the plastic hose into the measuring cylinder[C].



Warning

Promptly dry spilled fuel.

- 9) Install the fuel tank and close the cap.
- 10) When the engine is not running, switch on the ignition key. The fuel pump must work for 3 seconds, then stop and repeat this operation several times until the plastic hose is full of fuel.

Fuel pump flow rate check

Important

Do not activate the fuel pump when there is not fuel in the tank.

- After filling the plastic hose with fuel, measure drainage for 3 seconds.
- Repeat this operation several times
Fuel pump flow rate.
Standard: 3 seconds, ≥ 60 mL

If fuel flow rate is below the specified level, check battery status. If the battery is in good conditions, replace the fuel pump (see Removal/Installation of the fuel pump).

- After the check, install the fuel tank (see Installation of the fuel tank).
- Start the engine and check for the presence of fuel leakage.

Removal / Assembly of the fuel pump

Important

Do not let the fuel pump fall, especially on hard surfaces.
The impact caused by a fall may damage it.

Warning

Petrol is flammable and explosive under specific circumstances. Make sure to operate in a ventilated premise away from flames or sparks; this includes any type of ignition. Do not smoke. Shut down the ignition. Disconnect the terminal (-) of the battery. To reduce the leakage of fuel to a minimum, take fuel from the tank when the engine is cold. Prepare for leakage of fuel; any possible leakage must be promptly removed.

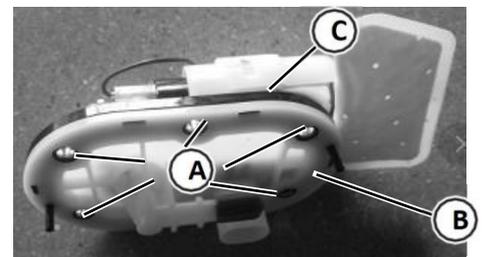
- Pump fuel out of the fuel tank.
- Remove the fuel tank (see Removal of the fuel tank).
- Pay attention to fuel leakage from the fuel tank, since fuel remains in the tank and in the fuel pump. Cap the tank fuel pipe.
- Reverse the fuel tank.

For removal.

- Remove the fuel pump screws [A].
- Remove the fuel pump [B].
- If the fuel pump gasket [C] is damaged, replace it with a new one.

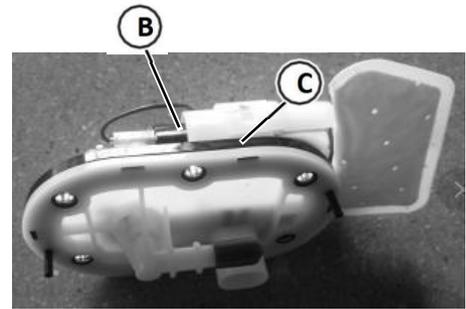
Important

Do not extract the fuel pump cable.
The wire terminals may get damaged otherwise.



Assembly

- Delicately remove dirt or dust from the fuel pump[B] using compressed air.
- If the gasket [C] is damaged, replace it with a new one.
- Check filter status, replace it if necessary.
- Tighten the pump screws alternatively and diagonally on the grafting surface.
Torque of the fuel pump screws: 6 Nm
- Tighten the screws alternatively and diagonally again to check their tightening.

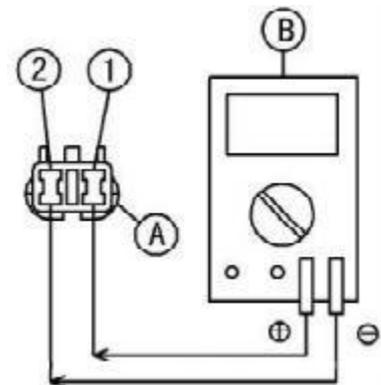


Fuel pump operation check

Note

Make sure the battery is fully loaded.

- Listen to pump noise in the tank to confirm its operation.
- Switch on the ignition key and make sure the fuel pump works (soft sound) for 3 seconds and then stops.
- Switch off the ignition key.
- If the fuel pump does not work as described above, check operating voltage.



Fuel pump operating voltage check

Important

Make sure the battery is fully loaded.

- Switch off the ignition switch.
- Remove the fuel tank.
- Disconnect the fuel pump connector[A].
- Measure operating voltage with the engine not running.

Connection of the multimeter.

Multimeter (+) → terminal 1 (yellow/black cable)

Multimeter (-) → terminal 2 (green cable)

When the ignition switch is on.

Standard: the multimeter [B] indicates battery voltage for 3 seconds, followed by 0 V.

If the reading remains at battery voltage and does not show 0 V, check the ECU control unit and the relay of the fuel pump.

If voltage meets the requirements but the fuel pump does not work, replace the fuel pump (see Removal/installation of the fuel pump).

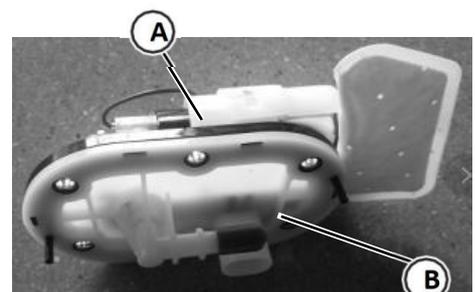
If there is no battery voltage, check the relay of the fuel pump.

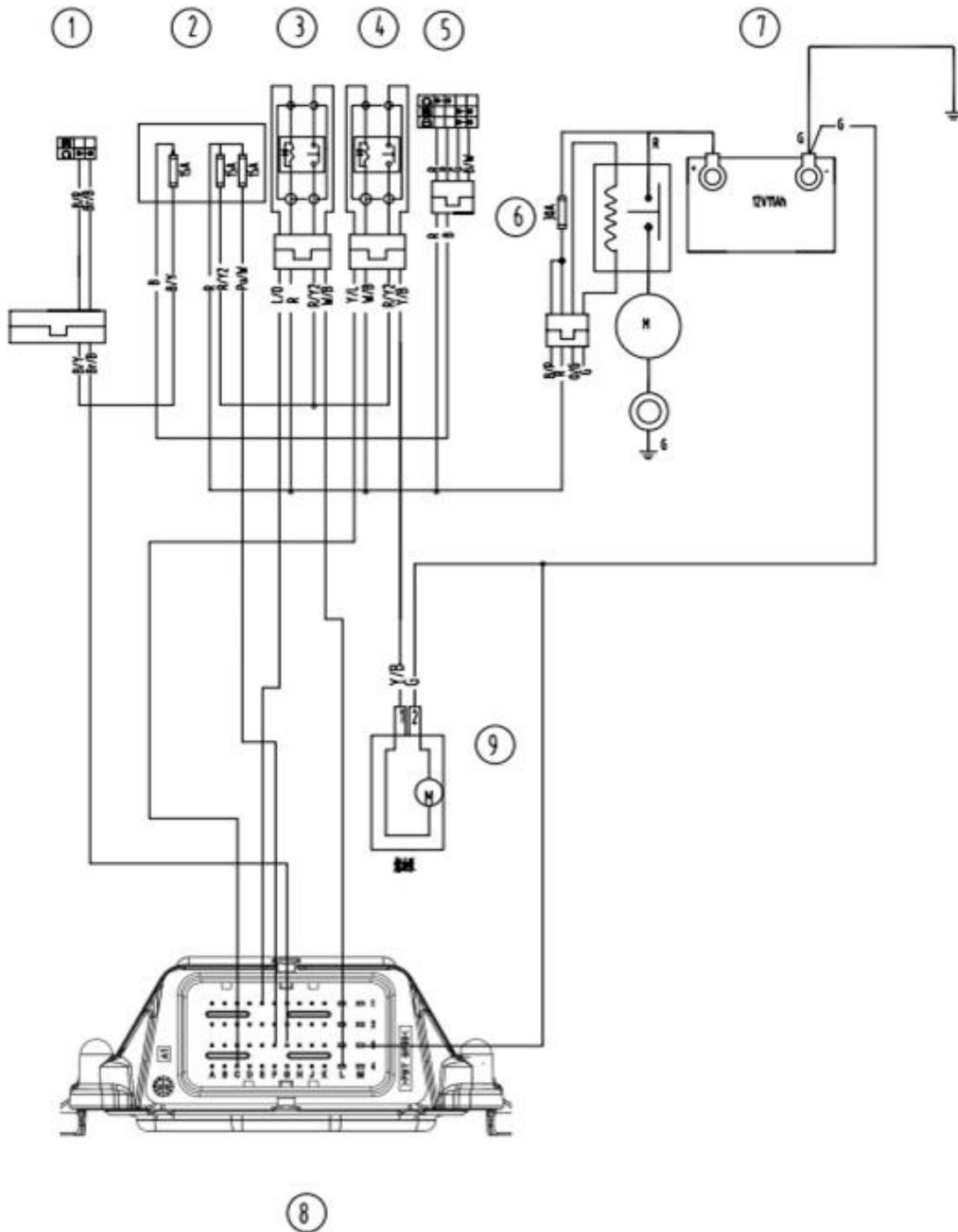
○ Notice

The pressure regulator is built into the fuel pump and cannot be removed.

Removal of the pressure regulator

The pressure regulator [A] is incorporated in the fuel pump [B] and cannot be removed.



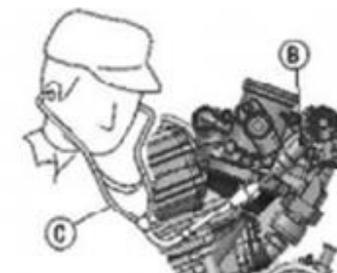
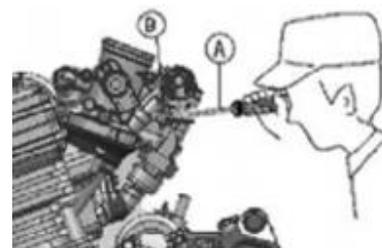
Connection circuit of the fuel pump


- 1 - Shutdown switch
- 2 - Fuse box
- 3 - Main relay
- 4 - Oil pump relay
- 5 - Ignition locking switch
- 6 - Main fuse
- 7 - Battery
- 8 - ECU
- 9 - Fuel pump

Injectors maintenance

1) Removal / installation of the injectors

- See Removal/installation of the throttle.
 - Start the engine.
 - Use the tip of the screwdriver [A] for the injector [B]. Place the tip on the injector, position the end of the handle in your ear and listen to the injector ticking.
 - A stethoscope [C] can be used too.
 - Repeat the same operation for all the other injectors.
- If all injectors produce a click at regular intervals, the injectors are in good conditions. The malfunction could be linked to the fuel pipe and it is necessary to check fuel pressure (see the section Fuel pressure check).
- When engine speed increases, the snaps become shorter in the intervals.



If the injectors do not snap, there might be a problem on the EFI circuit or with the injectors. Check the injector voltage first.

2) Injectors feeding voltage check

- Switch off the ignition key.
- Remove the fuel tank.
- Remove the air filter.
- Disconnect the injector connector[A].
- Connect the multimeter [B] to the injector connector according to the diagram:

Injector output voltage:

Cylinder 1

Multimeter (+) → Wire [C] (white/black)
 Multimeter (-) → battery (-)

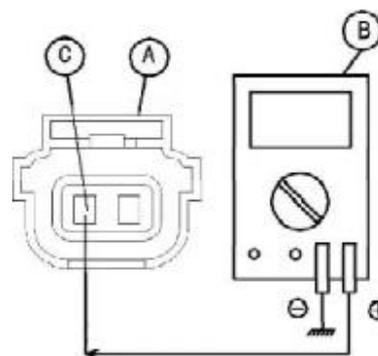
Cylinder 2

Multimeter (+) → Wire [C] (white/black)
 Multimeter (-) → battery (-)

- Switch on the ignition key.
- The input voltage to the injector must the same as battery voltage for 3 seconds and then drop to 0V.
- If voltage is normal, carry out a test of the inject or signal.

If the multimeter does not read as specified, check the following components.

- Main fuse 30A and main relay fuse 15° (see Fuse check in the Electric system chapter).
- The main relay(see Relay circuit check in the Electric system chapter).
- Feeding circuit (see injector wiring diagram).



3) Injection wiring hardness check

- Measure continuity between the ECU connector [B] and the injector connector [C] with a multimeter [A]. The dotted line in the diagram to the right shows cylinder 2.

Cylinder 1

Terminal 48 E C U (A4) ↔ Blue/white wire [D]

Cylinder 2

Terminal 47 ECU (B4) ↔ Blue/black wire [E]

Standard: Conduction

If the wiring hardness is in good conditions, check the injector resistance (see Check of injector resistance)

4) Injector signal test

- Prepare two test lamps and male terminals according to the diagram.
- Lamp power [A]: 12V × 3~3.4W
- Terminal width [B]: 1,8mm
- Terminal thickness [C] :0.8mm

Important

Do not use terminals large than the ones indicated above. Larger terminals may damage the injector main wiring hardness connector and entail the repair or replacement of the wiring hardness.

Make sure these lamps are connected in series. These lamps act as current limiters to avoid that an excessive current is absorbed by the solenoid valves in the injectors

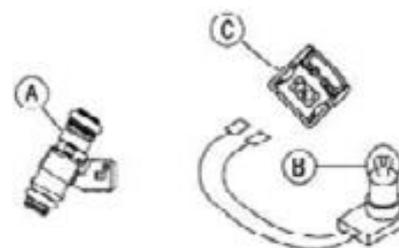
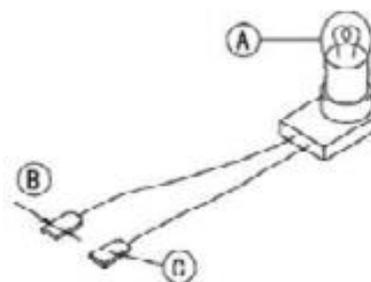
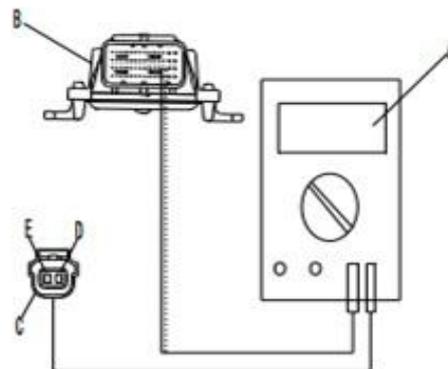
5) Test light connection

- Remove the fuel tank (see Removal of the fuel tank).
- Remove the air filter.
- Disconnect the injector connector [A].
- Connect each set of test lights [B] to the connector of the injector rail [C].
- Switch on the ignition key.
- During operation of the engine shaft with the starter motor, observe the test lamps.

If the test light flashes at regular intervals, the injector circuit and the wiring hardness of the ECU control unit are correctly operational. Check the injector resistance.

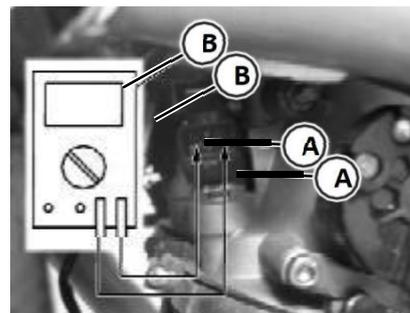
- The injector signal can also be obtained by connecting a multimeter (x10VAC) to the main wiring hardness connector (female) of the injector. Make the engine shaft rotate with the starter motor and check that the reading oscillates at regular intervals.

If the test light does not flash (or the multimeter does not oscillate), check the wiring hardness and the connectors again. If the wiring hardness is in good conditions, check the voltage of the injector. If the wiring hardness is in good conditions, check voltage of the injector, the ground and supply of the ECU control unit (see check of the ECU control unit feeding).



6) Injector resistance check

- Remove the fuel tank (see Removal of the fuel tank).
 - Remove the air filter.
 - Disconnect the injector connector[A].
 - Measure the injector resistance with a multimeter [B].
- Injector resistance
Standard: $12.5 \pm 1 \Omega$ (20 °C)
If the reading does not fall within the range, perform the “injector group test” to confirm.



7) Injector assembly test

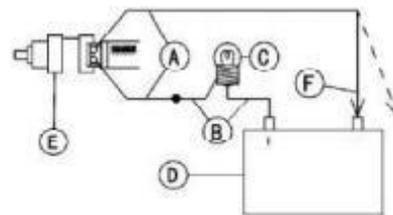
- Use two wires [A] and a test lamp group[B].
- Lamp power [C]: 12V × (3~3.4)W
- 12V battery [D]

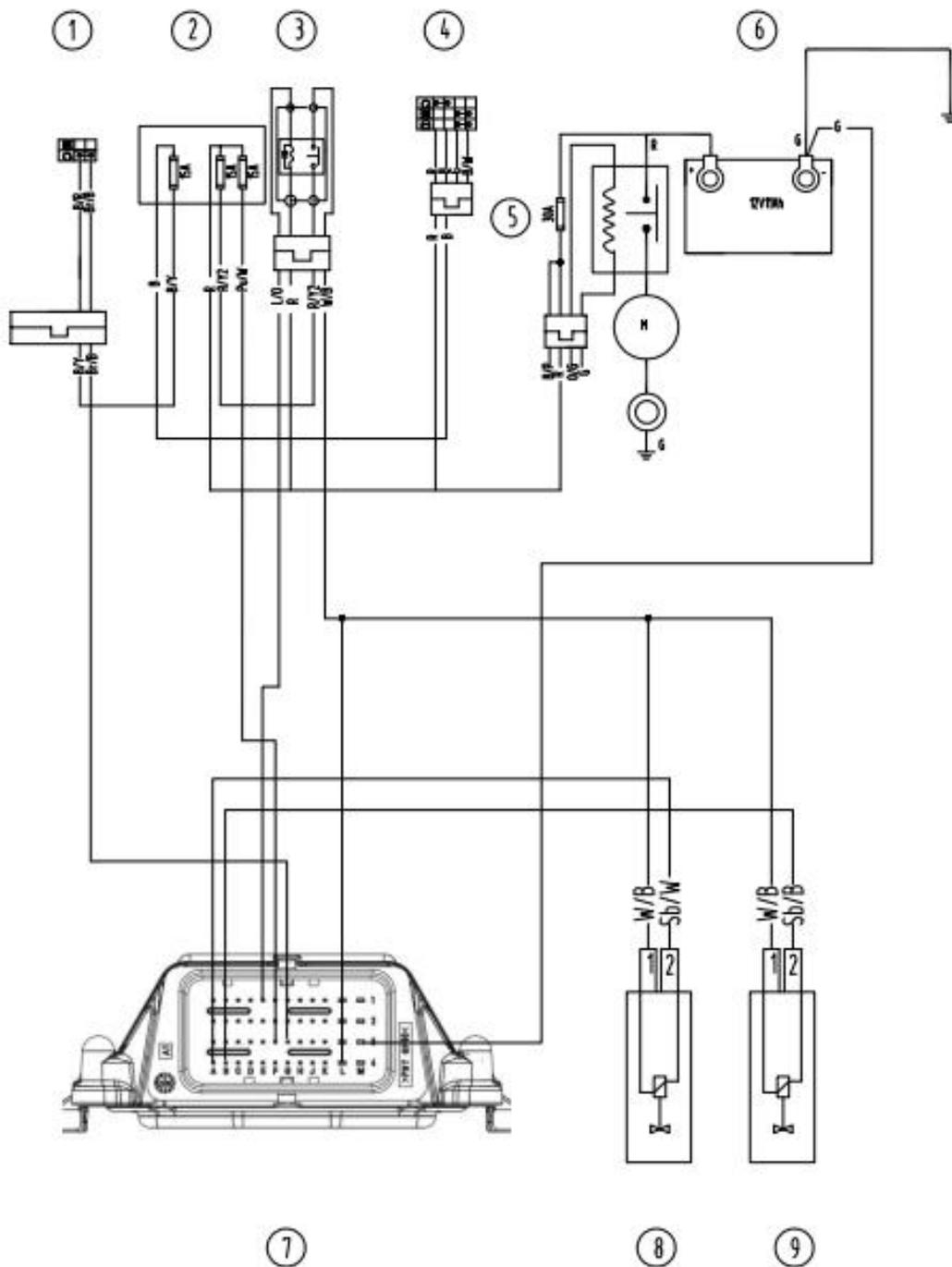


Warning:

Make sure that these lamps are connected in series. These lamps act as current limiters to avoid that the solenoid valve in the injector is subject to excessive current.

- Connect the test lights set to the injector [E] according to the diagram.
 - Open and connect the end of the cable [F] to the negative terminal of the battery (-). The injector should produce a click.
- If the injector does not trigger, replace the injector.
If the injector triggers, check the wiring hardness again. If the wiring hardness is in good conditions, replace the injectors (possibly blocked) or the ECU control unit.



Injection circuit connection diagram


- 1 - Shutdown switch
- 2 - Fuse box
- 3 - Main relay
- 4 - Ignition locking switch
- 5 - Main fuse
- 6 - Battery
- 7 - ECU
- 8 - Injector 1
- 9 - Injector 2

Repair of the throttle cable and grip

1) Check of the throttle grip free travel

- See check of the throttle control system in the chapter on periodic maintenance.
Throttle grip free travel adjustment
- See Check of the throttle control system in the Periodic maintenance chapter.

2) Throttle cable assembly

- Install the throttle cable according to the section on cables,wires and flexible hoses in the chapter on accessories.
- After assembling the top end of the throttle cable in the throttle grip, mount the bottom end of the throttle cable on the bracket of the cable on the throttle body group.
- After installation, correctly adjust all the cables of the throttle



Warning:

Operation of the incorrectly installed or adjusted throttle cables may lead to unsafe driving conditions.

3) Lubrication of the throttle cable

- See lubrication of the components in the chapter on periodic maintenance.

Repair of the throttle group

1) Idle speed check

See Idle speed check in the chapter on periodic maintenance.

2) Check/adjustment of engine vacuum synchronization

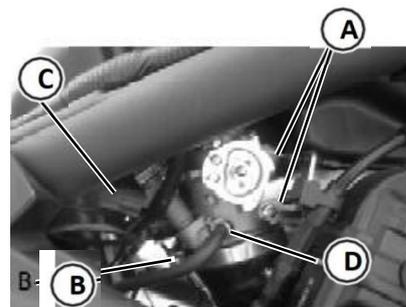
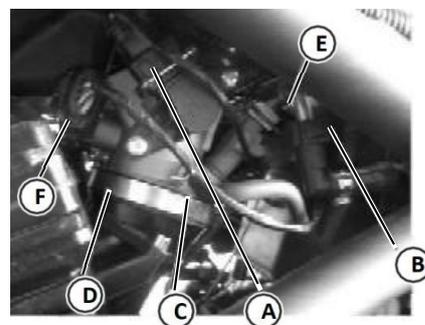
See Check of engine vacuum synchronization in the chapter on periodic maintenance.

Removal of the throttle body

Warning

Petrol is flammable and explosive under specific circumstances. Make sure to operate in a ventilated premise away from flames or sparks; this includes any type of ignition. Do not smoke. Shut down the ignition. Prepare for leakage of fuel; any possible leakage must be promptly removed. Disconnect the terminal (-) of the battery.

- Remove the fuel tank (see Removal of the fuel tank).
 - Remove the air filter (see Removal of the air filter).
 - Disconnect the throttle position sensor connector[A].
 - Disconnect the fuel pipe[B].
 - Disconnect the fuel evaporation tube of cylinder 1[C].
 - Loosen the clamp of cylinder 1[D].
 - Disconnect the connector of the injector of cylinder 1[E].
 - Disconnect the throttle cable[A].
 - Loosen the clamp[B].
 - Disconnect the connector of the cylinder injector 2[C].
 - Disconnect the fuel evaporation tube of cylinder 2[D].
 - Disconnect the temperature sensor and intake air pressure connector [F].
-
- Disconnect the throttle cable[A].
 - Loosen the clamp[B].
 - Disconnect the 2 cylinder injector connector[C].
 - Disconnect the fuel evaporation tube of the 2 cylinder[D].



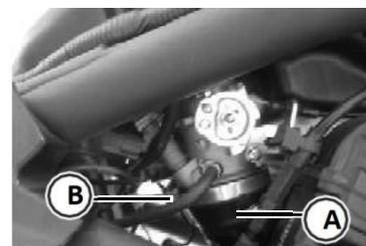
Remove the throttle body. Insert a clean cloth without fluff in the intake manifold.

 **Warning**

If dust enters the engine, it may cause excessive wear and serious damage.

Installation of the throttle body

- Install the throttle body in the intake collector of the engine.
- Tighten the clamps, ensuring that the clamps screws [B] are facing outwards.
- Connect the injector connector, the fuel evaporation line, the throttle cable and the quick fitting of the fuel line.

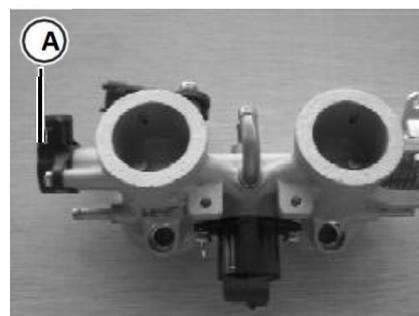


 **Warning**

Using the motorcycle with the throttle cables not correctly installed or adjusted may lead to unsafe driving conditions.

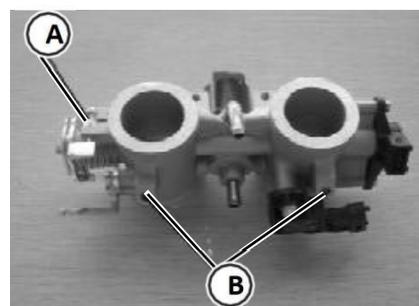
 **Warning**

Do not remove, disassemble or adjust the throttle position sensor [A] as it is adjusted or set by the manufacturer. Adjustment of these parts will entail poor performance and will require the replacement of the throttle body group.



 **Warning**

Do not remove, disassemble or adjust the throttle idle speed adjustment screw [A] and the synchronization screw [B]. They have been adjusted by the manufacturer. Adjustment of these parts will entail poor performance and will require the replacement of the throttle body.

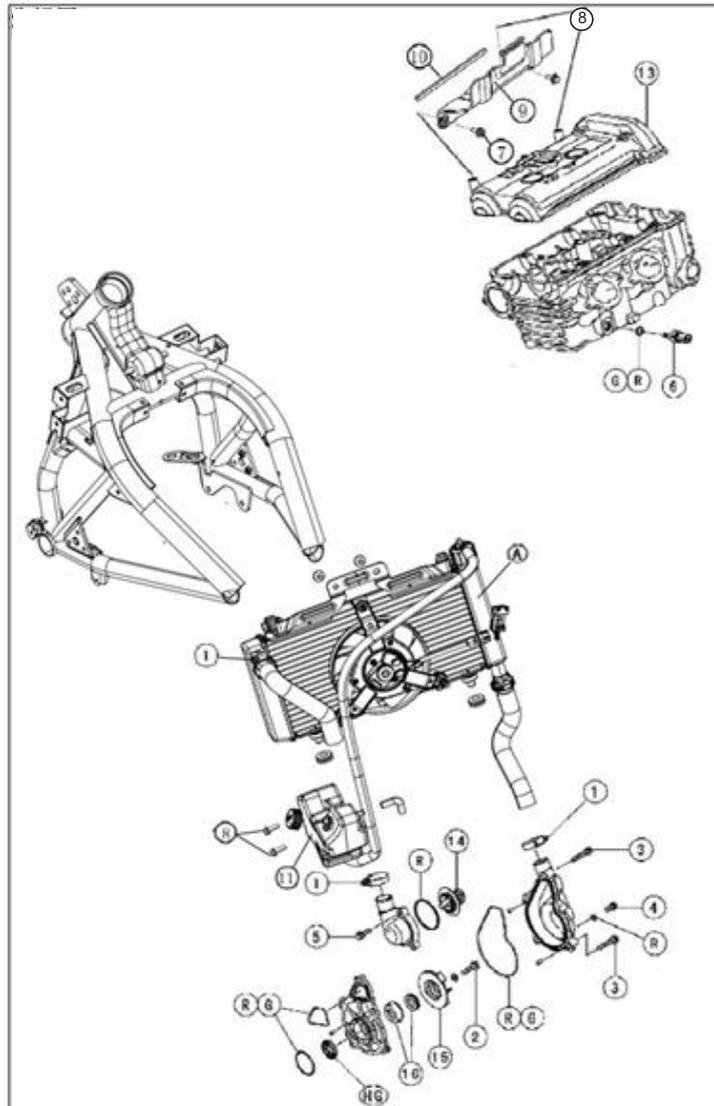


Chapter 5

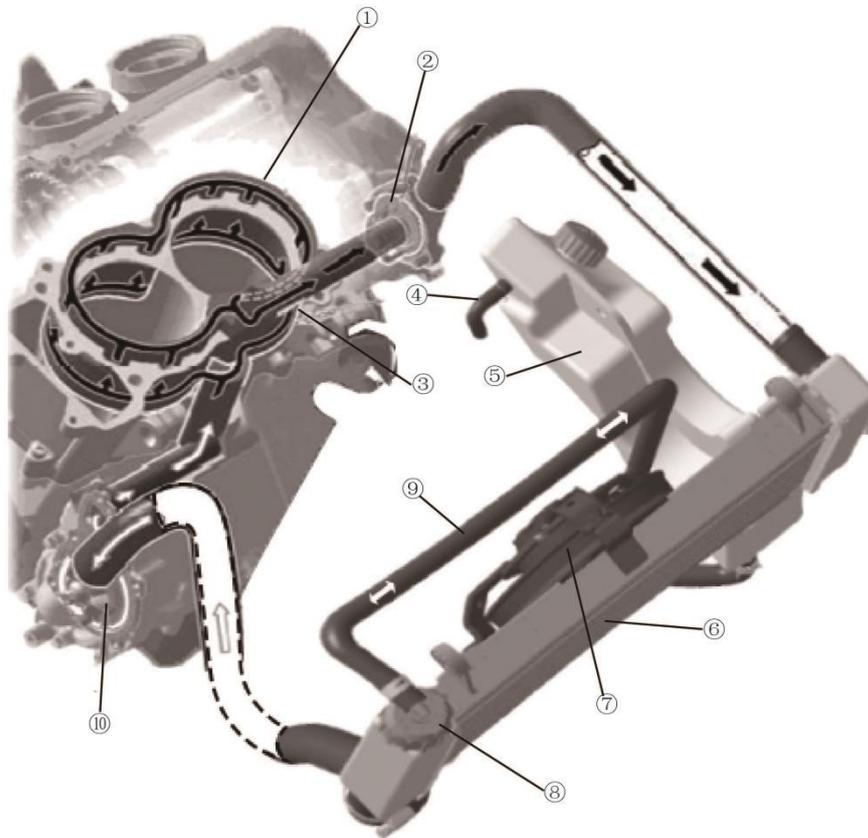
Cooling system



Tightening diagram



Po s.	Components	Torque (Nm)	Observation
1	Hose clamps	10	
2	Cover screws	10	
3	Valve cover screws	12	S
4	Cylinder head screws (M10 new head screws)	54	MO,S
	Cylinder head screws (M10 old cover bolts)	49	MO,S
6	Cylinder head screws (M6)	12	S
7	Support plate screws	20	L
8	Support plate screws	20	L

Coolant flow diagram


- 1) Head cooling chamber
- 2) Thermostatic radiator valve
- 3) Cylinder cooling chamber
- 4) Expansion tank overflow pipe
- 5) Coolant overflow tank
- 6) Radiator
- 7) Radiator fan
- 8) Radiator cap
- 9) Coolant overflow tank tube
- 10) Water pump

Refrigerante caldo
Refrigerante raffreddato

System operation

- Antifreeze is added to the coolant to protect the cooling system from rust and corrosion. When the engine is started, the water pump rotates to circulate the coolant.
- The thermostatic valve opens or closes the valve as the temperature of the coolant changes. The thermostatic valve constantly changes the valve opening to keep the coolant temperature in the correct range.
- When the coolant temperature decreases below 74°C, the thermostatic valve closes, the coolant flow stops and the engine temperature rises. When the coolant temperature rises above 80~84°C, the thermostatic valve opens and the coolant flows.
- When the temperature of the coolant exceeds 93 - 103°C, the radiator fan is activated via a relay. When the vehicle is operated at low speeds with insufficient air flow, the air speed is increased by the radiator fan. This improves the cooling function. When the temperature decreases below 91°C the fan relay disconnects and the radiator fan stops working.
- The cooling system controls the engine temperature and ensures that the engine operates at the required temperature over time.
- The radiator cap pressurises the cooling system to prevent the engine from overheating by inhibiting the boiling of the coolant. When the engine is warmed up, the coolant in the radiator expands. When the pressure in the cooling system rises to a certain level, the excess coolant passes through the radiator cap into the expansion tank and is temporarily stored there. On the contrary, when the engine has cooled and the pressure in the cooling system is lower than the outside atmosphere, the coolant in the expansion tank flows back into the radiator.
- The radiator cap has two valves. One is a pressure valve used to maintain the system pressure while the engine is running. When the pressure exceeds 112.3~141.7kPa, the pressure valve opens and releases the pressure to the expansion tank. When the pressure is released, the valve closes and keeps the pressure at 112.3~141.7kPa. When the engine cools down, a small valve (vacuum valve) inside the other cap opens. When the coolant cools down, it contracts and creates a vacuum in the system. The vacuum valve opens and allows coolant in the secondary tank to enter the radiator.

Recommended coolant	Glysantin G40
Colour	Green
Freezing point	-35°C
Total	1.6L(including radiator and engine interior)
Radiator cap maximum pressure	112.3~141.7kPa
Thermostat valve opening temperature	72°C
valve fully open temperature	85°C
full open lift	8mm

Coolant

1) Check

Remove the right-hand side cover (see Removing the right-hand side cover in the Chassis chapter).

Visually check the coolant in the expansion tank [A].

If a white cotton-like floating substance is found, the aluminium parts of the cooling system are corroded. If the coolant is brown, the iron or steel parts are rusting. In any case, rinse the cooling system.

If the coolant emits an unusual smell, check for leaks in the cooling system. The smell may be caused by a leak of exhaust fumes in the cooling system.



2) Coolant level check

See the coolant quantity in the Regular maintenance chapter.

3) Coolant drain

See Coolant change in the Periodic maintenance chapter.

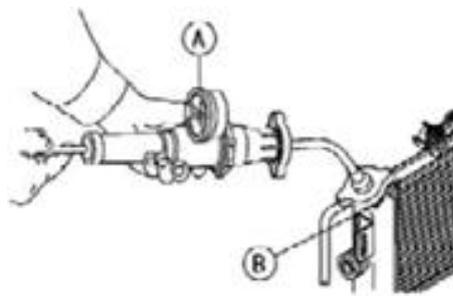
4) Coolant refill

See Coolant change in the Periodic maintenance chapter.

5) Pressure test

Remove the expansion tank (see Coolant Change in the Periodic Maintenance chapter).

Remove the radiator cap and install the pressure tester [A] on the radiator inlet [B].



Note

Wet the cap sealing surface with water or coolant to prevent the pressure from decreasing.

Take care to increase the pressure in the system to 141,7 kPa.

Important

During the stress test, do not exceed the pressure for which the system was designed.

Maximum pressure: 141.7kPa

Observe for at least 6 seconds.

If the pressure remains stable, the system is OK. If the pressure decreases but no external force is applied, check for internal leakage.

Drops of water in the oil indicate an internal leak. Check the cylinder head gasket and the water pump.

Remove the pressure tester, fill the coolant and refit the radiator cap.

6) Cooling system washing

After a period of use, the cooling system will accumulate rust and scale in the radiator. When such accumulation is noticed, rinse the cooling system. If this build-up cannot be cleaned, the system will block and the efficiency of the cooling system will be significantly reduced.
Drain the coolant (see Coolant change in the Regular maintenance chapter).
Fill the cooling system with water mixed with the flushing compound.



Warning

Do not use chemical cleaning products that are harmful to aluminium engines and radiators and carefully follow the instructions provided by the manufacturer of the cleaning product.

Warm up the engine and run it at normal temperature for about ten minutes.

Shut down the engine and drain the coolant.

Fill the system with water.

Preheat the engine and drain the coolant.

Repeat the previous two steps again.

Fill the system with coolant and purge the air from the system.

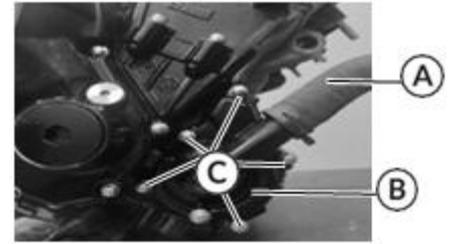
7) Expansion tank removal/installation

While changing the coolant, the expansion tank is removed and refitted (see Coolant change in the Periodic maintenance chapter).

Water pump

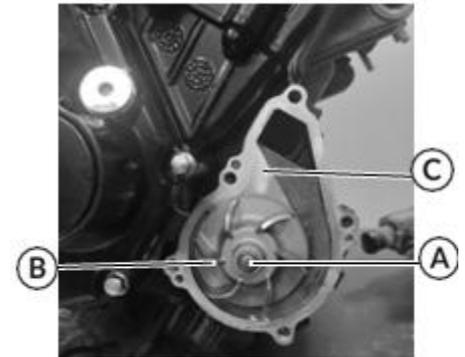
1) Pump removal

- Drain the coolant (see Coolant change in the Periodic maintenance chapter).
- Loosen the hose clamp from the water pump cover [B] and remove the radiator hose [A].
- Remove the water pump cover screws [C].
- Put the gearbox in first gear.
- Using the rear brake, remove the water pump impeller screw [A].
- Remove the impeller [B] and the water pump body [C].



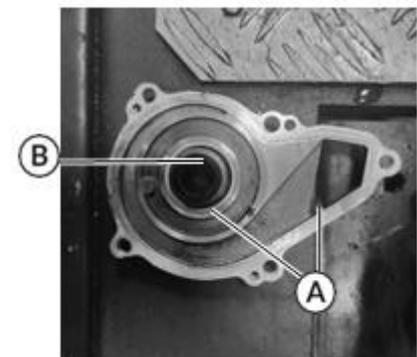
Note

Check the status of the radiator pipes; replace them if you notice any cut or cracks.



2) Water pump impeller installation

- When installing the water pump impeller screws, put the gearbox in first gear and use the rear brake.
- Replace the O-ring [A] of the new water pump housing and lubricate it with grease.
- Use high temperature resistant grease on the lip of the oil seal [B] of the water pump housing.



- Ensure that the positioning screw [A] is in position.
- Install the pump body.
- Tighten:

Tightening torque of the water pump impeller screw: 10N-m

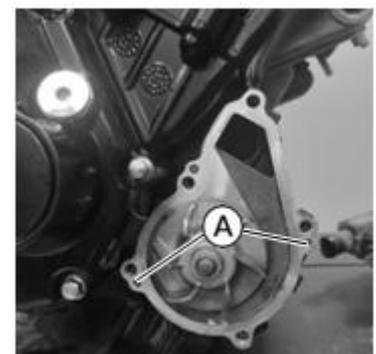
Note

Replace the pump cover O-ring [A] with a new one and lubricate it with grease.

3) Water pump cover installation

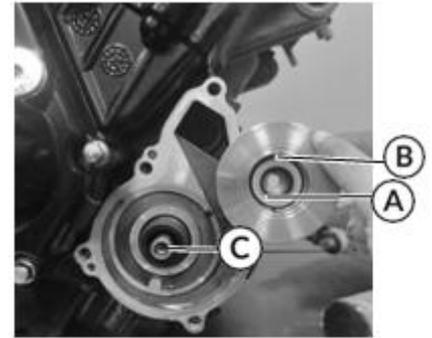
Mount the two positioning plugs [A].

Screw tightening torque: 10 N-m



4) Gasket inspection

Visual inspection, replace if any component is damaged.
 Gaskets and rubber seals can be easily removed by hand.
 Sealing ring surface [A]
 Rubber seal [B]
 Static water seal ring [C]

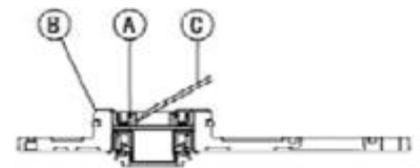


5) Pumoilseal removal

Important

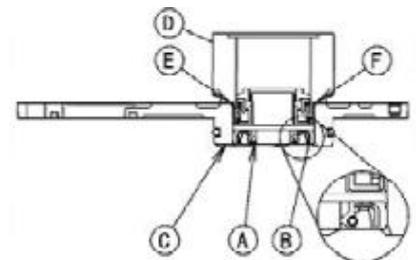
Do not damage the sealing surface of the water seal

- 1) Pull the oil seal [A] out of the pump body [B] with a hook [C].
- 2) Press the oil seal [A] out of the pump body with the punch [B].
 Special tools - Complete set of tools for mounting the water circuit seal.



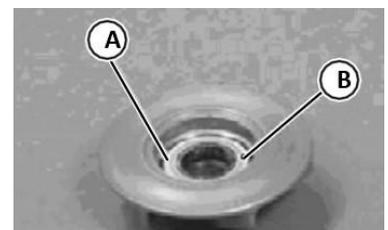
6) Pump body assembly

- 1) Apply high-temperature resistant grease [A] to the new oil seal [B].
- 2) Press the oil seal into the pump body with a sleeve, the sealing surface [C] will be completely flush with the end of the bore.
- 3) Use the special tool [D] to press the new oil seal into the pump body until its flange [E] touches the surface of the pump body [F].



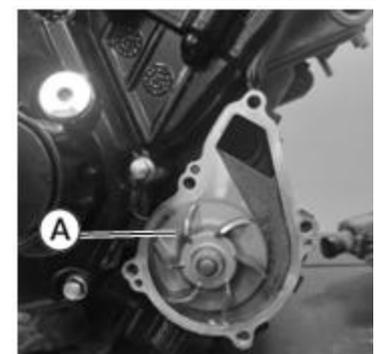
7) Impeller assembly

Clean the sealing surfaces with a solvent and use a small amount of coolant on the sealing surfaces as an initial lubrication of the seals.
 Apply the coolant to the rubber seal [A] and to the seal ring [B] surfaces and install the rubber seal and the seal ring.



8) Pump impeller inspection

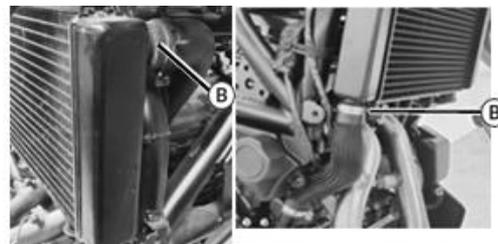
Visually inspect the impeller [A].
 Replace the impeller if the surface is corroded or if the blades are damaged (see Pump removal).



Radiator

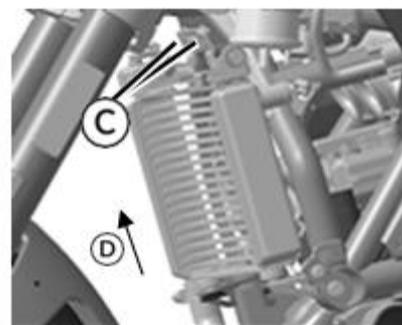
1) Radiator and radiator fan removal

- Drain the coolant (see coolant change in the Periodic maintenance chapter).
- Remove front cover, left/right fairing; (see front body assy removal/installation)
- Remove the expansion tank (see Coolant change in the Periodic Maintenance chapter)
- Remove the radiator fan motor connection [A] (disconnect)
- Release 2 water pipe clamp bolts[B];
- Remove 2 bolts[C];
- Lift the radiator [D] upward, taking care to protect the radiator core, and then pull it toward [E]

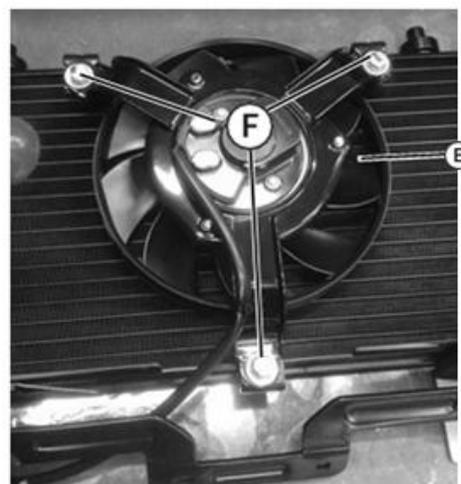


Important

Do not touch the fins of the heat sink as this could damage them and cause a loss of cooling efficiency.



If necessary, remove: the fan assembly screws [F], the radiator fan [E].



2) Radiator and radiator fan installation

- ①. Install the rubber cushion with its large side facing forward;
- ②. Install the radiator to the frame;
- ③. Align the frame protrusions and the holes on the radiator;
- ④. Tighten the radiator bolts;
- ⑤. Pay attention to the heat shield on the cylinder head cover when installing the radiator;
- ⑥. Locate the radiator pipe clamp bolts according to the picture

3) Radiator inspection

Check the radiator core.

If the airflow is obstructed, remove it.

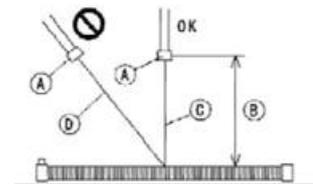
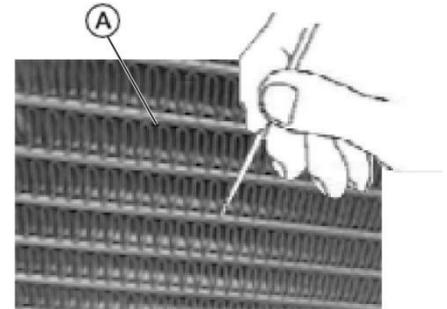
If the heat sinks [A] are deformed, adjust them carefully.

If the radiator tubes are clogged or the heat sinks are more than 20% deformed, replace them.

Note

When cleaning the radiator with a steam cleaner, pay attention to the following:

- To avoid damage to the radiator: hold the steam gun [A] more than 0.5 m away from the heat sink [B]. Hold the steam gun perpendicular [C] (not inclined [D]) to the surface of the heat sink.



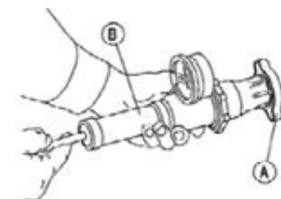
4) Radiator cap inspection

- Remove the expansion tank (see Coolant change in the Periodic maintenance chapter) then remove the radiator cap.
- Check the condition of the radiator cap valve springs [C] at the bottom [A] and at the top [B].
If there is visible damage to either, replace the radiator cap with a new one.
- Install the radiator cap [A] on the cooling system pressure tester [B].

Important

Use water or coolant to wet the sealing surface of the lid to prevent loss of pressure.

- Observe the pressure gauge and shake the tester to increase the pressure until the safety valve opens; the gauge needle moves rapidly downwards. Stop shaking and immediately measure the leakage time. The pressure relief valve must be open in the range specified in the table below and the gauge needle must remain in the same range for at least 6 seconds.



5) Radiator cap release pressure

Standard: 112.3~141.7kPa

If the cap does not maintain the specified pressure or if it resists too much pressure, replace it with a new one.

6) Radiator funnel neck check

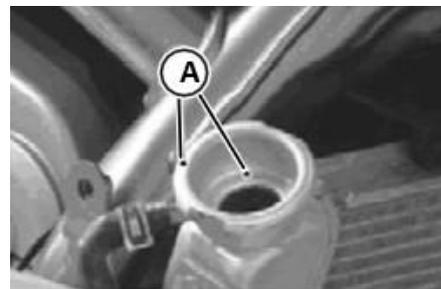
Remove the expansion tank (see Coolant change in the Periodic maintenance chapter).

Remove the radiator cap.

Inspect the radiator funnel neck for damage.

Check the condition of the top and bottom of the cap sealing supports [A].

They must be smooth and clean for the radiator cap to function properly.



Thermostatic valve

1) Thermostatic valve removal

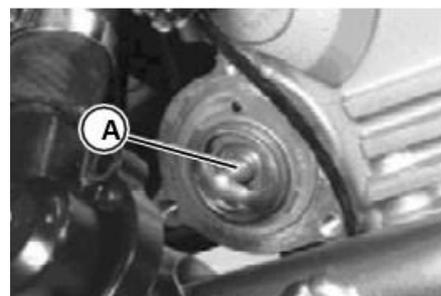
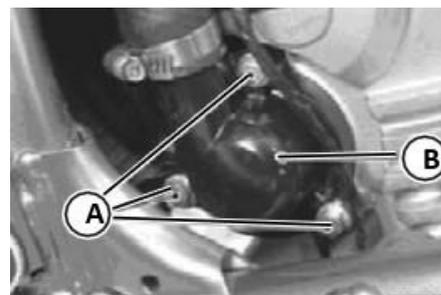
- Drain the coolant (see Coolant change in the Periodic maintenance Chapter).

- Remove the left-hand cover(see Left-hand cover in the Chassis chapter)

Remove the thermostat cover screws [A]

Remove thermostat cover [B].

Pull the thermostatic valve [A] out of the cylinder head.



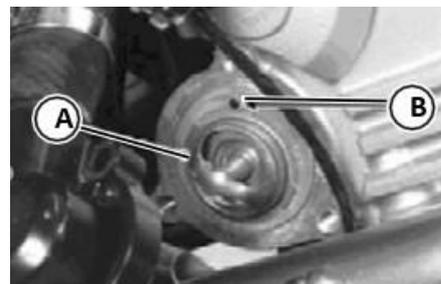
2) Thermostat assembly

- Install the thermostatic valve on the cylinder head [A] with the air exhaust hole [B] facing upwards.

- Install a new O-ring in the thermostat cover and grease it.

- Tighten the screws - tightening torque:10Nm

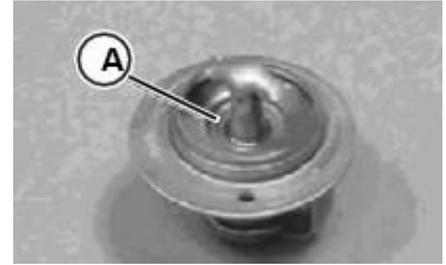
Fill the radiator with coolant (see Coolant change in the Regular maintenance chapter).



3) Thermostatic valve inspection

Remove the thermostatic valve and check it [A] at room temperature. If the valve is open, replace the thermostatic valve with a new one.

- To check the valve opening temperature, suspend the thermostatic valve [A] in a container with water and increase the water temperature.

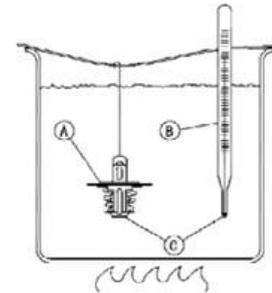


Note

The thermostatic valve must be fully immersed and it must not touch the sides or the bottom of the container. A standard thermometer [B] is suspended in the water so that the thermal position [C] is locked at the same depth. It is also important that the container is not touched.

If the measurement results are outside the specified range, replace the thermostatic valve with a new one.

Thermostatic valve opening temperature: 80~84°C.

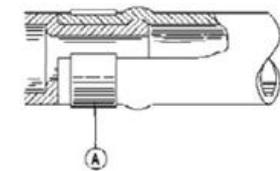


Flexible hose

1) Hose assembly

Assemble the hose, carefully following the bending instructions to avoid sharp bends, kinks, crushing and twisting.

Assemble the hose clamp [A] as close as possible to the end of the hose to eliminate the protruding reinforcement of the fitting. This will prevent the hose from loosening.



Important

Fasten the clamp screws correctly to prevent the clamp from coming into contact with other parts.

Radiator hose clamp screws – coupling torque: 2.5 Nm.

2) Hose inspection

(See the Periodic maintenance chapter for radiator hose damage and installation checks).

Water temperature sensors

Warning

Do not drop the water temperature sensor on a hard surface, the impact of a fall may damage the water temperature sensor.

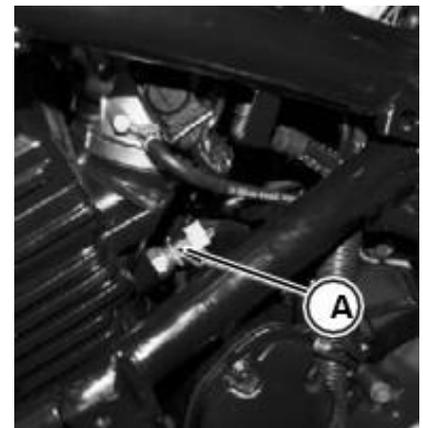
1) Water temperature sensor removal/assembly

See water temperature sensor removal/assembly in the Power System (EFI) chapter.

Water temperature sensor [A].

2) Water temperature sensor check

See Water temperature sensor check in the Electric system chapter.



Chapter 6

Engine



Disassembly diagram

Tightening torques

No.	Fastening components	Torque (N-m)	Observations
1	Clamp bolts	10	
2	Cylinder cover bolts	10	
3	Camshaft cover bolts	12	S
4	Cylinder head bolts (M10 new bolts of the head)	54	MO,S
	Cylinder head bolts (bolts of the old M10 cover)	49	MO,S
6	Cylinder head bolts (M6)	12	S
7	Voltage regulator bolts	20	L
8	Voltage regulator bolts	20	L
9	Turnbuckle bolts (283MT)	10	
10	Turnbuckle screw cap	28	
11	Spring seat bolt (283MT)	20	
12	Ignition spark plugs	15	
13	Camshaft sprocket bolts	15	L
14	Folded stall bolts	6	L
15	Folded stall bolts	6	

L: Thread lockers

M: Coat with molybdenum disulfide grease.

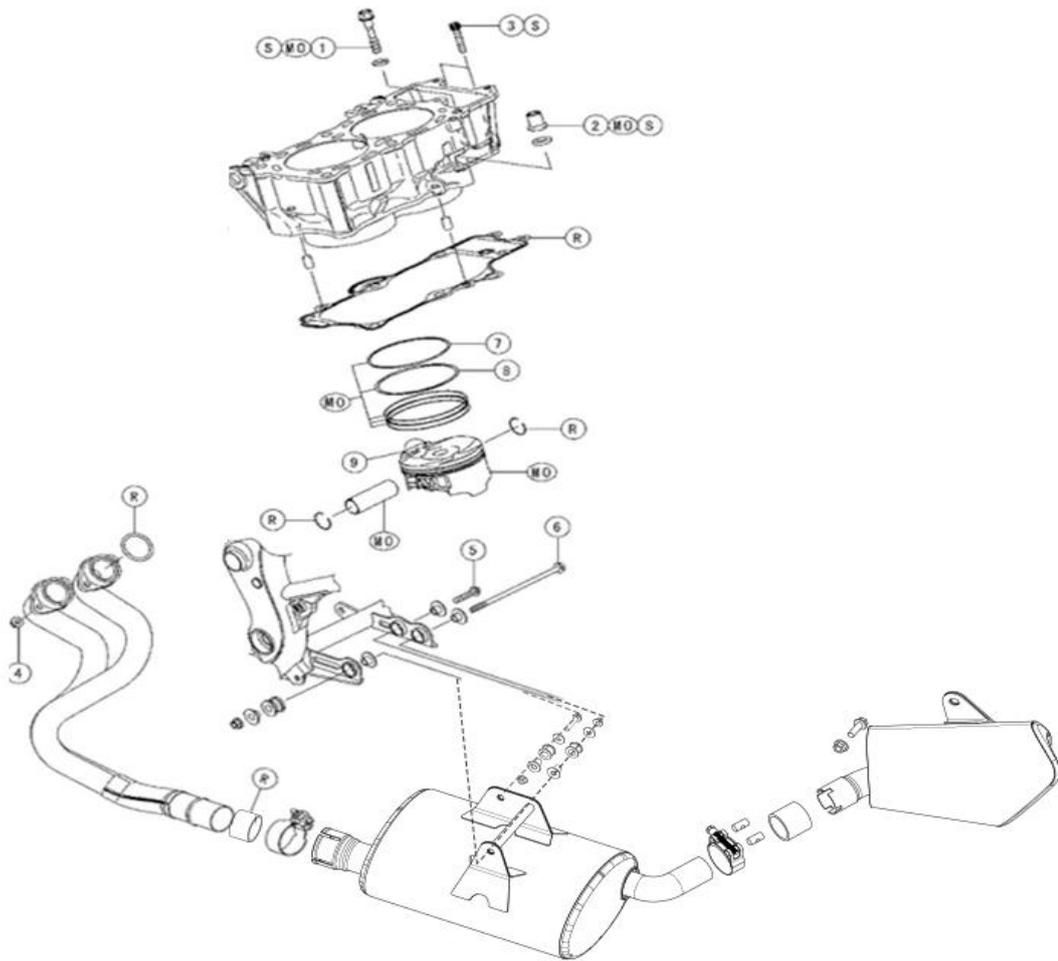
M 0: Application of a solution of molybdenum disulfide oil (molybdenum disulfide oil and grease mixture in a 10:1ratio).

R: Spare parts

S: Tighten in the described sequence.

SS: Silicone-coated sealant

Disassembly chart



Disassembly diagram

N o .	Fastening components	Torque (N. m)	Observatio ns
1	Cylinders fixing screw	27,5	MO,S
2	Cylinder body nut (M10)	49	MO,S
3	Cylinder head screws (M6)	12	S
4	Exhaust manifold fixing nut	17	
5	Silencer body support screws (front)	20	
6	Silencer body support screws (rear)	20	

7: "A1" mark facing upwards

8: "A2" mark facing upwards

M 0: Application of a solution of molybdenum disulfide oil
(molybdenum disulfide oil and grease mixture in a
10:1

ratio).

R: Spare parts.

S: Tighten in the described sequence.

Parameters

Components	Standard	Tolerance limits
Camshafts		
Cam height		
Intake	34.743-34.857mm	34,64mm
Exhaust (283MT)	35.843 - 35.957mm	35,74mm
Air inlet	35.743 - 35.857mm	35,64mm
Air inlet (283MT)	36.543-36.657mm	36,44mm
Clearance from the camshaft pin to the camshaft cover	0,028 a 0,071mm	0.16mm
Camshaft bore	23.950 a 23.972mm	23,92mm
Camshaft cover hole diameter	24.000 a 24.021mm	24,08mm
Camshaft pin wear	0.02mm	0.1mm
Cylinder head		
Cylinder compression pressure	961 a 1471kPaat400r/min(rpm)	---
Cylinder head flatness	---	0.05mm
Valves clearance		
Intake	0,20 a 0,26 mm	---
Exhaust (283MT)	0,22 a 0,28 mm	---
Air inlet	0,08 a 0,13 mm	---
Valve stem straightness	0.01mm	0.05mm
Valve stem diameter		
Intake	4,455 a 4,470mm	4,44mm
Air inlet	From 4,475 to 4,490 mm	4.46mm
Valve guide hole diameter		
Intake	4.500 to 4.512 mm	4,58mm
Air inlet	4.500 to 4.512 mm	4,58mm
Valve/valve guide clearance (oscillation method)		
Intake	From 0,07 to 0,14 mm	0,27mm
Air inlet	0,02 to 0,08 mm	0,22mm
Valve seat sealing tape		
Width		
Intake	From 0,5 to 1,0 mm	---

Components	Standard	Tolerance limits
Air inlet	From 0,5 to 1,0 mm	---
External diameter		
Intake	From 22,6 to 22,7 mm	---
Exhaust (283MT)	27,6 to 27,7 mm	---
Air inlet	From 26,7 to 26,8 mm	---
Air inlet (283MT)	32,6 to 32,7 mm	---
Valve spring free length		
Intake		
Exhaust (283MT)		40mm
Air inlet	41,6 mm	38,4mm
Air inlet (283MT)	39,9mm	40mm
Cylinders, pistons	41,6 mm	
Cylinder internal diameter	68.4 - 68.418mm	68,50 mm
Cylinder internal diameter (283MT)	83-83.032mm	83,1mm
Piston skirt diameter	68.366-68.384mm	68,24mm
Piston skirt diameter (283MT)	82.988-82.970mm	82,83mm
Cylinder/Piston clearance	0.030-0.045mm	---
Cylinder/Piston clearance (283MT)	0.015-0.037mm	---
Clearance between piston ring and groove		
First air ring	0,02 to 0,06 mm	0.16mm
First air ring (283MT)	0,03 to 0,07 mm	0.16mm
Second air ring	0,02 to 0,06 mm	0.16mm
Piston ring groove width.		
First air ring	1,01 to 1,03 mm	1.11mm
First air ring (283MT)	0,92 to 0,94 mm	1.02mm
Second air ring	1,01 to 1,03 mm	1.11mm
Piston ring thickness.		
First air ring	0,97 to 0,99 mm	0,90mm
First air ring (283MT)	From 0,87 to 0,89 mm	0,80mm
Second air ring	0,97 to 0,99 mm	0,90mm

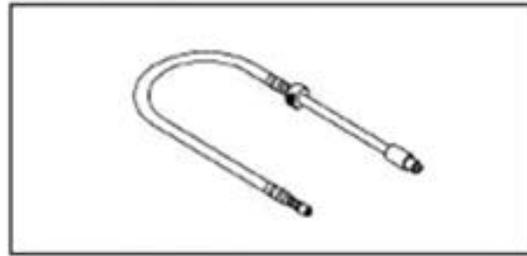
Components	Standard	Tolerance limits
Piston ring closure clearance		
First air ring	0,15 to 0,30 mm	0,7mm
First air ring (283MT)	0,25 to 0,40mm	0,7mm
Second air ring	0,20 to 0,40 mm	0,7mm
Second air ring (283MT)	0,40 to 0,55 mm	0,8 mm
Valve spring free length		
Intake	39,9mm	38,4mm
Exhaust (283MT)	41,6 mm	40mm
Air inlet	39,9mm	38,4mm
Air inlet (283MT)	41,6 mm	40mm
Cylinders, pistons		
Cylinder internal diameter	68.4 - 68.418mm	68,50 mm

Special tools and sealants

Pressure meter



Pressuremeter adapter



Specific tools of the engine

Fly-wheel extractor

0700-031000-922-00



Compression test manometer

Specifications for pressure measurement of the engine cylinder:
0MPa~2MPa

Piston seeger ring insertion pliers

0800-040005-922-001



Valves clearance adjustment feeler gauge



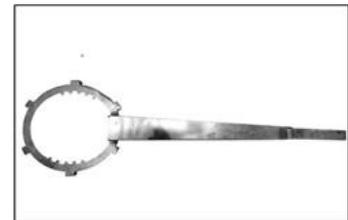
Spark plugs wrenches

0700-170200-923-001



Clutch wrench (removal/installation of the clutch nut, nut of the right hand end of the crankshaft)

0700-051000-922-001



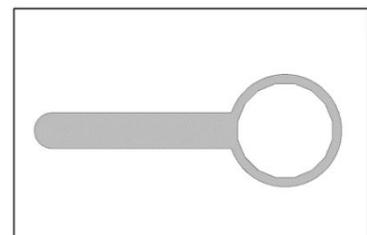
Fly-wheel wrench

0700-031000-922-001



Oil filter wrench

0700-070200-922-001



Removal of the engine from the vehicle

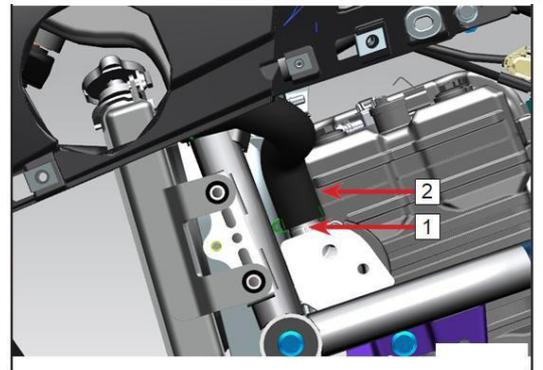
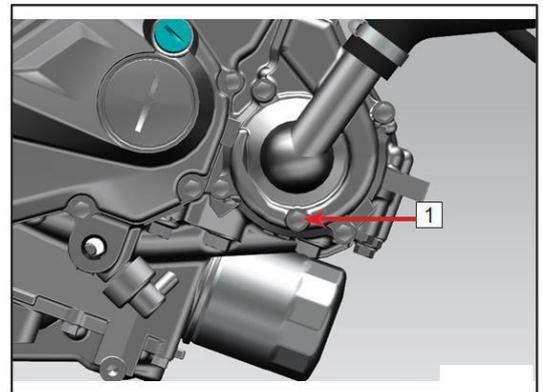
- Remove the silencer
- Remove the electric connectors from the engine
- Remove the fairings
- Remove the right and left hand guards
- Remove the engine protection group
- Remove the left/right hand frame guard
- Remove the water radiator cap.

Warning

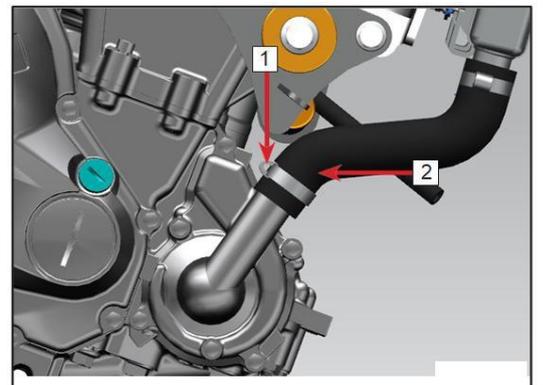
The engine must not be dismantled before it has cooled down entirely, or can only be dismantled after wearing special protective clothing to avoid burns.

Keep the vehicle complete in vertical position and pit a container under the engine to collect the coolant leaking from the vehicle.

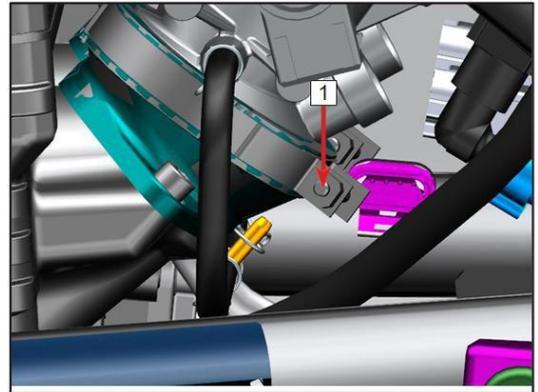
- Remove the M6 screw (1) and the gasket and unload the coolant.
- Loosen the hose clamp(1)
- Disconnect the pipe(2)



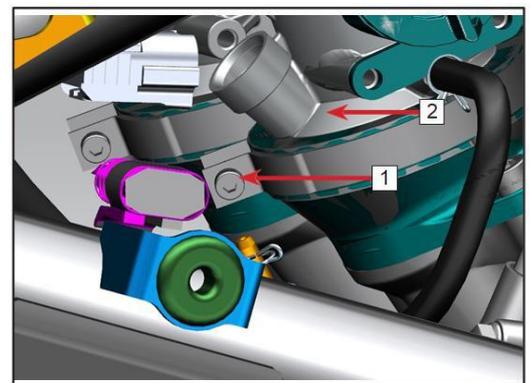
- Loosen the hose clamp(1)
- Disconnect the pipe(2)



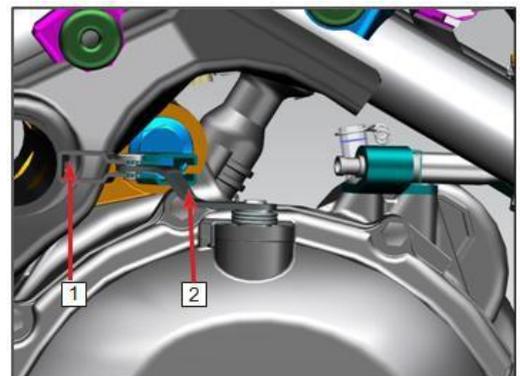
- Loosen the clamp(1)



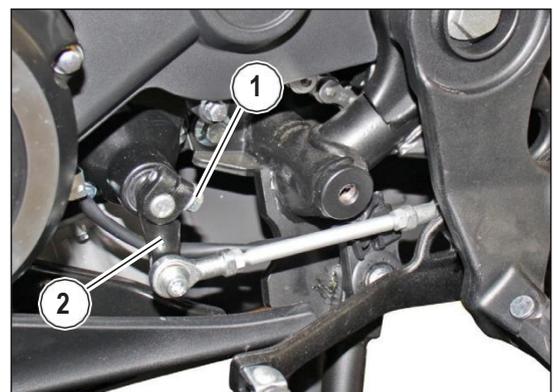
- Loosen the clamp (1), shake the air box (2) until it has loosened



- Disconnect the clutch cable
- Use the tool to rotate the clutch lever(2)
- Disconnect the cable(1)

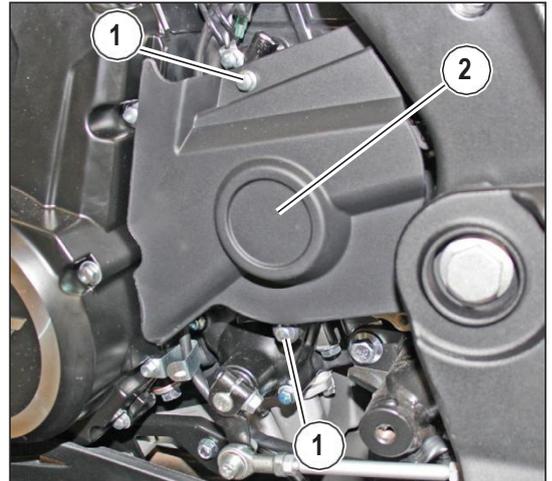


- Remove the clutch lever
- Loosen the M6 screw(1)
- Remove the gear lever group(2)

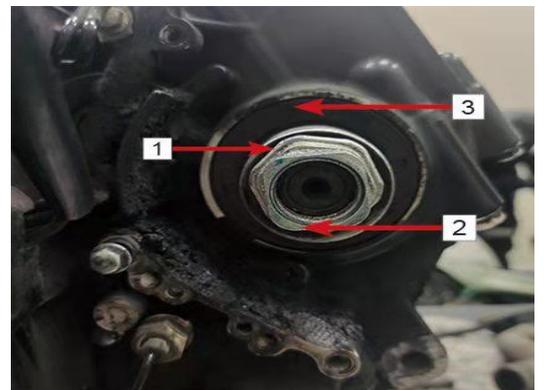


Removal of the front sprocket

- Remove the M6 screws(1)
- Remove the front sprocket cover(2)

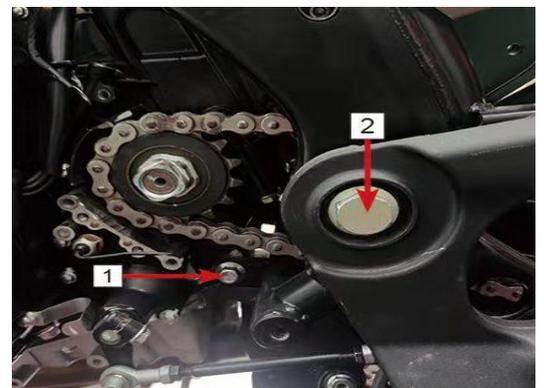


- Straighten the washer stop tab(1)
- Remove the nut M20(2)
- Remove the locking washer(1)
- Remove the chain front sprocket(3)


Removal of the engine group

- Position a lift under the engine to support it
- Remove the M10 nut (1); remove the corresponding screw
- Remove the M20 nut (2); remove the corresponding screw

Note: while you are unscrewing the nut, block screw rotation using a wrench



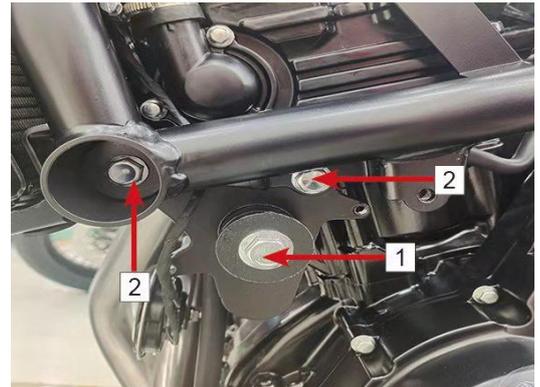
- Remove the M10 nut (1), remove the corresponding screw

Note: while you are unscrewing the nut, block screw rotation using a wrench



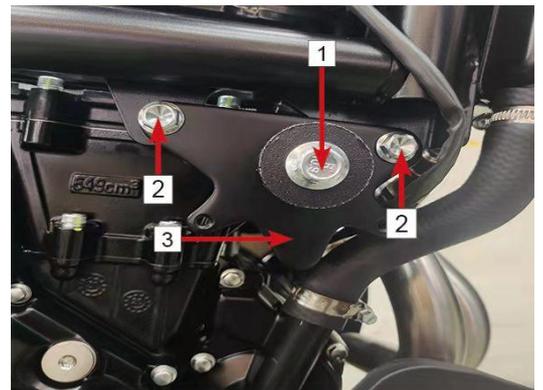
- Remove the M10 screw (1); remove the corresponding nut
- Remove the M8 screw(2)

Note: while you are unscrewing the nut, block screw rotation using a wrench



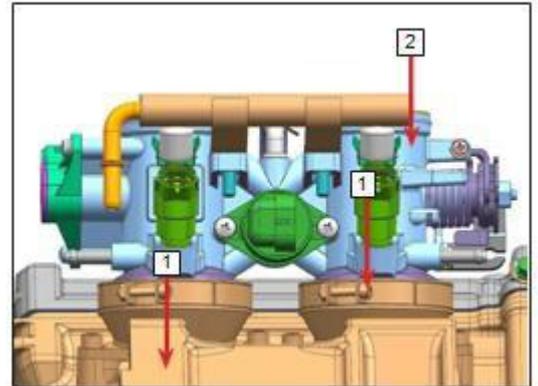
- Remove the M10 screw (1), remove the corresponding nut
- Remove the M8 screw(2)
- Remove the engine front support bracket(3)
- Release the engine from possible wiring harnesses and slowly lower the lift to remove the engine assembly

Note: while you are unscrewing the nut, block screw rotation using a wrench

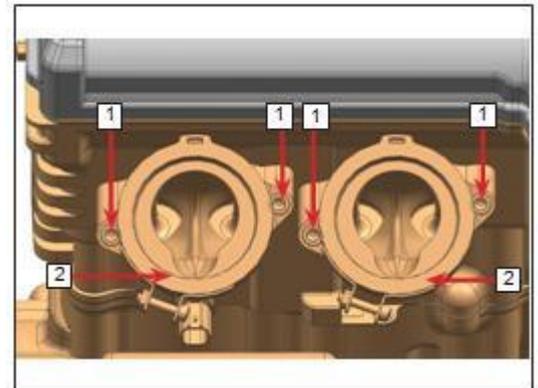


Engine intake system

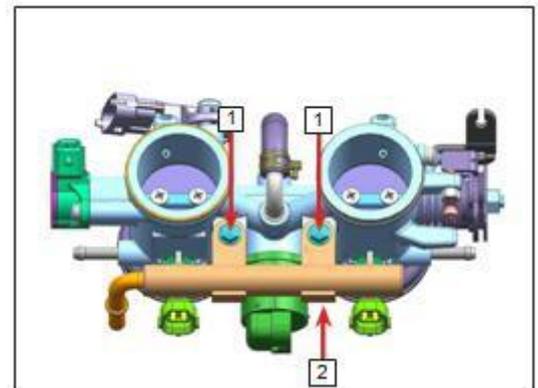
- Throttle body group disassembly
- Remove the air filter group (see the air filter group for more details)
- Loosen the ring(1)
- Remove the throttle group(2)



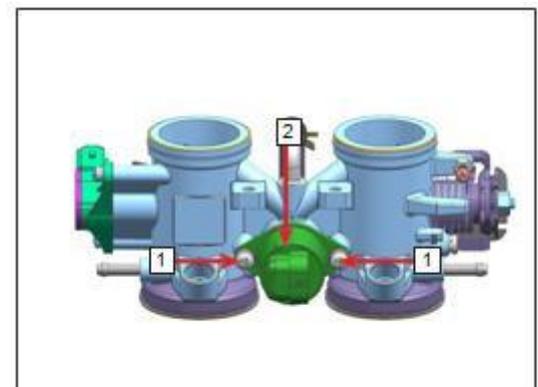
- Remove the cylinder head screw M6(1)
- Remove the air inlet group(2)



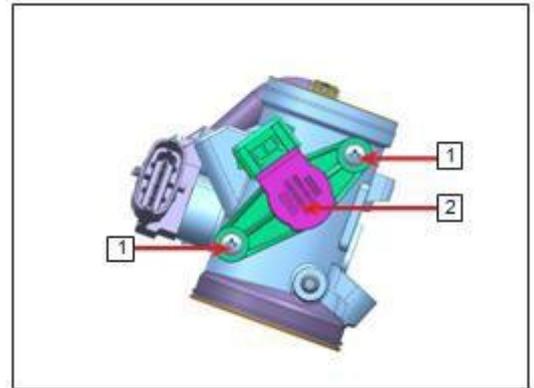
- Remove the screws(1)
- Remove the fuel rail(2)



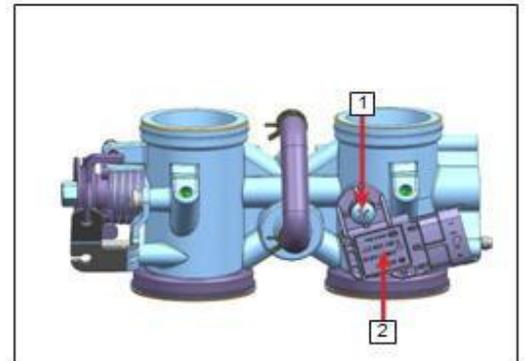
- Remove the screws(1)
- Remove the idle stepper motor(2)



- Remove the screws(1)
- Remove the throttle position sensor(2).



- Remove the screw(1)
- Remove the intake air pressure and temperature sensor(2)



- Throttle body
 - Check that the throttle body is not damaged by cracks. Replace with new components if necessary.
- Note: Idle position screw (1); work in pairs in case of disassembly.



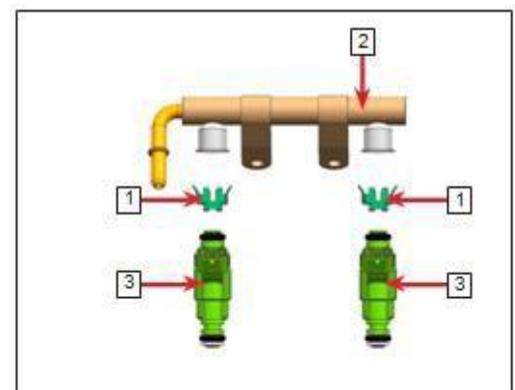
Injectors disassembly

- Push on each side of the injector cap spring(1)with both thumbs.
- Remove the injector cap spring(1)
- Remove the injector cap(2)

See the electric section for more details on the inspection.

Injectors reassembly

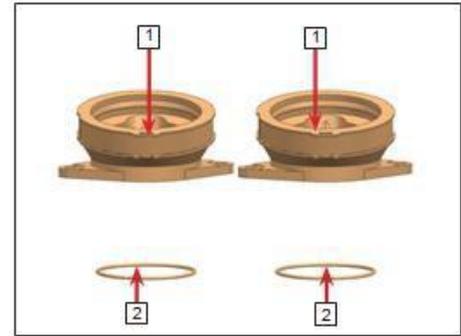
- Install the injector (3) on the injector cover(2)
- Reinstall the injector cap spring(1)
- The injector cap tabs (2) must be inserted in the injector cap spring slots (1)



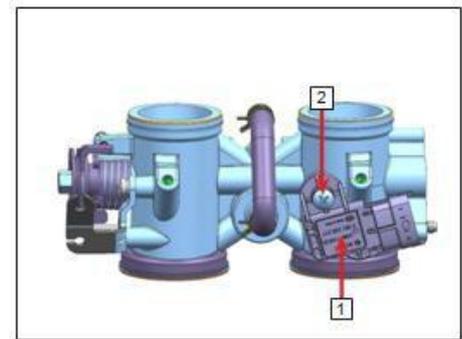
Inspection of the intake manifolds

- Check that the intake manifolds (1) are not broken and damaged, replace them with new components in such case.

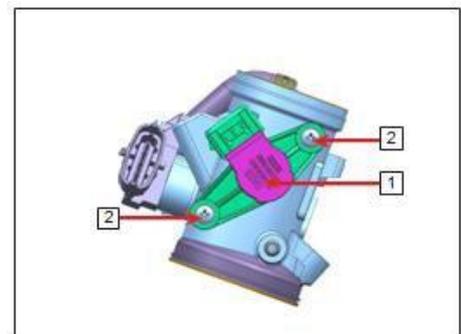
Check that the rubber gasket (2) is not broken, chipped, hardened or damaged and replace it with a new one if needed.


Throttle body group assembly

- Mount the intake air pressure and temperature sensor (1) and tighten the screw (2)



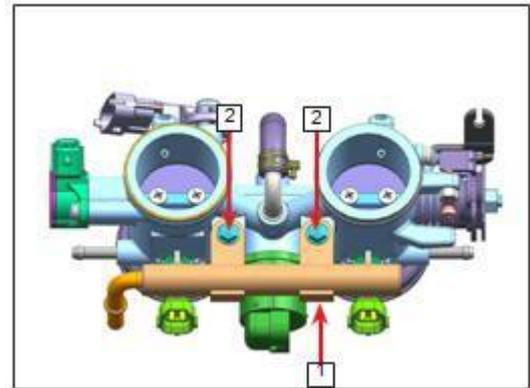
- Install the throttle position sensor(1)
- Tighten the screws(2)



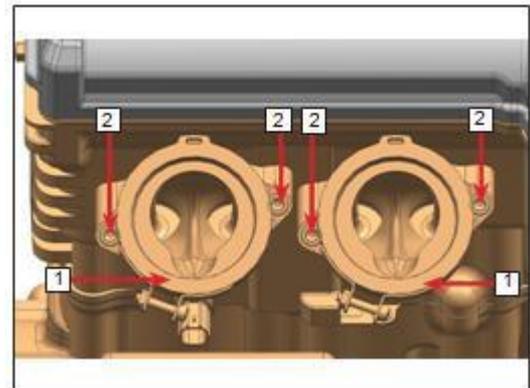
- Install the idle stepper motor(1)
- Tighten the screws(2)



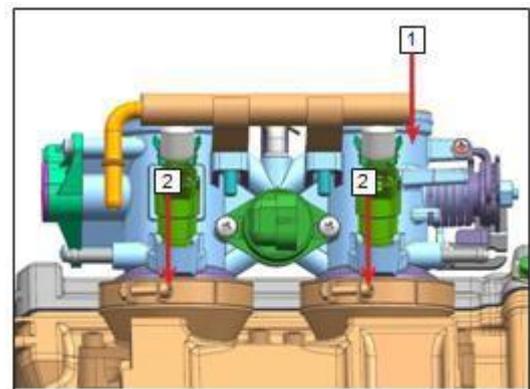
- Install the rail (1)
- Tighten the screws(2)



- Install the intake manifolds(1)
- Tighten the cylinder head M6 screws(2)



- Install the throttle body(1)
- Tighten the hose clamps(2)



Engine disassembly

Position the engine on the disassembly table and firmly fix it

Note

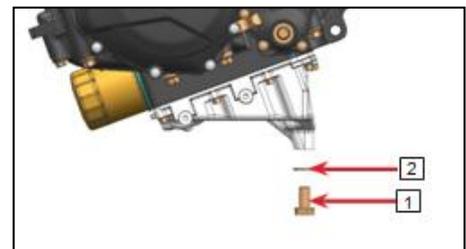
The engine must be firmly fixed to the disassembly table to avoid its fall and possible injuries to the personnel or damages to the engine itself.

Note

The engine must not be dismantled before it has cooled down entirely, or can only be dismantled after wearing special protective clothing to avoid burns.

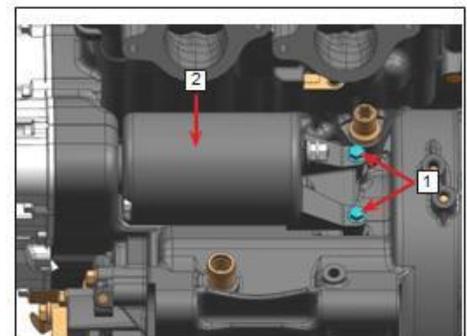
Oil drain

- Position a container under the disassembly table to collect oil.
- Dismount the oil lower cap M12×22(1)
- Remove the washer 12(2)
- Drain oil.



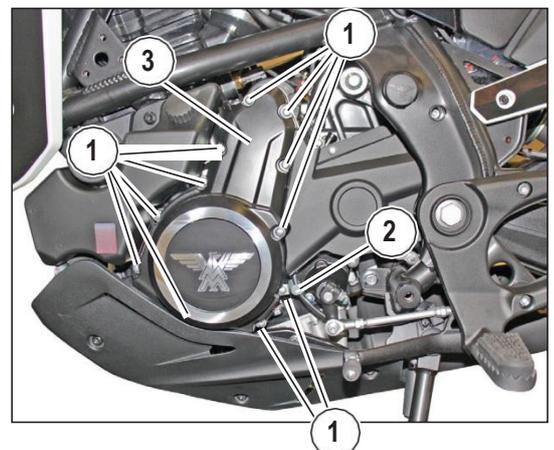
Starter motor disassembly

- Remove the M6 screws(1)
- Remove the starter motor group (2) by slightly moving it; if the starter motor is excessively tightened, loosen by beating it delicately with a rubber hammer. Do not beat it strongly



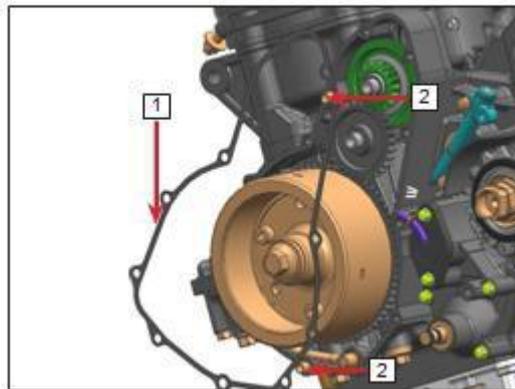
Fly-wheel removal

- Remove the M6 screws(1)
- Remove the wire terminals(2)
- Remove the left front cover(3)

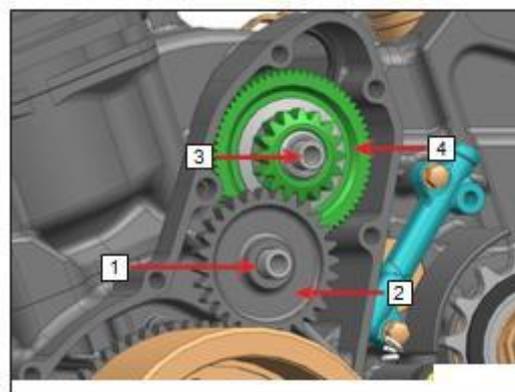


- Remove the paper sealing gasket(1)
- Remove the grub screw(2)

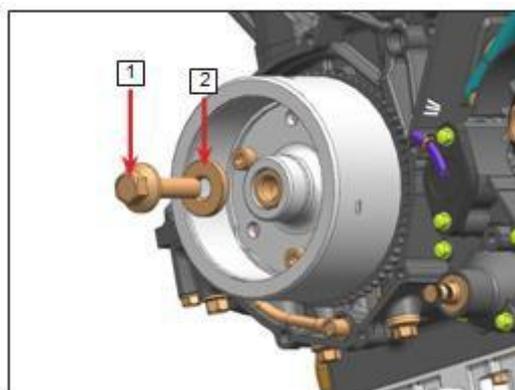
Warning: during disassembly, pay attention to the grub screw (2) in order to avoid its fall and possible loss.
When the left front cover is removed, the grub screw (2) can also be found on the left front cover.



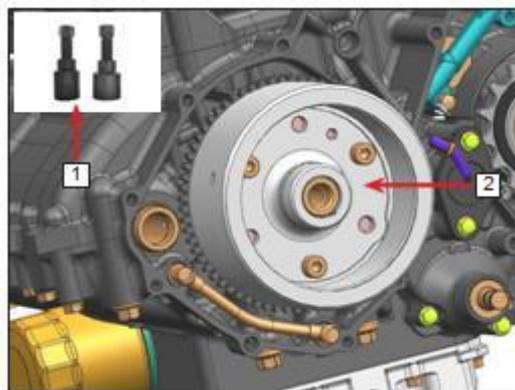
- Remove the counter gear shaft(1)
- Remove the ignition counter gear(2)
- Remove the counter gear shaft(3)
- Remove the duplex gear group(4)



- Remove the M12 screw(1)
- Remove the washer(2)

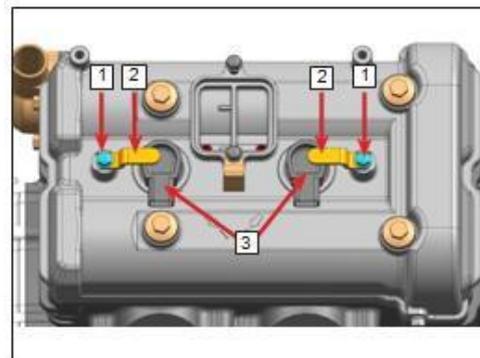


- Use the extractor (1) to remove the rotor(2)

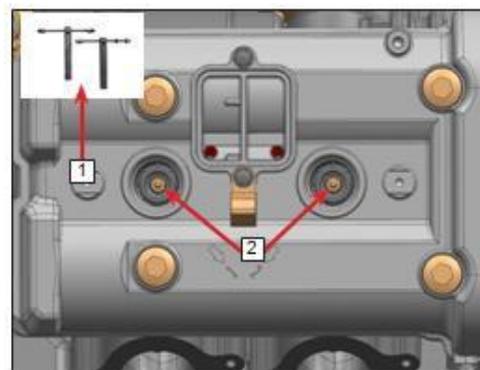


Removal of the ignition coil and of the spark plugs

- Remove the M6 screws(1)
- Remove the locking levers(2)
- Turn the ignition coil (3) anticlockwise loosening it.
- Extract the ignition coil towards the exterior(3)



- Spark plugs removal tool(1)
- Remove the spark plugs(2)

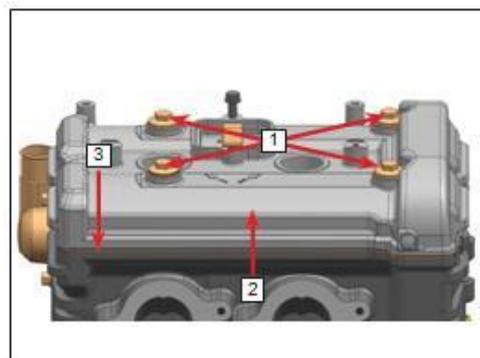


Head cover removal

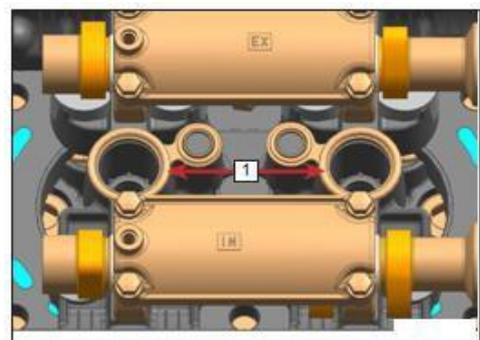
- Remove the M6 screws and the gaskets(1)
- Remove the head cover(2)
- Remove the gasket (3) of the head cover

Note

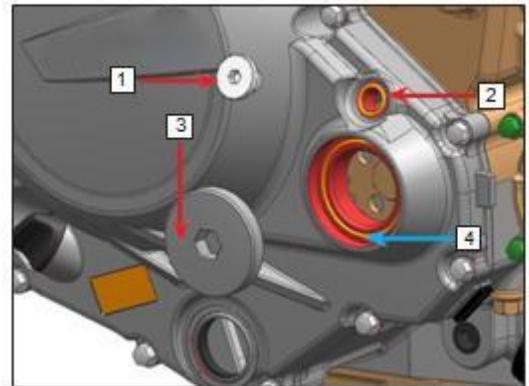
Replace the gasket (3) upon reassembly.



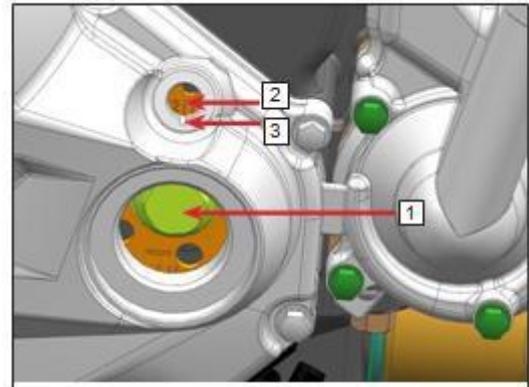
- Remove the spark plug hole gasket(1)



- Remove the variable valve timing check hole cap 1; remove the O-ring (2); remove the carter cover (3)
- Remove the O-ring(4)



- Position the wrench on the M8 bolt (1), turn clockwise
- Turn until the mark 2/T 2 is directly in front of mark 3 of the right cover timing check hole.

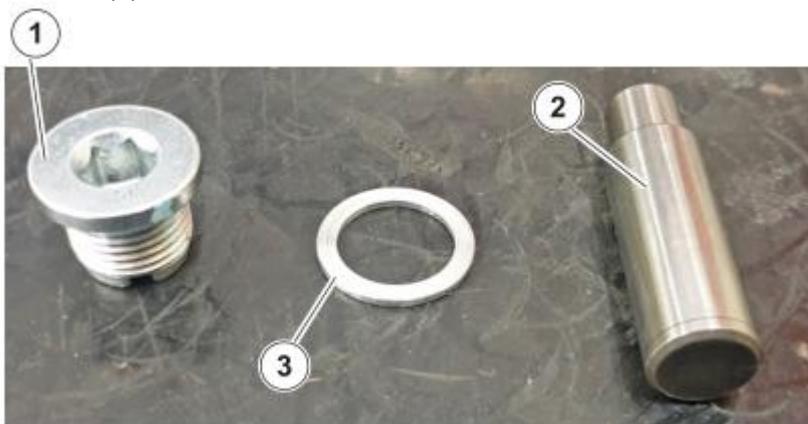
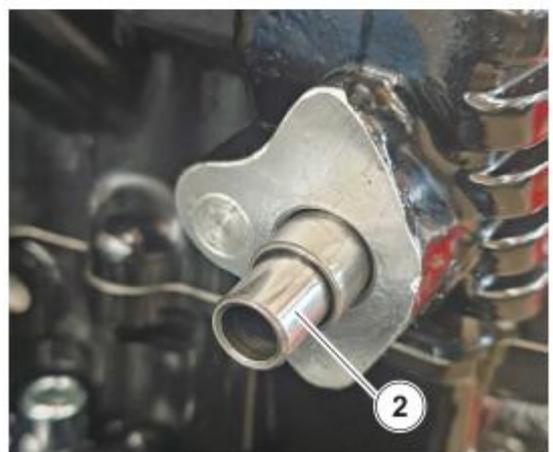


Distribution chain turnbuckle removal

Note

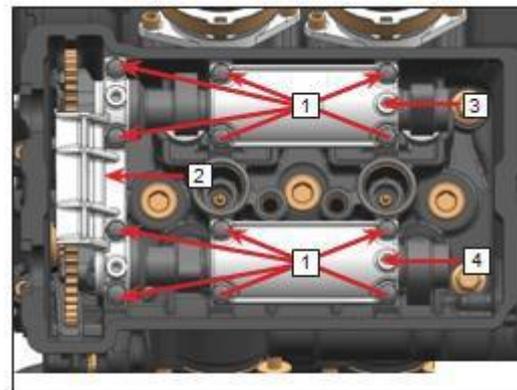
before disassembling the distribution chain turnbuckle, make sure the valves of the two cylinders are closed (See the paragraph "Camshafts group installation")

- Undo the Allen screw (1) and remove it with its respective aluminium washer.
- Extract the turnbuckle (2).
- Upon reassembly, check the position of the valves as described above, insert the turnbuckle as shown in the figure and tighten the screw (1) until end of travel taking care to replace the aluminium washer (3)



Camshafts disassembly

- Remove the M6 screws(1)
- Remove the chain pad(2)
- Remove the intake camshaft seat(3)
- Remove the exhaust camshaft seat(4)



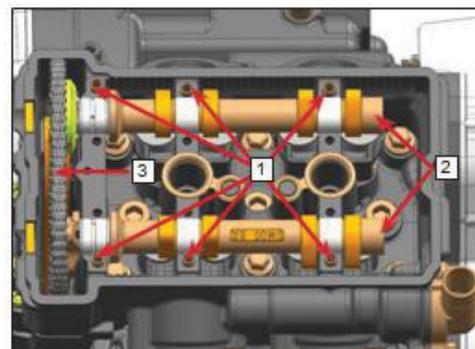
Note

When the camshafts are dismantled, ensure that the centring plugs do not fall inside the engine.

- Remove the caps(1)
- Remove the camshaft group(2)

Note

Remove and clean the camshaft group (2); hooks are necessary. Hook the distribution chain (3); avoid that the distribution chain (3) falls inside the engine.



Removal of the cylinder head

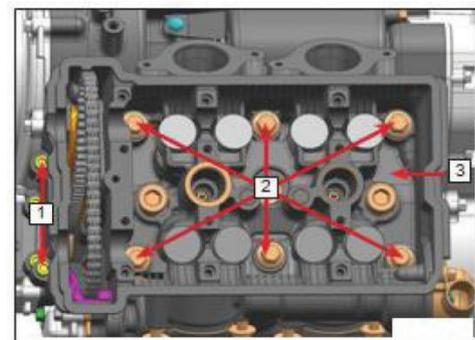
- Remove the hexagon head M6 screws (1) and the spacer
- Remove the M10 screws (2) and the spacer
- Remove the cylinder head(3)

Note

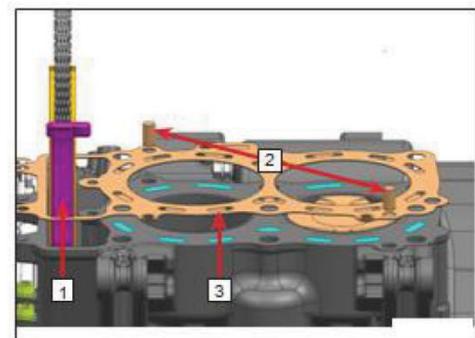
When the screws are removed, pay attention to the washers to avoid their loss or fall inside the engine. The M10 screws spacer(2) can be removed using a magnet.

Note

The cylinder head can be removed by moving it slightly from one side to the other. When the cylinder head is removed, the distribution chain must be hooked to avoid that it falls inside the engine.

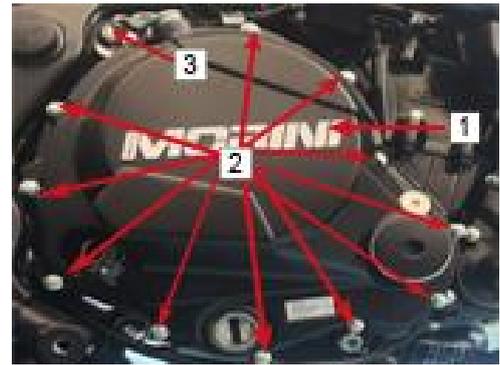


- Remove the chain pad(1)
- Remove the centring bushes(2)
- Remove the cylinder head gasket(3)

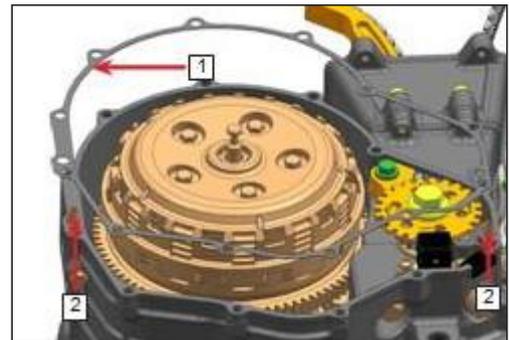


Removal of the right side cover

- Remove the M6 screws(1)
- Remove the right cover (2); (turn the clutch control during removal)
- Control Shaft assy(3), Rotate to the proper position and remove the right side cover



- Remove the paper gasket(1)
- Remove the bushes(2)


Removal of the clutch

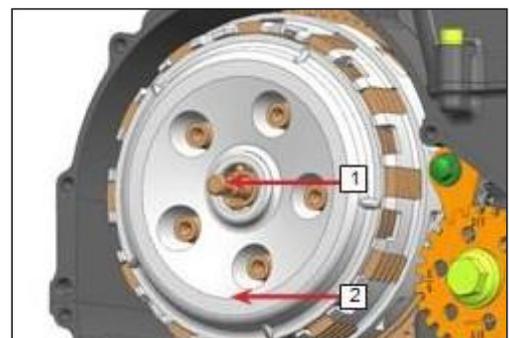
- Remove the M6 screws(1)



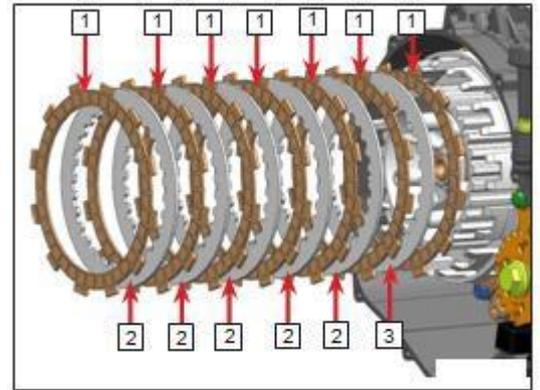
- Remove the springs(1)



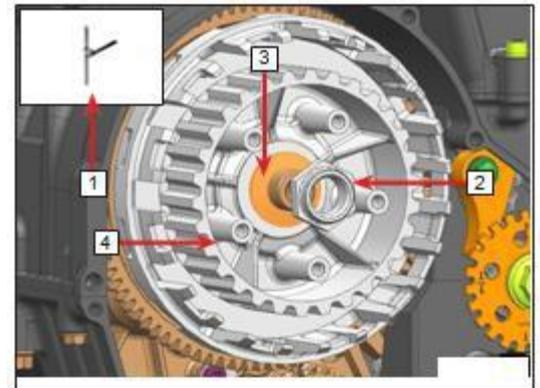
- Remove the rod (1) from the plate(2)



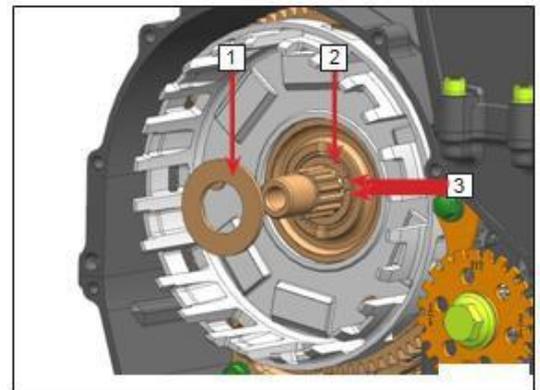
- Remove the trimmed discs(1)
- Remove the B iron discs(2)
- Remove the A iron discs(3)



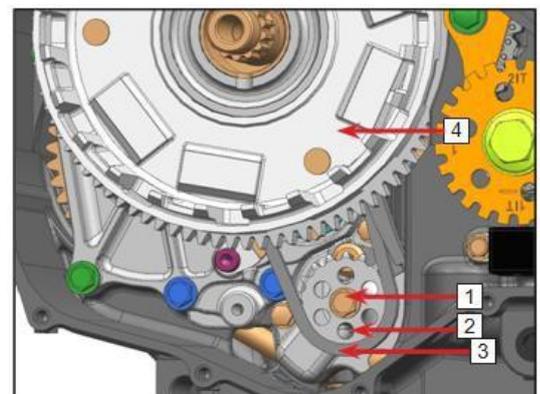
- Use the clutch locking tool(1)
- Lock the clutch drum, remove the M20 nut(2)
- Remove the washers(3)
- Remove the drum(4)



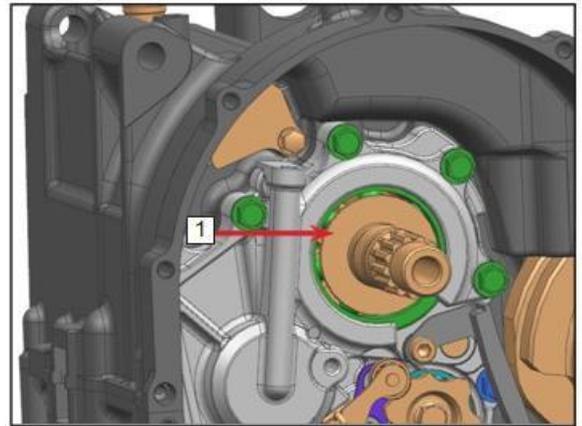
- Remove the washer(1)
- Remove the internal bush(2)



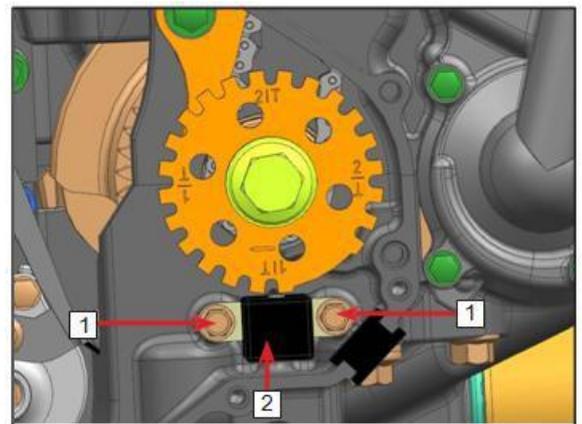
- Remove the M6 screw (1) and the washer; (left thread)
- Hold and remove the oil pump pinion (2) with a pair pliers. Remove the basket (4), the oil pump chain (3) and the toothed wheel of the oil pump together.



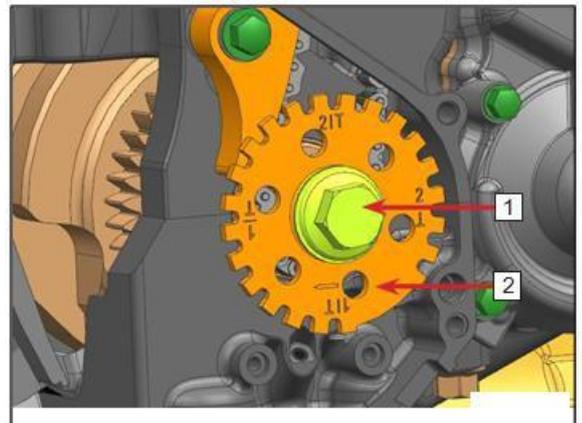
- Remove the washer(1)



- Remove the M5 screws(1)
- Remove the phase sensor

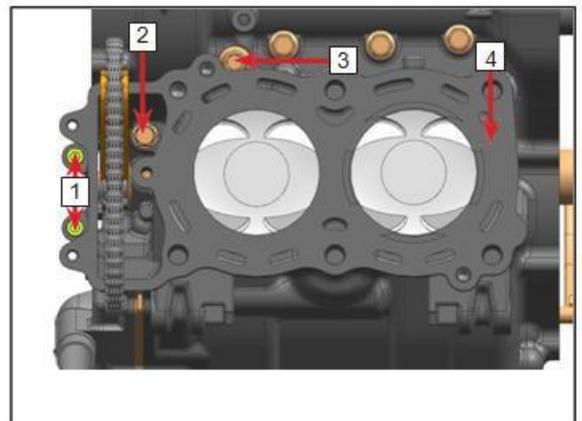


- Remove the M8 screw (1) and the washer
- Remove the phonic wheel (2) of the phase sensor



Cylinders block disassembly

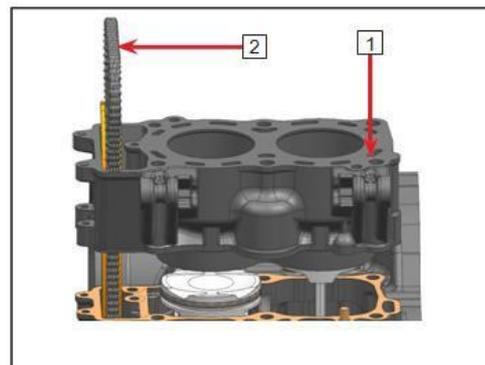
- Remove the M6 screws (1) and the spacer
- Remove the M8 screw(2)
- Loosen the M10 nut(3)
- Extract the cylinder body by shaking it upwards(4)
- Remove the nut (3) and the washer



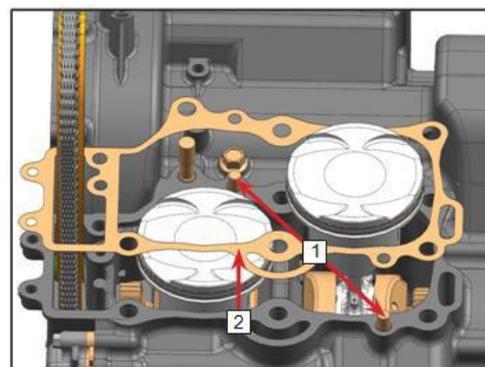
- Raise the cylinders block(1)

Note

When the distribution chain(2)is removed,use a hook to avoid that the distribution chain (2) falls inside the casing.



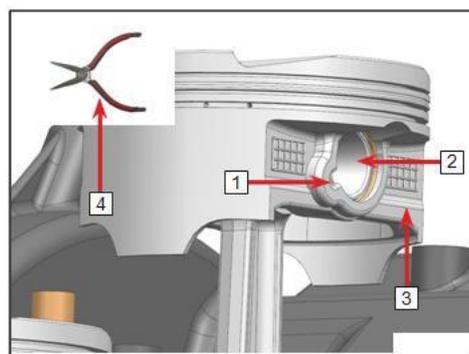
- Remove the centring bushes (1).
- Remove the cylinders block gasket (2)



Disassembly of the pistons

- Turn the crankshaft to adjust the piston in the right position.
- Remove the stop of the piston pin (1) from the notch indicated by the arrow, using the following special tool: piston pin stop installation tool (4)
- Remove the piston pin (2) from the side in which the pin stop has been removed.
- Remove the piston(3)
Turn the engine shaft to adjust the piston at the right position; use the same method to remove the other piston

Note: When the piston pin is removed, it is not necessary to remove the piston pin retaining ring from both sides. If the retaining ring of the piston pin is removed, it cannot be used again. It must be re- placed with a new one.

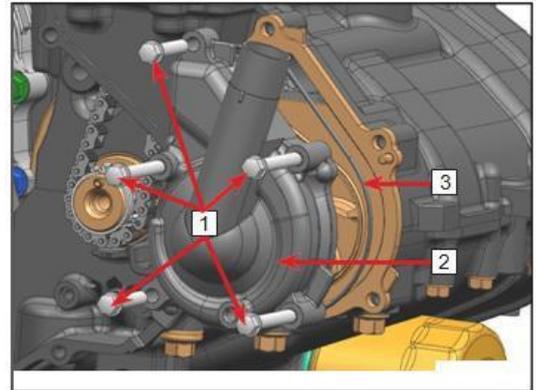


Removal of the tensioning plate group

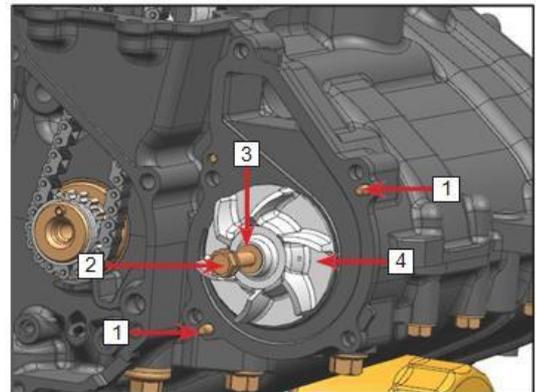
- Remove the threaded pin(1).
- Remove the tensioning plate group(2)

Water pump disassembly

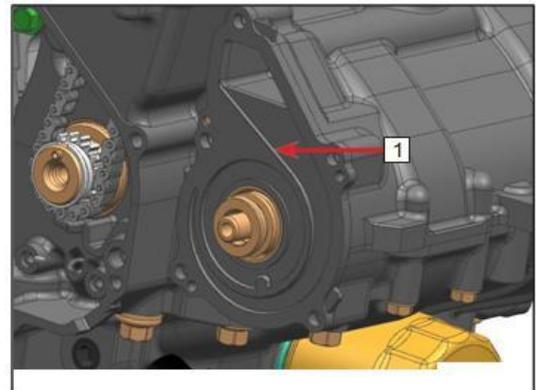
- Remove the M6 screws(1)
- Remove the pump cover (2); the pump cover gasket (3) will remain attached to the pump cover and will be removed together with it.



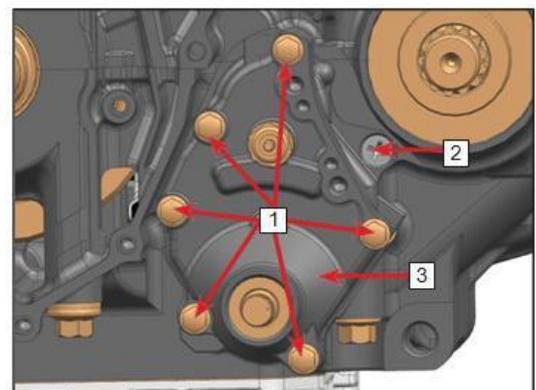
- Remove the pin(1)
- Remove the M6 screw(2)
- Remove the washer(3)
- Remove the pump impeller(4)



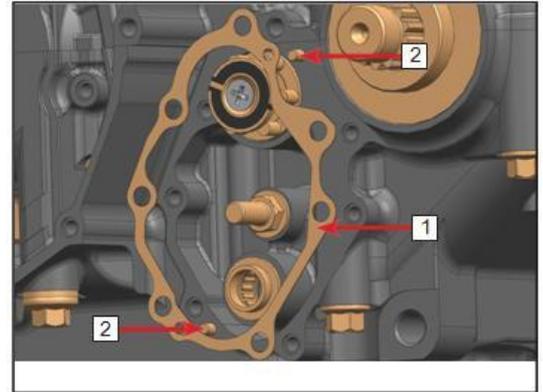
- Remove the pump body(1)


Removal of the gearbox

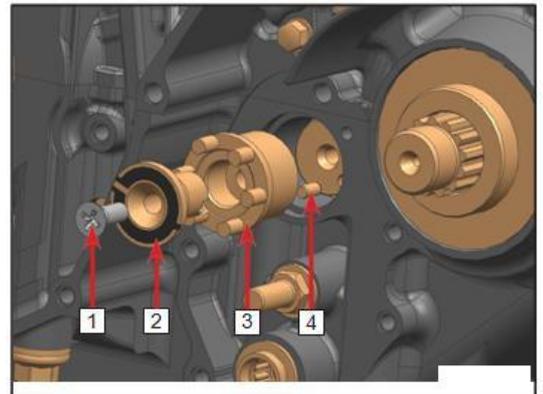
- Remove the M6 screws(1)
- Remove the screw(2)
- Remove the gearbox cover(3)



- Remove the gearbox shaft cover gasket(1).
- Remove the pin(2)

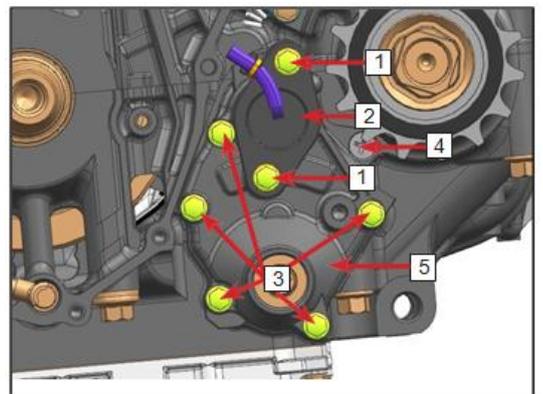


- Remove the screw(1)
- Remove the gears position sensor(2)
- Removal of the toothed wheel(3)
- Remove the rollers bearing(4)

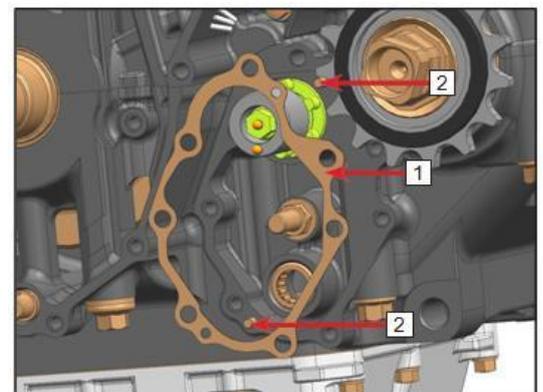


(state 2)

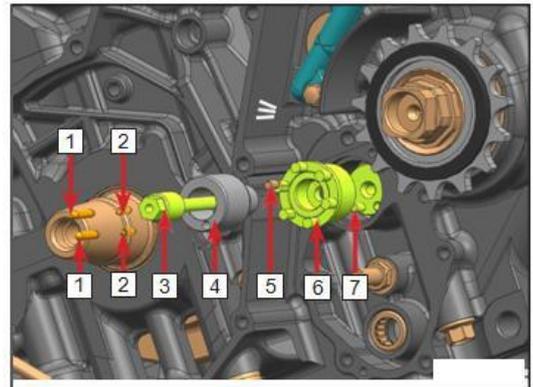
- Remove bolt M6[1]
- Remove the gear contactor [2];
- Remove bolt M6[3]
- Remove the screws [4]
- Remove the gear shift shaft cover [5].



- Remove the gearbox shaft cover gasket(1)
- Remove the pin(2)



- Remove the ball switch(1)
- Remove the fingerstock(2)
- Remove the screw(3)
- Remove the toothed wheel(4)
- Remove the grub screw(5)
- Remove the toothed wheel(6)
- Remove the rollers bearing(7)

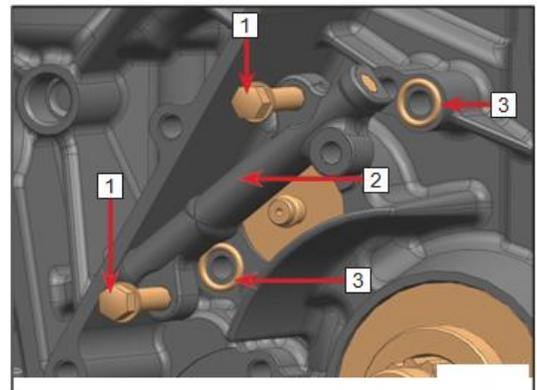


Removing the oil pipe IV assembly

Remove bolt M6[1]

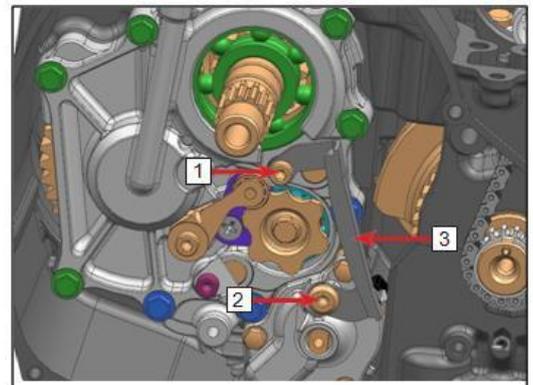
Remove the oil passage IV fitting [2];

The O-ring seal [3] is attached to the oil pass IV fitting [2], remove the O-ring seal [3].

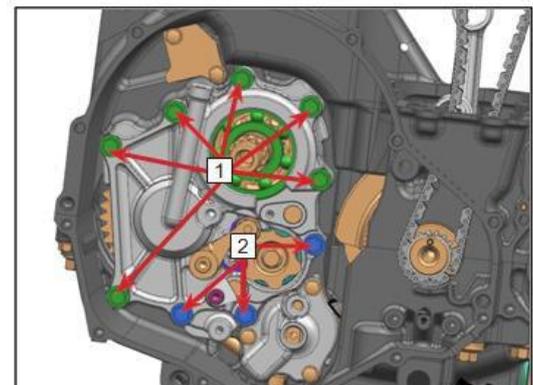


Removal of the gearbox

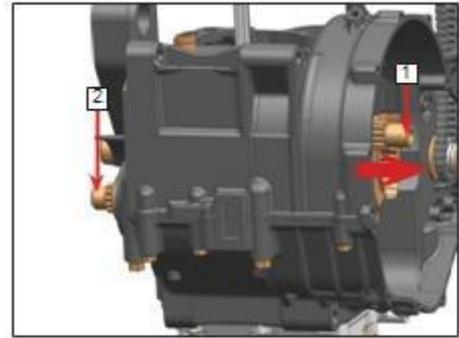
- Remove the M6 screw(1)
- Remove the M6 screw(2)
- Remove the oil pump chain guide group(3)



- Remove the M7 screws(1)
- Remove the M7 screws(2)

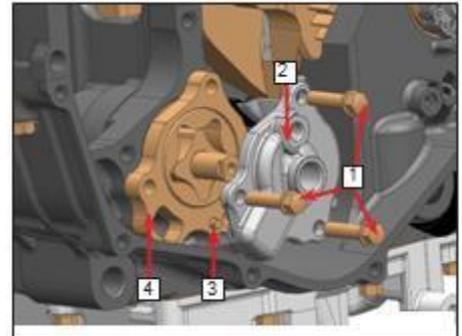


- Extract the shaft (1) in the direction of the arrow (it may move slightly); if moving it does not result in its extraction, delicately beat countershaft 2 with a rubber hammer in the direction of the arrow; then pull the shaft (1) again to extract the whole gearbox.

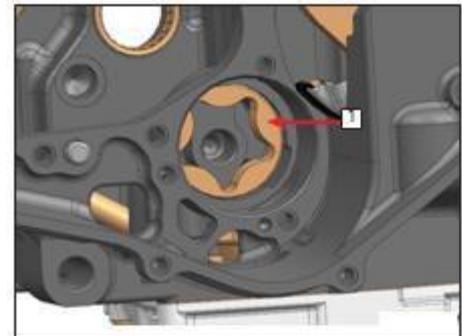


Disassembly of the oil pump group

- Remove the M6 screws(1)
- Remove the cover of the oil pump(2)
- Remove the centring grub screw(3)
- Remove the oil pump body(4)

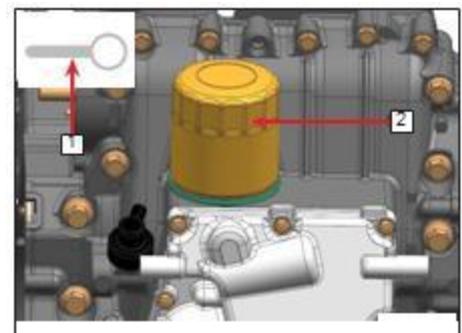


- Remove the external rotor of the oil pump(1)



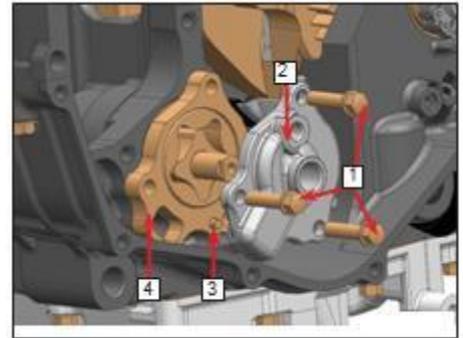
Removal of the oil filter

- Use a special wrench for the oil filter(1)
- Remove the oil filter(2)

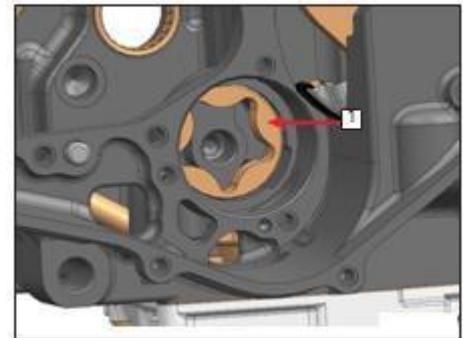


Disassembly of the oil pump group

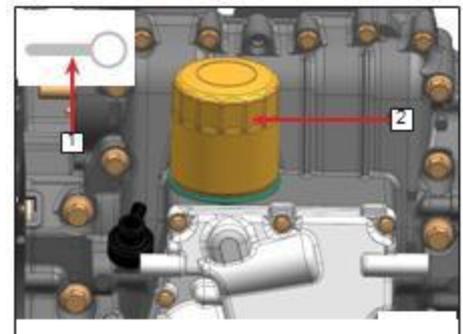
- Remove the M6 screws(1)
- Remove the cover of the oil pump(2)
- Remove the centring grub screw(3)
- Remove the oil pump body(4)



- Remove the external rotor of the oil pump(1)

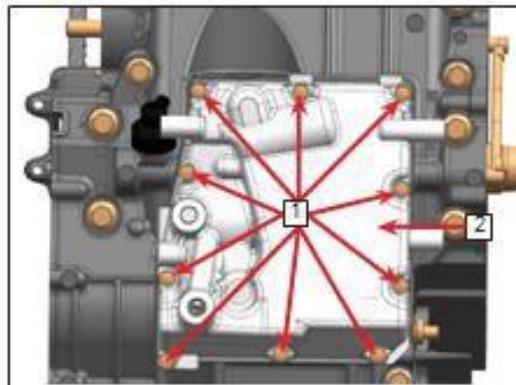
**Removal of the oil filter**

- Use a special wrench for the oil filter(1)
- Remove the oil filter(2)

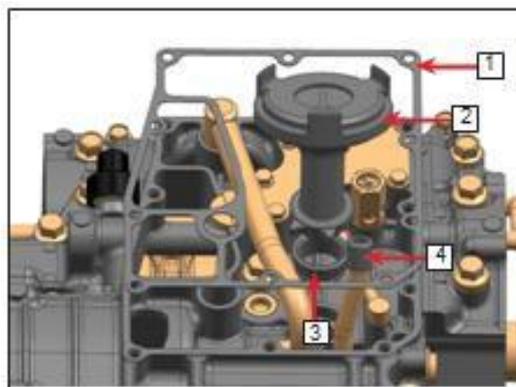


Disassembly of the oil sump

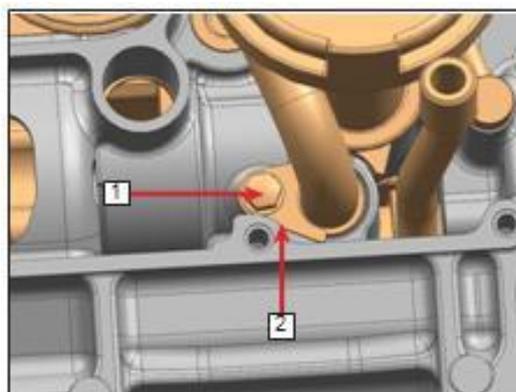
- Remove the M6 screws(1)
- Remove the oil sump(2)



- Remove the paper gasket(1)
- Remove the oil suction group(2)
- Remove the gasket(3)
- Remove the rubber sleeve of the oil return line(4)

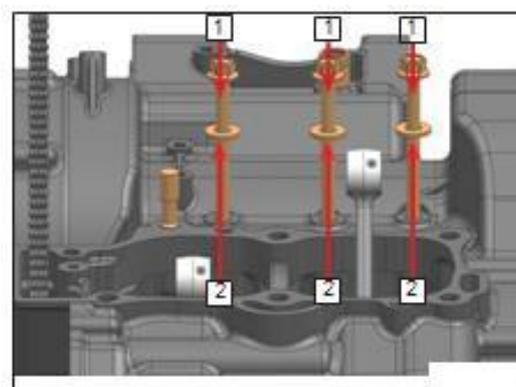


- Remove the M6 screw(1)
- Remove the plate(2)

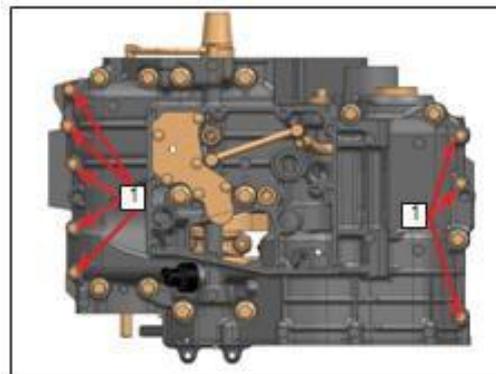


Division of the main crankcases

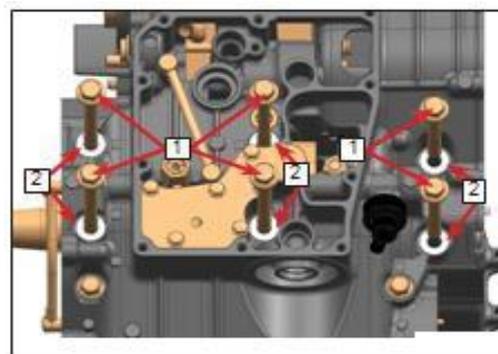
- Remove the M8 bolt(1)
- Remove the washers(2)



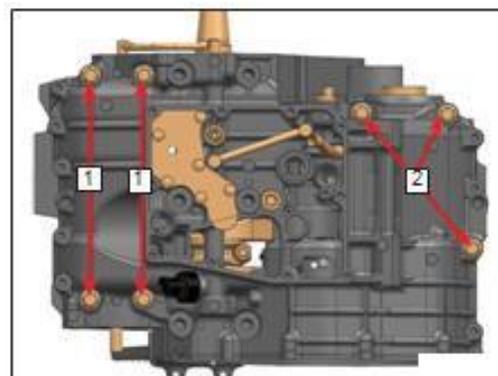
- Remove the M7 screws(1)



- Remove the M9 screws(1)
- Remove the washers(2)



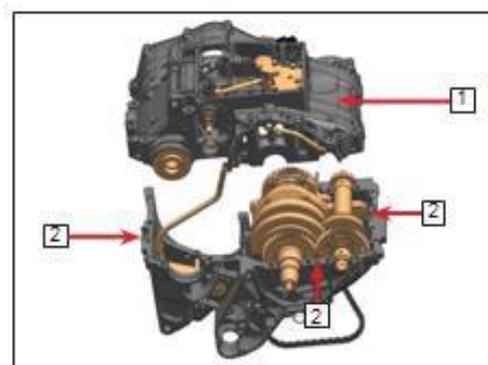
- Remove the M8 screws(1)
- Remove the M8 screws(2)



- Remove the lower crankcase(1)
- Remove the pins(2)

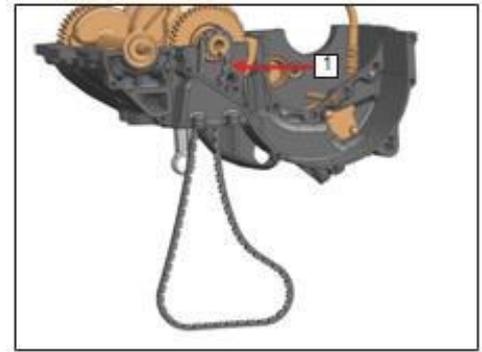
Warning

Pay attention to the pins 2 during disassembly; avoid their possible fall and loss.



Removal of the distribution chain

- Remove the distribution chain(1)

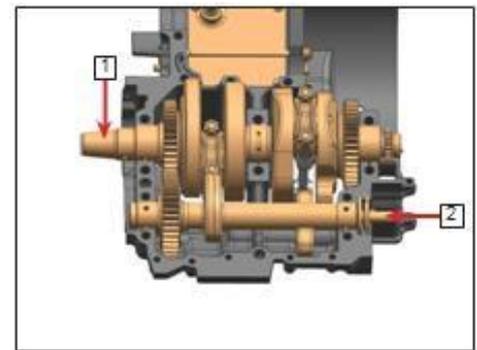


Removal of the crankshaft group and of the countershaft

- Remove the crankshaft group (1) and the countershaft(2)

Note

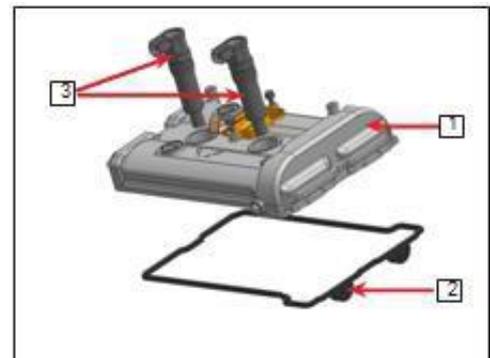
Pay attention when the crankshaft and countershaft are removed to avoid impacts and damages to the group.



Revision of various components of the engine

Inspection and repair of the cylinder head cover

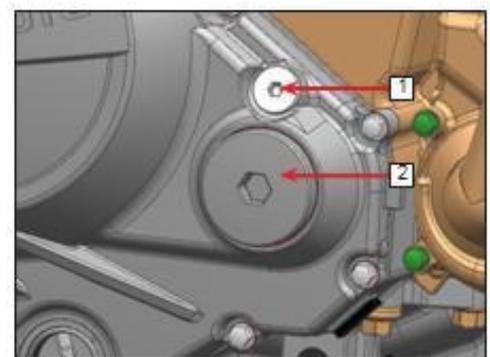
- Check the cylinder head cover (1); check for the presence of cracks, holes, etc. If one of these is spotted, repair the cracks, the holes, etc. or replace with new components. Check that the sealing gasket (2) is not spoiled and, if necessary, replace it with a new sealing gasket.
- Check the ignition coils (3) and replace them with new ones if damaged.



Check and adjustment of the valves clearance

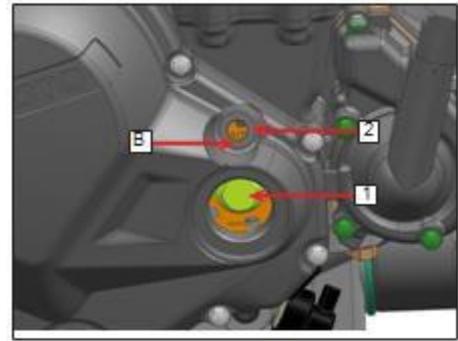
Note: Valves clearance must be checked and adjusted when the engine is cold (ambient temperature).

- Dismount the head cover as described in the paragraph "Removal of the head cover".
- Check the cylinders timing(1)
- Remove the valves cover, (refer to the Engine disassembly section) remove the variable valve timing hole cap(1)
- Remove the filter cover(2)



Cylinder 1 timing adjustment

- Rotate the crankshaft using the M8 screw(1)
- The stop at the top dead centre of the piston is reached when the "1/T" mark on the plate is aligned with the notch B on the inspection hole edge.

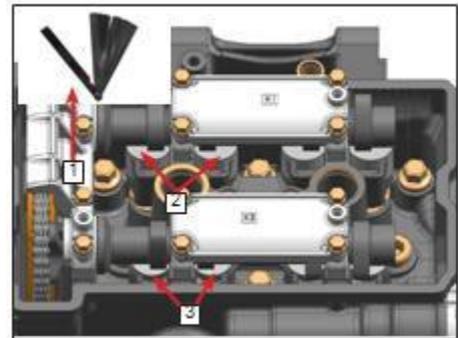


- Measure the intake valves (2) and exhaust valves (3) clearance using a feeler gauge (1) and register the measured data, check the valves tappets according to the registered data, if they do not meet the standard values, remove the stretcher and the intake and exhaust camshafts, replace the valves tappets with different thickness according to your registrations.
- Reassemble and measure again after assembly. Refer to the reassembly when the group is installed.

Standard values for valves clearance:

Exhaust 0.22 mm ~ 0.28 mm

Intake 0.08 mm ~ 0.13 mm



Cylinder 2 timing adjustment

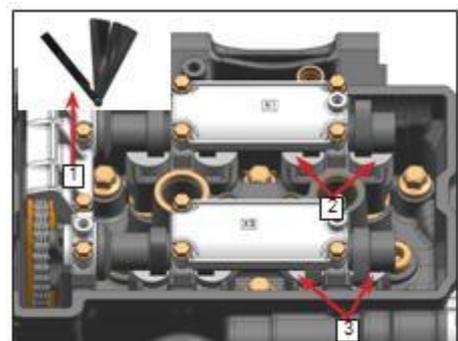
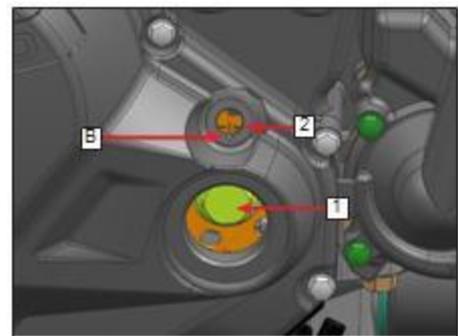
- Rotate the crankshaft using the M81 screw
- The stop at the top dead centre of the piston is reached when the "2/T" mark on the plate is aligned with the notch B on the inspection hole edge.

- Measure the intake valves (2) and exhaust valves (3) clearance using a feeler gauge (1) and register the measured data, check the valves tappets according to the registered data, if they do not meet the standard values, remove the stretcher and the intake and exhaust camshafts, replace the valves tappets with different thickness according to your registrations.
- Reassemble and measure again after assembly. Refer to the reassembly when the group is installed.

Standard values for valves clearance:

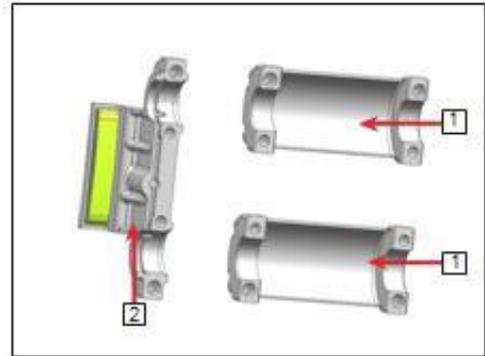
Exhaust 0.22 mm ~ 0.28 mm

Intake 0.08 mm ~ 0.13 mm



Camshaft rocker covers check

- See engine disassembly for more details
- Check that the camshafts rocker covers (1) do not show any visible sign of wear and impact. Replace them if spoiled.
- Check the camshaft positioning plate(2), check that the camshaft positioning plate does not show visible signs of wear. Replace it with a new one in such case.



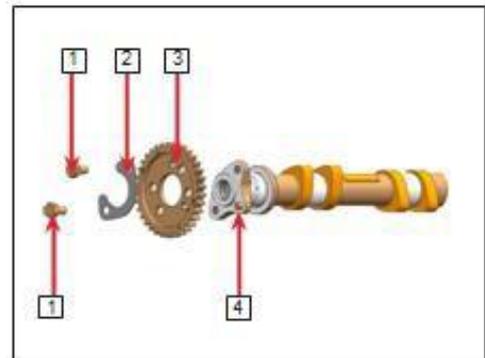
Camshaft cover hole diameter
 Standard: from 24.00 mm to 24.021 mm
 Wear limit: 24.05mm
 Note: if the camshaft cover hole is larger than the wear limit, replace the head group with a new one.

Camshaft disassembly

- Remove the M6 screws(1)
- Remove the cap(2)
- Remove the toothed wheel(3)
- Remove the roller bearing(4)

Measure the camshaft pins diameter

- Measure the camshaft pin diameter(1)

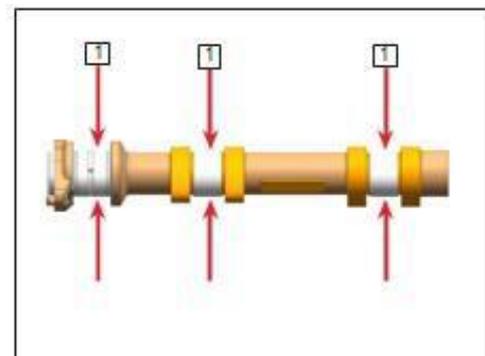


Camshaft pin diameter
 Standard: from 23.950 mm to 23.972 mm
 Wear limit: 23.920mm

Note: if the camshaft pin is smaller than the wear limit, replace the camshaft with a new one.

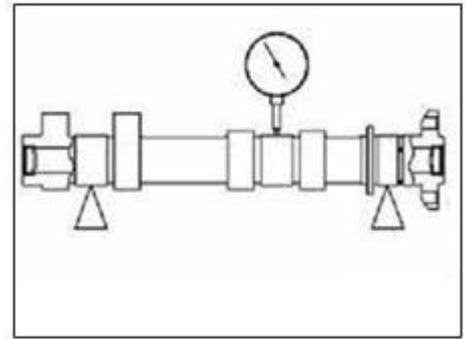
Camshaft/rocker cover pin clearance:

Standard:
 From 0,028 mm to 0,071 mm
 Wear limit: 0,13 mm



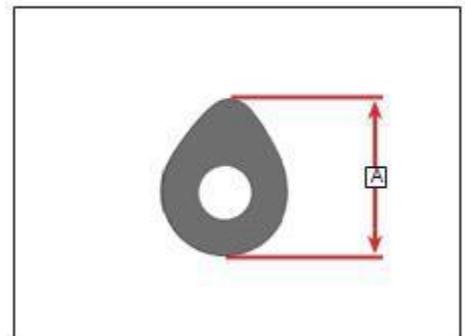
Camshaft misalignment

- Remove the camshaft (see Removal of the camshaft).
- If deviation exceed the operating limit,replace the camshaft with a new one.
- Position the camshaft in the specific template.
- Use a micrometer to measure misalignment in the specified position, as shown in the figure.



Cam wear

- Remove the camshaft (see Removal of the camshaft).
- Use a micrometer to measure the height of each cam A.
- If the cams are worn beyond the operating limit, replace the camshaft.



Height standard for the cams

Exhaust: from 35,843 mm to 35,957 mm

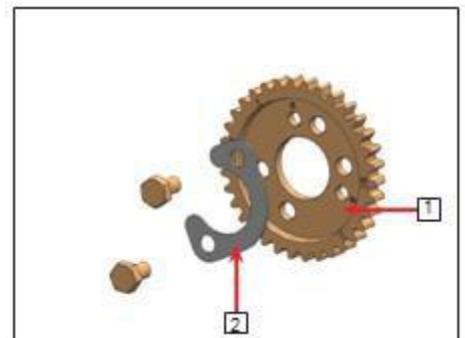
Air inlet: from 36,543 mm to 36,657 mm

Limits

Exhaust: 35.74 mm

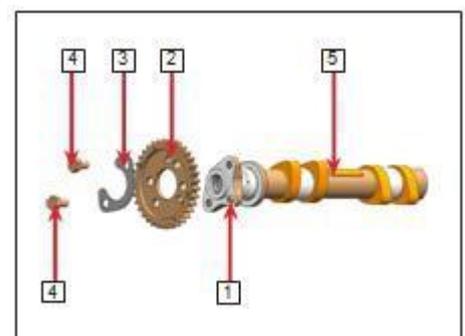
Intake: 36,44 mm

- Check the distribution pin(1)for visible breakage,broken teeth or wear, replace it with a new distribution pin if necessary. Check that the cap (2) is not damaged and replace it with a new one if damaged.



Camshafts groups assembly

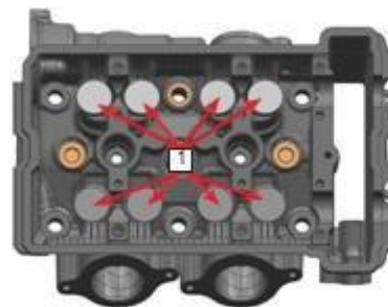
- Install the gear (1) on the camshaft(5).
- Install the stop (2).
- Install the cap (3).
- Tighten the M6 screws(4)



Removal of the valves

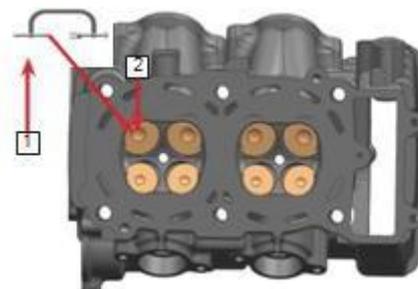
- Remove the cups(1)

Note: dismantled valves and the other parts must be kept in separate groups and marked to avoid confusion.



- Position the spring compression device (1), with the arrow directed towards the edge at the centre of the valve(2).
- Compress the spring

Warning: Always wear safety goggles while removing the valves springs. Pay attention when unlocking the valves. The parts may jump way due to the strong preload of the spring.



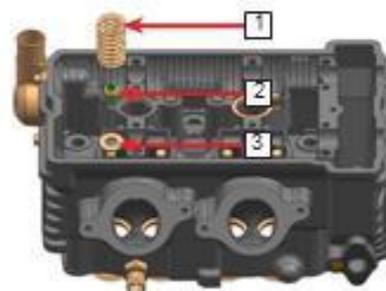
- Install the tool on the upper seat of the valve spring (3); tighten and compress the spring.
- Remove the valve locking half-cones using tweezers(2)
- Loosen the tool(1).
- Remove the upper seat of the valve spring(3)

Note: dismantled valves and the other parts must be kept in separate groups and marked to avoid confusion.



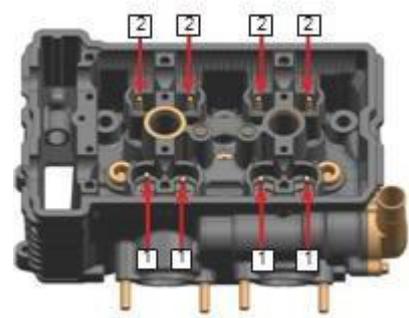
- Remove the spring(1)
- Remove the valve stem sealing group(2)
- Remove the lower seat of the valve spring(3)

Note: each time the valve is removed, the stem gasket must be replaced.



- Press the exhaust valves(1)downwards and extract them from the other edge.
- Press the intake valves (2) downwards and extract them from the other edge.

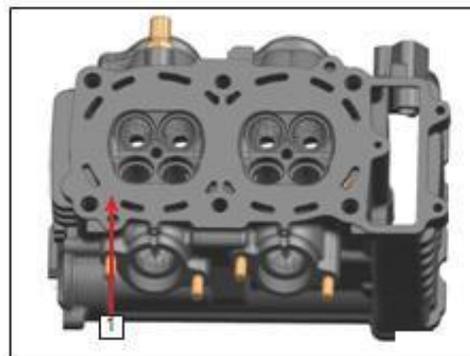
Note: dismantled valves and the other parts must be kept in separate groups and marked to avoid confusion.



Wear of the head

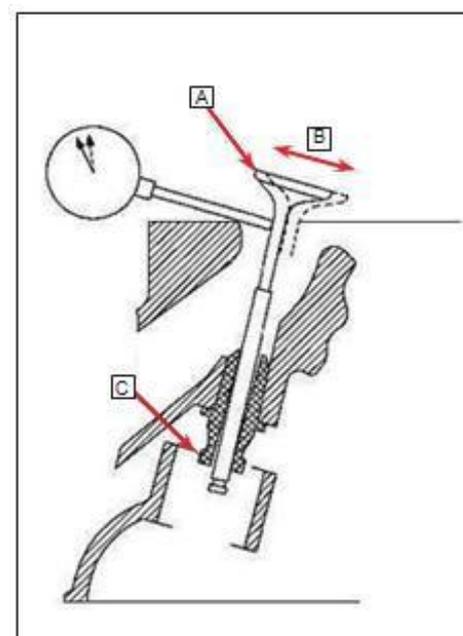
Head cleaning

- Position a ruler in various positions on the lower surface of the cylinder head (1). Measure clearance between the ruler and the cylinder head using a feeler gauge.
- Limit of planarity: 0.05mm
- If the cylinder head is distorted beyond the limit of wear, the head must be replaced



Measurement of the valve clearance on the guide

- Insert a new valve (A) in the valve guide (B), set the micrometer so as that it is perpendicular to the valve stem and as close as possible to the junction surface of the cylinder head.
- Make the valve oscillate to measure clearance of the valve in the guide.
- Repeat the measurement with a angle perpendicular to the first. If reading exceed the operating limit, replace the valve guide.

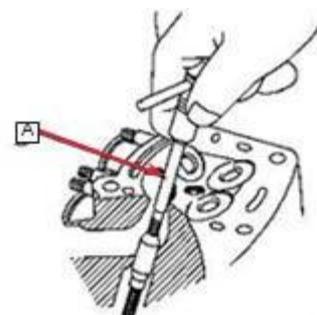


Note: The measured reading is not the true clearance of the valve guide since the point of measurement is on the valve stem.

Standard clearance of the valve/valve guide
 Exhaust 0.07 mm - 0.14 mm
 Intake 0.02 mm - 0.08 mm
 Operating limit
 Exhaust 0.27 mm
 Intake 0,22 mm.

Removal of the valves guides

- Remove the valves (See Removal of the valves)
- Remove the radial shaft seals and seats of the springs.
- Preheat the valves guides at 120°C - 150°C and delicately hammer the edge of the valves guide shaft (A) to remove the valves guides.



Warning: do not directly heat the cylinder head.
 Heat the head indirectly by immersing it in oil, then heat oil.

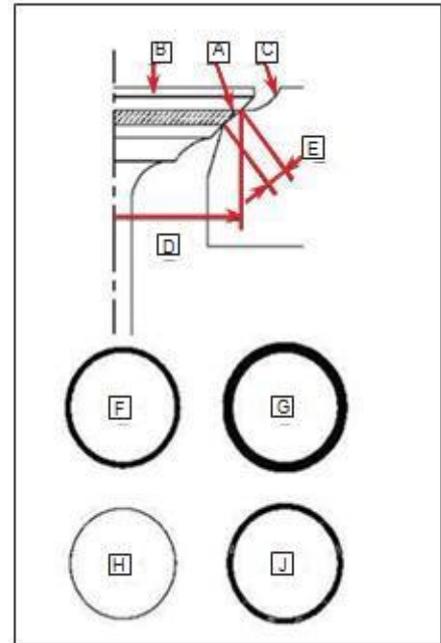
Special tools: Tool for valve guide Ø 4.5

Inspection of the valve seat

- Remove the valves (see removal of the valves)
- Check the sealing surface of the seat(A)of valve(B)and the ring of the valve seat(C)
- Measure the external diameter of the ring of the valve seat (D).

External diameter of the sealing surface of the standard valve seat
 Exhaust: from 26,6 mm to 26,7 mm
 Air inlet: from 32,6mm to 32,7mm

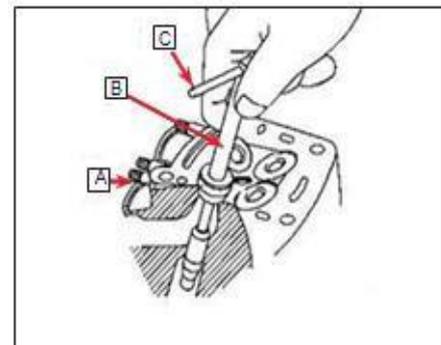
- If the external diameter is too large or too small,repair the valve seat ring (see repair of the valve seat).
- Use a Vernier calliper to measure the width (E) of the sealing surface of the valve seat without the accumulation of carbon residues.
- Width(F)is correct, if it is too wide (G), too tight (H) or irregular (J), repair the valve seat (see repair of the valve seat).



Standard valve seat sealing surface width
 Exhaust: from 0,9mm to 1,1mm
 Intake: from 0.9mm to 1.1mm

Repair of the valve seat

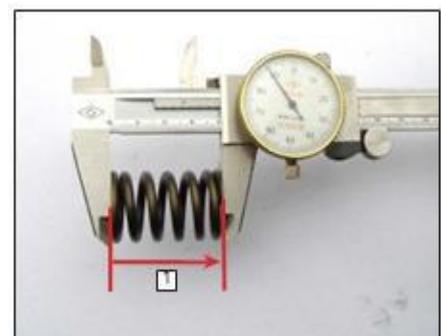
- Tool: Valve Seat Cutter (A) for maintenance of the valves seats.
- Valve seat ring, fixing shaft of the scraper (B), support(C).



Valves springs

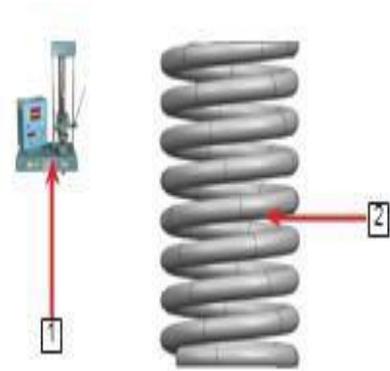
The valves springs have the task of ensuring the valves and valves seats sealing. A decrease in the spring force entails a decrease in the engine power and is cause of a great mechanical noise of the valves. Measure the spring free length, if the free length is lower than the limit value, replace the spring

Free length of the standard valve spring: 41,6 mm



- Use the tool (1) to measure the spring force when the spring (2) is compressed to the specified length and if this force does not fall within the specified interval, replace the spring(2).

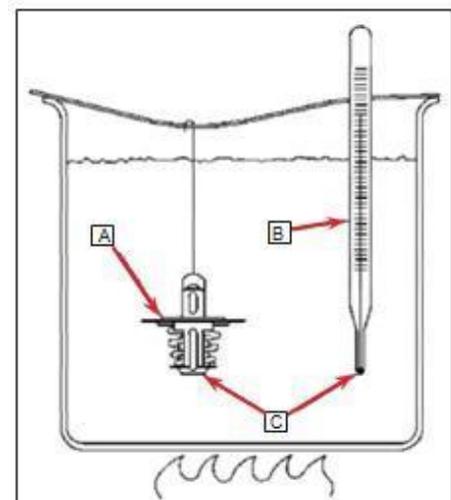
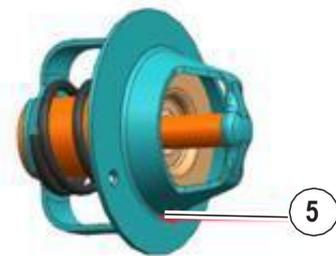
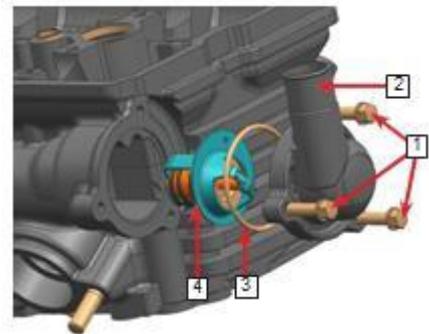
Compress the spring at 38,4 mm for the closure load of the intake valve, the spring force should be 103 Nm~121 Nm
 Compress the spring at 30,5 mm for the complete opening load of the exhaust valve, the spring force should be 422 Nm~466 Nm
 Compress the spring at 29,8 mm for the complete opening load of the intake valve, the spring force should be 455 Nm~503 Nm



- Measure tilt of the spring and replace it if its tilt does not fall within the specified interval
 Limit of tilt 2°

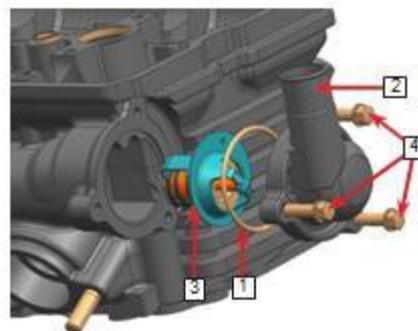
Inspection of the thermostat

- Remove the screws(1).
 - Remove the thermostat cover(2).
 - Remove the O-ring(3).
 - Remove the thermostat (4) and check the thermostatic valve at ambient temperature(5)
 - If the valve is open , replace the thermostat with a new one.
 - To check the valve opening temperature, suspend the thermostat (A) in the water container and increase water temperature.
 - The thermostat must be completely immersed and must not touch the sides or the bottom of the container. A standard thermometer (B) is suspended in water so as that the thermal position (C) is blocked at the same depth.
 - It is important not to touch the container.
 - If the measurement is out of the specified interval,replace the thermostat with a new one.
- Initial opening temperature: 70°C ~74°C
 Complete opening temperature: 83°C~87°C

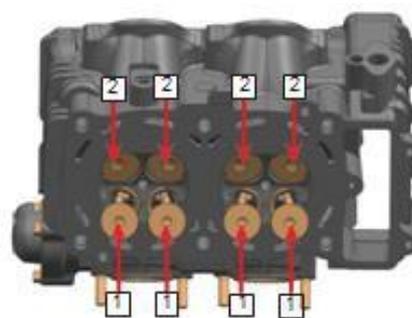


Reassembly of the head

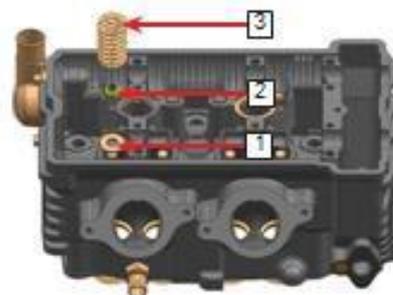
- Install the O-ring (1) on the thermostat cover(2).
- Install the thermostatic valve (3)
- Tighten the M6 screws(4)



- Install the exhaust valves according to the marks(1)
- Install the intake valves according to the marks(2)



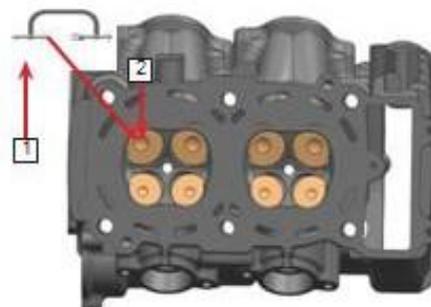
- Mount the lower spring seat(1)
- Install the seal rubber of the valve stem(2)
- Install the valve springs (3)



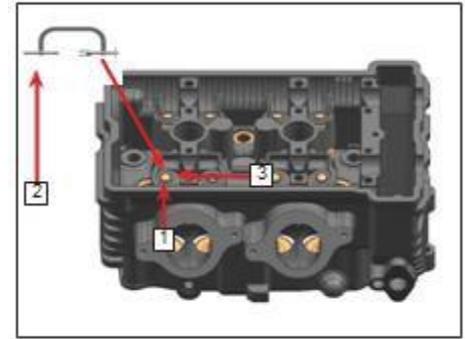
Note: each time the valve is removed, the stem gasket must be replaced with a new one

- Position the compression device of the valve spring (1) with the arrow pointing towards the edge at the centre of the valve(2)

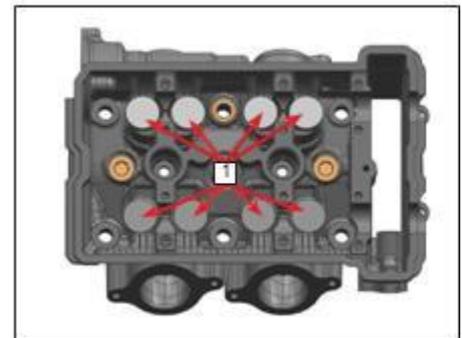
Warning: Always wear safety goggles during installation. Impede that the parts jump way due to the strong preload of the spring and hurt the service personnel.



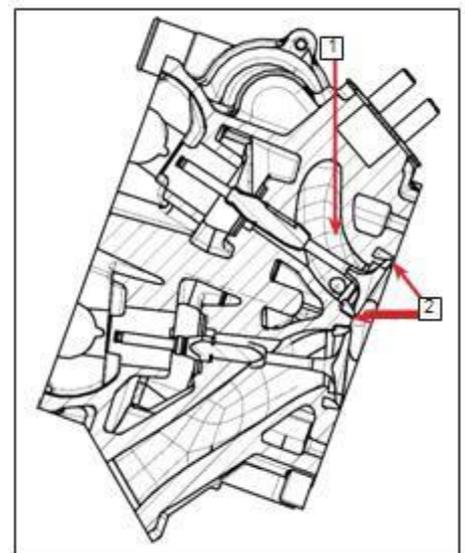
- Mount according to the correct installation mark
- Remove the upper seat of the valve spring(1).
- Position the compression tool of the valve spring (2) in the direction of the arrow
- Position it on the upper seat of the spring (1); tighten the tool and compress the valve spring.
- Use the tweezers to install the valve locking half-cones(3)
- Once in position, loosen the compression tool of the spring(2)



- Install the tappets (1) separately



- Check the head seal: inject a clean solvent in the intake/exhaust section(1) respectively, leave it for an appropriate time and check
- Leakage from the valves (2) must not be present



Inspection and repair of the cylinder block

- See Engine assembly and disassembly for further details
- Since wear of the cylinder block is different in different directions, measuring must be carried out at the top and at the bottom, from the left to the right and from the front to the rear (4 positions in total) as shown in the figure. If the measure cylinder bore is out of the limits, replace the cylinder block.

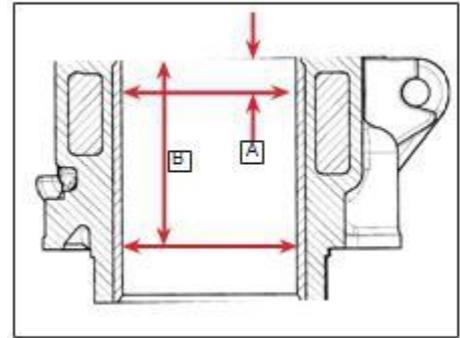
10mm(A)

60mm(B)

Cylinder bore

Standard: from 83.008 mm to 83.026 mm

Limit: 83,1 mm

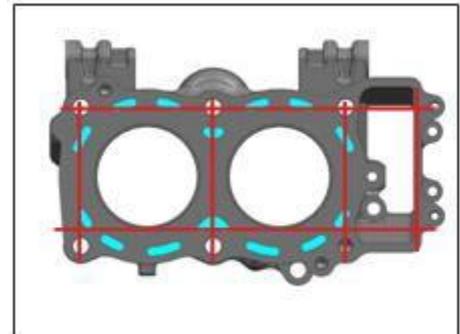


Distortion of the cylinder block

- Check planarity of the seal surface of the cylinder using a blade edge and a feeler gauge, register the value of each point of measurement and replace the cylinder block if reading exceeds the limit value.
- Planarity limit of the cylinder head:0.03mm

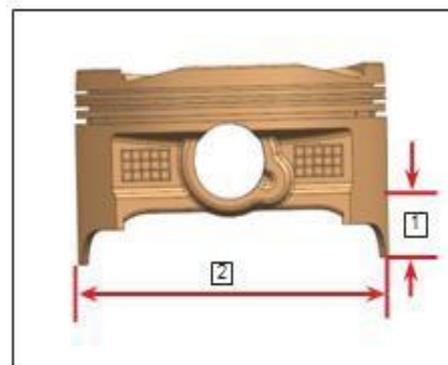
Note

When the cylinder block is replaced, the piston rings must also be replaced.



Inspection of the pistons

- For the details of removal and installation of the pistons, see Engine disassembly and assembly
- Measure the external diameter of each piston, at a distance of 10 mm from the lower edge
- If the measured value (2) is lower than the operating limit, replace the piston.



Piston diameter
 Standard: from 82.970 mm to 82.988 mm
 Operating limit: 82,83 mm

- If the clearance between the piston and the cylinder is higher than 0,10 mm, replace the cylinder or the piston, or both together.

Piston rings seat clearance

- The piston rings must be perfectly parallel to the seats surface. If they're not parallel, replace the piston and all the piston rings.
- When the pistonring is initsseat,determine the clearance by making different measures with the feeler gauge (1)

First ring
 Standard: from 0.03 mm to 0.06 mm V
 Limit: 0.16 mm
 Second ring
 Standard: from 0.02 mm to 0.06 mm
 Limit: 0,16 mm

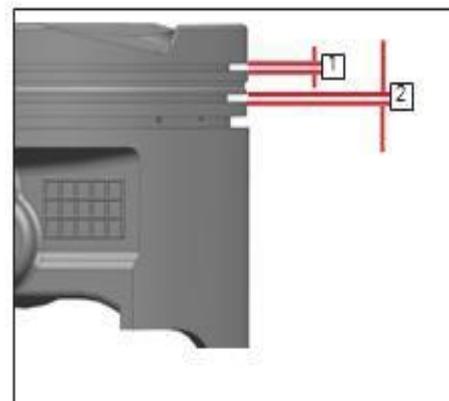


Piston rings seat width

- Use a Vernier calliper to measure width of the piston rings seat in different points around the piston.
- If width of one of the seats exceeds the operating limit,replace the piston.

Width of the piston ring first groove (1)
 Standard: from 0.92 mm to 0.94 mm
 Operating limit: 1.02 mm

Second width of the piston ring groove 2
 Standard: from 1.01v mm to 1.03 mm
 Operating limit: 1,11 mm



Piston rings thickness

- Measure thickness of the piston rings: measure thickness of the piston rings using a micrometer in different points.
- If thickness of one of the two rings exceeds the operating limit, replace all the rings.

Spessor della fascia (1)
Standard: 0.87 mm ~ 0.89 mm
Limite: 0.80 mm

Spessore della fascia (2)
Standard: da 0,97 mm a 0,99 mm
Limite: 0,90 mm

Note

When new rings are used in an old piston, check that the piston rings seats are not worn in any irregular way and that the piston rings are parallel to the seat surface. Replace the piston otherwise.

Piston rings edge clearance

- Put the piston ring (1) in the base of the cylinder, where the cylinder wear is minimal.
- Measure clearance of the piston rings edge using a feeler gauge.
- If one of the piston rings exceeds the limit, replace them all.

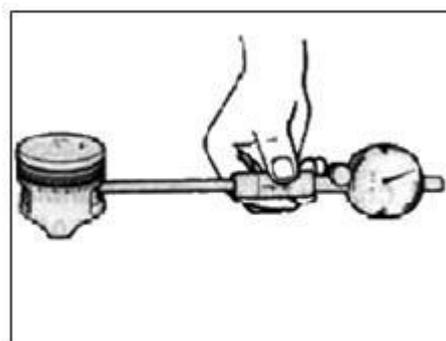
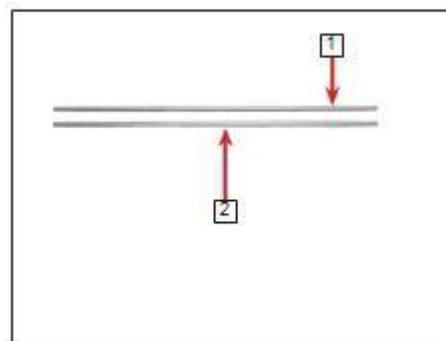
Distance between the two endpoints of the piston ring (1) once mounted
Standard: from 0.25 mm to 0.40 mm
Limit: 0.70 mm

Distance between the two endpoints of the piston ring (2) once mounted
Standard: from 0.40 mm to 0.55 mm
Limit: 0.80 mm

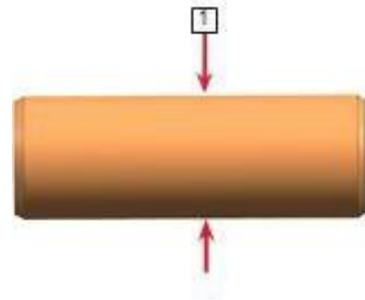
Piston seat and gudgeon pin

- Measure the internal diameter of the hole of the gudgeon pin using a bore gauge and the external diameter of the gudgeon pin using a micrometer. If the measured values exceed the following limits, replace both the piston and the gudgeon pin.

Piston gudgeon pin hole limit: from 19,004 mm to 19,010 mm



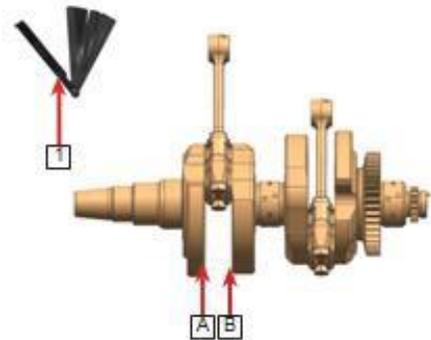
Measure the external diameter of the piston gudgeon pin in three positions using a micrometer (1),
 Piston gudgeon pin external diameter limit: from 18,996 mm to 19 mm



Inspection of the crankshaft piston rod subgroup

Piston rod clearance

- Measure the piston rod clearance: Put the large edge of the piston rod against the final side of the piston rod pin of the crankshaft on one side(A) and then insert a feeler gauge from the other side(B) to measure clearance.

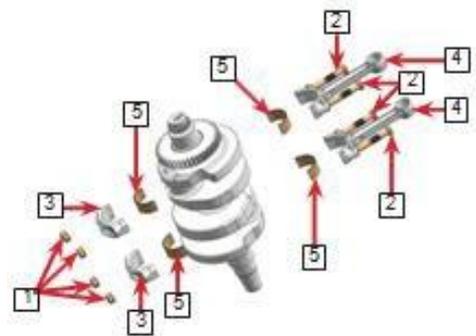


Standard for end of travel clearance at the edge of the piston rod.
 Standard value from 0.15 mm to 0.30 mm
 Limit: 0,50 mm

Note: if clearance exceeds the operating limit, replace the piston rod with a new one and measure clearance again. If clearance is still too high after replacing the piston rod, the crankshaft must be replaced.

Disassembly

- Remove the nuts of the piston rod M9(1)
- Remove the piston rod screws(2)
- Remove the lower caps(3)
- Remove the piston rods(4)
- Remove the brass bearings(5)

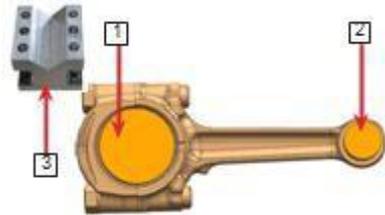
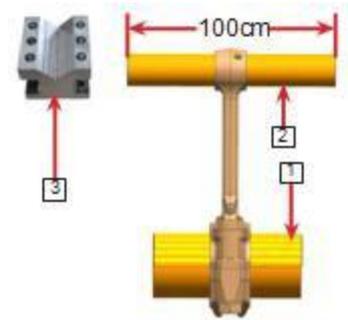


Warning

When the piston rod is removed from the crankshaft, ensure that the piston rod screws do not affect the crankshaft.
 When dismantled, mark the piston rod body and cap one by one.
 The piston rod screws must be tightened as follows:
 29 N-m + 90°; final torque in the range of 65N-m + 90N-m.

Parallelism of the piston rod

- Remove the piston rod brass bearing and reinstall the piston rod cap. Insert a shaft (1) in the piston rod head hole.
- Insert the shaft (2) (100 mm long) in the big end.
- Position the shaft(1) of the piston rod head on the V3 block. With the vertical beam, measure the difference in measure between the shaft(1) positioned on the piston rod big end and the shaft(2) positioned on the small end.



Note:if the parallelism of the piston rod exceeds the operating limit, the piston rod must be replaced.
Operating limit: 0.2 mm

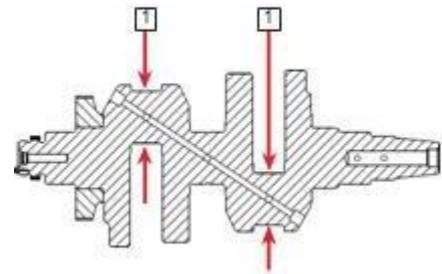
Crankshaft piston rod pins / piston rod bearings

- Measure the diameter of the piston rod pin (1) of the crankshaft with a micrometer.

Standard values for the diameters of the crankshaft piston rod pins. Standard values from 37,985 mm to 38,00mm
Operating limit: 37,97mm

Note: if the piston rod pin wear exceeds the operating limit, replace the crankshaft.

Note: if the measured diameter of the piston rod pin is not lower than the operating limit, but it does not correspond to the original mark of the diameter on the crankshaft, mark it again

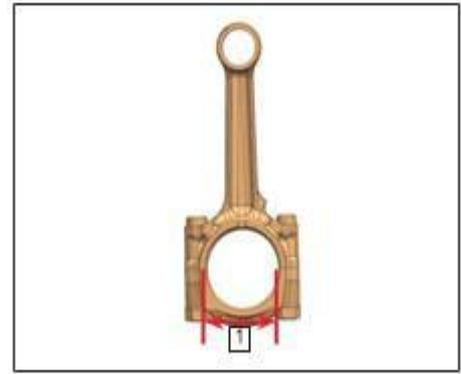


Piston rod shaft diameter

Dimension mark of diameter of the piston rod shaft marked on the external part of the second crank.

Measured diameter	Mark
ø37.985~ø37.990	3
ø37.991~ø37.995	2
ø37.996~ø38.000	1

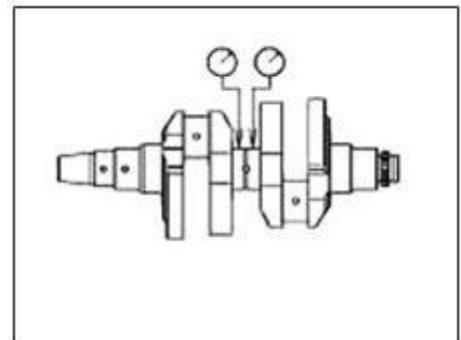
- Measure the piston rod big end (1) diameter, the diameter must correspond to the mark, remark it otherwise.
- After mounting the piston rod brass bearing, measure the diameter of the piston rod hole and take note of the values.



Marks of the piston rod big end hole

- 1 - 41.000 mm ~ 41.005mm
- 2 - 41.005 mm ~ 41.010mm
- 3 - 41.010 mm ~ 41.015mm

Clearance between the piston rod and the crankshaft pin.
0.032 mm~0.042 mm.



Note: the weight difference between the two piston rods must be $\leq 2g$

Crankshaft oscillation check

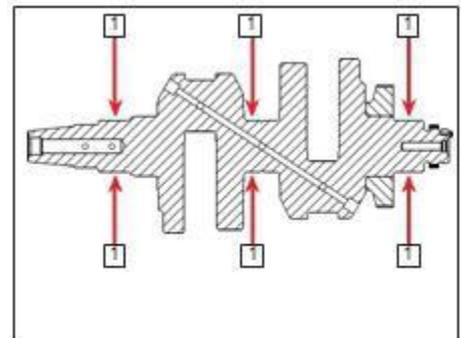
Measure the radial run-out of each pin of the crankshaft.

Standard values for radial run-out of the crankshaft pins.
Standard value 0.02mm
Wear limit 0,05 mm

Note:replace the crankshaft if the measure exceeds the wear limits

Crankshaft diameters

Measure the diameters (1) using a micrometer.



Values:

Standard value 37.984mm~38.00mm
Wear limit 37,97mm

Note:if one diameter is out of tolerance beyond the operating limit, replace the crankshaft

Note:if the measured diameter is not lower than the operating limit but it does not correspond to the original mark, it is necessary to mark it again.

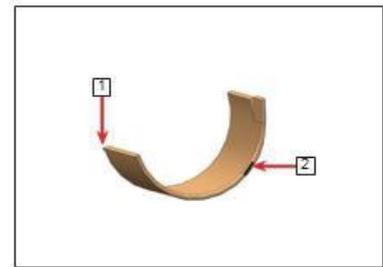
Marks of the crankshaft diameter.

- 1 = From 37,984 mm to 37,992 mm
- 2 = 37.993 mm ~ 38.000 mm

Mount the crankcases as indicted in the respective paragraph.
Use a micrometer to measure the crankshaft bore at 90° with respect to the crankcase front side.
The hole diameter must be the same as the mark diameter, mark it again otherwise.

Crankcase bore marks
 Yellow 41.000 mm~41.008 mm
 Green 41.008 mm~41.016 mm

According to the mark of the main crankshaft diameter and the mark of the crankshaft hole diameter in the crankcase, select the brass bearing (1) thickness through the colour indicator (2)



Bore of the main crankshaft of the crankcase / crankshaft
 Marks of the diameter on the crankcase:

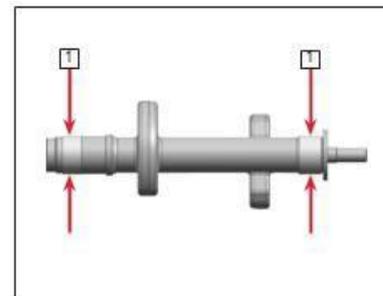
Crankcase bore colour	Diameter mark	Brass bearing colour
Yellow	2	Brown
Yellow	1	Black
Green	2	Black
Green	1	Orchid

Wear of the countershaft measured with a micrometer

- Diameter of the countershaft(1)

Standard values for the diameters of the countershaft.
 Standard values 27.987mm~28.000mm
 Operating limit 27,96 mm

Note:if the diameters of the countershaft are worn beyond the wear limit, replace them with new ones.
 Note:if the measured diameter is not lower than the wear limit, but it does not correspond to the original mark of the diameter on the countershaft, it is necessary to mark it again.



Countershaft diameter marks.

1 -27.987mm~27.993mm
 2 -27.993mm~28.000mm

Countershaft

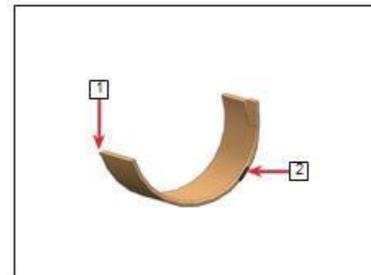
- Unite the crankcases following what is indicated in their respective paragraph. Use a micrometer to measure the crankshaft hole at 90° with respect to the crankcase surface.
- Use a micrometer to measure the bore of the counter-shaft at 90° with respect to the crankcase front side and measure the crankshaft bore diameter. The bore diameter must correspond to the marks, mark it again otherwise.

Countershaft bore marks on the crankcase.

Yellow - 31.000 mm~31.008mm
 Green - 31.008 mm~31.016mm

Depending on the countershaft diameter mark and the countershaft hole diameter in the crankcase, select the brass bearing(1)thickness through the colour indicator(2)

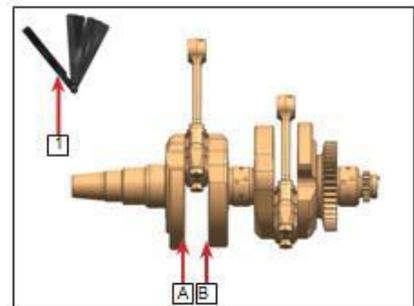
Bore of the crankcase countershaft / countershaft Diameter marks on the crankcase:		
Crankcase bore colour	Diameter mark	Brass bearing colour
Yellow	2	Brown
Yellow	1	Black
Green	2	Black
Green	1	Orchid



(Condition II)

Clearance of the piston rod big end

- To measure clearance of the piston rod big end: position the piston rod big end against the crankshaft from one side.
- Check that the crankshaft is positioned towards A as shown in the figure.
- Insert a feeler gauge between the piston rod big end and the crankshaft B and measure clearance.

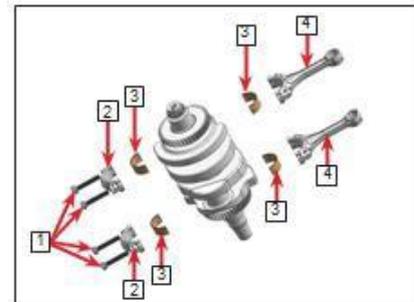


Standard clearance
Standard value = 0.15 mm~0.30 mm
Wear limit = 0,55 mm

Note: if clearance exceeds the operating limit, replace the piston rod with a new one and measure clearance again. If clearance is still too high after the piston rod replacement, the crankshaft must be replaced.

Disassembly

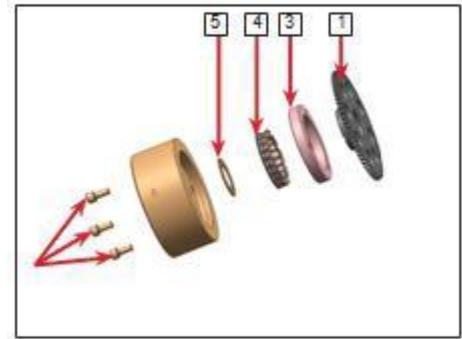
- Remove the screw of the piston rod M8(1)
- Remove the piston rod cap (2).
- Remove the piston rod body(4).
- Remove the brass bearings(3)



Warning: When the piston rod is removed from the crankshaft, ensure that the piston rod screw does not affect the crankshaft piston rod pin.
 Note: during disassembly, mark the piston rod body and cap one by one.
 Note: do not remove if the brass bearings 3 are not excessively worn or damaged.
 Note: the piston rod screws are tightened as follows:
 New screws = 20 Nm + 180° ± 5°.
 Already existing screws = 18N-m + 180° ± 5°.
 The piston rod screws cannot be reused more than three times

Removal of the freewheel

- Remove the starter large gear group(1)
- Removal of the cylinder head screws with hexagon socket M8(2)
- Remove the unidirectional support(3)
- Remove the unidirectional group(4)
- Remove the washers(5)



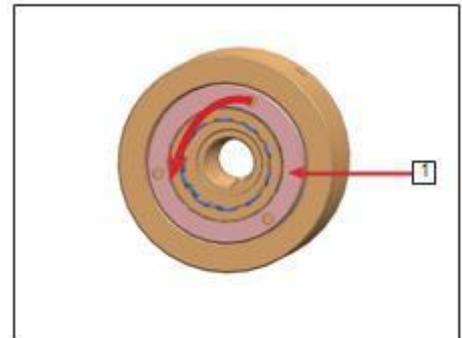
Warning

Do not hit the alternator rotor, since hitting it causes the loss of its magnetism.

Check

Turn the freewheel(1).The gear must rotate freely anticlockwise, but not clockwise.

If the freewheel group does not work according to its function or makes noise, disassemble the freewheel and check the damages to the single parts and replace them if damaged.

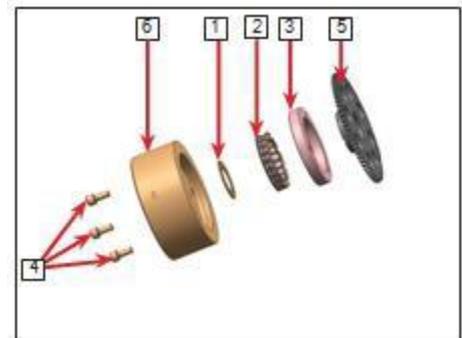


Reassembly

- Fix the unidirectional group (2) to the unidirectional support(3).
- Ensure the anticlockwise direction of rotation and position the washer (1) on the magnet
- By rotating the rotor, mount the unidirectional group (2) on the rotor magnet (6); use the cylinder head screw with hexagon socket M84 (use threadlocker).

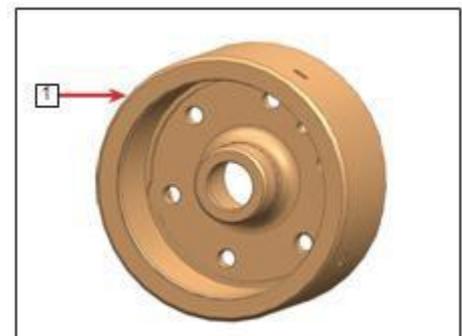
Tightening torque: 34 N-m

- Apply a correct quantity of oil to the internal ring of the control group (2) and screw it in the initial position.
- Install the gear(5)



Inspection of the magnets on the rotor

- Inspect the inside of the rotor (1) for scratches or other damage.
- Check the key groove (1) for wear or other damage
- Inspection of the teeth on the external ring of the rotor(1)to check tilt or other damage.
- Inspect the seat of the crankshaft key for wear or other damage.
- If these components are severely damaged, they must be replaced.



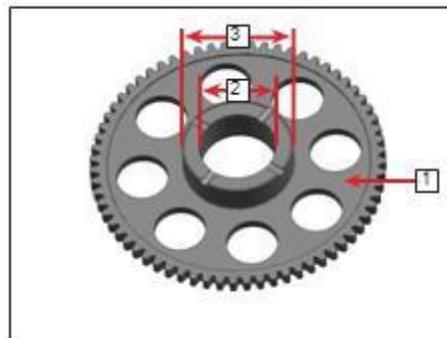
Ignition duplex gear

Check wear and damage to the ignition gear (1)
 Determine the internal and external diameter of the ignition gear (1)

Limits of use:

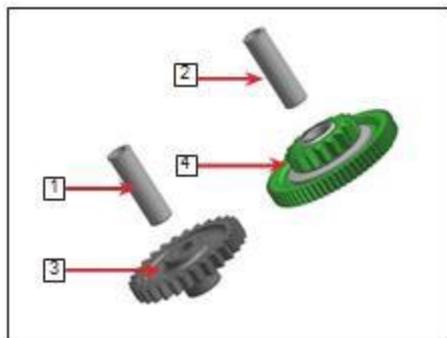
External diameter 3: 51.705mm~51.718mm
Internal diameter 2: 32.025mm~32.05mm

Replace the gear (1) of the starter motor if these tolerances are exceeded.



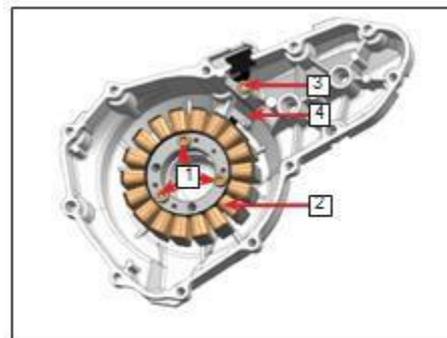
Check wear and damage to the intermediate gear of the starter motor (3) and of the duplex gear group (4) and replace them with new parts if necessary.

Check the intermediate gears shafts (1) and (2) for wear and damage and replace them if worn or severely damaged.



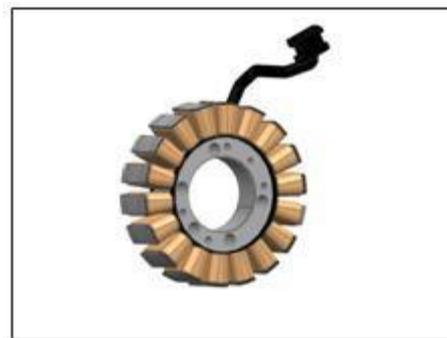
Disassembly of the stator

- Remove the hexagon head screws M6(1)
- Remove the stator group(2)
- Remove the screw M6(3)
- Remove the pressure plate(4)
- Remove the stator(2)



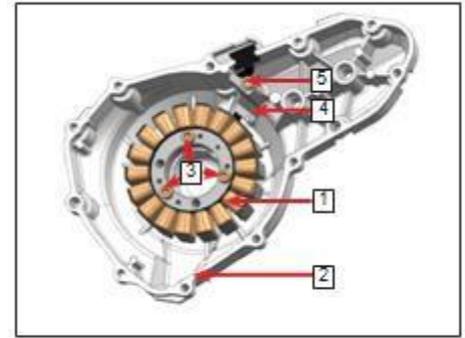
Inspection of the stator

- Check the conditions of the stator and replace it if damaged.
- Check that the metal coil is not broken, spoiled or damaged. Replace it in this case.



Reassembly of the stator

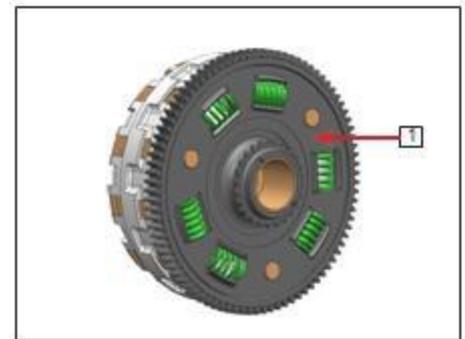
- Fix the magnet stator (1) to the left lateral cover (2) of the engine.
- Tighten the screw(1).
- Tighten the hexagon head screws M6(3)
- Install the plate(4).
- Assembly screws M6 (5)



Clutch group check

If the flexible coupling springs are worn, there will be clearance between the gear and the clutch and an abnormal noise will be generated. If clearance is excessive, the primary gear group must be replaced (1)

- If worn or damaged, replace both gears
- If operation is noisy, replace both gears

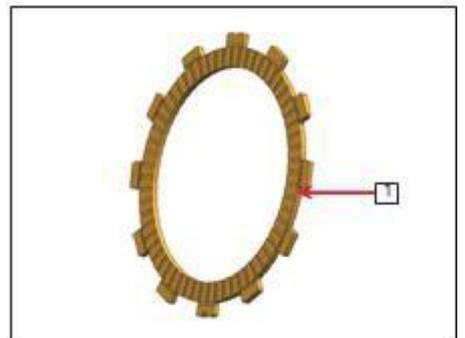


Clutch disc group

Visual inspection of friction and of the steel plates for seizure, overheating, discolouring or signs of irregularity.

Measure thickness of each disc (1) in different points, replace if it shows any sign of damage or wear.

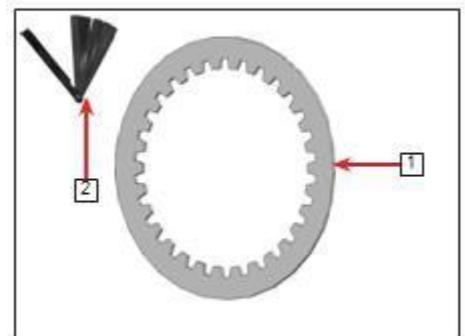
Disc thickness Standard from 2,95 mm to 3,05 mm Limit 2,8 mm
--



Check of clutch disc deformation

Each steel clutch disc (1) must be placed on a comparing surface, measure the empty space between the two using a feeler gauge (2). The gap is the quantity of deformation of the clutch or steel plate. If an disc is deformed beyond the limit, replace it with a new one.

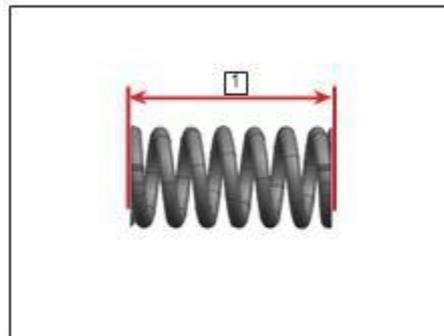
Deformation limits Standard 0,15 mm or less Limit 0,3 mm
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Clutch springs

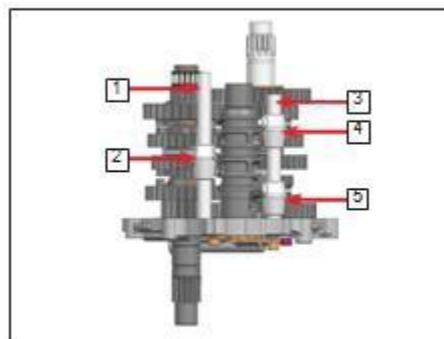
Measure the free length of the clutch springs (1).
If the spring is shorter than the operating limit, it must be replaced.

Free length of the spring
Standard 33.1mm~34.1mm
Limit 32,6 mm

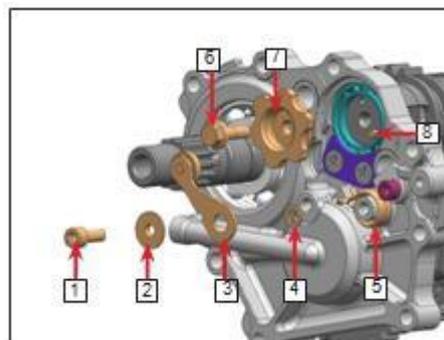


Disassembly of transmission

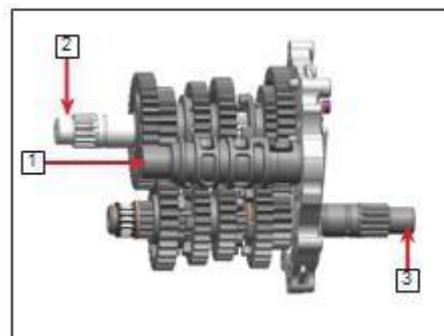
- Extract the shaft (1)
- Remove the main fork(2)
- Extract the shaft (3)
- Remove the forks (4) and(5)

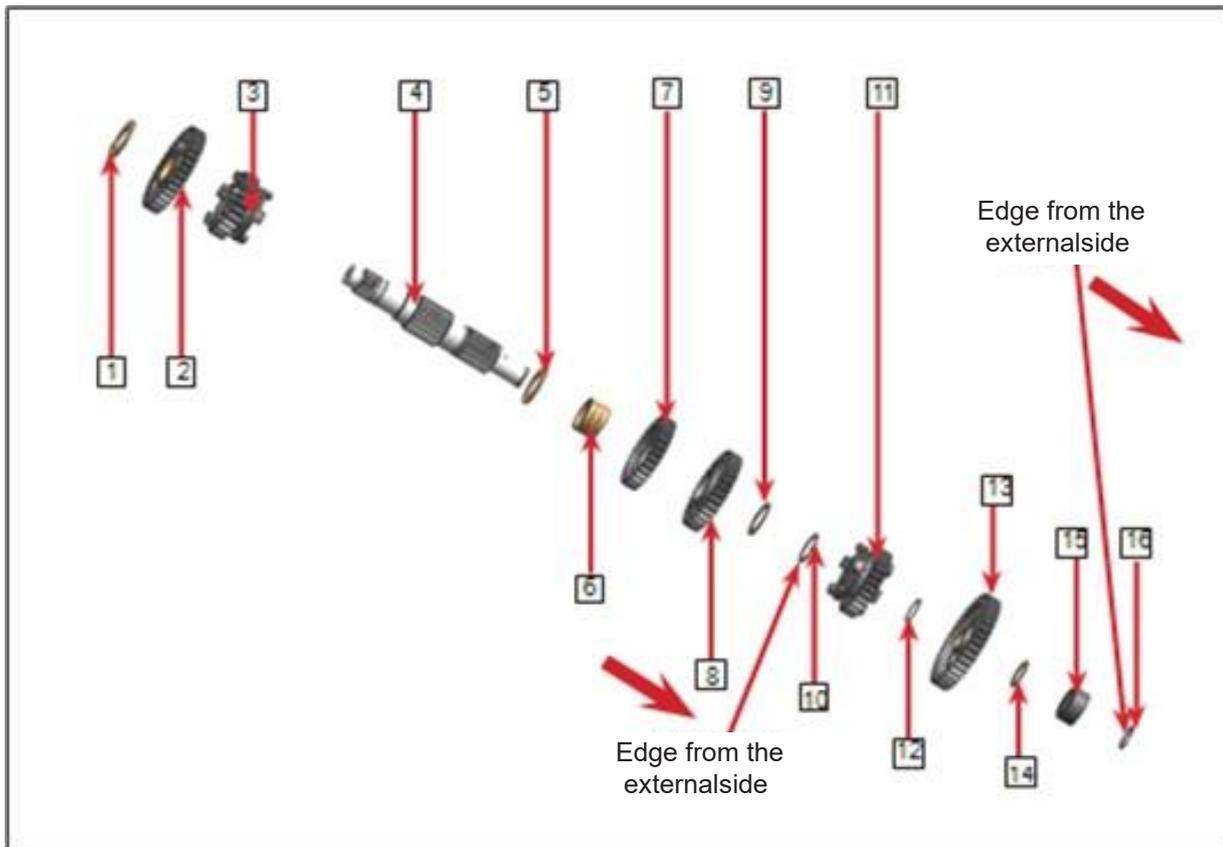


- Remove the screw M6(1)
- Remove the washer(2)
- Remove the pawl(3)
- Remove the washers(4)
- Remove the spring(5)
- Remove the screw(6)
- Remove the star wheel(7)
- Remove the bearing(8)



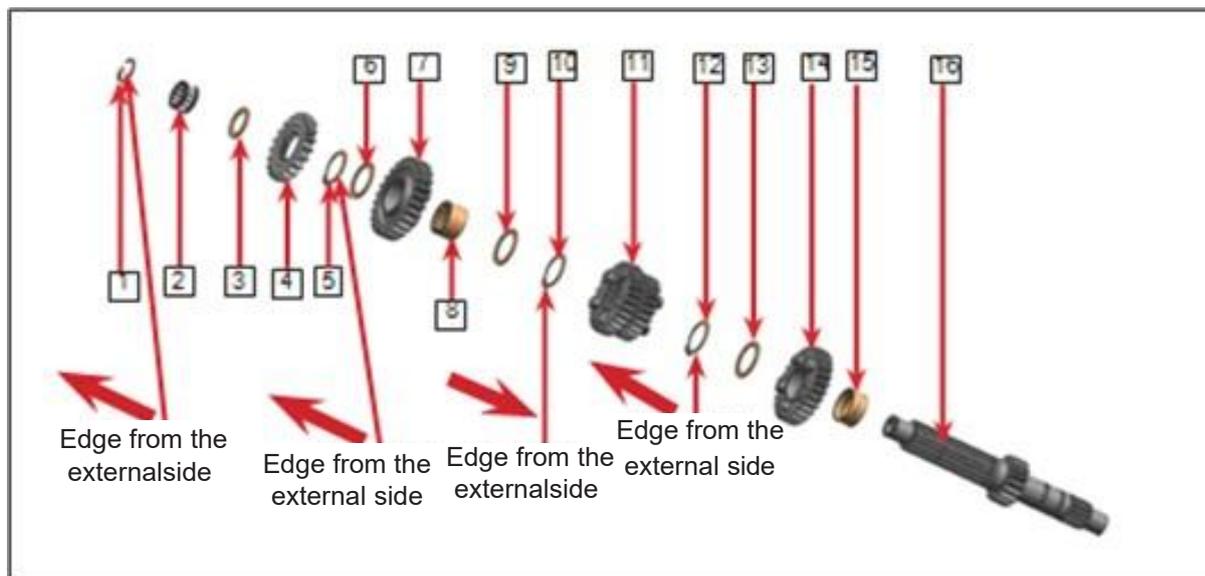
- Remove the shifting drum(1)
- Remove the secondary shaft(2)
- Remove the main shaft(3)



Gearbox main shaft


- 1) Washer 25 x 39 x2
- 2) 2nd speed gear
- 3) 6th speed gear
- 4) Main shaft
- 5) Washer Ø 30
- 6) Brass bearing
- 7) 4th speed gear
- 8) 2rd speed gear
- 9) Grooved washer
- 10) Seeger Ø30
- 11) 5th speed gear
- 12) Washer 20,4 x 25 x 0,5
- 13) 1st speed gear
- 14) Washer 20,4 x 28 x 1,2
- 15) Roller bearing 20 x 26 x13,8
- 16) Seeger Ø20

Gearbox secondary shaft



- 1) Seeger Ø20
- 2) Roller bearing
- 3) Washer 20,5 x 30 x1,5
- 4) 2nd speed gear
- 5) Seeger Ø28
- 6) Grooved washer
- 7) 6th speed gear
- 8) Brass bearing 28 x14,7
- 9) Grooved washer
- 10) Seeger Ø28
- 11) 3rd-4th speed gear
- 12) Seeger Ø28
- 13) Grooved washer
- 14) 5th speed gear
- 15) Brass bearing 28 x 1416

Note

Replace the dismantled seeger rings during reassembly.

Inspection of the gears

Check that the each tooth of the gears are not discoloured, worn, rounded, cracked. Replace them with new parts otherwise.

Note

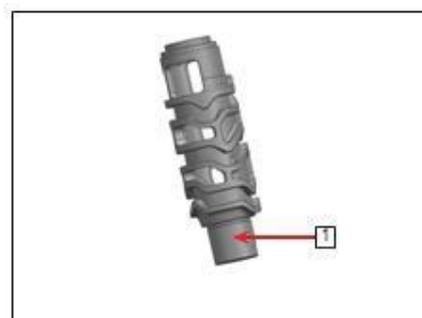
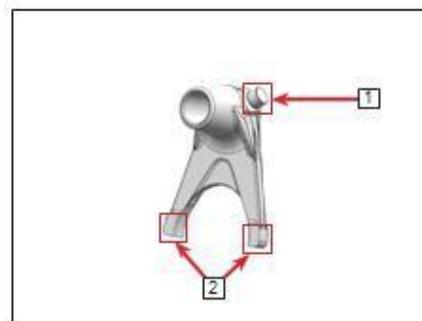
Replace dismantled seeger rings during reassembly.

Gearbox forks

Check the gearbox fork bushing (1), check the tips (2).
If scratched, bent or damaged, replace it with a new fork.

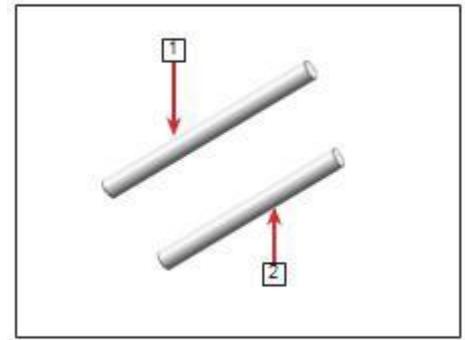
Shifting drum

Check the shifting drum grooves and inspect the cylindrical surface.
Replace if worn or damaged.

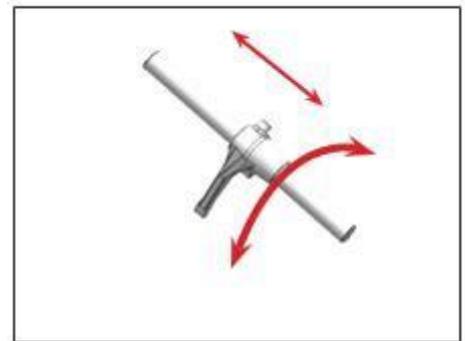


Check of the forks shaft

Check the forks shafts (1) and (2) and replace them if distorted, scratched, worn or damaged.

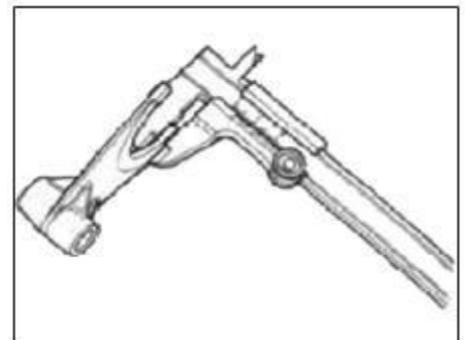


Make the gearbox fork slide/rotate in the direction of the arrow as shown and, if it does not move freely, replace the gearbox fork or shaft.

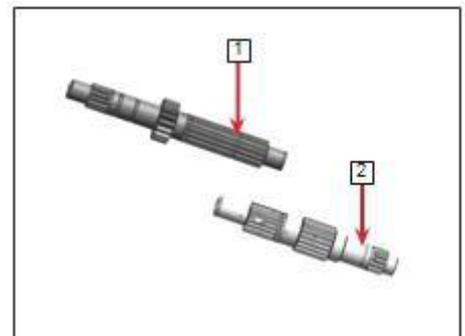


Measure the fork thickness using a Vernier calliper

Fork thickness standard value: 4.8 mm~5.0 mm

**Main and secondary shafts**

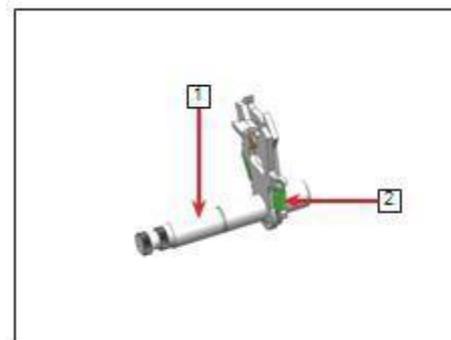
Check that the shafts (1,2) are not bent, worn or damaged; replace them otherwise.



Inspection of the gear selector

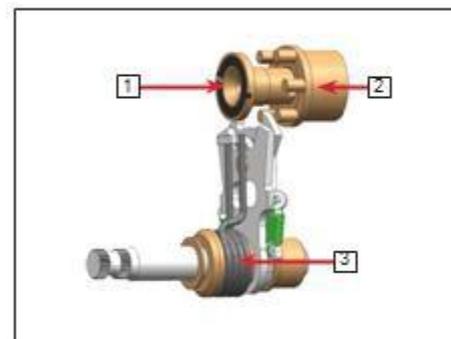
Check the selector (1) for damages, bending, wear and replace it if necessary.

Check that the spring (2) is not damaged or severely deformed, replace it with a new one otherwise.


Gear selector 1

Check that the selector 2 is not damaged or deformed and replace it with a new one otherwise.

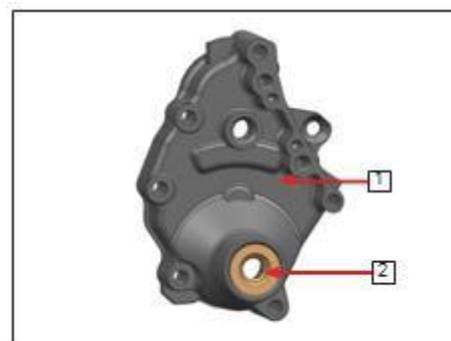
Check that the gear lever return torsion spring 3 is not damaged or deformed and replace it with a new one otherwise.


Cover of the gearbox shaft

Check that the gearbox shaft cover 1 is not cracked, damaged or severely deformed and, in such case, replace it.

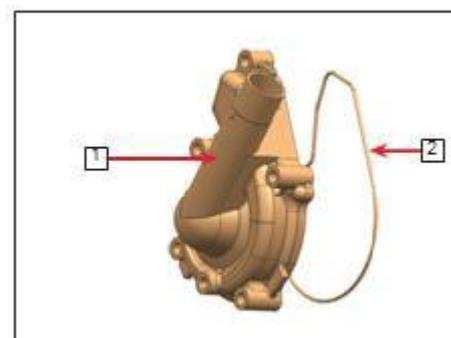
Turn the roller bearing 2 with the help of your hands and replace it with a new one if locked or damaged.

Check that the radial shaft seal is not damaged and, in such case, replace it.


Revision of the water pump group

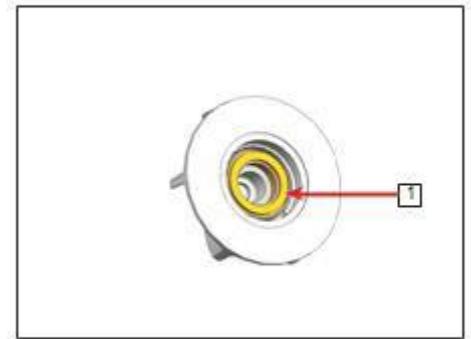
Check that the cover of the pump 1 is not cracked, damaged or severely deformed and, in such case, replace it.

Check that the cover gasket of the pump 2 is not hardened or damaged and replace it if necessary.

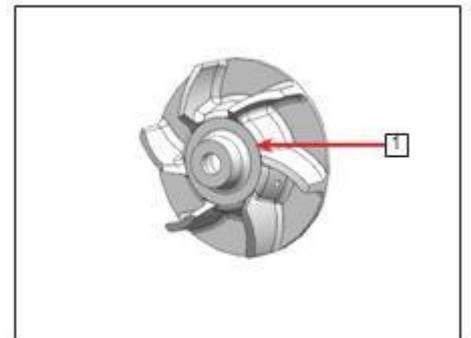


Disassembly of the water pump impeller

Remove the water ring seal (1).

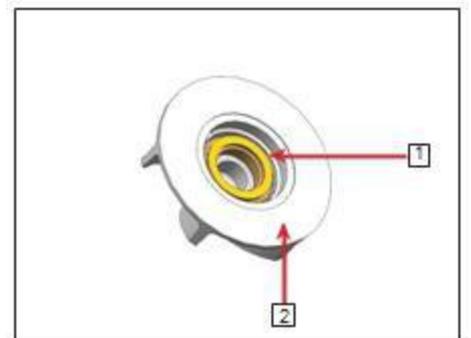


Check that the impeller (1) of the pump is not damaged and, in such case, replace it.



Reassembly of the water pump impeller

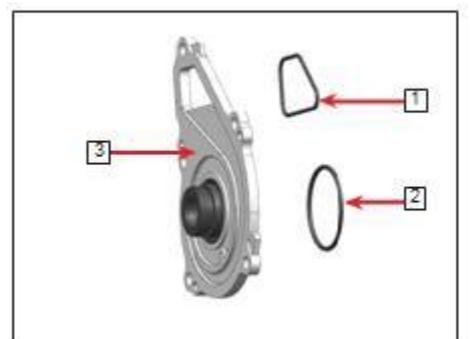
Clean the water ring seal with a soft and clean cloth with an appropriate quantity of alcohol and then install it in the corresponding installation hole of the pump impeller.



Check of the pump body

O-ring 34 x 2,5 (1) and seal of the pump body (2).
If hardened or damaged, replace it.

Check that the pump body (3) is not broken, damaged or severely deformed and, in such case, replace it.

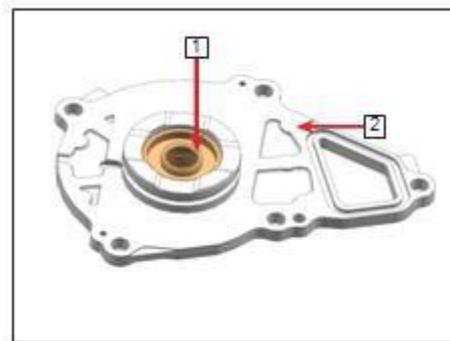


Water seal

Visually inspect the seal; if one of the components is damaged, replace the seal as a whole. If it is not damaged, it can be removed without disassembly.

Note

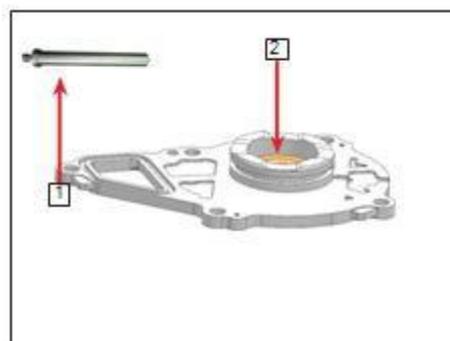
The removed ring seals must not be reused.



Use the special tool: punch for water seal (1) to push the static ring of the seal (2) out of the pump body.

Note

Replace all the ring seals which have been removed.



Seals reassembly

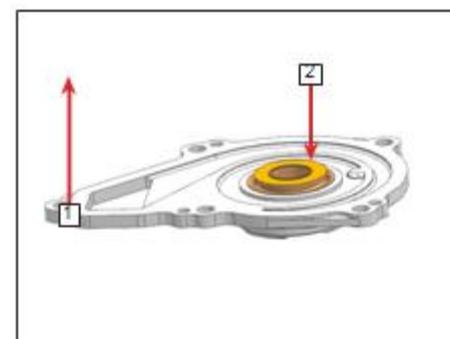
Position the pump body flat on a working table with the protruding side facing upwards.

Insert the radial shaft seal 12 x 32 x 5,5 (2) from the flat end.

Apply an appropriate quantity of sealant for surfaces on the external surface of the radial shaft seal (2) and align it with the assembly hole of the pump body.

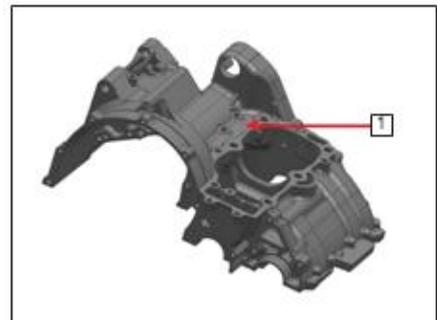


Apply 5699 sealant on the surface of water seal ring, using special tool [1] to install the water seal into the body in proper position.

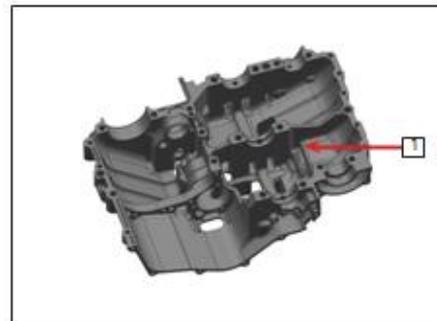


Check crankcase
Check the bearing shell, if wore severely, replace new one.

Check the upper crankcase [1] for cracks or damage,
and replace it with a new one.



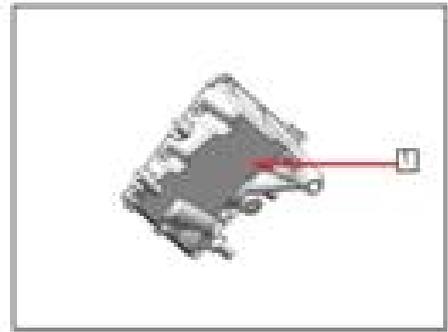
Check the lower crankcase [1] for cracks or damage,
and replace it with a new one.



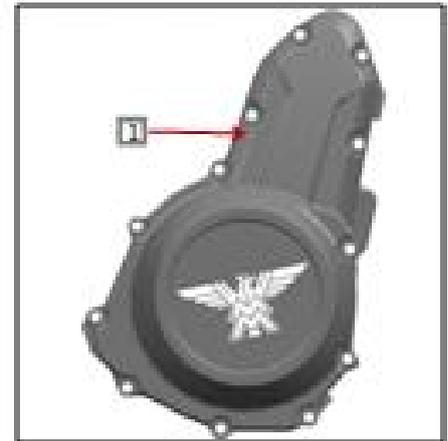
Check the left rear engine cover[1] for cracks or
damage, and replace it with a new one.



Check the oil pan [1] for cracks or damage, and replace it with a new one.



Check the left side cover [1] for cracks or damage, and replace it with a new one.



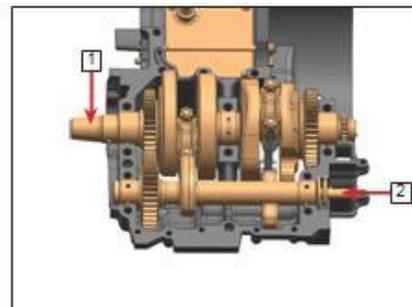
Check the right crankcase cover [1] for cracks or damage, and replace it with a new one.



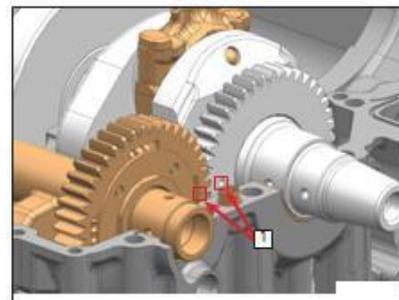
Engine reassembly

Installation of the crankshaft group and of the balance shaft

Apply a solution of molybdenum bisulphide oil on the main elements of the crankshaft and balance shaft during their assembly.

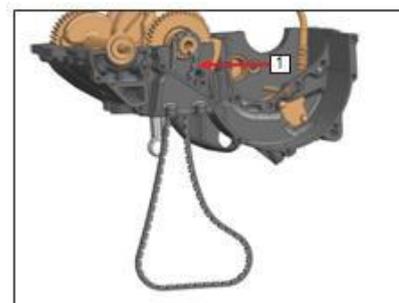


Note: the gears must be aligned with point 1 during installation.



Installation of the distribution chain

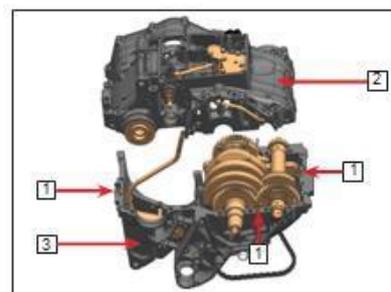
Install the distribution chain (1)



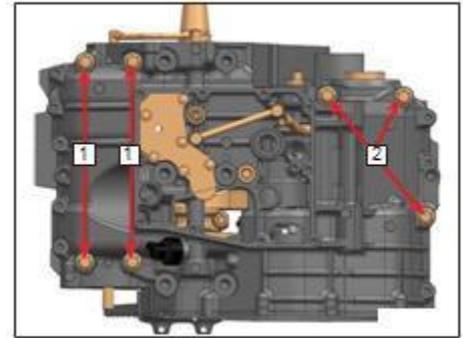
Crankcase 1 assembly

Apply sealant on the bearing surface of the crankcases in an even, central and uninterrupted manner.

Unite the bottom crankcase (2) with the top crankcase (3).



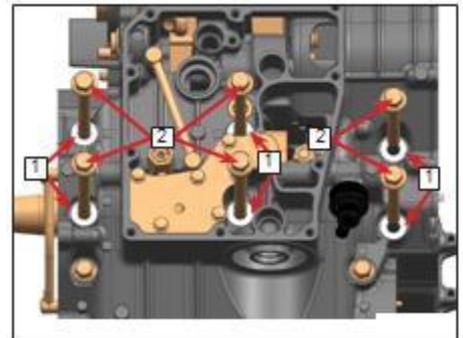
- Screws M8 (1); 35 Nm (tighten at a torque of 20 Nm first, then 35 Nm and lubricate the threads and both sides of the seal with an appropriate quantity of oil mixture)
- Screws M8(2); 27.5 Nm (tighten at a torque of 20 Nm first, then 27.5 Nm)



Note: Align the holes before inserting a screw. When the screws are tightened, they must be pre-tightened diagonally before the definitive tightening.

Note: make sure the crankshaft rotates freely.

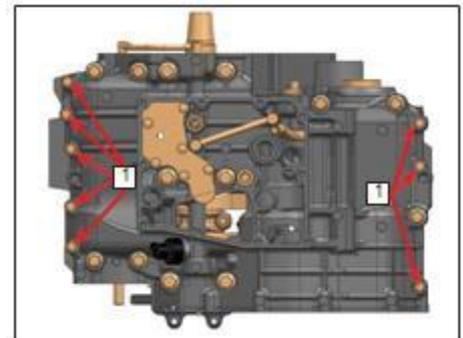
- Tighten the screws with washer M9(2); torque: 44 Nm; (tighten at a torque of 20 Nm first, then 20 N-m and then 44 Nm, lubricate the threads and both sides of the seal with an appropriate quantity of oil mixture)



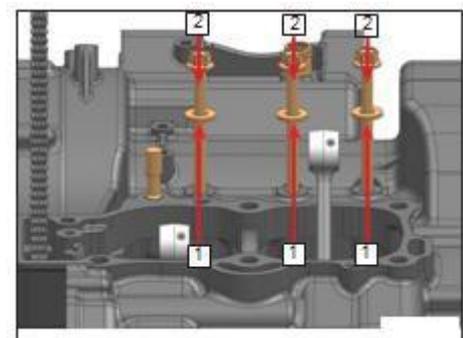
Note: When the screws are tightened, they must be pre-tightened diagonally. Reposition the screws in the same disassembly order.

Note: At this point, check that the crankshaft rotates freely.

- Cross pre-tighten the M7 screws 1, then tighten them at the correct torque.
- Tighten torque: 20 Nm



- Tighten the screws with the washer M8(2);
- Tighten torque: 27,5 Nm



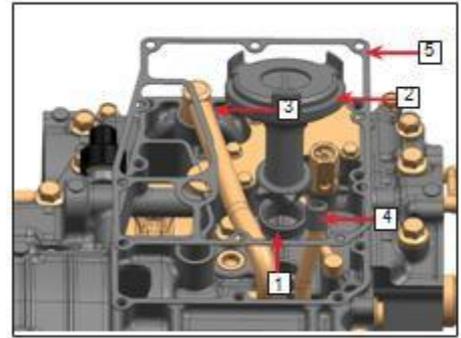
Note: Each bolt must be lubricated with an appropriate quantity of oil mixture on the threading and on both sides of the gasket.

Note: when screw 2 is tightened, it must be tightened from the inside towards the outside in 2 or 3 times

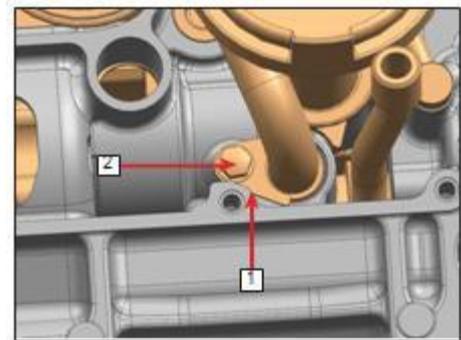
Cross tighten two times.

Installation of the oil sump subgroup

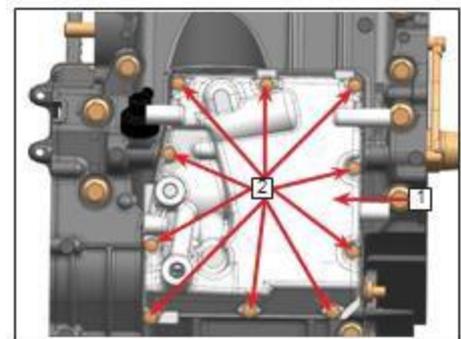
- Install the gasket(1).
- Install the intake group(2).
- Install the oil tube (3) with 2 O-ring 14x2,5 and then apply an appropriate quantity of lubricating oil to the corresponding assembly holes.
- Install the rubber sleeve for the return line(4).
- Install the paper gasket(5).



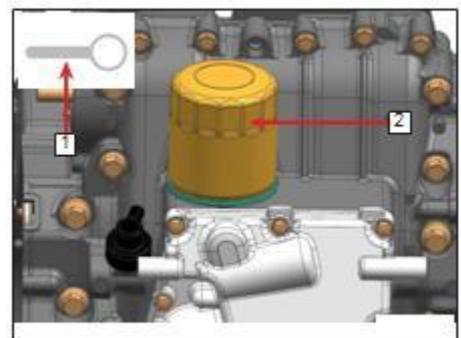
- Install the retaining plate(1) in the corresponding installation position.
- Apply an appropriate quantity of sealant and threadlocker for 243 threads
- Screw (2); tightening torque M6: 8Nm



- Adjust the oil return hose in the corresponding assembly groove of the oil sump and install the component(1).
- Tighten the screws (2) M6 x25
- Tightening torque: 11 Nm~13Nm

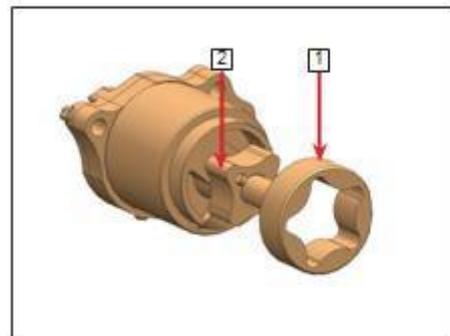

Installation of the oil filter

- Use a specific tool (1) to install the oil filter(2); tightening torque 16 Nm~18 Nm

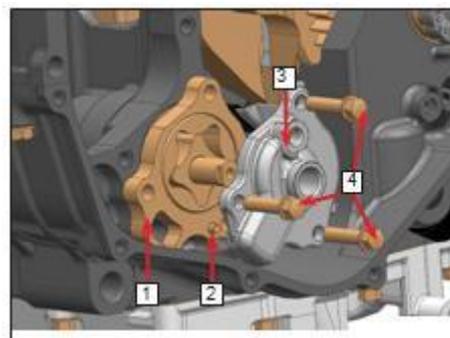


Installation of the oil pump group

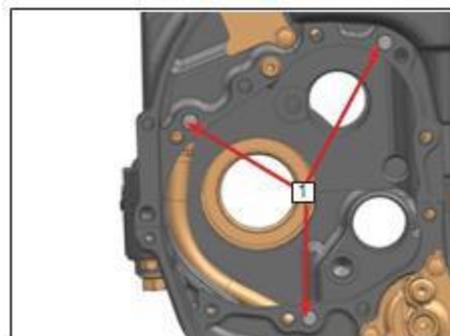
- Install the external rotor of the main oil pump(1)on the internal rotor (2)



- Install the oil pump body(1)
- Install the grub screws(2)
- Install the cover (3)
- Tighten the screws M6(4)


Gearbox assembly

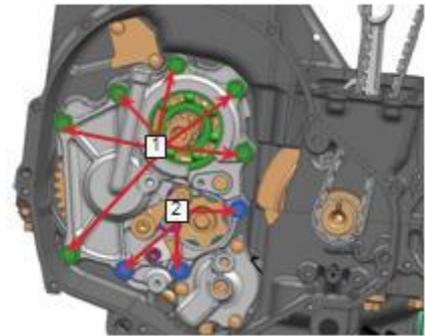
- Install the centring pins.



- In the direction of the arrow,insert the gearbox cover subgroup(1) in the corresponding assembly position.



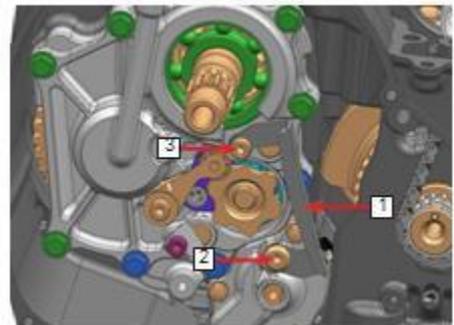
- Apply the appropriate quantity of threadlocker 243, install the screws (1).
- Screws M7×30 Tightening torque: 19 Nm~21Nm
- Apply an appropriate quantity of threadlocker 243, install the screws (2).
- Screws M7 x 26 Tightening torque: 20Nm


Note

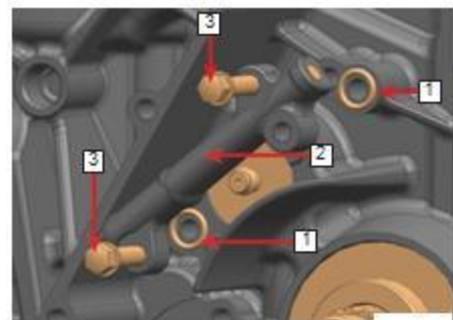
Tighten the screws in a crossed sequence

Installation of the oil pump 1 chain guide group

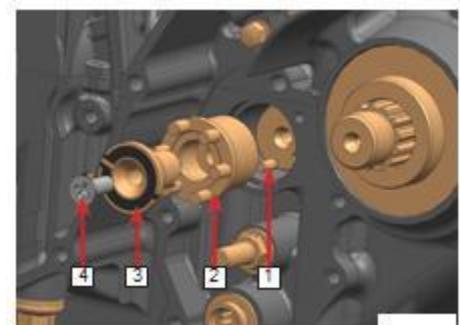
- Apply the appropriate quantity of threadlocker 243 on the screws (3).
- M6×12 Tightening torque: 10Nm
- Apply an appropriate quantity of threadlocker 243, M6 x 9screws (2)


Installation of the tube junction

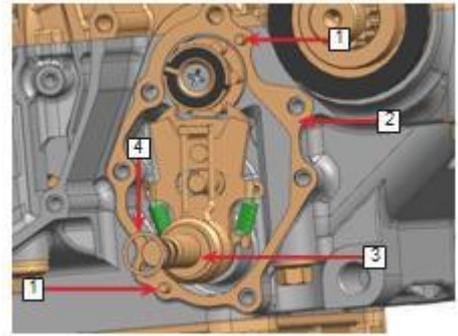
- Apply the appropriate quantity of oil to the edges of the O-ring(1); mount the junction (2) on the oil passage tube.
- Insert the junction of the tube cover (2) in the corresponding hole of the upper compartment,confirm the internal hole alignment and beat it in the hole using a nylon hammer.
- Tighten the M6 screws 3; (to be installed together with the top bolt)


Installation of the gearbox mechanism

- Install the grub screw(1)
- Selector (2)
- Install the travel sensor (3).
- Apply an appropriate quantity of threadlocker 243 on the screws(4)

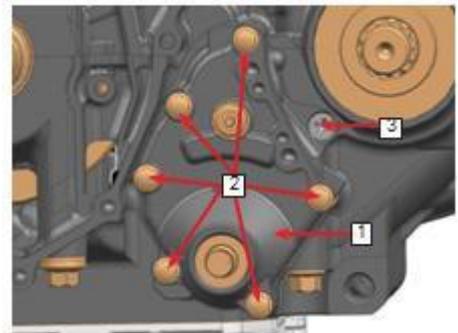


- Mount the grub screws(1)
- Install the seal paper gasket(2)
- Install the gearbox shaft subgroup(3)
- Mount the washers(4)



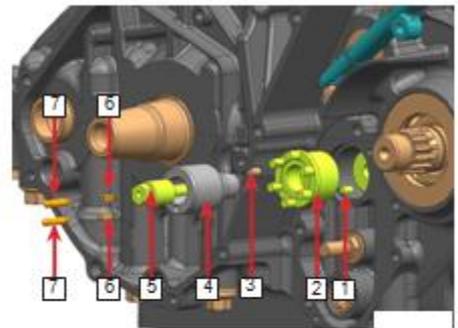
- Mount the gearbox cover(1)
- Mount the M6 screws (2); tightening torque 12N-m
- Mount the screw (3)

Note: When installing, put the bolt into the bolt hole first, the height of the exposed part should be the same, if not, adjust the corresponding position of the bolt. When tightening the bolt, it should be pre-tightened diagonally before tightening.

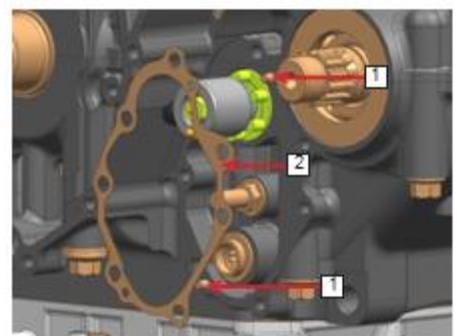


(state 2)

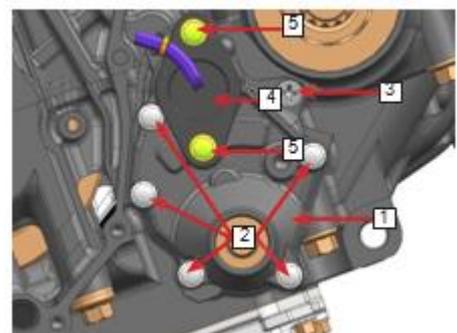
- Install the needle roller [1];
- Install the track wheel [2];
- Install the dowel [3];
- Install the gear drive wheel [4];
- Install the contact bolts [5];
- Install the contact spring [6];
- Install the ball contacts [7].



- Install the dowel[1];
- Install gear shift shaft cover gasket[2].

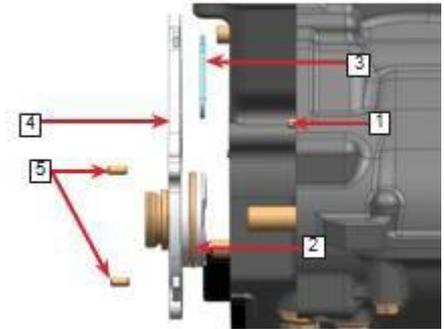


- Install gear shift shaft cover[1];
- Install bolt M6[2]
- Install screw[3];
- Install gear position sensor[4];
- Install bolt M6[5]



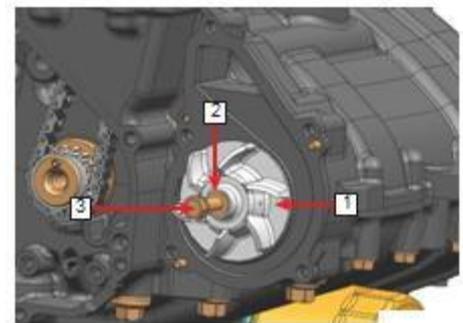
Installation of the water pump

- Install the grub screw(1)
- Apply an appropriate quantity of oil to the O-ring(2)
- Fix the gasket of the pump body(3) to the pump body(4);avoid its fall.
- Install the pump body(4)
- Install the grub screws(5)

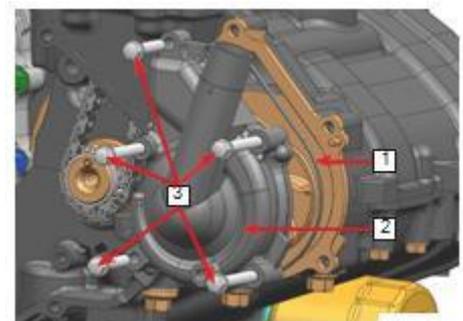


- Install the impeller(1)
- Position the washer on the M6 screw(2)
- Tighten the screw(3)

Note: the clearance between the impeller and the pump body must be 0,2~0,7, use a feeler gauge.

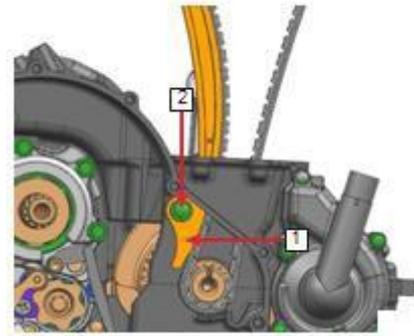


- Install the pump cover gasket (1) on the pump cover(2)
- Install the pump cover(2)
- Tighten the screws M6(3)



Assembly of the tensioning plate group

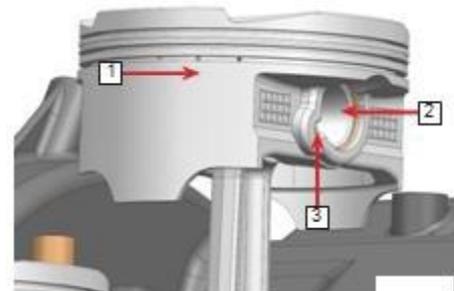
- Mount the tensioning plate(1)
- Install the screw (2), apply threadlocker243
- Tighten at a tightening torque of 20N-m.



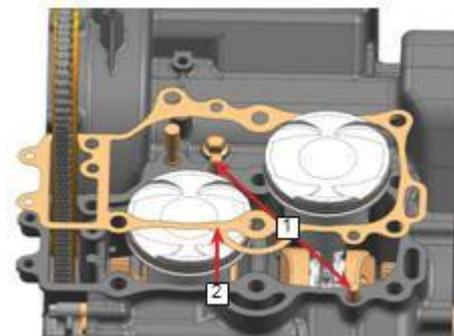
Pistons assembly

- Preassemble the seeger ring of the gudgeon pin on one side to mount the piston(1)
- Install the piston gudgeon pin(2)
- Install the seeger ring of the piston gudgeon pin (3) on the other side

Note: The remove seeger must be replaced with a new one.

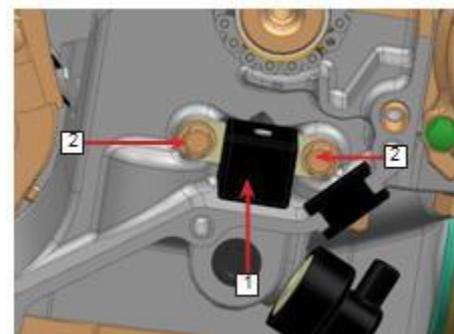


- Rotate the crankshaft to adjust the piston at the right position;operate in the same manner to install the other piston
- Mount the grub screws(1)
- Install the cylinders lock gasket(2)



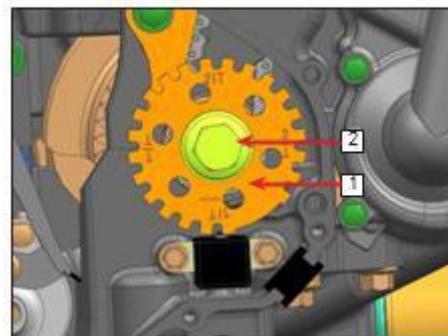
Phase sensor assembly

- Tighten the screws M5(2)



- Install the phonic wheel(1).
- Screw the M8 screw(2) and the spacer; threadlocker sealant 243, tightening torque 40N-m

Note: the distance between the phonic wheel and the sensor must be of 0,55 mm



Cylinders block assembly

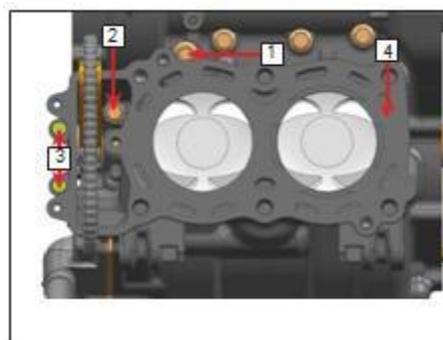
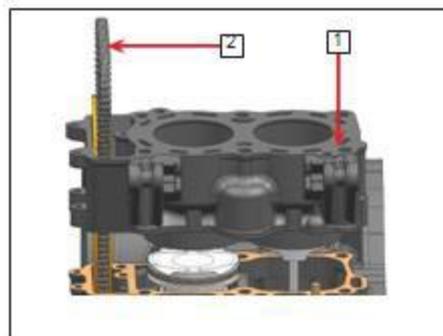
- Rotate the crankshaft until when the pistons surfaces of cylinder (1) And of cylinder (2) are at the same height and apply an appropriate quantity of oil to the cylinder body
- Install the cylinders block(1).

Note: during disassembly, hook the distribution chain (2) to avoid its fall inside the crankcase.

Note: There are 3 elastic bands on the piston, during installation it is necessary to ensure that the opening of the upper band is on the side of the piston marked as“0”.
The other two bands must be positioned at 120° the one from the other.

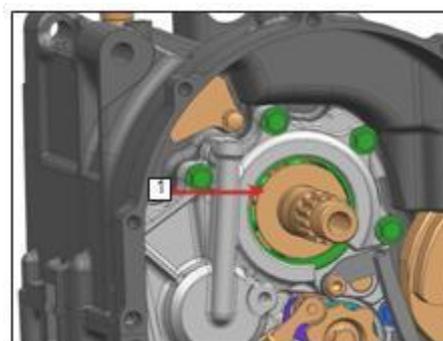
Position the elastic bands with the reference mark in the top part.

- Tighten the nut M10(1)
- Tighten the screw with washer M8(2)
- Install the hollow hexagon screws M6 (3) and the washers
- Install the cylinders block gasket(4)



Clutch group assembly

- Insert the washer(1)



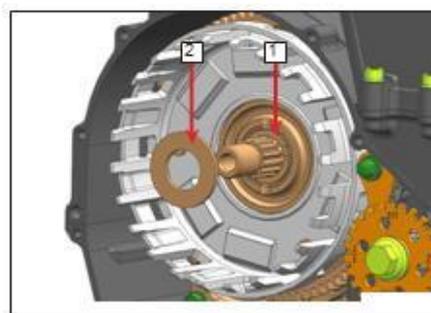
- Fix the chain group of the oil pump (2) to the sprocket of the main hub
- On (1), hook the sprocket of the oil pump (3) to the chain(2).
1 = Screw M6 x 20 (left thread)
- Apply an appropriate quantity of threadlocker 243, apply the gasket
- 6.3 x 16.3 x 1.2 Fix the sprocket of the oil pump.
Tightening torque of 12 N-m.

Note

During assembly, pay attention to the alignment of the sprocket with output gear.



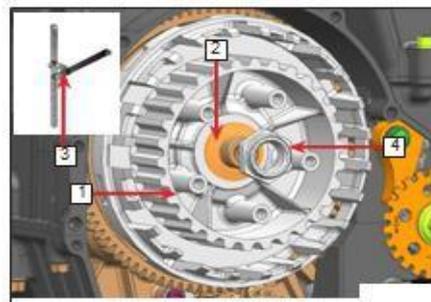
- Mount the bushing (1) (with the edge driller towards the exterior) with an appropriate quantity of oil between the corresponding main shaft and the central hole of the main hub group.
- Insert the washer(2)



- Insert the drum(1)
- Insert the washer(2)
- Use the special tool Clutch stop wrench (3); fix the clutch hub; apply an appropriate quantity of threadlocker 243, tighten the nut M20 (4). Tightening torque 132N-m

Note

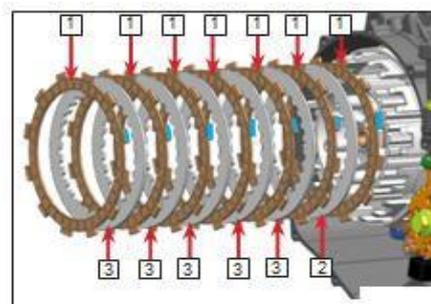
Once the nut has been tightened, turn the hub group by hand. It must rotate easily.



- Mount the trimmed discs(1)
- Mount the metal discs A(2)
- Mount the metal discs B(3)

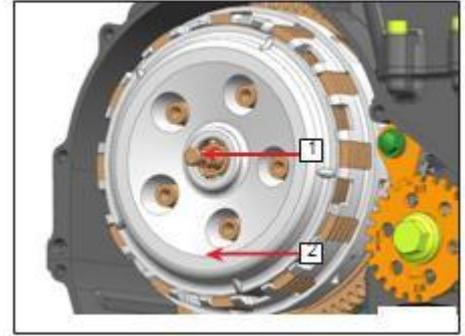
Note

The first 6 clutch discs are mounted with the opening marks aligned and the outer clutch disc is mounted misaligned with respect to the others.

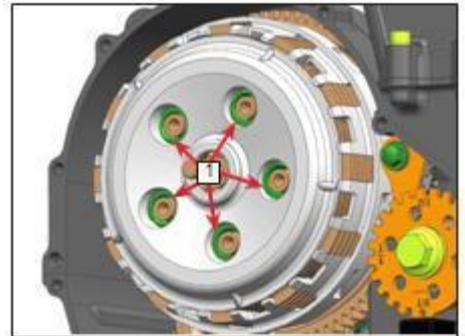




- Install the rod (1)
- Install the clutch plate(2)



- Install the springs (1)

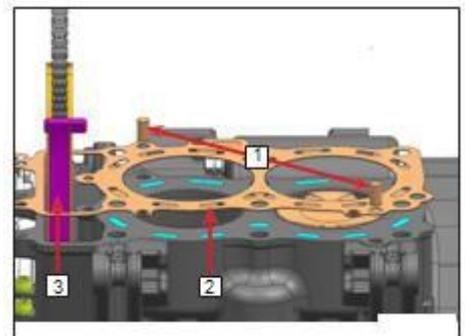


- Tighten the screws M6(1)

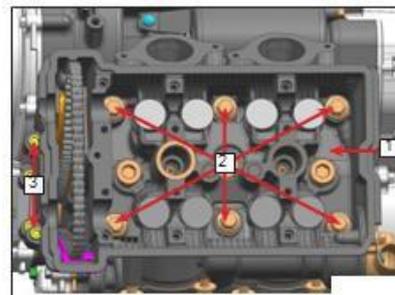


Installation of the cylinder head

- Mount the grub screws(1)
- Install the cylinder head gasket(2)
- Apply pressure to install the chain guide(1)



- Install the head(1)
- Tighten the screws M10 (2; tightening torque 54 N-m (tightening torque of the used screws 49N-m)
- Tighten the hexagon head screw M6(3)



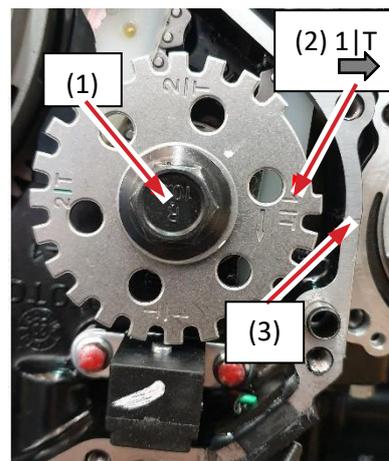
Note: when the cylinder head is installed, hook the distribution chain to avoid its fall inside the crankcase.

Installation of the camshaft group

- By operating on the screw M8 (1); rotate and stop when the mark(2) on the toothed disc is aligned with the notch on the crankcase(3)

Warning:

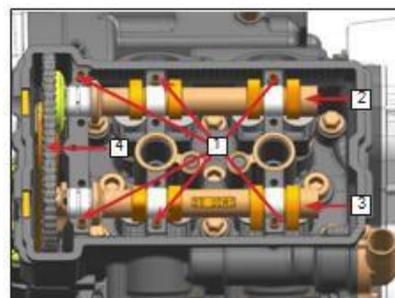
Check that the distance between the position sensor and any of the teeth of the freewheel is equal to 0,55 mm.



- Install the intake camshaft group (2)(IN)
- Install the exhaust camshaft group (3)(EX)
- Position the distribution chain (4) on the gears.

Note

Pay attention to the positioning of the centring plugs of the headframe (1).

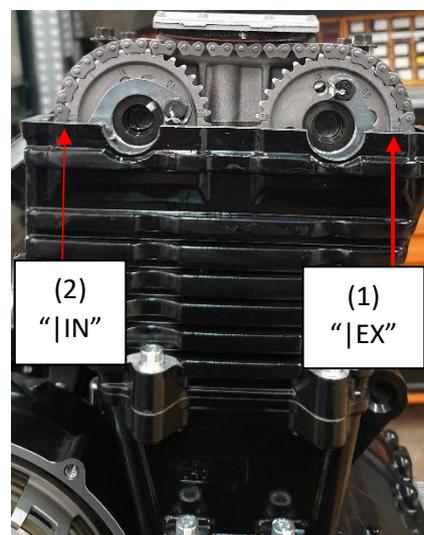
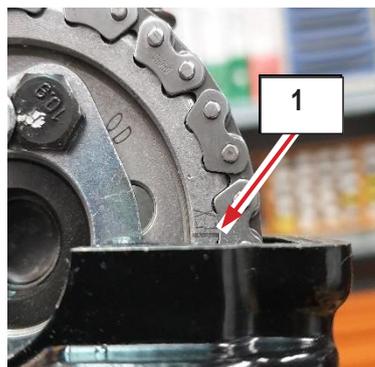
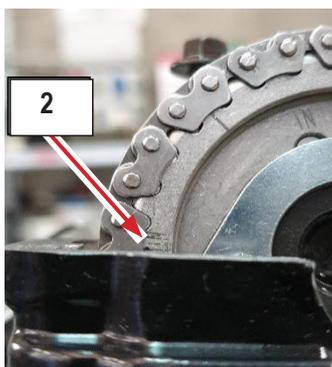


Note

When the intake camshaft group is installed, the marking line (2) "IN" on the toothed wheel must be aligned with the head surface. When the exhaust camshaft group is installed, the marking line (1) "EX" on the toothed wheel must be aligned with the head surface.

Note

The distribution chain must not be rotated during assembly.



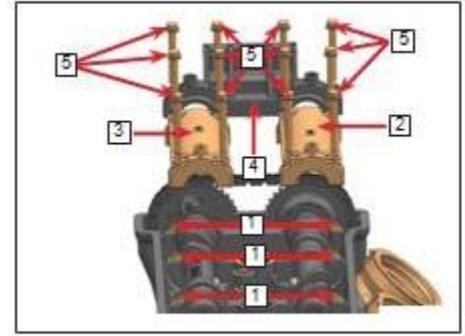
- Mount the centring plugs(1)
- Install the headframe of the intake camshaft(2)
- Install the headframe of the exhaust camshaft(3)
- Install the camshaft positioning plate(4)
- Tighten the fixing screws(5)

Note

The screws(5) must be tightened in three steps, in the following order 5N-m, 8N-m, 12N-m. Tighten diagonally in turn.

Note

The exhaust camshaft headframe possesses an "EX" mark and the intake camshaft headframe possesses an "IN" mark.

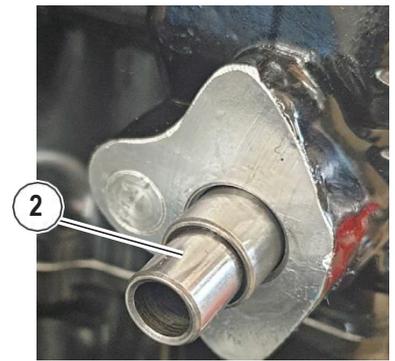
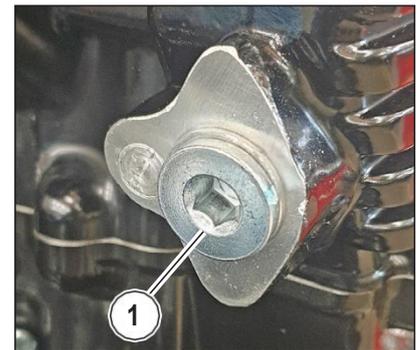
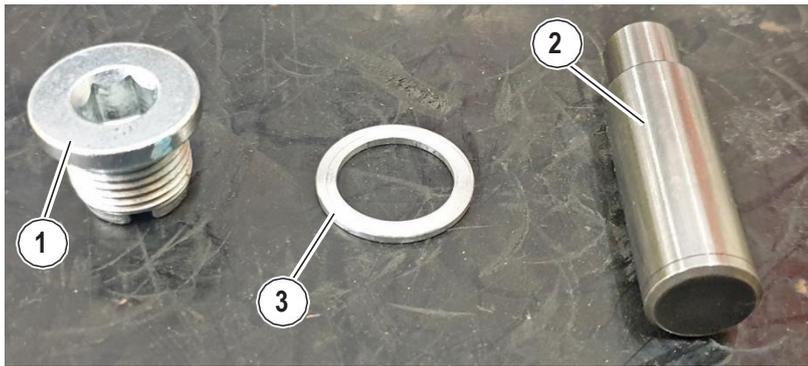


Distribution chain turnbuckle reassembly

Note

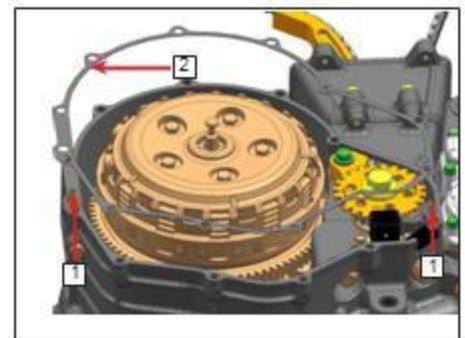
Before mounting the turn buckle of the distribution chain, make sure the valves of the two cylinders are closed (See the paragraph "Installation of the camshafts group")

- Insert the turnbuckle (2) as shown in the figure and tighten the screw (1) until end of travel taking care to replace the aluminium washer(3).



Crankcase right cover reassembly

- Install the grub screws of the right cover(1)
- Install the seal paper gasket(2)

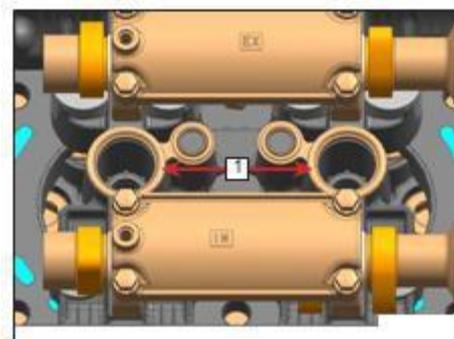


- Install the right cover (1); (turn the clutch control during installation) (Shaft group (3), turned to the right position).
- Tighten the screws M6(2)

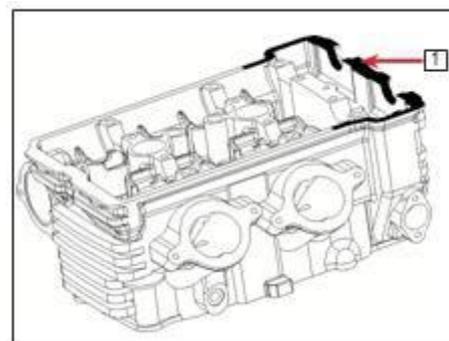


Installation of the cylinder head cover

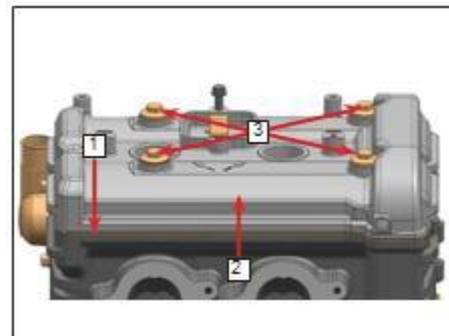
- Install the spark plug hole gasket(1)



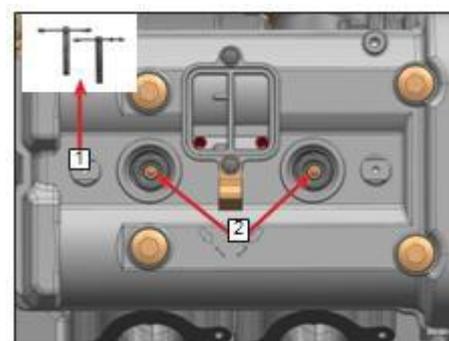
- After this operation, apply sealant 5699 to the indicated area of the cylinder head(1)



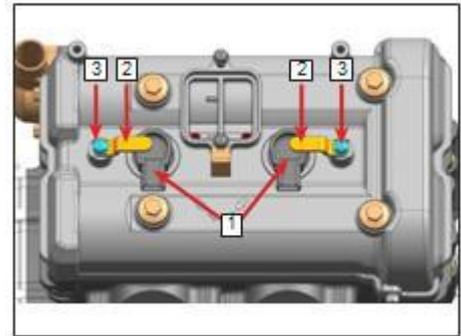
- Position the gasket (1) on the head cover(2)
- Install the head cover(2)
- Install the head cover screws M6(3).
- Tightening torque: 11N-m~13N-m



- Mount the spark plugs with a special tool(1);
- Tightening torque:15 N-m

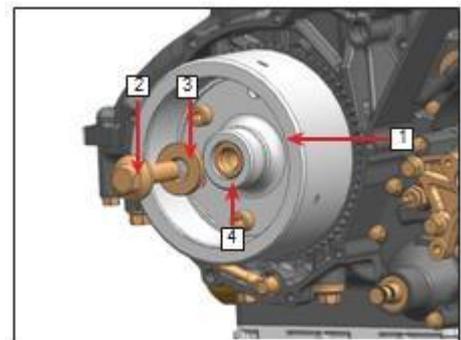


- Mount the ignition coils(1)
- Mount the fixing plates(2)
- Tighten the screws M6(3)

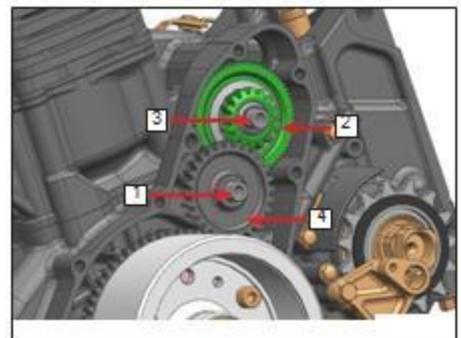


Installation of the flywheel

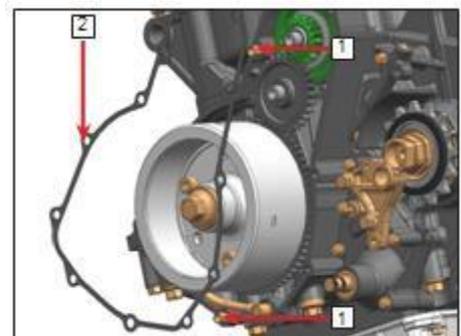
- Apply an appropriate quantity of oil to the edge of the crankshaft and to the internal hole of the magnet rotor and install the magnet rotor (1)
- Position the washer(3) on the bolt M12(2) and screw by applying an appropriate quantity of threadlocker243
- Tightening torque 155N-m



- Install the intermediate gear shaft(3)
- Install the duplex gears group(2)
- Install the intermediate gear shaft(1)
- Install the ignition intermediate gear(4)



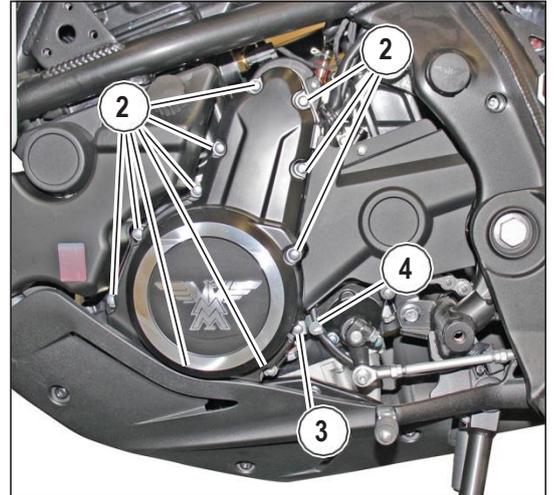
- Mount the grub screws(1)
- Install the paper gasket(2)



Installation of the left front cover

Install the screws M6 (2) and the screw M6 (3). TO install the screw (3), install the clamp (4) above.

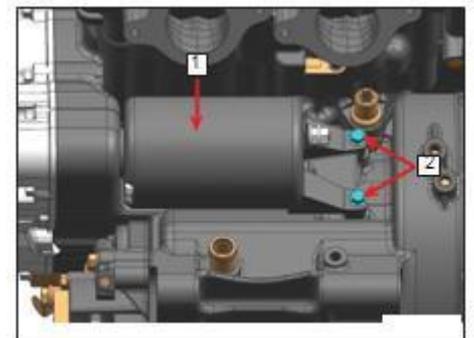
Note: When the screws are installed, insert them in the respective holes first. The height of the exposed part should be the same, adjust the corresponding position of the screws otherwise.
During tightening, pretighten diagonally before fully tightening.



Installation of the starter motor

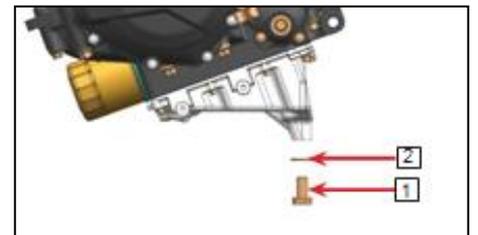
- Install the starter motor (1) which can be installed by delicately beating it with a rubber hammer.
- Tighten the screws M6(2)

Note: Before the assembly, apply a small quantity of oil to the “O” ring on the cylinder side of the starter motor group.



Installation of the oil drain screw

- Position the seal washer(1)
- Screw the oil drain magnetic screw M12(2)
- Torque value :28N-m~32N-m



Lubrication systems

Oil level check



Warning

The use of a motorcycle with insufficient, deteriorated or contaminated engine oil may accelerate wear and result in seizures of the engine or of the gearbox, accidents or injury.

Check that the level of oil is at the top pint (1) in the visualization window of oil level between the 2 levels.

Note

Position the motorcycle vertically with respect to the ground.

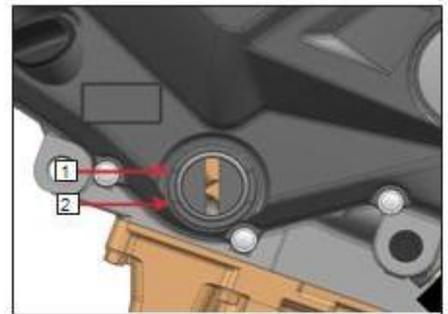
If the motorcycle has recently been used, wait a few minutes until all oil has been drained.

If oil has just been changed, start the engine and let it run at idle speed for some minutes. This will fill the oil filter with oil. Switch off the engine and wait a few minutes for oil to stabilize.



Warning

Making the engine run rapidly before oil reaches all the parts may cause seizure of the engine. The oil pressure indicator switches on if the oil is already extremely low or if the pump oil or oil passages are clogged or do not work correctly. If the indicator remains switched on when running at higher speed than the idle speed, immediately turn off the engine to find the cause.



If oil level is too high, use a syringe pump or other suitable equipment to remove the oil in excess.

If oil level is too low, add the right quantity of oil through the filling hole. Use the same type of engine oil.

Note: If the type and model of oil is unknown, for refilling when the engine oil level is low, prioritise the brand of oil specified by the parent company. Then, replace oil entirely as soon as possible.

Engine oil change

Make sure the vehicle is in horizontal position before changing oil; the oil and the filter must be changed at the same time and when the engine is hot.

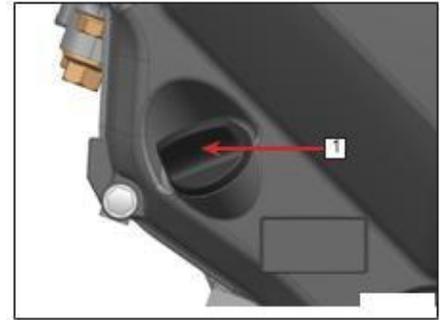
Note: Engine temperature could be high at the moment of replacement, wait for temperature to be suitable for this operation.

Note: See disassembly/assembly of the engine for more details on disassembly/assembly of the oil filter and oil drain.

Note

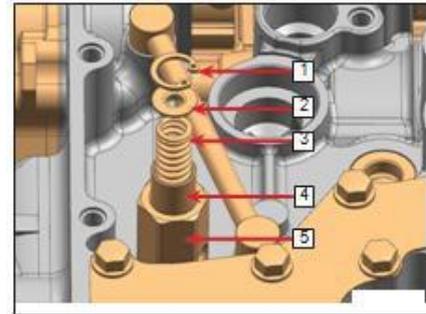
The condition of oil draining from the engine reflects the conditions of the engine itself. Check drained oil for the presence of metal fragments, which are a sign of a problem inside the engine.

- Unscrew the oil filling cap(1)
- Fill with the correct quantity of oil



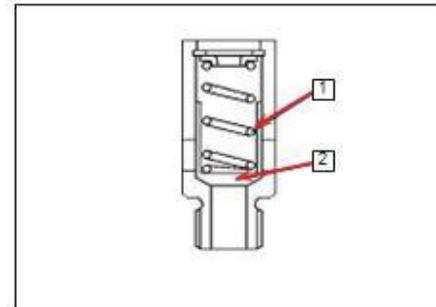
Disassembly of the pressure relief valve

- Remove the seeger ring (1) using a spring clamp
- Remove the relief valve spring seat(2)
- Remove the restrictor spring(3)
- Remove the pressure relief valve insert(4)
- Remove the pressure relief valve body with a wrench(5)



Check of the oil retaining valve

- Check by pushing the limiter core using a soft stick
- It must slide delicately squashing the limiter spring(1)
- Check that the insert of the nozzle (2) returns in the seat



Note: check the retaining valve as set. Disassembly and assembly alter the valve performance; normally, the butterfly valves are not dismantled.

If a block is encountered during the listed checks, clean the valve with a solvent with a high flash point and blow away any foreign particles which possibly remained in the valve using compressed air.

 **Warning**

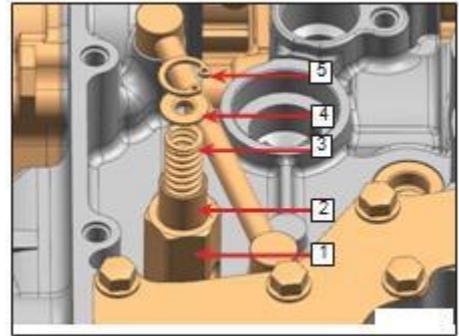
Clean the oil nozzle in a well ventilated area and ensure that the work area is free from sparks or flames. Do not use gasoline or solvents with a low flash point due to the risk of highly flammable liquids.

Note

If cleaning does not work, replace the whole valve. The oil retaining valve is highly accurate and does not allow to replace the single parts.

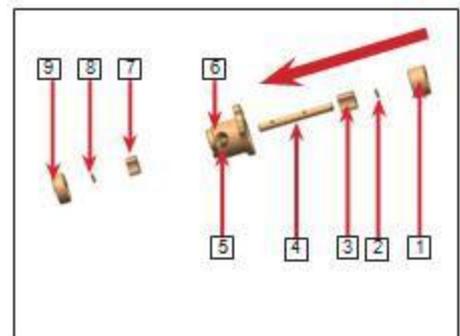
Reassembly of the pressure relief valve

- Remove the pressure relief valve body using a wrench(1)
- Install the pressure relief valve core(2).
- Install the limiter spring(3)
- Insert the limiter spring seat(4)
- Use a spring clamp to make pressure on the valve spring seat to install the seeger ring (5) in position.



Oil pump disassembly

- Remove the external rotor of the secondary oil pump(1).
- Remove the internal rotor of the secondary oil pump(3).
- Remove the needle roller (2) through the hole(5).
- Remove the external rotor of the main oil pump(9).
- Push the oil pump shaft(4) towards the direction of the arrow and turn the internal rotor (7) of the oil main pump which is pushed in the opposite direction of the arrow, remove the needle roller(8).
- Remove the internal rotor (7) of the pump shaft main pump(4).
- Remove the oil pump shaft (4) from the pump body(6).

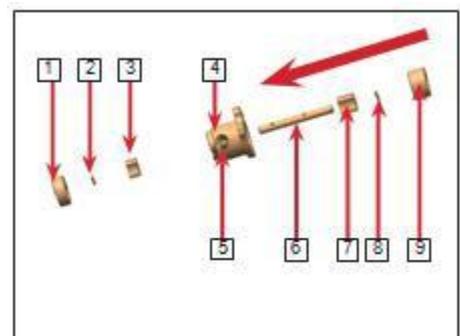


Check

Check that the various parts of the oil pump are not severely worn or damaged and, if they are, replace the oil pump group.

Oil pump reassembly

- Install the oil pump shaft (6) on the oil pump body(4)
- Install the internal rotor of the main oil pump(3)
- Install the rollers (2)
- Install the external rotor of the oil main pump(1)
- Install the roller (8) through the hole(5)
- Install the internal rotor of the secondary oil pump(7)
- Install the external rotor of the secondary oil pump(9)



Note

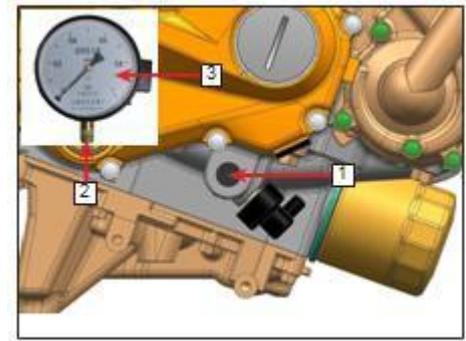
The secondary oil pump rotor is wider than the main oil pump rotor.

Oil pressure measurement

- Remove the bottom fairing
- Remove the cap (1) and connect the adapter (2) and the manometer(3)
- The taper pin inserts itself in the hole.

Special tool: Oil manometer, 10kgf/cm²
 Adapter for oil manometer, PT3/8

- Start the engine and heat it.
- Make the engine run at the specified speed and read the oil manometer.
- If oil pressure is excessively below the normal value, immediately check the oil pump, the oil limiter and/or the main shaft wear status.
- If oil pressure is excessively above the normal value, check if the oil passages are clogged.



Oil pressure

Standard: At 4000r/min (rpm), oil temperature at 90 °C (194°F):
 From 216 kPa to 294 kPa (2.2kgf/cm²~3.0kgf/cm²,31psi~43psi)

- Turn off the engine.
- Remove the oil manometer and the adapter.

 **Warning**

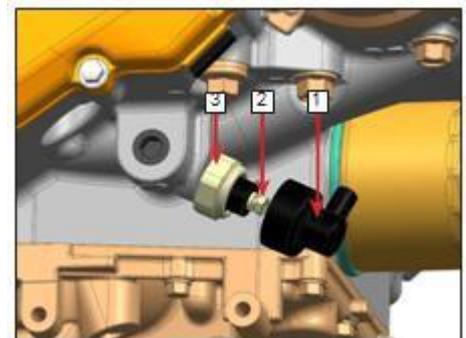
Pay attention to possible burns.

Apply threadlocker to the cap and tighten.
 Torque: 20N·m

Low oil pressure alarm sensor removal

Drain engine oil (see the engine assembly section for further details).

- Remove the safety cover(1)
- Remove the screws of the segments(2)
- Remove the switch(3)

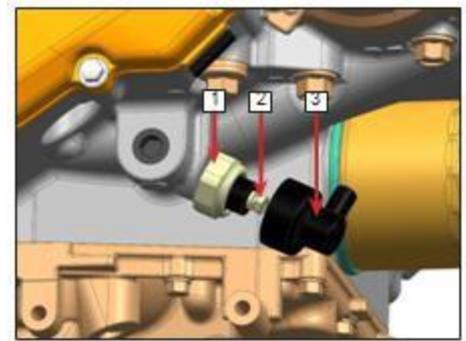


Inspection and repair

See the electric section for further details.

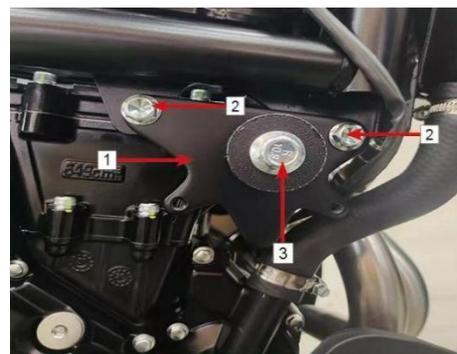
Reassembly

- Apply sealant silicone to the sensor(1)
- Install the low oil pressure alarm sensor (1); torque: 15N-m
- Connect the wire to the screw (2) and install the latter(2)
- Position the safety sleeve(3) on the oil low pressure alarm switch (1)

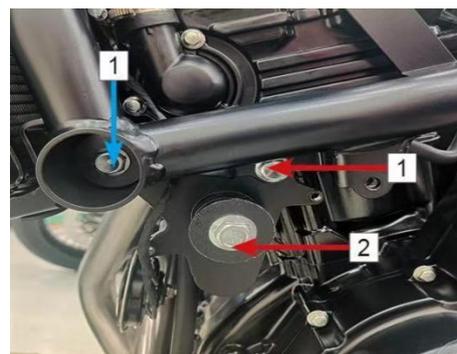


Installation of the engine on the complete vehicle

- Position the engine on the jack and lift it upwards.
Move in correspondence of the screw holes.
- Mount the front assembly bracket of the engine(1)
- Tighten the screw M8(2)
- Insert the screw M10 (3) through the hole and tighten the nut



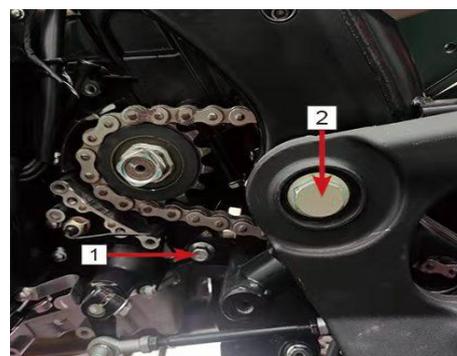
- Tighten the screws M8(1)
- Insert the screw M10 (2) through the hole and screw the nut



- Insert the screw (1) through the hole, screw the nut M10

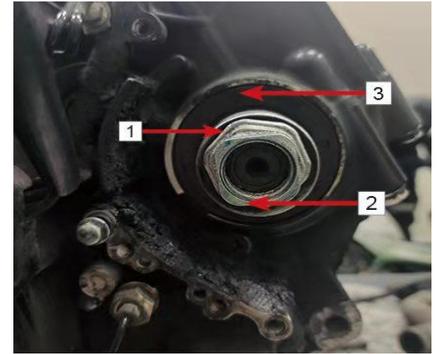


- Insert screw M10 (1) first and then the nut M20(2)
- Tighten the screws

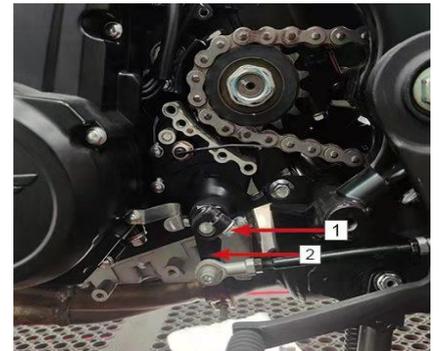


Installation of the sprocket

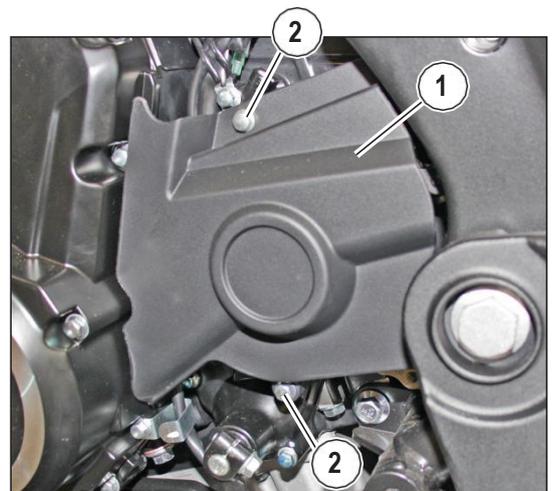
- Install the safety washer(2)
- Apply the appropriate quantity of threadlocker 243 and install the nut M20 (3) ; Tightening torque:125N-m



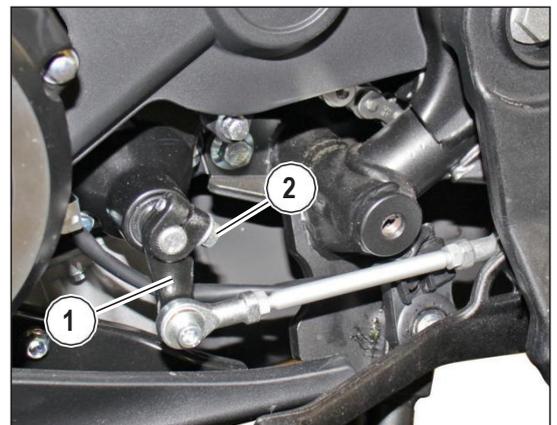
- Mount the support (1); tighten the screws M6 (2)



- Install the sprocket cover (1)
- Tighten the screws M6(2)

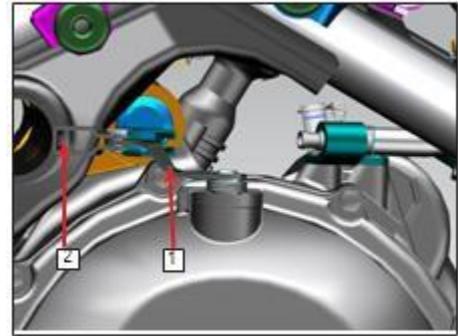

Installation of the gearbox lever group

- Install the gearbox lever group(1)
- Tighten the screw M6(2)



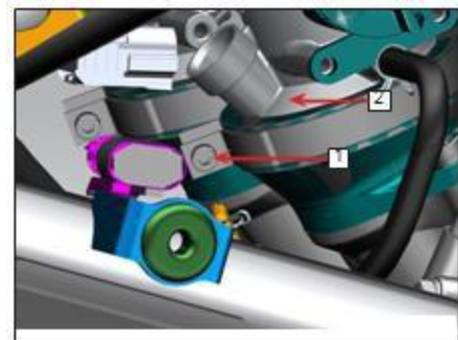
Installation of the clutch cable

- Turn the clutch lever(1) with the specific tool; install the clutch cable (2)

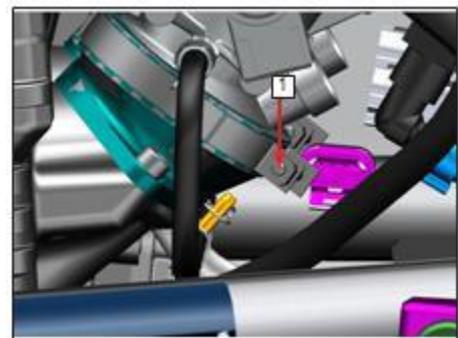


Air filter connection

- Position the throttle body(2)
- Tighten the clamp(1)

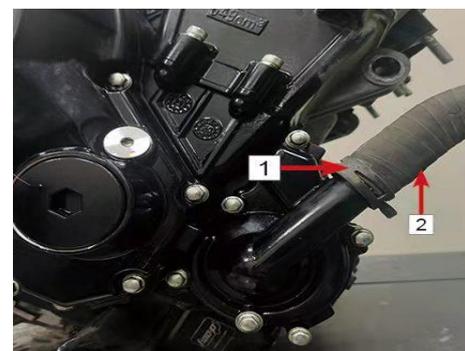


- Tighten the clamp(1)

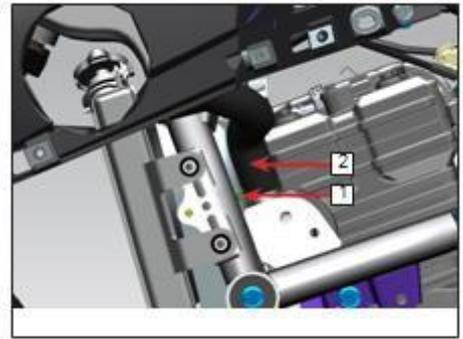


Installation of the radiator tubes

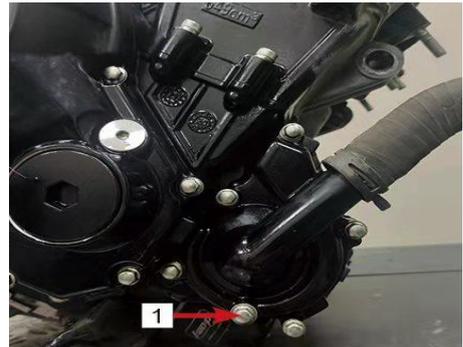
- Tighten the tube (1) to the engine using a hose clamp(2)



- Use a hose clamp to fix the tube (2) to the engine
- Tighten the hose clamp(1)



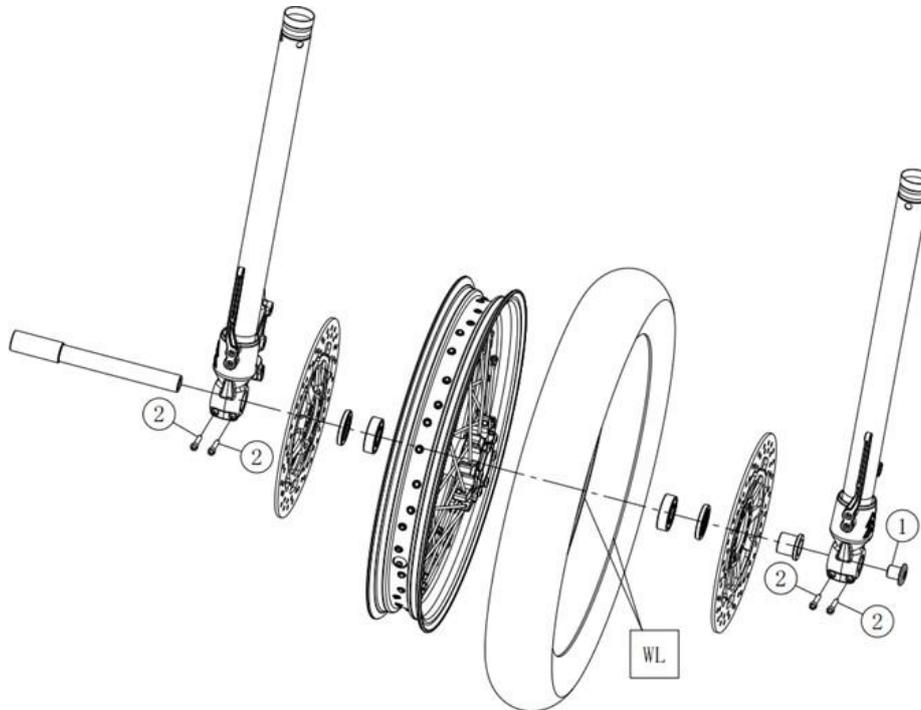
- Install the exhaust screw (1) and the gasket



Chapter 7

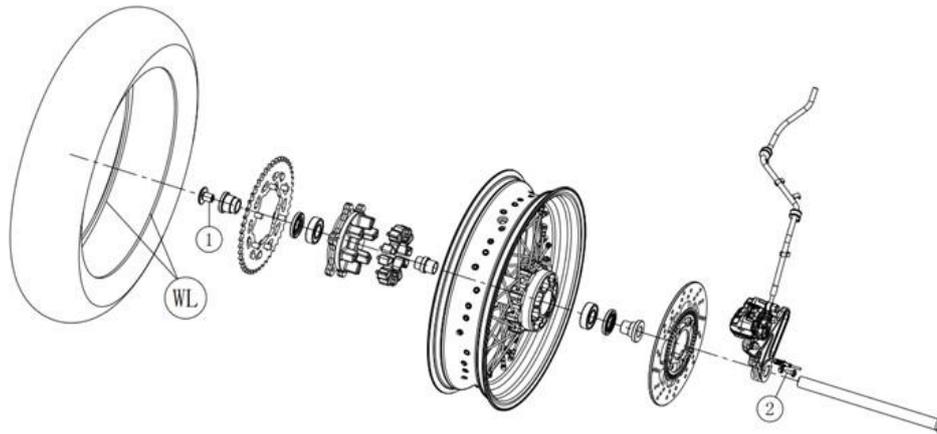
Tyres and rims



Front wheel


Pos.	Fastening components	Torque	Observation
1	Wheel axle pin fastening screw	80 Nm	
2	Pin blocking screws	10 Nm	

Rear wheel



Pos.	Fastening components	Torque	Observation
1	Wheel axle pin fastening screw	120 Nm	Grease the thread and the screw underhead with copper grease
2	TC screw M6x16 galvanised black	6 Nm	

Wheels (rims)

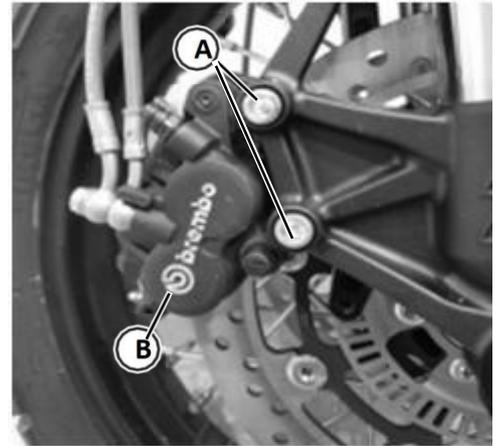
Front wheel assembly/removal

Front wheel removal

1. Remove:
 - Brake caliper assembly screws [A]
 - Front brake caliper [B]
2. Unscrew the wheel axle pin fastening bolt located on the left side
 - Loosen the locking screws [C] of the front pin
 - Wheel axle pin removal [D]
3. Pull out the wheel axle pin from the right side and remove the wheel.

Warning

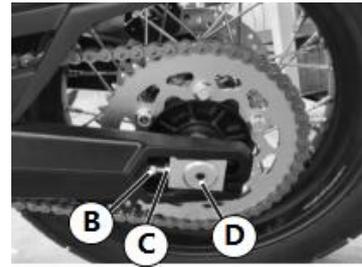
Do not place the wheel face down on the ground, as this could damage or deform the brake disc. Place a wooden block under the wheel so that the disc does not touch the ground.



Rear wheel assembly/removal

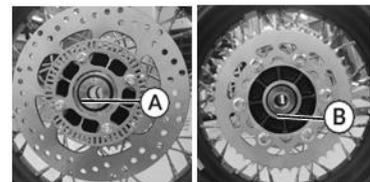
Rear wheel removal

Loosen the lock nuts (B) and adjusting bolts [C] on both sides;
 Loosen and remove the rear wheel axle nut [D];
 Push the rear wheel forward;
 Remove the drive chain from the rear sprocket to the left [E];
 Pull out the rear axle and then remove the rear wheel.



Assembling the rear wheel

- Coat the bearing oil seal lip with high temperature resistant grease;
- Install the bushings [A] and [B] on both sides of the wheel hub;
- The drive chain meshes with the rear sprocket;
- Install the rear brake caliper assy[C] to the rocker arm limit [D]
- Insert the rear wheel axle from the right side of the wheel,
- After adjusting the drive chain to the proper position, tighten the rear axle nut



Rear axle nut fixing torque: 95 N.m

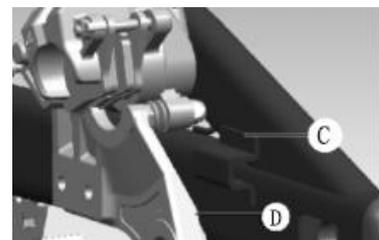
- According to the position of the spacer, tighten the lock nuts and adjusting nuts on both sides



Warning

If the rear wheel axle nut is not securely tightened or the cotter pin is not installed, an unsafe driving condition can result.

- Adjust the tension of the drive chain after installation (refer to the inspection and adjustment of the tension of the drive chain in the chapter of regular maintenance)
- Installing the rear brake caliper (See caliper installation in chapter Brakes)
- Check rear braking performance(See Brake Operation Check in chapter of regular maintenance)



Warning

Must check braking performance before driving, otherwise an accident may occur.

Wheels inspection

Wheel balancing check

- Lift the front/rear wheels off the ground

Special tools - Jacks

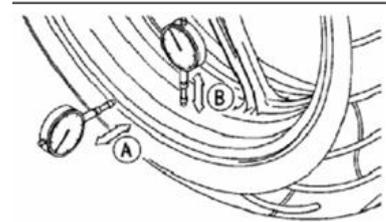
Lifting accessories

- Gently rotate the wheel and check the rotation, if you notice that the wheel movement is blocked or strained, replace the wheel hub bearing
- Check the wheel for small cracks, dents, bends or deformations
- If there is any damage to the wheel, replace the wheel

- Remove the wheel

Measure the rim wobble with a micrometer, axially [A] and radially [B].

If the rim deformation exceeds the repair value, check the wheel or the wheel bearing, if the problem is not caused by the bearing, replace the wheel

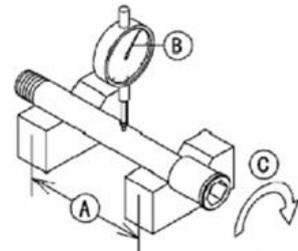


Standard values for the rim run-out.

Axial	TIR0.5 mm (o meno)
Radial	TIR0.8 mm (o meno)
Repair limits	
Axial	TIR1.0mm
Radial	TIR1.0mm

Wheel pin inspection

- Remove front and rear wheel pins (see Front/rear wheel removal)
- Visually inspect front and rear axle pin for damage, if the wheel axle pin is damaged or bent replace it
- Position the wheel axle pin in two V-blocks [A] 100 mm apart and place a micrometer [B] on the wheel axle pin right in the middle of the two V-blocks.
- Rotate the axle pin [C] to measure the oscillation, the difference between the highest and lowest micrometer reading is the oscillation.
- If the pin oscillation exceeds the repair value, replace the pin.



Standard: TIR 0.03mm (or less)

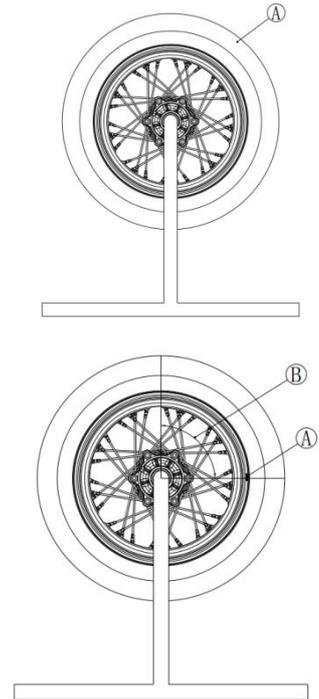
Wear limit: TIR 0.2mm

Wheel inspection

- Remove front and rear wheels (see Front/Rear Wheel Removal)
- Support the wheel so that it can rotate freely
- When turning the wheel lightly and the wheel stops, mark [A] on the top left of the wheel
- Repeat the operation several times, if the wheels stop at different positions, it means that the wheels are well balanced; if the wheels always stop at a certain position, adjust the dynamic balance of the wheels (see Dynamic Balance Adjustment)

Dynamic balance adjustment

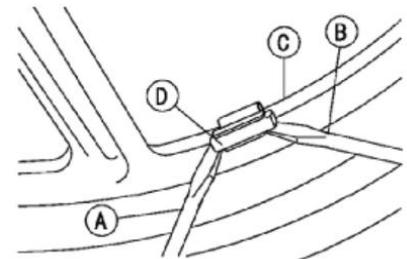
- ①. If the wheel always stops in one place, use tape to attach a balance weight to the rim mark [A]
- ②. Rotate the wheel 1/4 turn [B] and check if the wheel stops at the same position. If yes, use the balance weight to correct
- ③. If the wheel rotates and the counterweight goes up, replace the counterweight with the next size,
- ④. If the wheel rotates and the counterweight goes down, replace the one with the lighter one. Repeat the above operation until the wheel remains stationary after 1/4 turn, rotate the wheel 1/4 turn and 1/4 turn to check if the wheel is balanced, repeat if necessary until the wheel balance is obtained Permanently install the balance weight.



Balance weight removal and installation

Balance weight removal

- Insert a flat-blade screwdriver [A] between the stiffener [C] and the balance weight [D] according to the illustration
- Use two screwdrivers to tilt up the balance weight and remove the balance weight.
- Discard used balance weights



Warning

Do not hit the screwdriver, or you will damage the rim.



Warning

If there is any play in the balance weight at the rim stiffener, the blades and/or clips have been stretched. Replace loose balance weights. Do not reuse balance weights that have already been used. Unbalanced wheels can cause unsafe driving conditions.

Balance weight

No.	weight
1	5g
2	10g
3	15g
4	20g
5	25g
6	30g

○ Notice

Balance weights available at your dealer in 5, 10, 15, 20, 25 and 30 gram sizes; balances less than 30 grams will not affect running stability

Do not use a balance weight over 30g, if the wheel needs extra balance weight, remove the wheel to find out the reason.



Tyres pressure check and adjustment

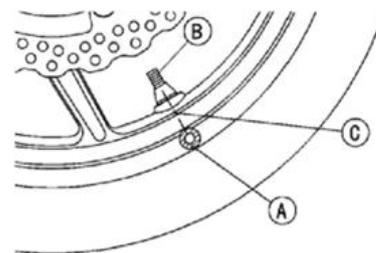
- Check the tyre pressures as described in the regular maintenance chapter.

Inspection

- See wheels/tyres damage check in the Periodic maintenance chapter

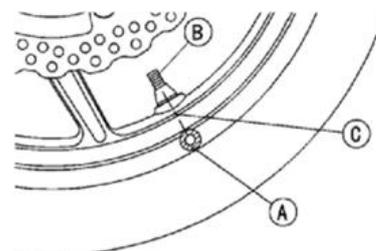
Tyres removal

- Removing
Wheels (see removal of front/rear wheels)
Valve (to release air)
- To keep the wheels balanced, mark the position of the valve stem on the tyre with a chalk so that the tyre can be reinstalled in the same position with the chalk mark[A]
Inflation valve [B]
Alignment [C]
- See the Regular maintenance chapter for Tyre pressure / Tyres check



Inspection

- See Wheels/tyres damage Inspection in the Periodic maintenance chapter
- Tyres removal
- Removing.
Wheels (see Front/rear wheels removal)
Valve (for releasing air)
- To keep the wheels balanced, mark the position of the valve stem on the tyre with a chalk so that the tyre can be reinstalled in the same position with the chalk mark[A]
Inflation valve [B]
Alignment [C]
- Lubricate both the tyre beads and the rim flanges with a soap and water solution or a rubber lubricant, this helps the beads to glide over the rim flanges.



Warning

Do not use engine oil or petroleum-based products for lubrication, as this can damage the tyres.

Remove the tyres from the rim using a special tyre changer.



Warning

Tyres cannot be removed with hand tools.

Tyres assembly

- Check rims and tyres and replace if necessary
- Clean rim and tyre sealing surfaces and polish if necessary with a fine emery cloth
- Replace the inflation valve with a new one



Warning

Replace the inflation valve each time the tyre is replaced. Do not re-use the inflation valve.

- Install the new inflation valve on the rim
- Remove the valve cap, lubricate the stem seal [A] with a solution of soapy water or rubber lubricant and push the valve [B] off the rim from the inside out until it is in position.



Warning

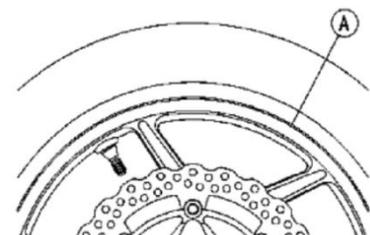
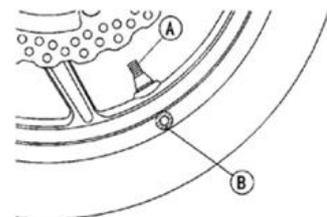
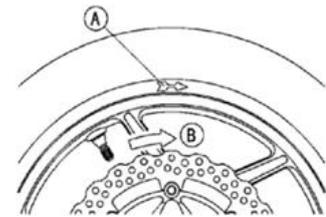
Do not use engine oil or petroleum-based products to lubricate the valve stem. These may cause the rubber to deteriorate.

- Inflation valve as shown in the illustration
- Valve cap[A], Cursor[B], Stem seal[C], Stem[D], Seat[E], Open valve [F]
- Check the front and rear tyres rotation markings and assemble them on the rim.

Tyre rotation mark [A]

Direction of rotation [B]

- Assemble the tyre on the rim so that the valve [A] is aligned with the tyre balance mark[B] (chalk mark made during the removal process or yellow mark applied on the new tyre)
- Assemble the tyre bead on the rim flange using the tyre changer
- Lubricate the tyre bead and the rim flange with a soapy water solution or rubber lubricant to help the tyre adapting to the sealing surface of the rim when inflating the tyre
- Centre the rim on the tyre bead and inflate the tyre with compressed air until the bead rests against the sealing surface



Danger.

When inflating tyres, ensure that there is a slider and that the inflation does not exceed 4.00 kPa (4.0kgf/cm²,57psi). Over-inflation can cause a tyre to burst and cause injury or even death.

- Check that the rim line [A] on both tyre side walls is parallel to the rim flange "If the rim flange and tyre are not parallel, re-assemble the tyre and remove the valve".
- Lubricate the rim flange and the tyre bead
- Install the valve and re-inflate the tyre.
- Check for air leaks after the tyre bead has been placed on the rim flange
- Inflate the tyre slightly above the standard inflation
- Use a soapy water solution or soak the tyre, if there are bubbles, it indicates air leakage
- Adjust the tyre pressure to the prescribed pressure (see tyre pressure check in the regular maintenance Chapter)
- Assemble the inflation valve cap
- Adjust the wheel balance (see Balance adjustment)

Tyre pressure sensor coupling

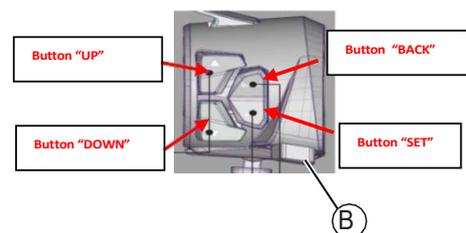
In order to avoid incorrect tyre pressure signals to the rider, we recommend the following procedure for resetting the sensors and for their coupling to the TPMS control unit each time the wheel or sensor is changed.

- A. Check that the TPMS control unit is connected: Remove the rear and front seat, then check that the connector (A) on the left hand side of the motorbike is connected. If the control unit is connected and the sensors are not paired or they do not read the correct pressure measurement, the warning light  in the display will flash yellow.
- B. Use the control panel on the left of the handlebar (B) to perform the commands described below



Before starting the procedure, briefly rotate both the front and rear wheels at 5km/h to activate the sensors.

1. Enter the BIKE INFO menu on the dashboard
2. Press simultaneously ↓ + SET
3. The front wheel pressure indicator flashes (in white)
4. Press SET
5. The front wheel pressure indicator flashes (in yellow)
6. Inflate the tyre slightly and then deflate it slightly until the pressure indicator (yellow) becomes steady, if the indicator turns red, switch off the motorbike and start the process again.
7. Press BACK
8. Press ↓
9. The rear wheel pressure indicator flashes (in white)
10. Press SET
11. The rear wheel pressure indicator flashes (in yellow)
12. Inflate slightly and then deflate the tyre slightly until the pressure indicator (yellow) becomes steady, if the indicator turns red, switch off the bike and start again from the beginning
13. Simultaneously press and hold ↑ +BACK.

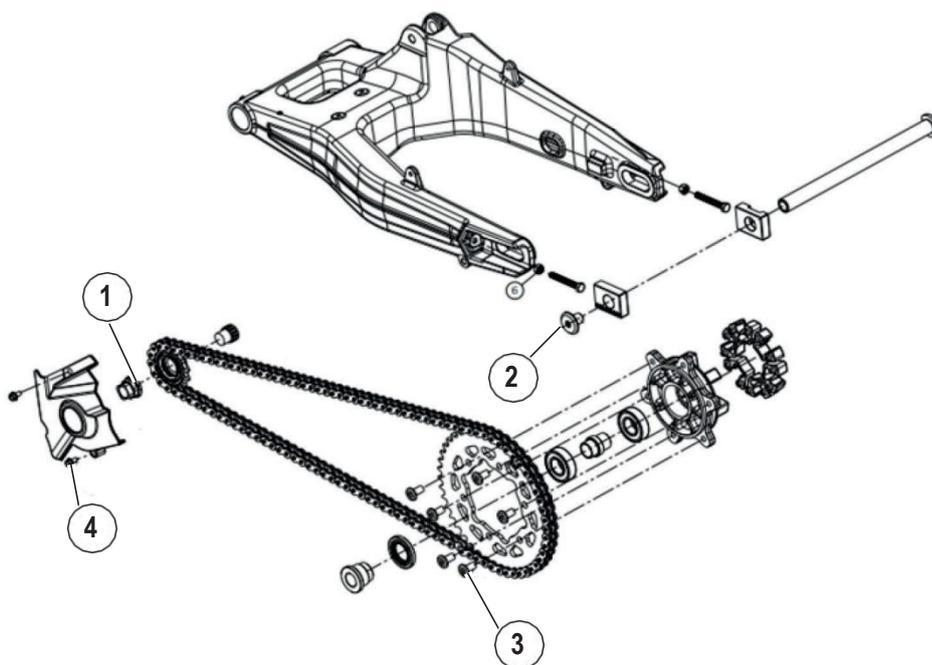


Once these steps have been completed, the display will show the front and rear wheel pressure measurement expressed in kPa with non-flashing numbers.

Chapter 8
***Front sprocket and rear
sprocket***



Front sprocket and rear sprocket assembly components



Pos.	Fastening elements	Torque	Observation
1	Front sprocket nut	135±13,5 Nm	
2	Rear axle pin screw	120±9,5 Nm	Grease the screw thread and underhead with copper grease
3	Sprocket screws	40±4 Nm	Loctite 243
4	Sprocket cover screws	8±0,8 Nm	

G: Grease use.

HG: High-temperature resistant grease use.

HO: Heavy oils application.

L: Non-permanent blocking agents application.

MO: Molybdenum disulphide oil solution application.

(10:1 weight ratio between oil and molybdenum disulphide grease mixture)

R: Spare parts

Operations	Standard values	Wear limits
Transmission chain	From 30 to 40 mm	-
Transmission chain loosening	From 317,5 to 318,2 mm	323mm
Transmission chain wear Standard chain	Japan RK Section o DID520×S01118 114 sections	
Sprocket Sprocket deformation	0,4 mm or less	0,5 mm

Special tool

Inner circlip pliers



Transmission chain

- Install the sprocket and tighten the screws.
- After installing the sprocket, adjust the transmission chain tension(see Transmission chain tension adjustment in the Periodic Maintenance chapter).



Warning

Do not place the wheel with the brake disc or with the sprocket facing downwards on the ground. The brake disc or sprocket could be damaged. Place wooden blocks under the wheel so that the disc and the sprocket do not touch the ground.

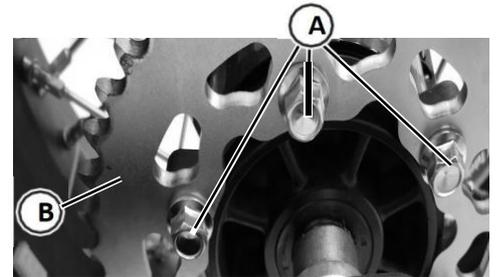
- Remove the rear sprocket nut[A]
- Remove the sprocket[B]

Rear wheel sprocket installation

- Install the sprocket so that the tooth number marking faces outward.
- Tighten the rear wheel sprocket screws

Rear wheel sprocket screw torque: 40 Nm + Loctite 243

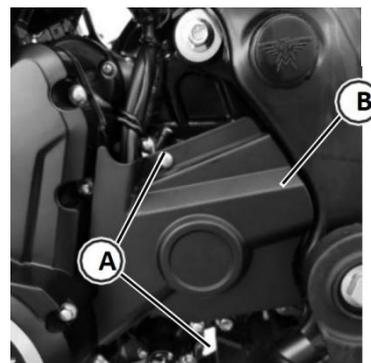
- Rear wheel assembly (see rear wheel assembly in the wheels/tyres chapter)



Engine front sprocket

Engine front sprocket removal

- Remove:
 - Front sprocket cover screws [A]
 - Sprocket cover [B]

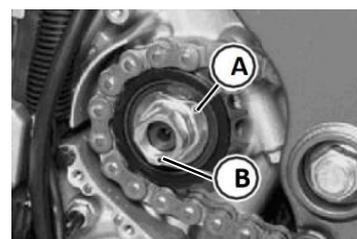


- Lift the flap of the bent washer [A].
- Remove the front sprocket nut [B] and washer [A]

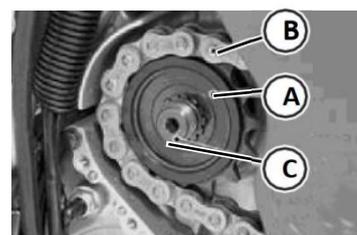
Note

When loosening the engine front sprocket nut, keep the rear brake applied.

- Use the side stand to support the rear wheel from the ground
- Loosen the wheel pin screw.
- Loosen the transmission chain (see the regular maintenance Chapter for the transmission chain free play adjustment)



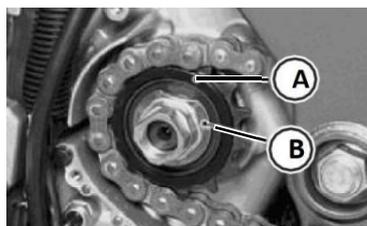
- Remove the transmission chain from the front sprocket.
- Remove the front sprocket [A] and the transmission chain [B] from the shaft [C].
- Release the transmission chain from the front sprocket.



- Replace the sprocket washer.
- Assemble the front sprocket [A] so that the word "outer" is facing outwards.
- Apply a solution of molybdenum disulphide oil to the threads of the output shaft.
- After torque tightening the front pinion nut, bend the washer [B]

Note

Tighten the engine front sprocket nut with the rear brake applied.
Tightening torque: 125Nm



Front sprocket and sprocket wear check

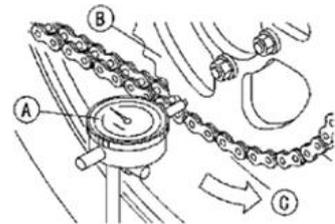
- Visually inspect the front sprocket and sprocket teeth for wear and damage
- If the front sprocket teeth are worn, replace the sprocket and check the transmission chain wear(see the Periodic maintenance chapter for the transmission chain wear check)
- Worn teeth (engine front sprocket)[A]
- Worn teeth (sprocket)[B]
- Direction of rotation[C]

Note

Check the wear status of the transmission components.

Sprocket deformation check

- Raise the rear wheel off the ground with a suitable system so that it can rotate freely.
- Position a comparator [A] on the crown wheel [B] next to the teeth as shown in the figure and rotate the rear wheel[C] to measure the crown wheel oscillation(deformation), the difference between the top and bottom micrometric reading is the quantity of oscillation(deformation).
- If the oscillation exceeds the set limit, replace the sprocket.



Sprocket oscillation

Standard: 0,4 mm or less

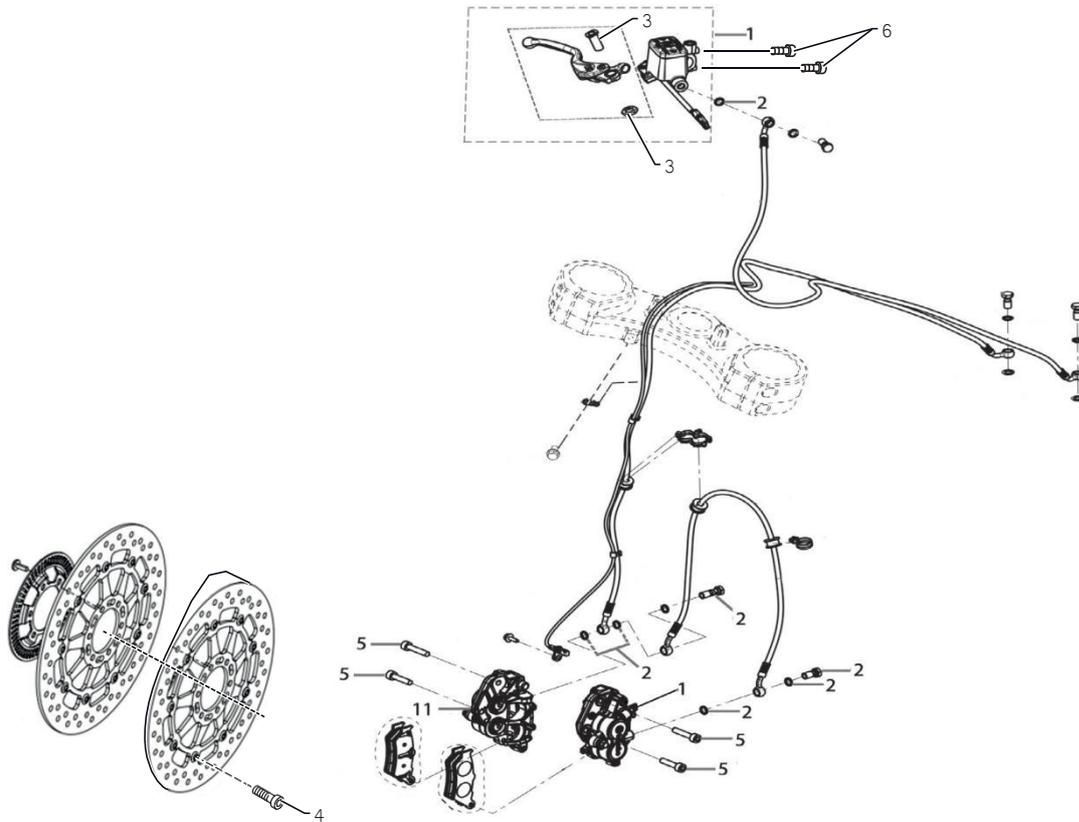
Set limit : 0,5 mm

Chapter 9

Front and rear braking system

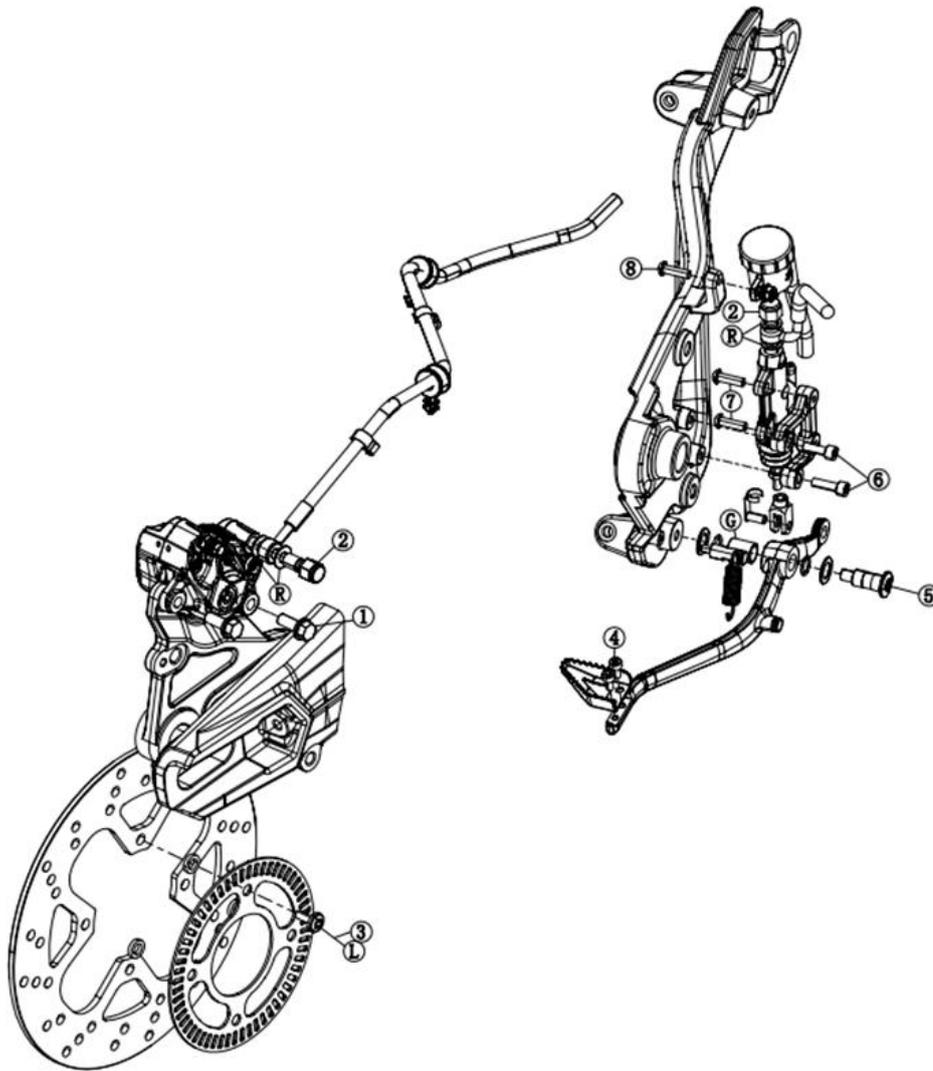


Front braking system components



Pos.	Fasteners	Torque	Observation
1	Exhaust valve	8 Nm	
2	Drilled bolt for brake pipe on caliper	25 Nm	
3	Brake lever pin Self-locking nuts	6 Nm	
4	Front brake disc screws	35 Nm	Loctite 243
5	Front caliper fastening screws	40 Nm	
6	Brake pump collar fixing screw	9 Nm	S

- B:** Brake fluid application
- L:** Application of non-permanent locking agents.
- R:** Spare parts.
- S:** Following the prescribed tightening sequence.
- Si:** Application of silicone grease (e.g. PBC grease)

Rear braking system components


Pos.	Fasteners	Torque	Observation
1	Caliper fixing screw	25 Nm	
2	Drilled bolt for brake pipe on caliper	25 Nm	
3	Phonic wheel screw	25 Nm	
4	Brake pedal screws	10 Nm	Loctite 243
5	Brake pedal pin	25 Nm	Si
6	Fastening screws for rear brake pump support	12 Nm	
7	Pump fastening screws	10 Nm	
8	Rear brake oil tank fastening screw	10 Nm	

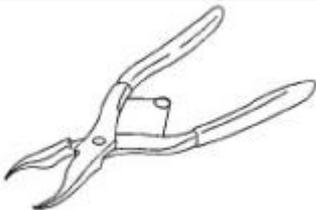
- B:** Brake fluid application
- L:** Non-permanent locking agents application.
- R:** Spare parts.
- S:** Following the prescribed tightening sequence.
- Si:** Silicone grease application

Specifications

Components	Standard	Wear limit
Brake lever, brake pedal Brake lever position Brake lever free travel Brake pedal free travel Pedal position	5 adjustable positions (driver-friendly) Not adjustable Not adjustable Approx. 40 mm below the top of the footrest.	
Brake pad thickness Front Rear	4.0mm 5.0mm	1 mm 1 mm 1 mm 1 mm
Brake disc thickness Front Rear	From 4,3 to 4,7mm From 4,8 to 5,2mm	4.0 mm 4,5 mm
Brake fluid type	DOT4	

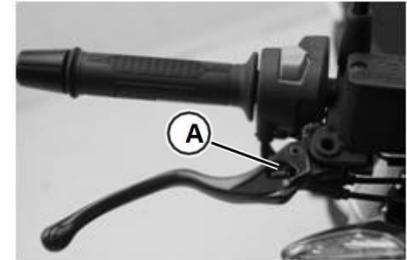
Special tool

Inner circlip pliers

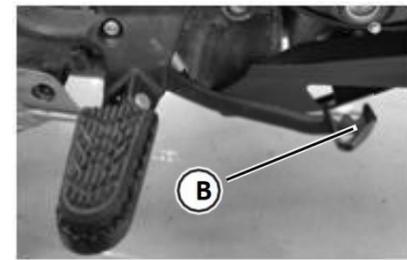


Brake lever, brake pedal**1) Adjusting the front brake lever position**

- The front brake lever distance adjuster [A] with knob can be adjusted to suit the size of the user's hand.
- Minimum distance from the knob to the front brake lever: 103 mm, maximum distance: 103 mm, maximum distance: 118mm

**2) Rear brake pedal position check**

- Check whether the rear brake pedal [B] is working properly
- Press and release the rear brake pedal and observe whether the brake pedal is able to return to a starting position without hindrance.



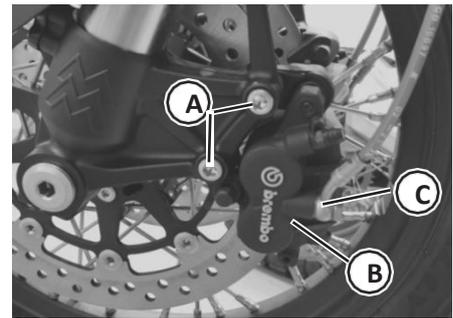
Brake calipers

1) Front brake caliper removal

Note

The right brake caliper removal is the same as the left brake caliper

- Unscrew the left front caliper fastening screws [A] and detach the left front caliper from the brake disc [B]
- Unscrew the drilled bolt [C] of the front brake pipe.



Warning

Immediately clean any leakage of brake fluid (corrosive)

2) Rear brake caliper removal

- Loosen the rear brake caliper fastening screws [E] and detach the caliper from the brake disc [F]

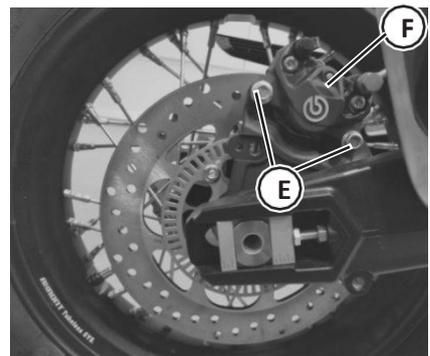
Tightening torque.

- Front and rear caliper fastening screws

Front: 40Nm

Rear: 25Nm

- Brake pipe drilled bolt: **25Nm**
- Amount of fluid in the brake fluid reservoir check
- Drain the air from the brake pipes (see Draining the air from the brake pipes)
- Check that the braking performance is good and that there is no brake fluid leakage



Warning:

Check the braking performance before driving to ensure it is good.

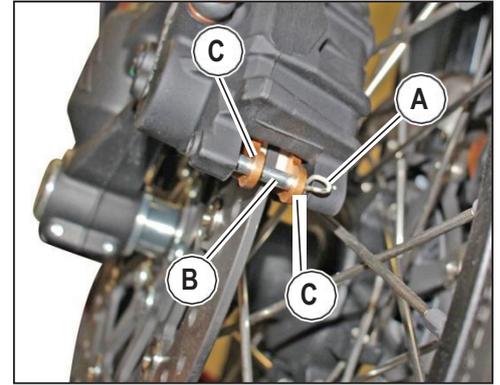
Brake pads

1) Front brake pads removal

- Remove the front brake caliper (see the front brake caliper removal).
- Remove the cotter pin[A]
- Extract the pin[B]
- Remove the brake pads[C]

2) Front brake pads assembly

- Strongly press the caliper pistons by hand
- Insert the pads [C] in the specific seats
- Insert the pin [B] and the cotter pin[C]
- Assemble the front brake caliper (see caliper assembly)



Warning

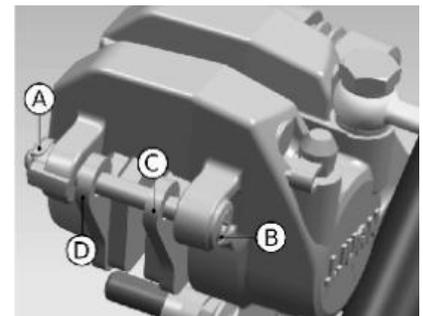
Check the braking performance before driving to ensure it is good.

3) Rear brake pads removal

- With the assembled pipe, remove the rear brake caliper (see the rear brake caliper removal)
- Remove the cotter pin [A] and extract the pin[B]
- Remove the brake pads [C] and[D]

4) Rear brake pads assembly

- Strongly press the caliper pistons by hand
- Insert the pads [C] and [D] in their specific seats
- Insert the pin [B] and the cotter pin[A]
- Assemble the rear brake caliper (see the Rear brake caliper assembly)



5) Brake pad wear check

- Refer to the brake pad wear inspection in the Periodic Inspection chapter



Warning

Check the braking performance before driving to ensure it is good.

Brake master cylinders

- Before removing any component of the braking system, drain the oil contained in the circuit

1) Front brake master cylinder removal

- Remove the drilled bolt [A] to disconnect the brake oil pipe from the master cylinder [B] (see brake oil pipe removal/assembly)
- Disconnect the connector of the front brake stop switch [C]
- Unscrew the assembly screws [D] and remove the master cylinder complete with the oil pan.

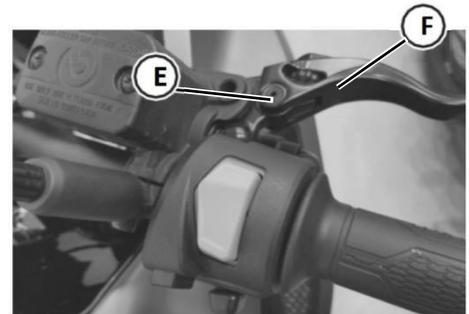


Warning

Immediately clean any leakage of brake fluid (corrosive)

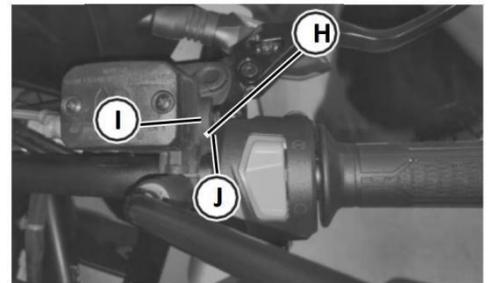
Removing the lever

- Brake lever locking nut [G]
- Brake lever [F] screw [E]



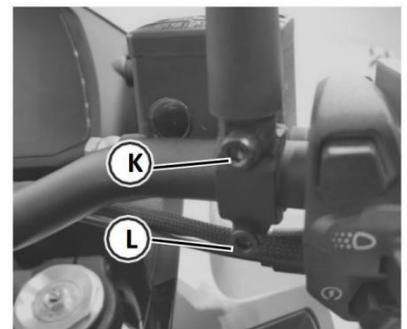
2) Front brake master cylinder assembly

- Mount the brake pump [I] and the collar [H] in correspondence with the position mark located on the handlebars
- Tighten the upper fastening screw [K] first, followed by the lower fastening screw [L].
- Torque front brake master cylinder tightening screw: **8 Nm**
- Replace the washers on both sides of the drilled bolt [A]
- Tighten the drilled bolt
Torque - drilled bolt: **25 Nm**
- Bleed the air from the brake circuit
(See how to bleed the air from the brake pipes)



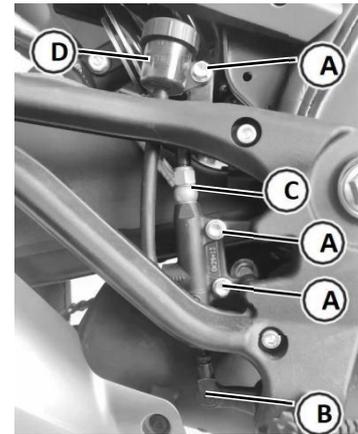
Warning

Check the braking performance before driving to ensure it is good.



3) Rear brake master cylinder removal

- Unscrew the rear brake pump screws[A]
- Remove the stop[B]
- Unscrew the hydrostop switch[C]



4) Rear brake master cylinder assembly

- Replace the washers on both sides of the hydrostop switch[C]
- Mount the brake pump on the support by tightening the screws [A] at the tightening torque **10Nm**
- Mount the hydrostop switch [C] at the tightening torque **25Nm**
- Mount the stop [B]
- Bleed the air from the brake pipes (see bleeding the brake pipes method)



Warning

Check the braking performance before driving to ensure it is good.

Front brake pump inspection

- See the brake master cylinder gaskets replacement in the regular maintenance chapter.

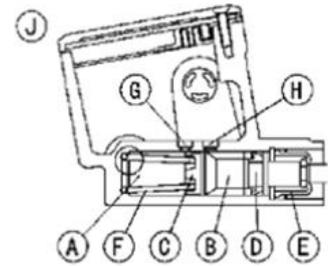
Rear brake pump inspection

- See the brake master cylinder gaskets replacement in the regular maintenance chapter.

Pump body inspection

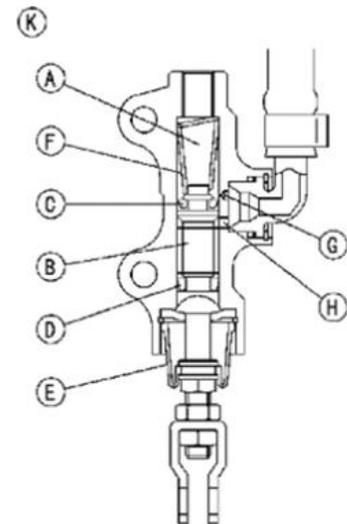
Front brake master cylinder [J]

- Remove the brake master cylinder (see the front/rear brake master cylinder removal)
- Front and Rear Brake Pump Removal
- Check that the inside wall [A] of each front sprocket [B] is free from scratches, rust or dents on the outside
- Replace the brake master cylinder or the front sprockets if they are damaged in anyway
- Check the main master cylinder [C] and the secondary master cylinder [D], if any of the covers are worn,damaged,softened (broken) or swollen,the front sprocket assembly must be replaced with new ones
- Check for possible oil leakage and, in case of leak, the piston group must be replaced with a new pumping system



Rear brake master cylinder [K]

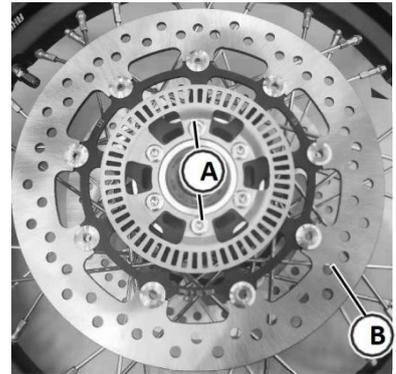
- Check the dust cover [E] for damage
If damaged, replace it
- Check that the front sprocket return spring [F] is not damaged in any way, if it is, replace it
- Check that the air vent [G] and the air intake [H] are not blocked
If the air vent is blocked, the brake pads remain in contact with the disc, clean the vent with compressed air.



Brake discs

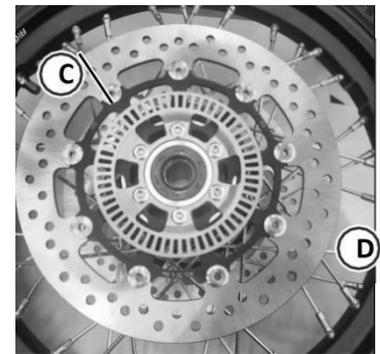
1) Brake disc removal

- Remove the wheel (see removing the front/rear wheel in the Wheels/tyres chapter).
- Unscrew the assembling bolts (A) and remove the brake disc.
- Remove the spacers of the phonic wheel



2) Brake disc assembly

- Assemble the disc on the wheel so that the side marked [C] is facing outward
- Apply thread-lockers to the screws of the front and rear disc assembly [D].
Tightening torque
Screws of the brake disc assembly: **35Nm**



3) Brake disc inspection



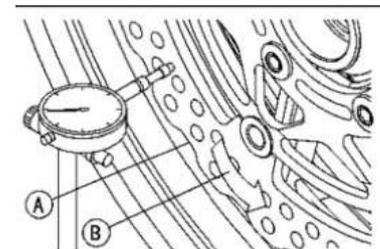
Important

Measure the thickness of each brake disc [A] at the point of greatest wear. If the disc is worn beyond the wear limit, it must be replaced with a new one.

- Measuring zone [B]

S Brake disc standard thickness:

Standard thickness		Wear limit	
Former	4-4,5 mm	Former	Depending on the actual situation
After	4,5-5mm	After	Depending on the actual situation



Deformed brake disc

- Lift the wheel off the ground (see Removing the front/rear wheel/tyre chapter)
Special tools - jack
Jack attachment
- Position a comparator on the disc [A] as shown in the figure and turn the wheel [B] by hand to measure the quantity of oscillation of the disc.
- If the oscillation exceeds the permitted limit, replace the disc.
- . Disc oscillation
Standard: 0,15 mm or less
Allowed limit: 0.3 mm

Brake fluids

1) Brake fluid level check

- See “brake fluid level check” or “brake fluid change” in the Periodic maintenance chapter.

2) Brake fluid change

- See “brake fluid change” in the periodic maintenance chapter
- Draining air from the brake pipes

Brake fluid has a low compression factor so that all movements of the brake lever or pedal are transmitted directly to the caliper to achieve the braking effect. However, air is easily compressible. When there is air in the brake pipes and you hold the brake lever down or press the pedal, the air in the pipe is compressed, in which case you will feel that the lever or pedal yield to compression.

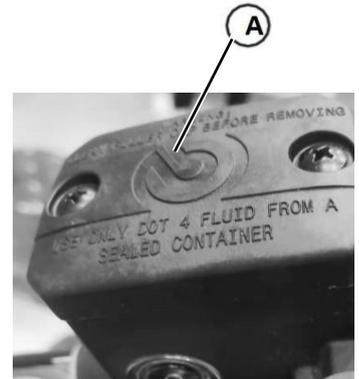
Dangers

- If, after the brake fluid has been changed, the brake lever feels soft or spongy when it is pulled or the brake pedal is depressed, bleed the brake system.

Notice

Bleed the air from the front brake lines as follows:

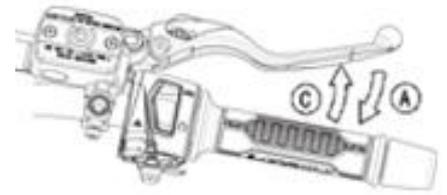
- Remove the brake fluid cup cover [A] and the partition;
- Remove the rubber cover of the bleeder valve [B] on the brake caliper;
- Attach a clean plastic hose to the bleeder valve [B] and put the other end of the hose into the container;
- Add fresh brake fluid to the upper scale line (MAX) of the brake fluid cup
- Slowly press the brake lever and release it, and cycle the operation several times until the air in the brake fluid cup, brake hose and brake pump is completely exhausted same operation for bleeding the air in the rear brake lines.



Bleeding air from the brakes

Repeat this operation until no more air enters the plastic hose

1. Pull the brake lever until it hardens and keep it pulled[A]
2. Quickly open and close the bleed valve [B] while maintaining the braking force
3. Release the brake lever[C]



Warning

- During air exhaust, the brakes fluid level must be frequently checked and filled with new fluid if necessary. If the brake fluid in the reservoir is completely depleted during bleeding, bleeding must be repeated. This is because air can enter the hoses



Front brakes:

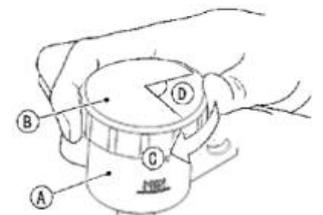
Drain the air from the right front caliper first, then repeat for the left caliper

- Remove the plastic tube.
 - Assemble the spacer and the oil pan cover
- Tightening torque:
Oil pan cover screw: 1.0Nm

Rear brakes:

Correctly assemble the rear brake oil pan according to the following instructions

- First of all, tighten the rear brake pan cover by hand, [B] by turning clockwise [C] until you feel a slight resistance, this indicates that the top of the cover is touching the pan opening, then hold the brake oil pan [A] with one hand and the cover with the other hand and tighten it another 1/6 turn[D]
 - Tighten the drain valve and fit the rubber plug
- Torque - bleeding valve: 8 Nm
- Check the brake fluid level
(see Brake fluid level check in the Periodic maintenance chapter)
- After draining the air, check that the braking performance is good, that there are no brake fluid leaks etc.



Dangers

The following precautions must be observed when using disc brakes.

1. Do not re-use the old brake fluid.
2. Do not use brake fluid from unsealed or long-opened containers.
3. Do not mix two types or brands of brake fluid, as this will lower the fluid boiling point and cause brake failure, which can lead to deterioration of the rubber parts.
4. Do not leave the brake fluid reservoir cap open for long periods of time.
5. Do not leave the brake fluid container open.
6. Do not change the brake fluid in wet or windy weather.
7. Brake components different from pads and discs must be cleaned with disc brake fluid, isopropyl alcohol or ethanol. Do not use other fluids to clean these parts. Petrol, engine oil or any other petroleum fraction will cause rubber parts to deteriorate. Oil spillage on any part will make cleaning very difficult and will eventually cause the rubber parts of the disc brake to deteriorate.
8. When removing the brake pads or discs, be careful not to get brake fluid or other oils on them. If they accidentally become dirty with brake fluid or oil, clean them with a suitable cleaning product. If they cannot be cleaned, replace the brake pads or discs with the new ones.
9. Brake fluid can damage painted surfaces; clean painted surfaces immediately if they have been contaminated by brake fluid.
10. If the brake line fittings are not tightened properly or the air bleeder valve is open, the air must be bled.

Brake pipe removal/assembly

See Brake Pipe Replacement, Brake Pipe Inspection in the Periodic Maintenance chapter.

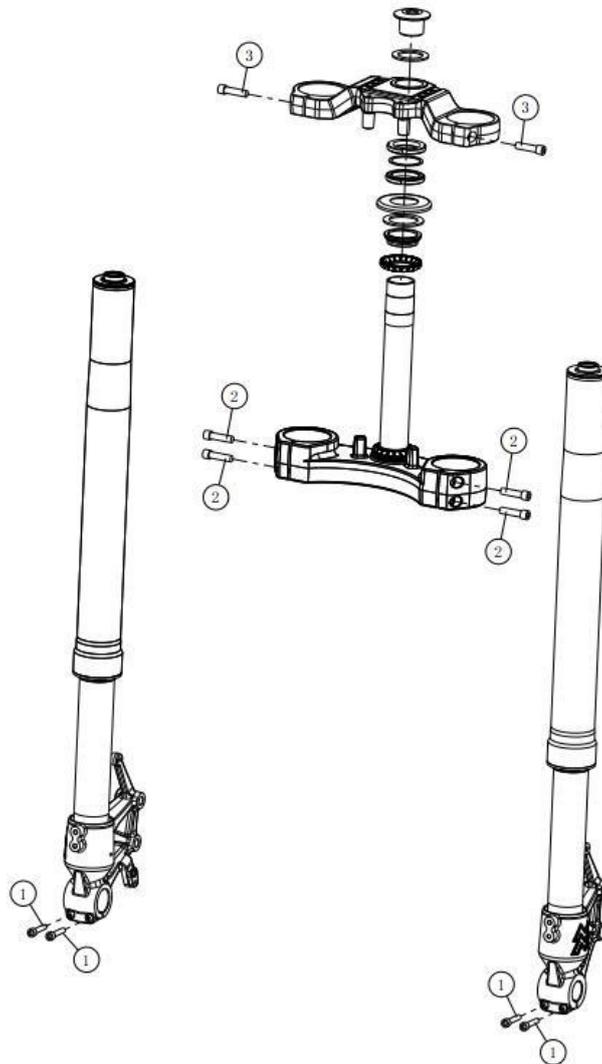
See Brake pipe damage and the assembly inspection in the Periodic maintenance chapter.

Chapter 10

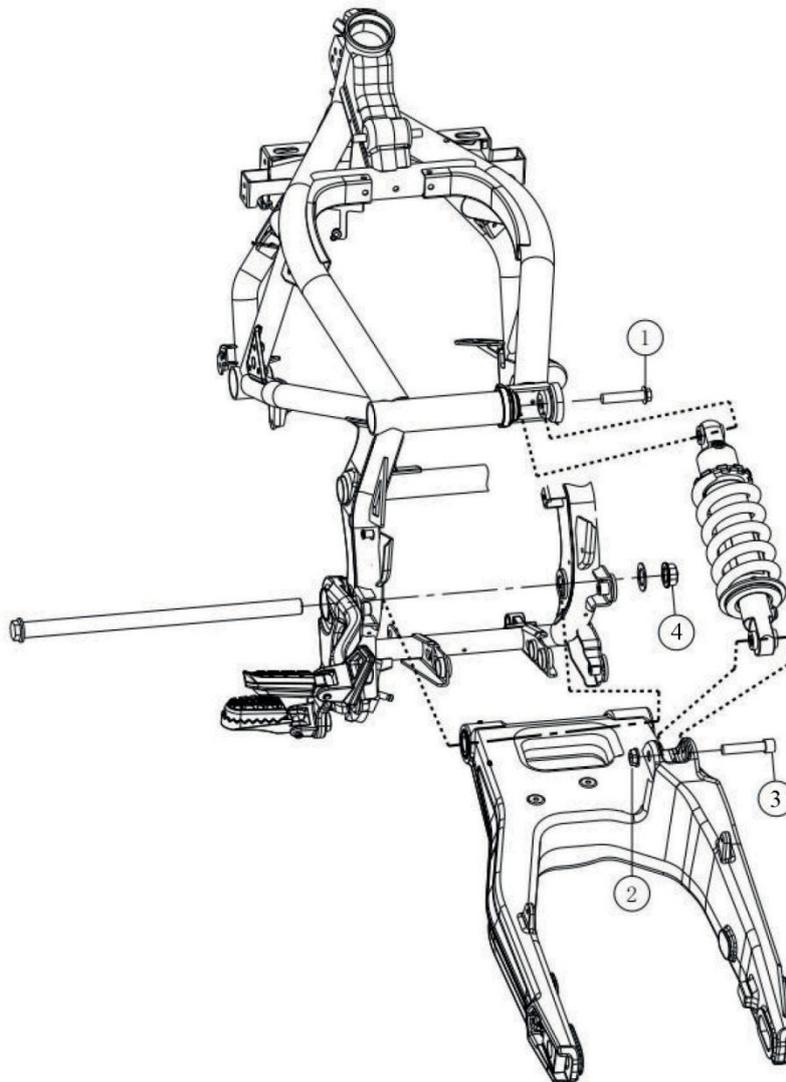
Front and rear suspension



Front fork exploded view



Pos.	Fasteners	Torque	Observation
1	Wheel axle pin locking screw	8 Nm	Tightening sequence A - B - A
2	Stem locking screw on steering base	25 Nm	Tightening sequence A - B - A
3	Stem locking screw on steering head	25 Nm	

Rear suspension exploded view


Pos.	Fasteners	Torque	Observation
1	Rear suspension fixing screw	60 Nm	
2	Rear suspension fixing screw nut	60 Nm	
3	Rear suspension bottom fixing pin	60 Nm	
4	Rear swing-arm pin nut	120 Nm	

Front fork

Note

The front fork is set in the factory based on a rider weight of 75 kg, but it can be adjusted to suit actual conditions or specific riding needs during actual use.

Spring preload

The spring preload (for both front forks) is adjustable via the adjuster (A).

- Tighten the adjuster (turn clockwise) to increase preload.
- Loosen the adjuster (turn anti-clockwise) to reduce preload.

The preset value is 2 clicks clockwise from the fully open position.

Note

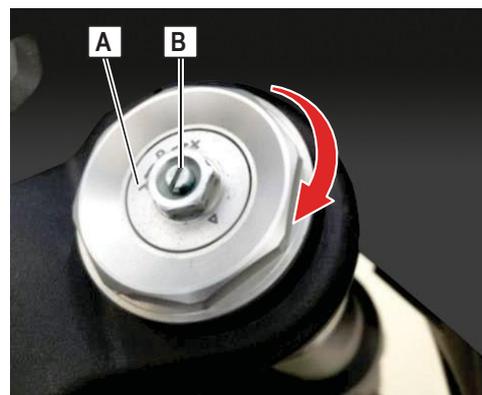
The left and right front forks must be set to the same value.

Compression damping (adjustment (B)-left fork)

The compression ratio can be changed using the adjusting screw (B) on the left-hand end. To damp the compression, turn the screw anticlockwise from the absolute starting position of the adjuster. The compression ratio can be changed using the adjusting screw (B) on the left hand side.

Note

Turn the adjustment screw (B) anticlockwise to reduce the compression ratio (suspension stiffness increases). The default position is 4 turns anticlockwise from the fully closed position.



Extension damping (adjustment (B)-right)

The extension ratio can be changed using the adjustment screw (B) placed on the end.

Note

Turn the adjustment screw (B) anticlockwise to reduce the rebound ratio (suspension stiffness increases). The default position is 3 turns anticlockwise from the fully closed position.

NOTE:

For further information regarding the front fork, please refer to the related manufacturer's manual in chapter 15 "Appendices" of this manual.

Oil type: cod. 208148 (SHELL TELLUS S2 V 32 OIL)

Oil quantity for each rod: 720 cc

Adjustment position setting:

- Extension setting: 3 turns from all closed
- Compression setting: 4 turns from all closed
- Spring preload: 2 turns from all open

Rear suspension

• The rear suspension is equipped with an external adjuster for setting of the shock absorption parameters based on the various load conditions.

Note

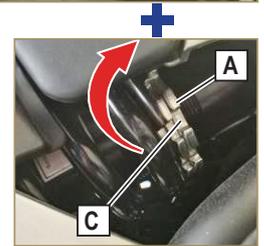
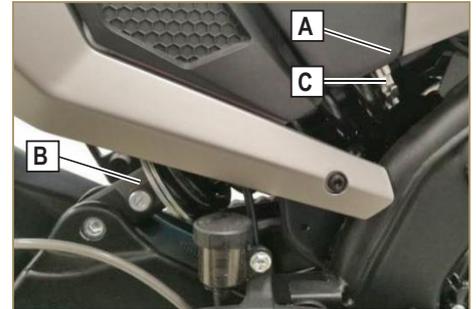
The factory setting of the rear suspension is calibrated on the basis of a driving weight of 75 kg.

Spring preload adjustment

The adjustment rings of the spring preload (A and C) are located on the right side under the driver's seat.

Use them to adjust the spring pre-load as shown below:

- Tighten the adjuster (turn clockwise) to increase preload;
- Loosen the adjuster (turn anti-clockwise) to reduce preload.



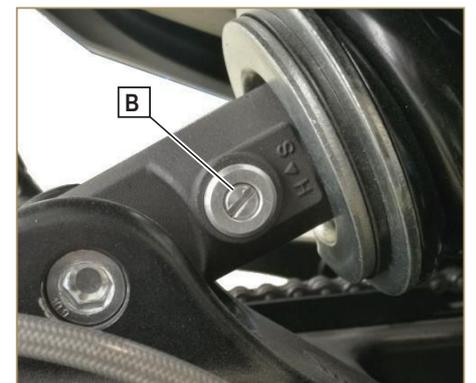
Extension adjustment

Use the adjustment screw (B) to adjust extension speed of the rear suspension.

Turn the screw clockwise to gradually reduce the extension speed.

Turn the screw anticlockwise to gradually increase it.

The default position is 12 anti-clockwise clicks from the fully closed position. The compressive strength is not adjustable.



Warning

After each suspension adjustment, it is advisable to drive at a low or medium initial speed to become familiar with the driving behaviour of the newly adjusted vehicle.

- Spring: K160
- Free length: 176mm
- Preload: 11,5mm
- Return: 12 click from all closed

Spring Preload Adjustment

①. Use the hook wrench [A] to rotate the adjusting nut [B] to adjust the spring preload;

○ Attention

The average weight of motorcyclist is 68kg without passenger or accessories, adjust to the third gear position;

Spring preload gear position

Standard position:	3rd gear position
position range:	1st to 7th gear position

If the spring preload is not suitable for the driving conditions, refer to the table below to adjust to the appropriate gear;:



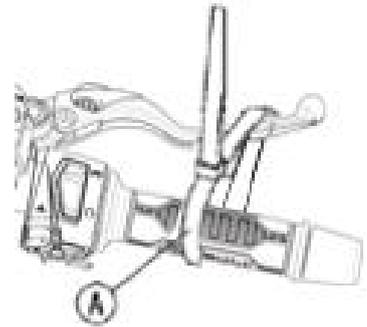
Gear position	Damping	shock absorber hardness	Load	Road condition	Riding speed
1st	weakest	softest	lightest	best	Low
↕	↕	↕	↕		
7th	strongest	stiffest	heaviest	worst	High

Removal of the rear suspension

Remove:

Muffler (see Muffler disassembly in the Engine Cylinder Heads chapter)

- Lift the rear wheel off the ground
 - Special tools - jack: lifting accessories
- Grasp the front brake lever slowly and tie it to the handle with a clamp [A].

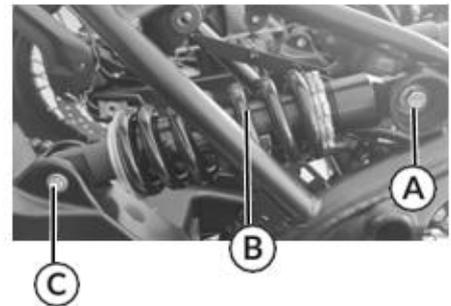


Warning

Make sure to keep the front brake engaged (lever pulled) during removal of the suspension, otherwise the motorcycle may tip over, which may cause an accident and cause injury.

Remove:

- Upper bolt[A]
- Lower nut and washer
- Lower bolt[C]
- Remove shock absorber[B]



Installation of the rear suspension

- Operate inversely to the removal operations
- Tighten to the specified torque:
 - Suspension fixing screw: 60N-m
 - Suspension fixing nut: 60N-m
- Reassemble the removed parts (see the related chapter)

Rear swing-arm

Swing-arm removal

- Removal: Muffler body
(See Muffler Body Removal in the Coverings/Exhaust system Chapter)
- Removal: Rear wheel (see Rear Wheel Removal in the Wheels/Tires Chapter)
- Removal: Left and right footrest brackets (see the left and right footrest bracket removal in the chapter Coverings/Exhaust system)

Special tools

- Jacks
- Lifting accessories

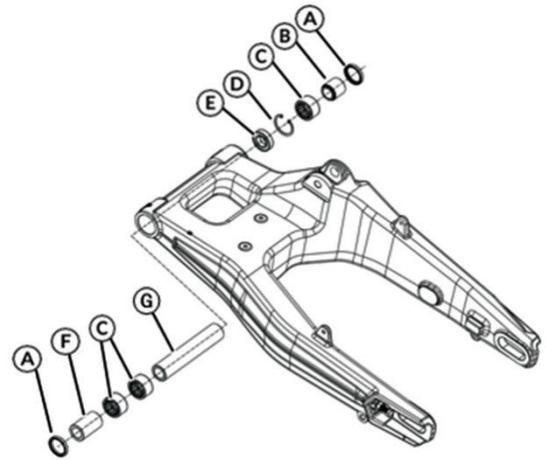
Rear swing-arm assembly

- Assemble the swing-arm inversely to the order of removal
- Grease the oil seal lips
- Ensure that the oil seal and spacer are installed in the rear roller cage
- Tighten the swing-arm pin nut
Torque - swing-arm pin nut: 120Nm
- Reassemble the removed parts (see the related chapter)

Rear swing-arm bearings removal

Removal of:

- rear swing arm
- seal[A]
- bushing[B]
- needle bearing[C]
- circlip[D]
- bearing[E]
- bushing[F]
- inner bushing[G]
- special tool–inner circlip pliers



Inspection of rear swing arm bearings



Warning

Do not remove the bearing for inspection, removal will damage the bearing

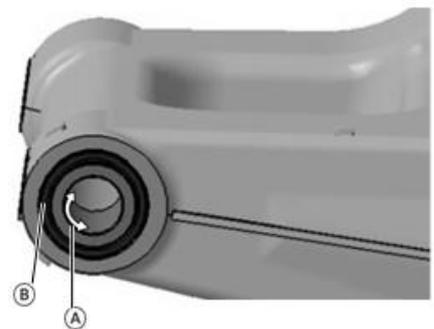
- Check the needle roller bearings and ball bearings installed in the rocker arm
- The rollers and balls in the bearing are usually relatively wear-resistant, and the measurement of alignment wear is difficult. Visually inspect bearings for wear, discoloration or damage instead of measuring
- If needle bearings and sleeves show any signs of abnormal wear, discoloration or damage, replace them in full.

When checking the clearance and running condition, rotate [A] the bearing in the rear rocker arm back and forth;
 Replace the bearing if there is a gap in the bearing, the running is not smooth condition;
 Check the bearing oil seal [B] for bulge or leakage;
 If the oil seal is damaged or leaking, replace the bearing.
 Rear rocker arm bearing lubrication.

○ **Notice**

Because the bearings are greased and sealed, there is no need to lubricate the chain guard inspection

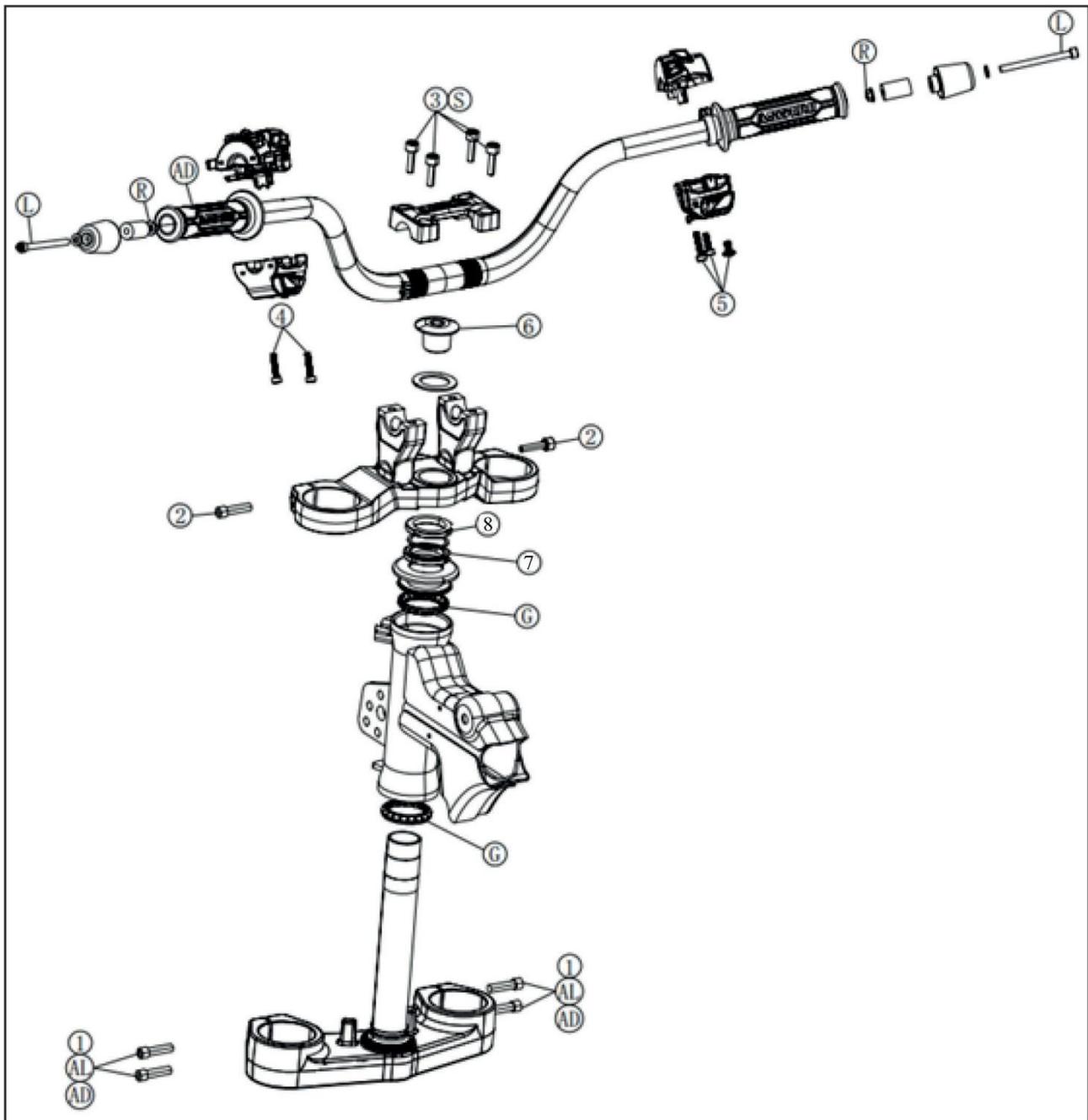
- See Chain Guard Wear Check in the Periodic Maintenance chapter



Chapter 11

Steering assembly



Steering assembly components


Pos.	Fasteners	Torque	Observation
1	Lower steering plate locking screw	25 Nm	AL
2	Upper steering head locking screw	25 Nm	
3	Handlebar risers fastening screw	25 Nm	S
4	Left-hand switch fastening screw	8 Nm	
5	Right switch fastening screw	8 Nm	
6	Steering head fastening screw	60 Nm	
7	Steering column fixing ring	50 Nm	
8	Steering column fixing ring	60 Nm	

AD: Apply adhesive.

AL: Alternate the tightening of the fastening screws and fasten them twice to ensure an even torque.

G: Apply grease.

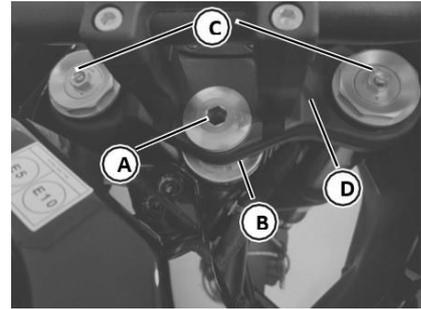
L: Non-permanent locking agent application.

R: Parts replacement.

S: according to the specified tightening sequence

Steering bearing removal

- Remove the front wheel as described in the related section.
- Remove the front light as described in the related section.
- Handlebar (see Handlebar Removal)
- Remove the steering fastening cap screw[A].
- Unscrew the top plate fastening ring nuts [B] and washers
- Loosen the fixing screws of the fork rods on the steering head[D]
- Remove the steering head[D].

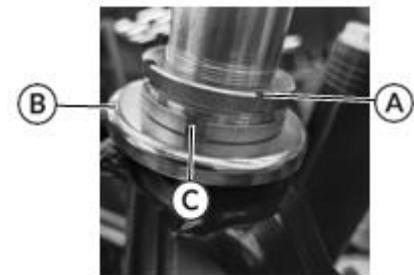


•Removal:

Lower connecting board combination[E]
 (See Removal of the Dashboard Cover in the Body Chapter)
 Front shock absorber (see front shock absorber
 removal in Suspension chapter)



- Remove locknut II of the steering column [B] and the washer[C]



- Remove the fixing ring of the steering column[A] and the dust cover of the upper fixing ring[B]
- Special tool - spanner for the steering column ring nut [C]
- Remove the steering base [D]downwards

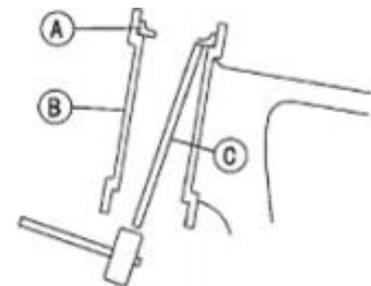


Bearing seat removal and bearing removal from the steering column

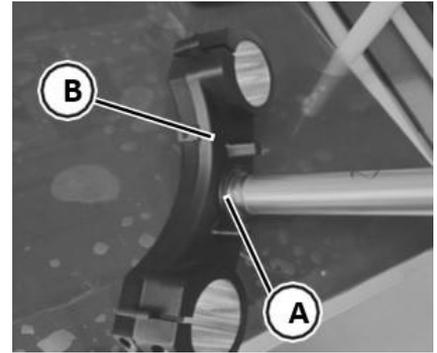
- In order to remove the bearing seat [A] inserted in the quill [B], insert the shaped rod[C] inside the quill[B] and use a hammer to extract the seat [A]

Note

If the steering head bearing is damaged, it is recommended to replace the upper and lower bearings (including the bearing retaining ring).

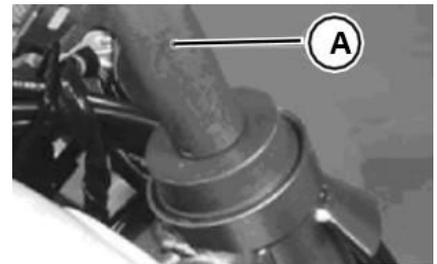


- Remove the lower bearing seat [A], with a suitable chisel [B] by levering on the steering base

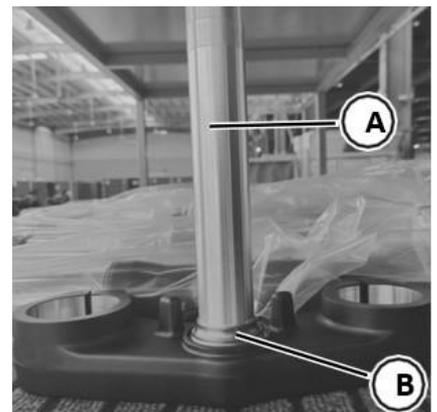


Steering bearing assembly

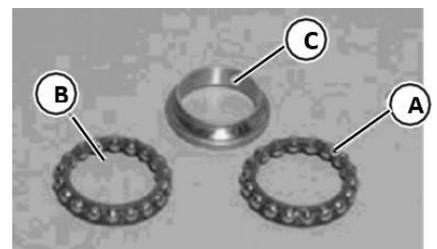
- Replace the bearing seat with a new one
- Grease the seat assembling tool and insert it into the steering column
Special tools - bearings kit[A]
- Replace the bearing seals with new ones



- Apply grease to the oil seal
- Remove the bearing retaining ring and apply grease to the bearings mounted on the steering column
Special tool - steering column bearing remover / Steering column bearing removal adapter



- Grease the lower bearing [A] and assemble it on the column
- Grease the ball bearing [B] and the retaining ring[C]



- Reassemble all the components proceeding in reverse order to the disassembly

Installation of the steering unit

Assemble the steering column as follows:

- Insert the steering column [A] inside the quill [B] checking that the bearings have been inserted correctly [C] with proper greasing.
- Mount the washer [D] and the dust cover [E].
- Screw the rings [F] with the specific wrench at a torque of 50 Nm
- Mount the washer [G] and the locknut [H] and screw it with a torque equal to 60Nm
- Mount the steering head [I]
- Mount the steering fixing screw [L] and screw it without tightening
- Insert the rods of the front suspension and fix them to the plates by first tightening the lower screws [M] with a torque of 25 Nm and then the upper screws [N] with a torque of 25Nm
- Tighten the screw [L] with a torque of 60Nm
- Reassemble the wheel and handlebars as described in their respective paragraph.



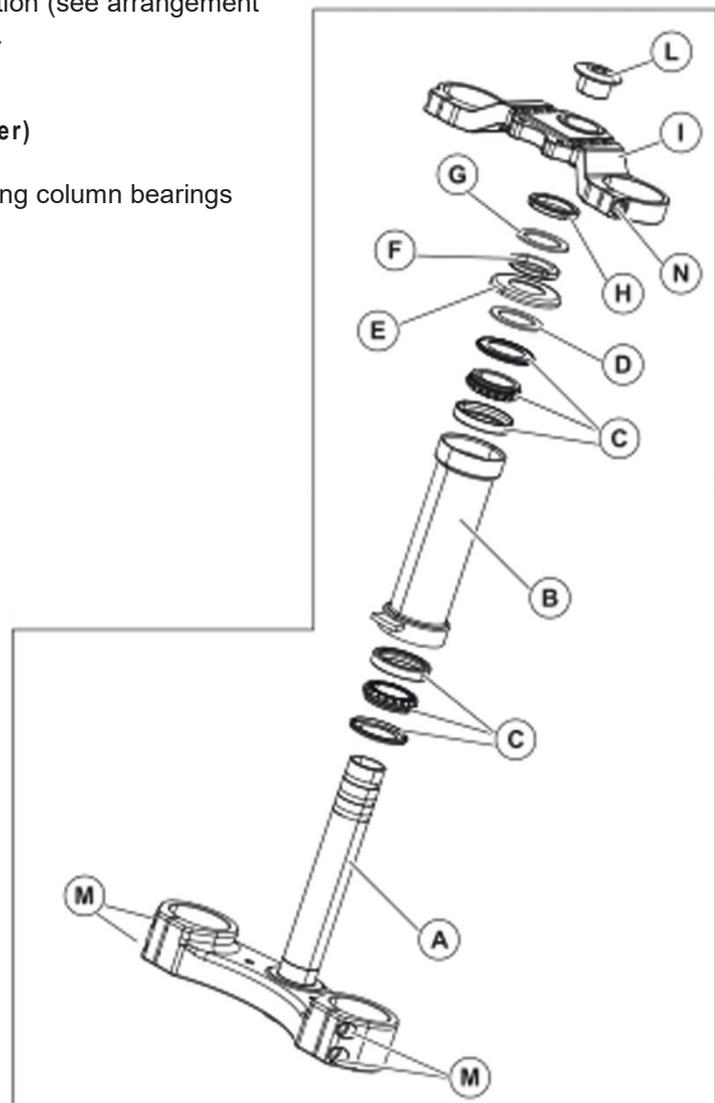
Warning

Please place cables, clamps etc. on the fork tubes in their original position, otherwise they will prevent handlebar rotation (see arrangement of cables, wires and hoses in the attached chapter).

Removed parts assembly (see the related chapter)

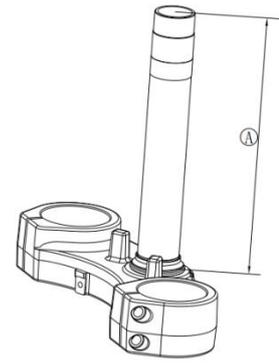
steering column bearings lubrication

See the periodic maintenance chapter for the steering column bearings lubrication.



Steering column check

- Whenever the steering column is removed or if the steering does not turn correctly, check that the steering column is not deformed.



- If the steering column [A] and its components are deformed, replace.
- If the fastening washer [A] is damaged, replace it with a new one.



Handlebar

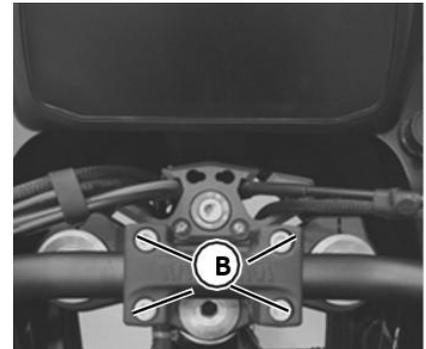
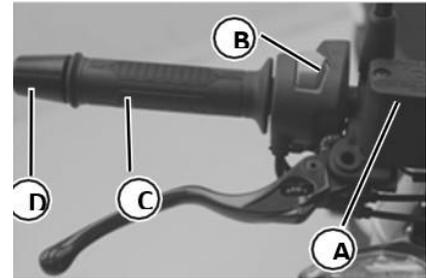
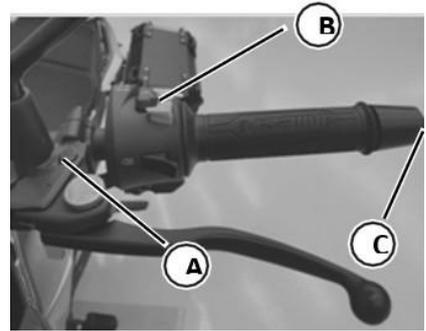
Handlebar removal

Remove:

- Clutch lever assembly[A]
- Left-hand switch[B]
- Left rocker arm[C]

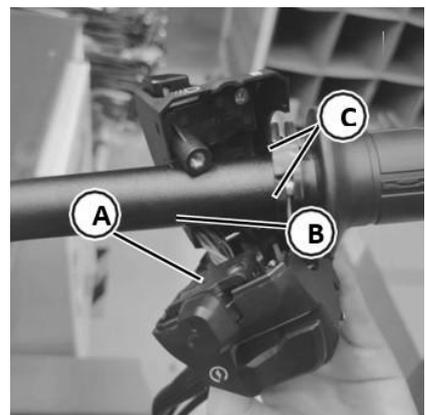
- Front brake master cylinder[A]
(see front brake master cylinder removal in the Brakes chapter)
- Right-hand switch[B]
- Right rocker arm[D]
- Throttle grip assembly[C]

- Remove the handlebar mounting screws [B] and the clevis[A]



Handlebar assembly

- Torque - steering knob mounting screw: 25N-m
- Clutch lever assembly installation
(See clutch lever installation in the clutch chapter)
- Install the left-hand switch
Insert the pin [A] in the handlebar hole [B]
Torque - left-hand switch fastening screw: 10Nm
- Assemble the accelerator knob
- Assemble the accelerator cable on the knob[C]
- Assemble the right-hand switch
Insert the pin [A] in the handlebar hole [B]
Torque - right-hand switch fastening screw: 8Nm
- Apply the threadlock to secure the right-hand rocker arm screw
- Assemble the front brake master cylinder
(see front master cylinder installation in the Brakes chapter)



Combination Switch

○ Notice

The installation and removal of the left combination switch is similar to that of the right combination switch;

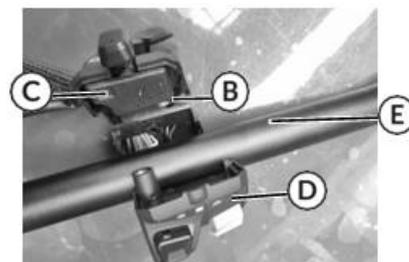
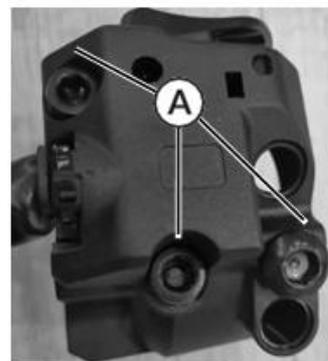
1) Combination switch installation

- ①. Remove bolt [A]
- ②. Put the positioning boss [B] of the lower part [D] of the combination switch into the positioning hole [E] of the handlebar;
- ③. Install the upper part of the combination switch [C];
- ④. Install the fastening bolts [A];

Combination switch bolt - coupling torque: 4 N.m

! Important

When disassemble the combination switch, do not tear the wire to avoid damage to the circuit;



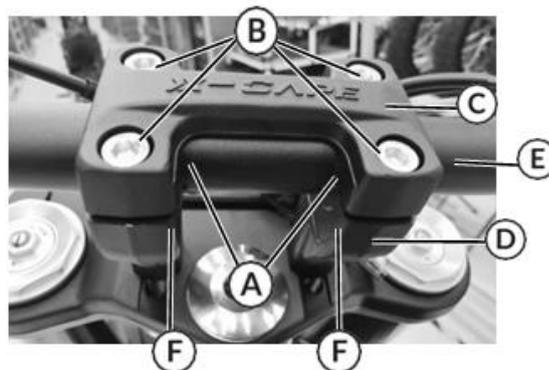
Handlebar

1) Handlebar installation

- ①. Place the handlebar on the lower pressing block [D], and align the positioning circle [A] on the tube with the side [F] of the two lower pressing blocks;
- ②. Install the upper pressure block [C];
- ③. Install the fastening bolts [B];

2) handlebar removal

- ①. Loosen the fastening bolts [B] of the upper pressure block [C];
- ②. Remove the handlebar [E];



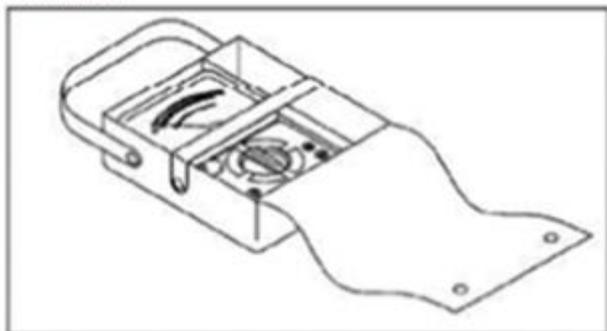
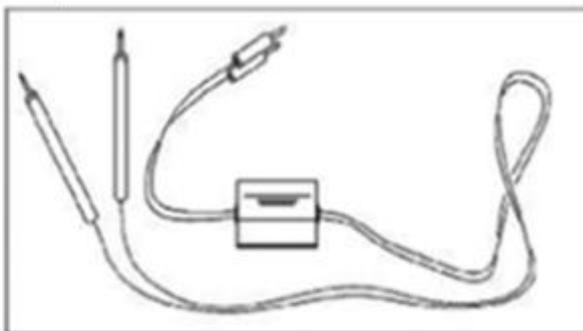
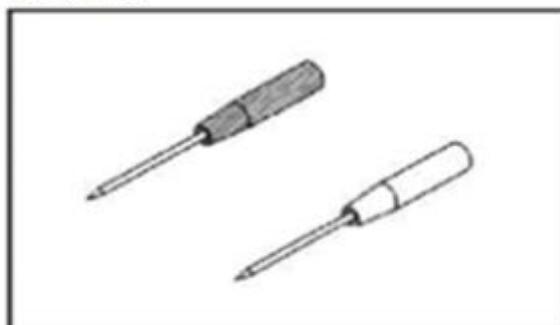
Chapter 12

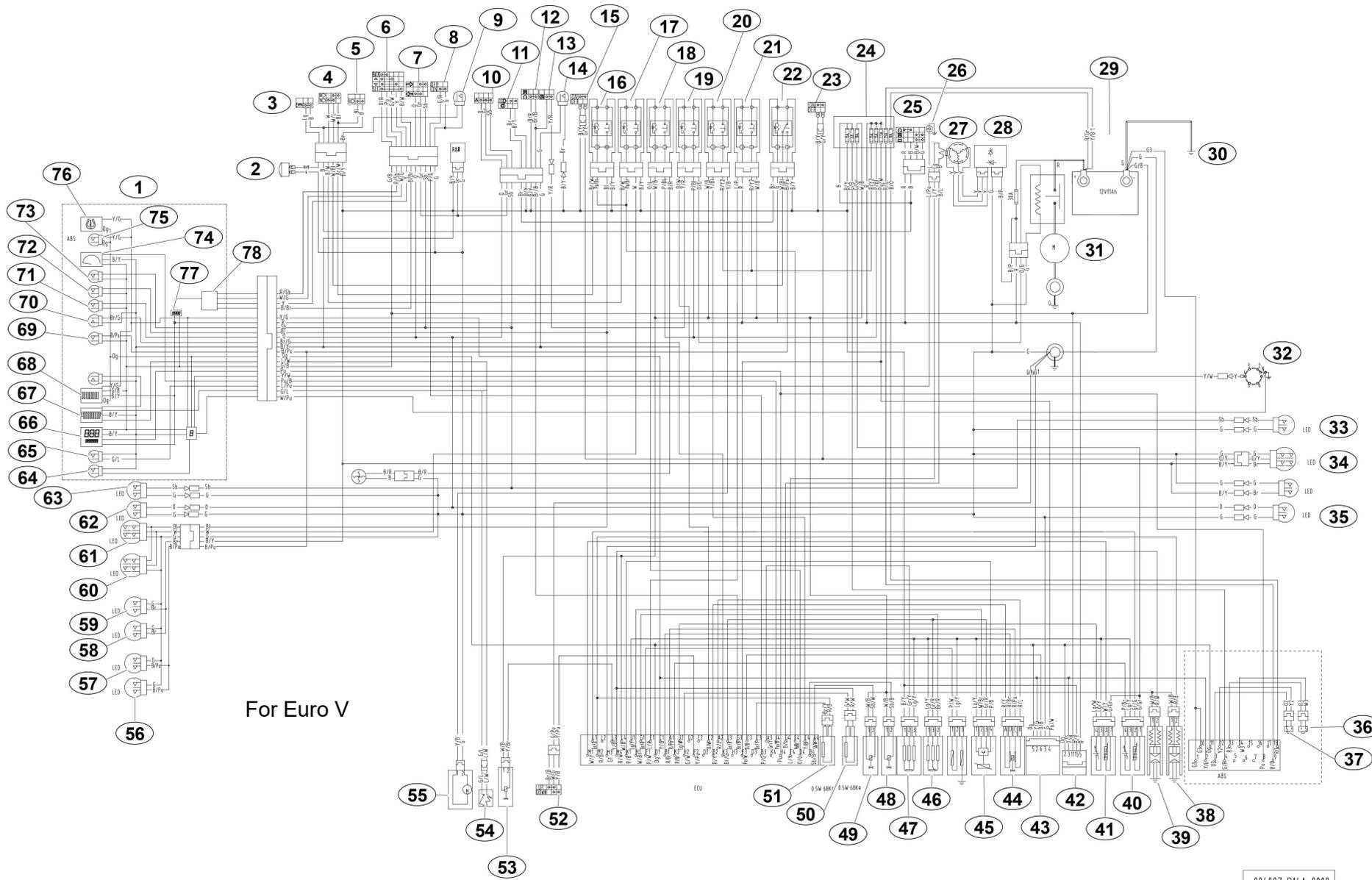
Electric systems



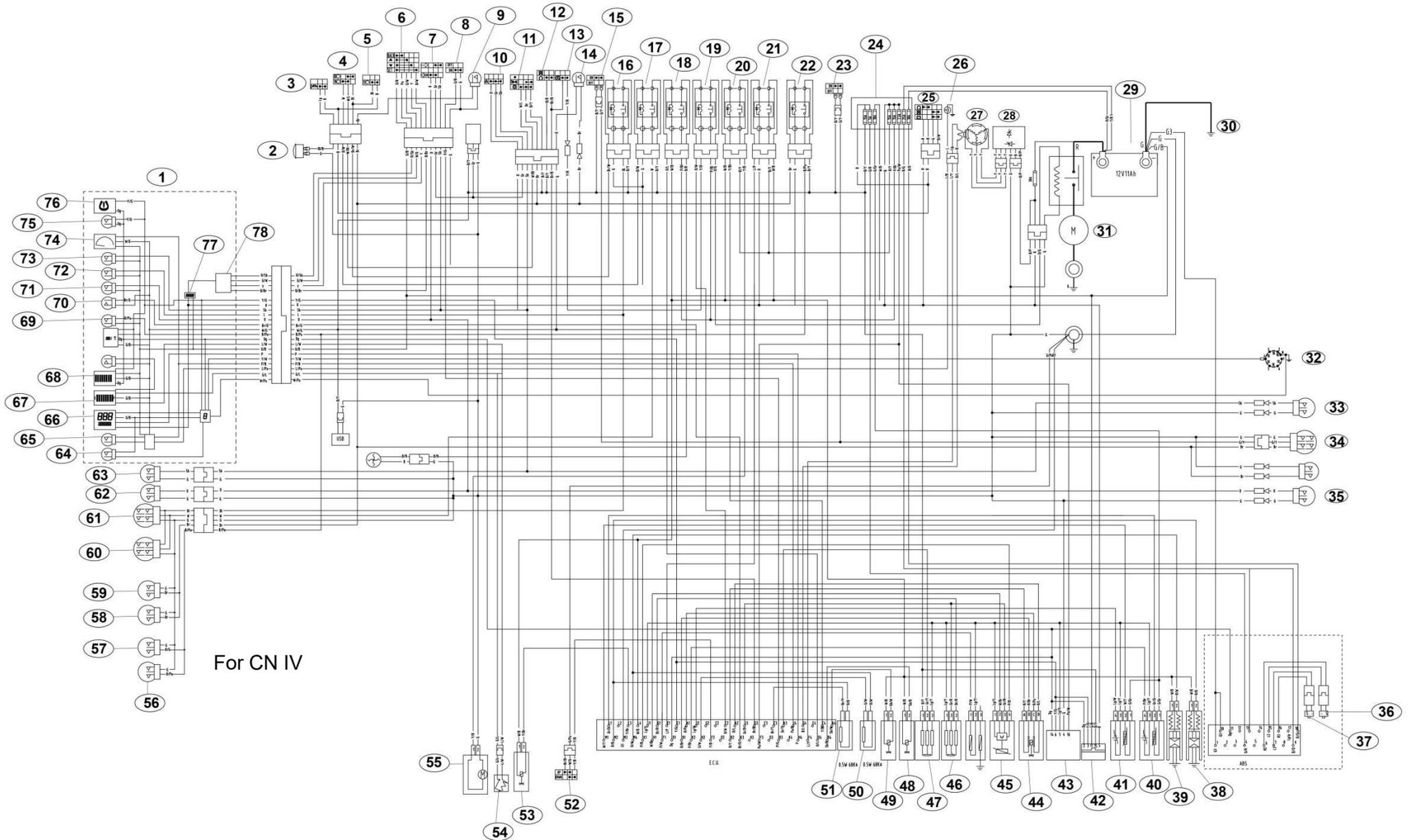
Electric system diagram

Components	Standard
Battery Model Model name Capacity	Maintenance-free wet sealed battery YTX12-BS(MF) 12V 11Ah
Voltage	
Charging systems Type Alternator output voltage Stator coil resistance Charging voltage	Three-phase AC 4000RPM 42V or higher 0,18 a 0,27Ω 14.2-15.2V
Ignition systems Crankshaft sensor resistance Crankshaft sensor peak voltage Primary coil resistance Secondary coil resistance Primary peak voltage	376~564Ω 376~564Ω 1.1~1.5Ω 1.1~1.5Ω 1.1~1.5Ω
Spark plugs Electrode distance	0.8~0.9mm
Electric starter system Starting the engine Brush length Switch diameter	12mm (service limit: 6.0mm) 28mm (maintenance limit: 27mm)
Switches and sensors Rear brake switch Engine oil pressure switch connection Water temperature sensor resistance value	Pedal stroke After 10mm,open When the motor is stopped: on See below

Special tools**Multimeter****Adapter****Electric motors rotor puller****Screwdriver****Electric motor rotor fastener**



For Euro V



Electric diagram

1. Dashboard	46. TPS	Wiring color table	Br. Brown
2. Horn	47. TILT	R. Red	Br/R. Brown / Red
3. Horn button	48. Injector cylinder 2	R/Br. Red / Brown	Br/Y. Brown / Yellow
4. High beam & low beam switch	49. Injector cylinder 1	R/Y. Red / Yellow	Br/G. Brown / Green
5. Pass	50. Ignition diagnostic sampling resistor 2	R/G. Red / Green	Y/Br. Yellow / Brown
6. Back & Set	51. Ignition diagnostic sampling resistor 1	R/L. Red / Blue	Br/W. Brown / White
7. Steering	52. Side stand sensor	R/Pu. Red / Purple	Br/B. Brown / Black
8. Friction	53. Canister valve	R/Gr. Red / Grey	Pu. Purple
9. Right handlebar button kit backlight	54. Fuel level sensor	R/W. Red / White	Pu/B. Purple / Black
10. Emergency light	55. Fuel pump	R/B. Red / Black	Gr. Grey
11. Illumination	56. DRL	O. Orange	Gr/R. Grey / Red
12. Switch off	57. DRL	O/Br. Orange / Brown	Gr/G. Grey / Green
13. Switch on	58. Position lamp	O/R. Orange / Red	Gr/W. Grey / White
14. Left handlebar button kit backlight	59. Position lamp	O/G. Orange / Green	Gr/B. Grey / Black
15. Left brake	60. High & low beam	O/L. Orange / Blue	W. White
16. High beam relay	61. High low beam	O/W. Orange / White	W/Br. White / Purple
17. Low beam relay	62. Front left turn signal	O/B. Orange / Black	W/R. White / Red
18. Cooling fan relay	63. Front right turn signal	Y. Yellow	W/Y. White / Yellow
19. Ignition auxiliary relay	64. Neutral indicator	Y/R. Yellow / Red	W/G. White / Green
20. Fuel pump relay	65. Oil pressure warning	Y/Bl. Yellow / Blue	W/Bl. White / Blue
21. Principle relay	66. Speed	Y/W. Yellow / White	W/Pu. White / Purple
22. Front beam relay	67. Fuel level indicator	Y/B. Yellow / Black	W/B. White / Black
23. Rear brake	68. Liquid temperature	G. Green	B. Black
24. Fuse box	69. DRL indicator	G/R. Green / Red	B/Br. Black / Brown
25. Ignition lock	70. Check engine light	G/Y. Green / Yellow	B/R. Black / Red
26. Oil pressure alarm switch	71. Right turn signal indicator	G/L. Green / Blue	B/Y. Black / Yellow
27. Stator	72. High beam indicator	G/W. Green / White	B/L. Black / Blue
28. Voltage regulator	73. Right turn signal indicator	G/B. Green / Black	B/W. Black / White
29. Battery	74. RPM indicator	P/Br. Pink / Brown	Lg. Light green
30. Grounding	75. ABS Indicator	P/B. Pink / Black	Lg/Br. Light yellow / Brown
31. Starter motor	76. Tire pressure	Gr/Y. Grey / Yellow	Lg/R. Light green / Red
32. Gear sensor	77. Clock	O/L. Orange / Blue	Lg/Y. Light green / Yellow
33. Right rear turn signal	78. Menu	L/Y. Blue / Yellow	Lg/W. Light green / White
34. Taillight		L/G. Blue / Green	P/W. Pink / White
35. Left rear turn signal		L/W. Blue / White	Y/Pu. Yellow / Purple
36. Rear wheel speed sensor		Bl/B. Blue / Black	Sb. Light blue
37. Front wheel speed sensor		LR. Pink	Sb/W. Light blue / White
38. Ignition coil of cylinder 1		Sb/B. Light blue / Black	Dg. Dark green
39. Ignition coil of cylinder 2		Y/G. Yellow / Green	Bl. Blue
40. Oxygen sensor of cylinder 1		R/Sb. Red / Light blue	L/Pu. Blue / Purple
41. Oxygen sensor of cylinder 2		B/Pu. Black / Purple	Pu/Br. Purple / Brown
42. Tire pressure control		P/G. Pink / Green	L/P. Blue / Pink
43. EPI diagnosis		P/Bl. Pink / Blue	Pu/W. Purple / White
44. Stopper		G/Gr. Green / Grey	B/P. Black / Pink
45. Throttle body temperature & pressure sensor		B/O. Black / Orange	

Warnings

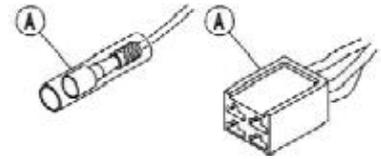
There are many important precautions that must be taken when servicing electrical systems. Learn and observe the following rules.

1. Do not invert the battery cable connection. Doing so will burn out the electrical components diodes.
2. Always check the battery before troubleshooting other components of the electrical system. Check carefully the electric system.
In order to check the electric system carefully, a fully charged battery is required.
3. Electronic components should not be hit by hammers, etc, or dropped on hard surfaces. Hard impacts can damage components.
4. To avoid damage to electronic parts, do not disconnect the battery or other electrical wires or components when the ignition is on or when the engine is running.
5. Do not leave the starter switch on when the starter motor is not running, or you may burn out the starter motor windings.
6. Make sure not to short-circuit the cable connected directly to the positive terminal (+) of the battery with the negative terminal of the chassis.
7. Do not replace defective parts until the cause of the failure has been determined.
If the failure is caused by one or more items, they must be repaired or replaced.
8. Make sure all circuit connectors are clean and not loose, and check wires for signs of burning, wear, etc. Poor wiring and connections can affect the operation of the electrical system.
9. Measure the coil resistance and winding when the parts are cold (at room temperature).

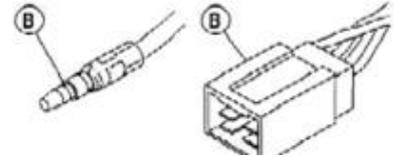
Colour coding:

R:Red	R/W:Red / White	B/N:Black / White	W/Pu:White/Purple	R/Gr:Red/Gray
G:Green	B/L:Black / Blue	Lg/W: Light green/ White	Y/B:Yellow/Black	P/Bl:Pink/Blue
Gr:Gray	G/R:Green/Red	Lg/Y: Light green/Yellow	W/B:White/Black	G/Gr:Green/Gray
O:Orange	Sb/W:Light blue/ White	B/Br:Black / Brown	Y/Br:Yellow/Brown	G:Green
Y:Yellow	Y/G:Yellow/Green	B/Y:Black / Yellow	G/Pu:Green/Purple	W/Br:White/Brown
Dg:Dark green	Br/G:Brown/Green	R/Sb: Red/Light blue	Y/Pu:Yellow/Purple	Br/R:Brown/Red
Sb:Light blue	W/G: White/Green	G/B:Green/Black	W/Y: Yellow/White	P/W:Pink/White
L:White	B/Pu:Black / Purple	Pu/B:Purple/Black	Gr/G:Gray/Green	L/P:Blue/Pink
L:Blue	Y/W:Yellow/White	L/Pu:Blue/Purple	R/B:Red/Black	R/Br:Red/Brown
Pu:Purple	L/W:Blue/White	G/L:Green/Blue	P/B:Pink/Black	R/Pu:Red/Purple
Fr:Brown	P/Br:Pink/Brown	O/W: Orange/White	R/Y:Red/Yellow	R/L:Red/Blue
B:Black	Br/G: Brown/Green	Gr/R:Gray/Red	Br/B:Brown/Black	Pu/W:Purple/White
Lg: Light green	Br/Y:Brown/Yellow	P/G:Pink/Green	Gr/Y:Gray/Yellow	L/Y:Blue/Yellow
	O/L: Orange/Blue	Sb/B:Light blue/ Black	R/G:Red/Green	B/O:Black/Orange
	Br/W: Brown/White	G/Y:Green/Yellow	Y/R:Yellow/Red	BL/B:Blue/Black

Female connector [A]

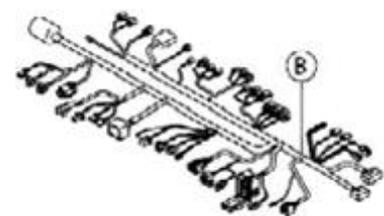
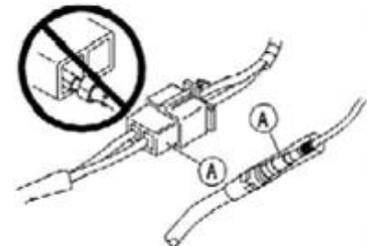


Male connector [B]



Wiring inspection

- Visual inspection of the wiring harness for signs of burning, wear, and breakage
If there is any defect in the wiring harness, replace the damaged harness.
- Disconnect each connector [A] and check for corrosion, dirt and damage.
If the connector is corroded or dirty, clean it carefully.
If there is damage, replace the connector.
- Check the wiring continuity.
- Use the wiring diagram to find the end of the wire that may have a problem. Connect a hand-held tester between the wire ends.
Set the tester to the x1Ω range and read the tester reading.
- If the tester does not read 0 Ω, the wire is defective.
- If necessary, replace the wire or wiring[B].



Battery

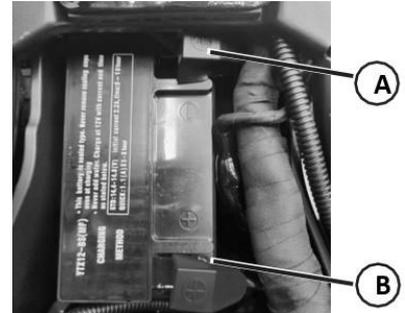
Remove

- Remove the pilot seat.
- Disconnect the negative (-) cable [A].
- Lift the insulation guard from the positive (+) terminal [B] and disconnect the (+) cable(+)

Warning

Make sure the negative cable is disconnected first

- Remove the battery.



Assembling the battery

- Place battery in the battery holder.
- Apply a thin layer of grease to the terminals to prevent corrosion.
- Assemble the positive (+) cable [B]first.
- Cover the positive (+) terminal with insulation.
- Assemble the negative (-) cable (A).

Initial charge

- An initial charge of the sealed battery is recommended.
Standard charge: 1.1A X (5-8) hours
The charging rate will vary depending on the storage time, temperature and type of charger used.
- After the initial charge, let the battery sit for 30 minutes, then use a voltmeter to check the voltage.
If it is below 12.8V, repeat the charging cycle.

Warning

Battery is maintenance free, do not remove and add water or electrolyte to the battery

Preventive measures

- 1) No need to add distilled water
The battery does not need to be filled with distilled water during its life cycle. It is dangerous to pry open the end cap to add distilled water. Do not do it.
- 2) Charging the discharged battery
If the engine does not start, the horn sounds faintly or the light is dim, the battery is out of power. Charge for 5-8 hours according to the charging current in the specifications (see specifications).
If an emergency requires a quick charge, precisely follow the maximum charge current and time conditions indicated on the battery.

**Important**

The battery is designed to be discharged and then recharged according to the method specified above and the battery will not suffer any abnormalities. However, if the battery is recharged outside of these conditions, the battery performance will be significantly reduced. Do not remove the end cap during the charging period. In the unlikely event that overcharging produces excessive gas, the pressure relief valve will release the gas to ensure that the battery is in good condition.

- 3) If the bike is not used for several months, recharge the battery and remove the negative cable before storing the bike, and discharge and recharge the battery once a month during storage.
- 4) Battery Life:
If the battery does not start the engine after several recharges, the battery has exceeded its life expectancy. Replace the battery. (Make sure the motorcycle's starting system is in order).

**Important**

A sealed battery can operate at its full potential only if it is equipped with the right vehicle electrical system. Therefore, when replacing a sealed battery on a motorcycle, you should demand that the new battery has the same specifications as the original one.

**Warning**

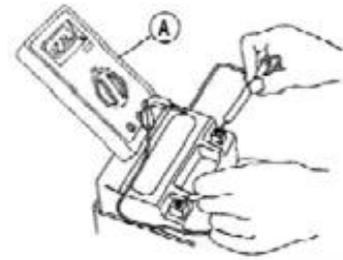
During charging the battery emits an explosive mixture of hydrogen and oxygen; keep it away from sparks and open flames. When using a charger connect the battery to the charger before switching it on. This will prevent sparks from igniting any gases in the battery. The battery should not be near a fire and the terminals should not be loose.

Charging conditions check

Check the battery charge by measuring the battery terminal voltage with a multimeter [A].

Remove:

- Seat (see the seat removal in the Chassis chapter) Battery insulation sleeve (see Battery removal)
- Disconnect the battery terminals.



Warning

Make sure that the negative (-) cable is disconnected first.

Measure the battery terminal voltage

Note

Use a digital voltmeter with one decimal place to measure the voltage. If the reading is 12.8V or higher, no charging is required. If the reading is lower than specified, it must be charged.

Note

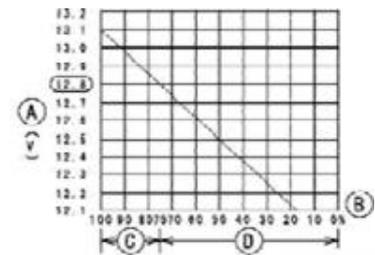
Standard battery terminal voltage: 12.8V or higher

Terminal voltage (V) [A]

Battery charge rate (%) [B]

Good [C]

Needs to be discharged and then charged [D]

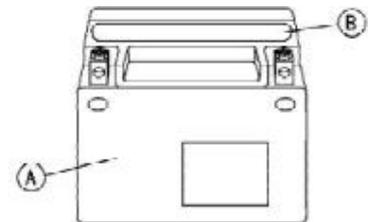


Recharging after discharge

- Remove the battery [A] (see the Battery removal).
- According to the battery terminal voltage. Recharging after discharge requires the following method.

Warning

The battery is sealed. Do not remove the sealing cap during charging [B]. Do not add distilled water. Charge as shown below.



Battery charge

Terminal voltage: less than 12.8V

Standard charge: 1.1A X (5-8)h (see table below)

Fast charge: 5A X 1h

In general, do not charge fast, if fast charging is needed, follow with terminal voltage less than 11.5V

Standard charging method 1.1Ax20h 1.1Ax20h

Note

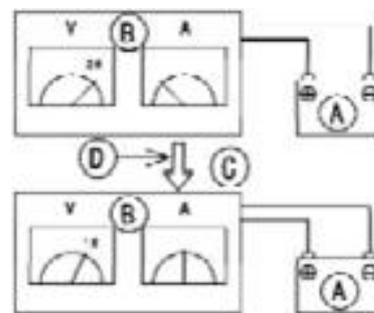
If the battery is not initially receiving power, charge it until it reaches a maximum voltage of 25V. If the battery receives power, charge it using the standard voltage charging method. If the battery does not start charging after 5 minutes, replace the battery.

Battery [A]

Charger [B]

Standard value [C]

Battery starts charging[D]



- Determine the battery condition after discharging and charging.
- Determine the battery condition by measuring the terminal voltage according to the following table 30 minutes after full charge

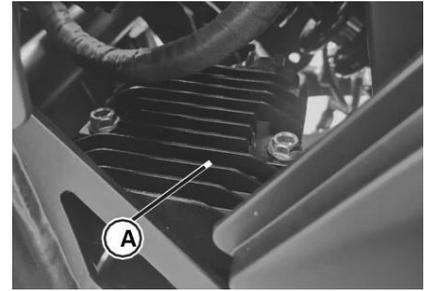
Standard	Result
From 12.8V to 14.0V	Good
From 12.0 to 12.8V	Undercharged - Recharge

Charging systems

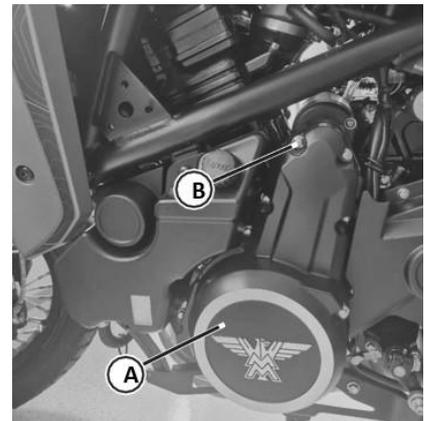
Left fairing removal

Remove

- Remove the left rear fairing(see the lower fairing removal in the Chassis chapter).
- Disconnect the rectifier connector[A].

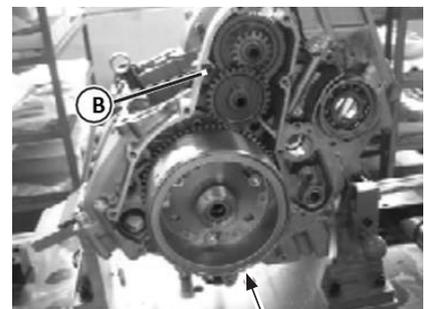


- Position a suitable container under the flywheel cover[A], drain oil and remove the cover screws [B].
- Remove the cover



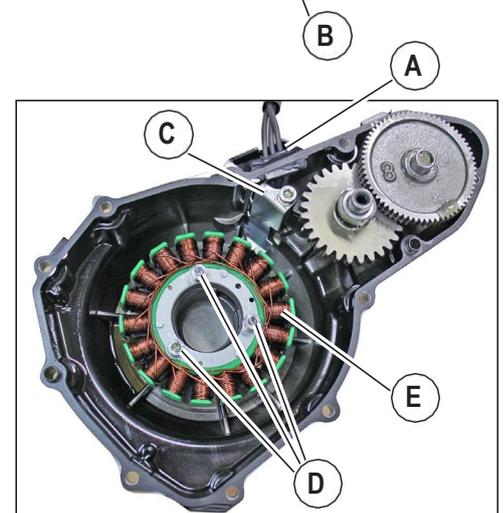
Flywheel cover assembly

- Apply sealant around the fairlead of the stator connector[A].
 - Check that the centring plugs [B] on the cover are positioned correctly.
 - Install the new gasket and the left side crankcase. Tighten.
- Torque - Crankcase Screws: 9,8 N m /9,5 N m



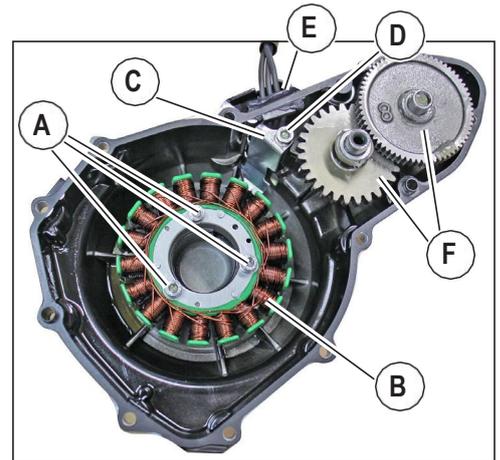
Removal of the stator

- Remove the fastening plate screws[C].
- Remove the stator cable grommet[A].
- Remove the screws [D] of the stator.
- Remove the stator[E]



Installation of the stator

- Apply threadlocker to the stator [B] screw threads [A] and tighten. Tightening torque: 12Nm
- Fix the stator cables with the fixing plate[C] and tighten the screws[D]. Torque - fixing plate screws: 10Nm
- Apply sealant to all the sides of the fairlead[E] and the cables of the stator and firmly press the rubber fairlead in the left lateral cover.
- Insert the left lateral cover.



Note

Correctly reassemble the gears [F] and shims of the ignition system.

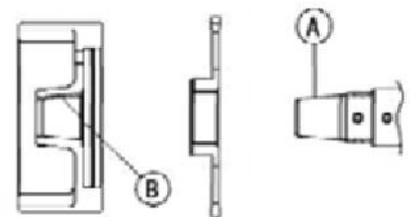
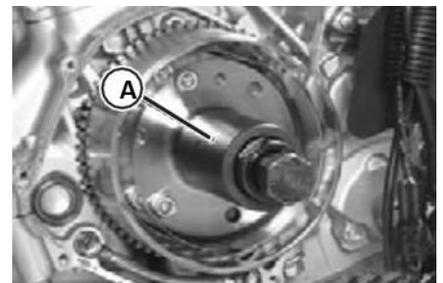
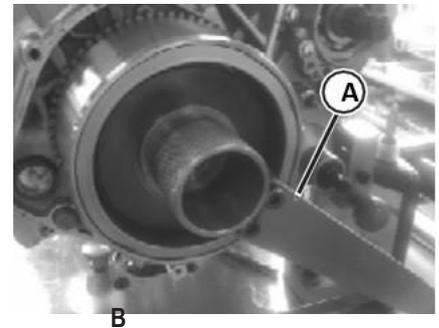
Flywheel removal

- Remove the left side cover.
- Remove the starter motor intermediate gear, duplex gear and shaft.
- Wipe oil from the rotor outer circumference.
- Keep the rotor firmly stationary with the specific tool [A] and remove the fixing screws of the rotor and the washers. Special tool: Rotor retainer
- Use the extractor [B] to remove the flywheel. Special tool - flywheel puller assembly

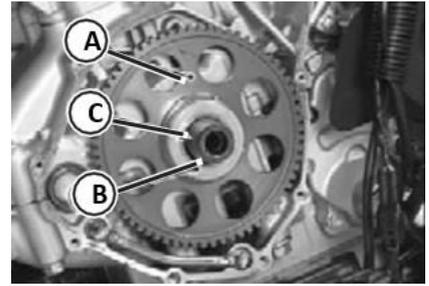
Warning

Do not try to hit the rotor as that will result in the loss of magnetism of the magnet.

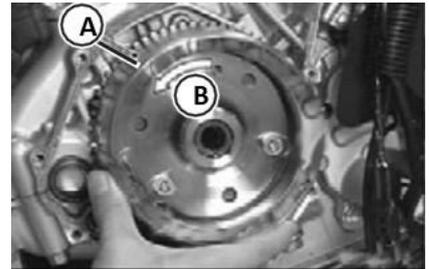
- Using a cleaning fluid, wipe off any traces of oil or dirt from the following places and dry with a clean rag. The motor shaft conical part[A]. The flywheel conical part [B].



- Assemble the starter gear [A] and the washer[B].
- Clean the crankshaft conical part [C] and dry it.



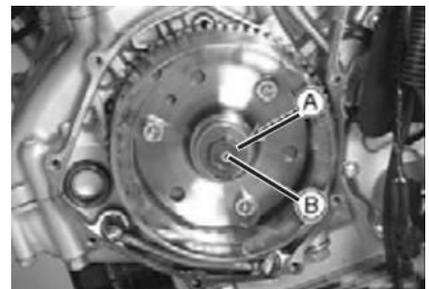
- Assemble the flywheel [A] and turn it counterclockwise[B].
- Assemble the washer[A]



Note

Check that the flywheel is assembled in the crankshaft before tightening to torque.

- Install the flywheel bolt [B] and tighten to a torque of 70Nm.
- Check the tightening with a flywheel puller.
If the flywheel is not pulled with a torque of 20 Nm, the flywheel is assembled correctly.
If the flywheel is pulled with a force which is less than 20 Nm, clean the crankshaft and the flywheel cone from oil or dirt and dry them with a clean rag. Tighten and recheck for proper tightness as described above.
- Torque - flywheel screw: 155 Nm
- Check that the free wheel rotates freely in one direction
- Install the left side crankcase.



Magnet check

There are three types of magnet failures: short circuit, open circuit (burned wiring), or demagnetized rotors.

- A shorted-circuit or open coil circuit will result in zero output.
- A fall or impact on the alternator or the proximity of an electromagnet
- A drop or impact on the alternator or the proximity of an electromagnet field can cause the rotor to become demagnetized, resulting in low output voltage.

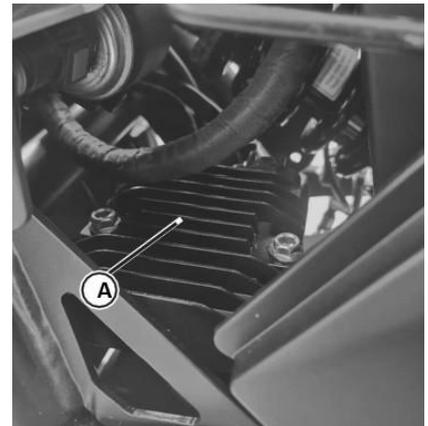
Check the magnet output voltage according to the following procedure.

- Turn off the engine.
- Disconnect the voltage regulator connector [A].
- Connect the multimeter as shown in Table 1.
- Turn on the ignition and start the engine.
- Record the voltage reading (three measurements)

Alternator output voltage

Table 1

Multimeter	Connectors		4000rpm
	Multimeter (+)	Multimeter (-)	
250V AC	Magnet Black cable	Another black cable magnet	40V or higher



- If the output voltage is within the range of the values in the table, the magnet is functioning well.
- If the output voltage is below the values in the table, the magnet is defective.

Check the stator coil resistance according to the following.

- Shut down the engine.
- Connect a multimeter according to the table below.
- Record the readings (three measurements).

Multimeter	Connectors		Multimeter Display
	Multimeter (+)	Multimeter (-)	
*1Ω	Magneto black wire	Another magnet black wire	0.10~0.3Ω

- If any one of the two conductors is higher than the resistance shown in the table, the stator should be replaced.
- If any one of the two conductors is much lower than the set resistance, the stator is shorted-circuit and should be replaced.
"If the stator coil resistance is normal, but the voltage indicates a faulty alternator, the rotor magnetism may be weak, replace the rotor.
- Using a multimeter with the highest resistance range, measure the resistance between each black wire and the Chassis ground.
If the multimeter reads below infinity, there is a ground short-circuit indicating that the stator needs to be replaced.
Check the ground stator coil resistance according to the following.
- Shut down the engine.
- Connect the multimeter according to the following table
- Record the readings (three measurements).

Multimeter	Connectors		Multimeter Display
	Multimeter (+)	Multimeter (-)	
Maximum resistance Maximum Range	Any of the black magnet cables	Engines Housing	∞

- Using a multimeter with the highest resistance range, measure the resistance between each black wire and the chassis ground.
- If the multimeter reads below infinity, it indicates a ground short circuit and the stator must be replaced.

If the stator coil resistance is normal, but the voltage indicates a faulty alternator, the rotor magnetism may have become weak and the rotor should be replaced.

Voltage regulator

Voltage regulator check

Check the output voltage of the voltage regulator according to the following procedure.

- Turn off the power switch.
- Connect a multimeter as shown in table 1.
- Run the indicator as indicated in Table 1 RPM.
- Note the voltage reading, which matches the description in the table below.

Multimeter	Connectors		Rotation speed
	Multimeter (+)	Multimeter (-)	1500-5000RPM
20V DC	Positive battery terminal	Negative battery terminal	13V-15V

- If the regulator rectifier output voltage is not in the 13V-15V range, the rectifier is damaged.

Regulator removal

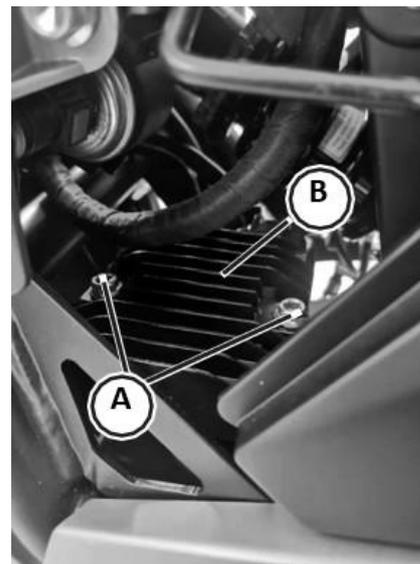
- Remove the screws [A].
- Disconnect the connector.
- Remove the regulator [B].

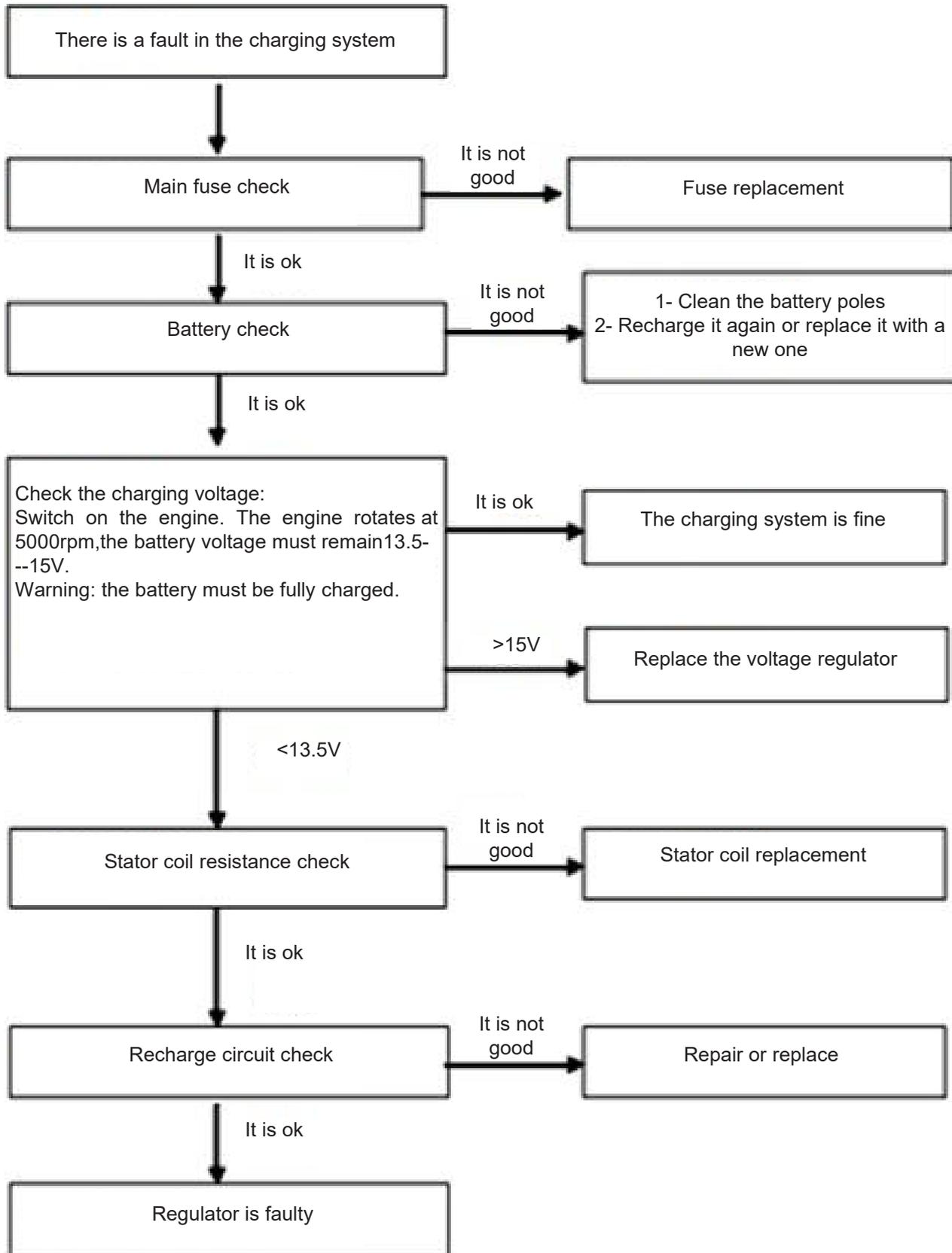
Free Wheel Assembly removal/ installation

- See the Magnet Rotor removal/installation.

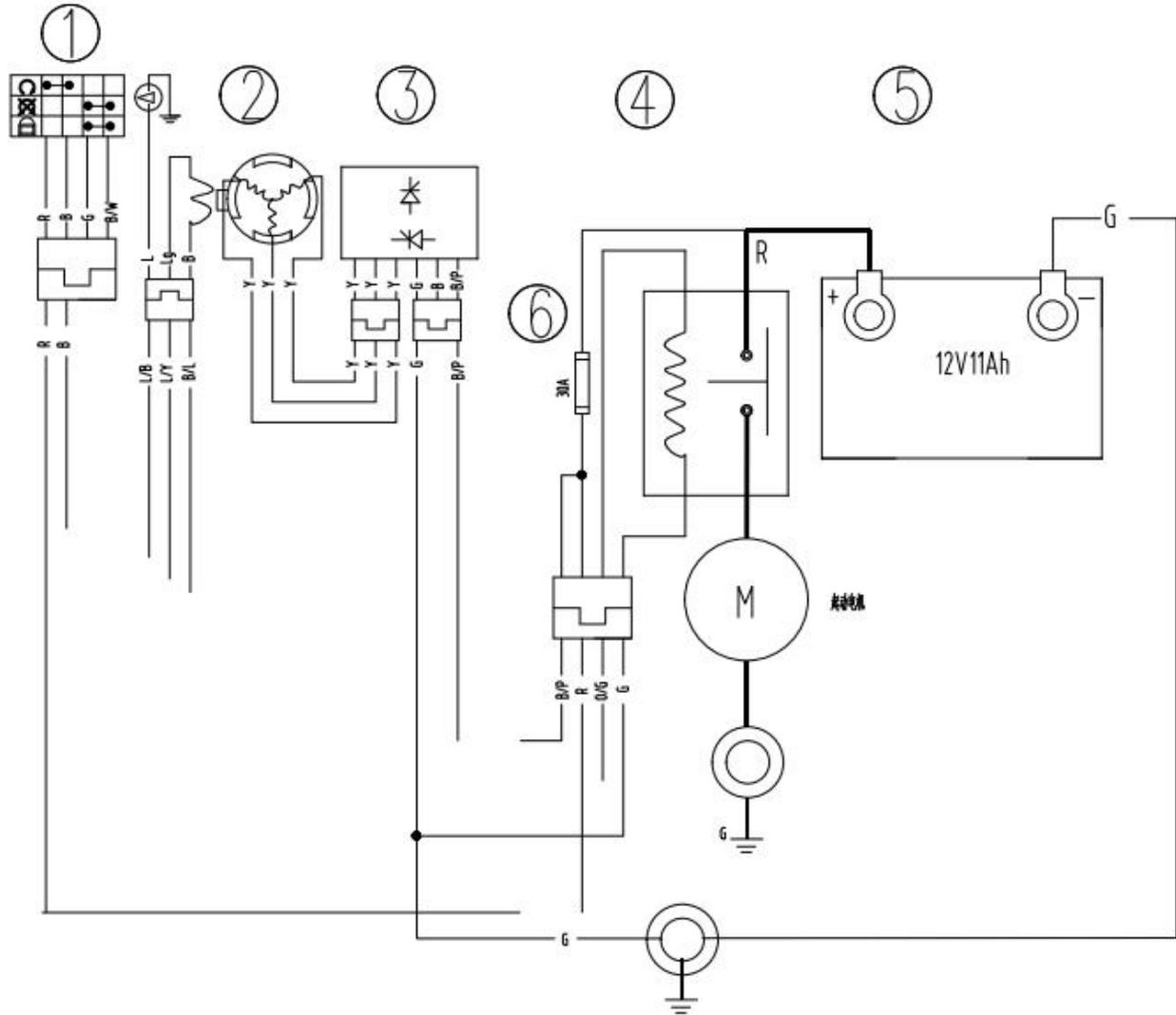
Free-wheel assembly check

- Remove the left side crankcase.
- Remove the intermediate starter gear assembly.
- Rotate the free-wheel gear [A] by hand.
- The free-wheel should rotate freely clockwise [B] but not counter-clockwise.
- If the free-wheel does not operate according to its function or if the inertia clutch assembly does not operate or makes noise, proceed to the next step.
- Disassemble the free-wheel assembly and visually inspect the components.
If there are any damaged or worn parts, replace them.



Charging system troubleshooting table


Charging circuit connection diagram



- 1. Ignition switch lock
- 2. Magnet assembly
- 3. Voltage regulator
- M. Motor starter
- 4. Ignition relay
- 5. Battery
- 6. Fuse box

Ignition system

Warning

The ignition system generates extremely high voltages. Do not touch the spark plugs or the ignition coils while the engine is still running, as this could cause a serious electric shock.

Important

Do not disconnect the battery cable or any other electrical connection when the ignition is switched on or the engine is running, as this may cause damage to the ECU.

Removing the crankshaft phase sensor

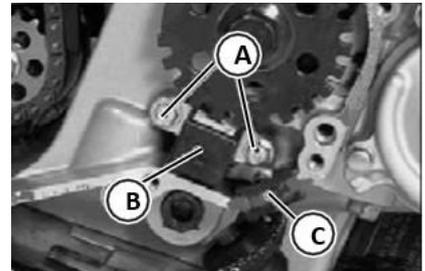
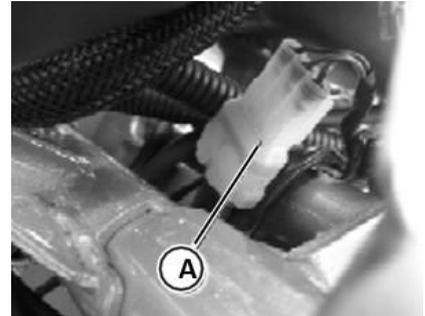
Removal:

- Right-hand side engine crankcase (see the right-hand crankcase removal in the Engine chapter)
- Sensor cable connector [A].
- Remove screws [A].
- Remove the sensor [B].
- Remove the rubber grommet [C].

To assemble, follow the steps in reverse order of removal.

Phase sensor fastening bolt torque: 6 N m: 6 N m

- Apply sealant [A] to the rubber grommet of the sensor cable.
- Install the removed parts (see the corresponding section).

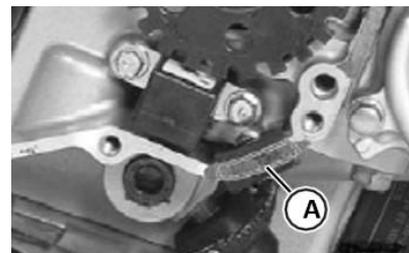


Phase sensor check

Phase sensor resistance check

Remove:

- Right-hand fairing (see the right-hand fairing removal in the Chassis chapter).
- Sensor cable connector [A].
- Measure the sensor resistance
- Set the multimeter [B] to the range $\times 100 \Omega$.
Multimeter (+) \rightarrow Red cable
Multimeter (-) \rightarrow Black cable



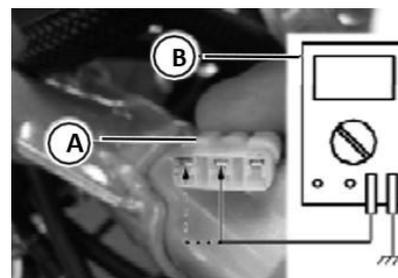
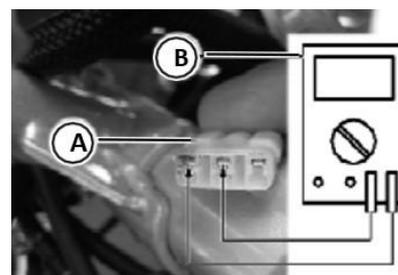
If the resistance exceeds the specified value, the trigger is open and must be replaced.

If it is below this resistance value, the trigger is short-circuited and must be replaced.

Phase sensor resistance: 2 50 to 3 00 Ω (test at 20°C)

Ground insulation resistance measurement

- Set the multimeter [B] to the highest resistance range
Multimeter (+) \rightarrow black cable or green cable
Ground insulation resistance: ∞
- Measure the resistance between the sensor cable [A] and the chassis ground using the multimeter highest resistance range.
Any reading below infinity indicates a short circuit or poor trigger insulation and must be replaced.



Peak trigger voltage check

Note

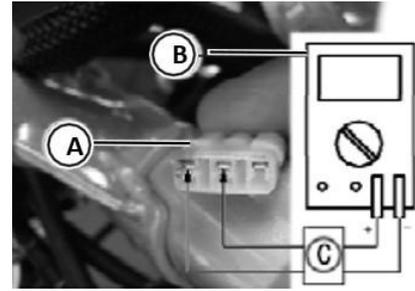
- Make sure that the battery is fully charged.
- Use the peak voltage adapter [A] to determine the condition of the phase sensor.

Note

It is more reliable than using a resistance measurement method inside the sensor.

Remove:

- Sensor cable connector [A] (see the trigger Removal).
- Set the multimeter [B] to the DC10V range and connect the peak voltage adapter [C].
- Connect the positive terminal of the peak voltage adaptor [C] to the green cable and connect the negative terminal to the black cable of the connector.
- Rotate the ignition switch and turn ON the engine stop switch.
- Press the start button and run the engine for 4 to 5 seconds with the gearbox in neutral to measure the peak trigger voltage.
- Repeat the measurement 5 or more times
Standard: 1.9 V or higher

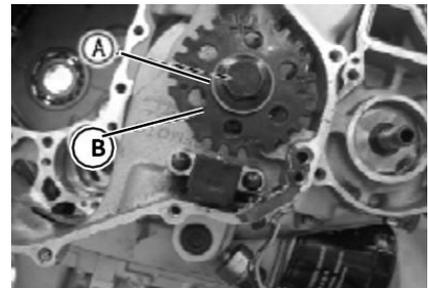


If the multimeter reading is not in the specified range, check the sensor.

Sensor Plate removal

Remove:

- Clutch cover (see the clutch cover removal in the Clutch chapter).
 - Remove the sensor disc screw [A].
 - Remove the disc [B].
- Install the sensor disc:
- Install the sensor disc on the crankshaft.
- Tighten the rotor screws.
Torque: 40 Nm



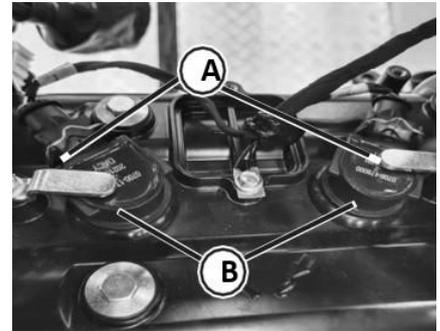
Ignition coil

Ignition coil removal

- Remove the outer parts near the fuel tank.
- Remove the fuel tank.
- Disconnect the ignition coil connector[A].
- Disconnect the ignition coil[B]

Warning

When removing the ignition coil, do not pry open the ignition coil connector part.

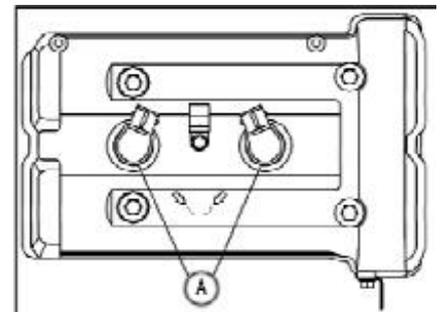


Ignition coil assembly

- Insert the ignition coil according to the illustration, paying attention to the direction[A].
- Connect the connector.

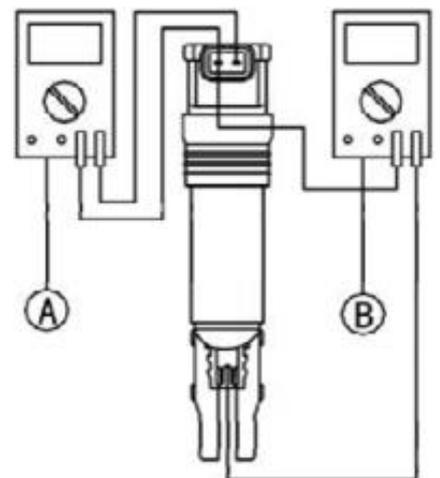
Warning

Do not touch the ignition coil head when installing the ignition coil.



Ignition coil check

- Remove the ignition coil(see the ignition coil removal(ignition coil and spark plug chapter).
- Measure the primary coil resistance [A] as follows.
Connect a multimeter between the coil terminals.
Set the multimeter to the x10 Ω range and read the multimeter reading.
Measure the secondary coil resistance [B].
Connect the multimeter between the plug terminal and the coil negative (-) terminal.
Set the multimeter to the x1 k Ω range and take a multimeter reading.



If the multimeter reading is not in the specified range, replace the ignition coil.

Primary coil resistance: 1.1 to 1.5 Ω (20 °C) Secondary

coil resistance: from 1.1 to 1.5 k Ω (20 °C)

If the multimeter does not read within the specified range, replace the ignition coil.

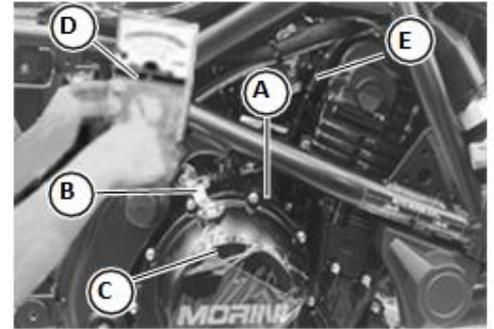
Primary coil peak voltage check

Ensure that the battery is fully charged.

- Remove the ignition coil, but not the spark plug.

Measure the primary peak voltage as follows.

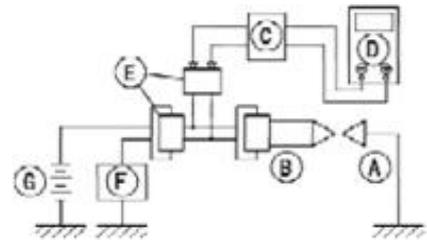
- Install the new spark plugs [A] on each ignition coil [B] and ground them to the engine.
- Connect the peak voltage adapter [C] to a multimeter [D] with the multimeter set to the DC250V range.
- Connect the adapter to the peak voltage adapter cable [E] which is connected between the ignition coil connector and the ignition coil.



Warning

To avoid high-voltage shocks, do not touch the spark plug or multimeter connection.

- Turn on and off the ignition switch "ON".
- With the engine in neutral, press the start button and run the engine for 4 to 5 seconds to measure the primary voltage peak.
- Repeat the measurement 5 or more times.



Primary ignition coil peak voltage: 8.8 V or higher

- Repeat this test for other ignition coils.

If the reading is lower than the specified value, check the following items.

- Ignition coil
- Ignition
- ECU

Spark plugs

Spark plugs removal

- See spark plug replacement in the periodic maintenance chapter.

Assembling spark plugs

- See the periodic maintenance chapter for the spark plug replacement.

Spark plugs condition check

- See the spark plug condition check in the periodic maintenance chapter.

Engine ignition safety devices check

Lift the rear wheel off the ground so that it rotates freely.

Step 1 Check

Start the engine as follows:

- Gear selector: gear engaged
- Clutch switch: released (lever not pulled)
- Side stand: Down or up
- Turn ON the ignition key and press the starter button.
- The starter motor should not run.

If the engine starts, check the neutral switch, the auxiliary relay, the ignition relay.

If the components are OK, replace the ECU.

Step 2 Check

Start the engine as follows:

- Gear selector: not in neutral
- Clutch switch: engaged (lever pulled)
- Side stand: Raised
- Turn ON the ignition key and press the starter button.
- The starter motor should run and the engine should start.

If the engine does not start, check the clutch switch, side stand switch, auxiliary relay and ignition relay.

If the components are OK, replace the ECU.

Step 3 Check

Start the engine as follows:

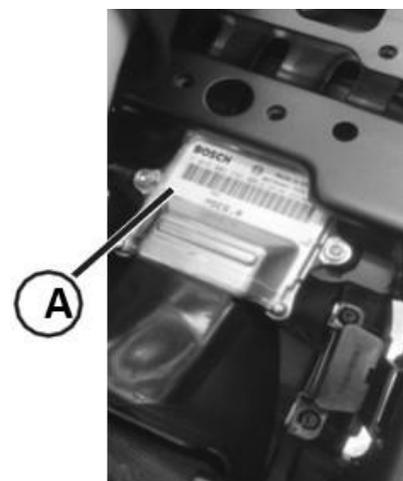
- Gear selector: gear engaged
- Clutch switch : engaged (lever pulled)
- Side stand : raised
- Turn ON the ignition key and press the starter button to start the engine.
- Lower the side stand, the engine should stop.

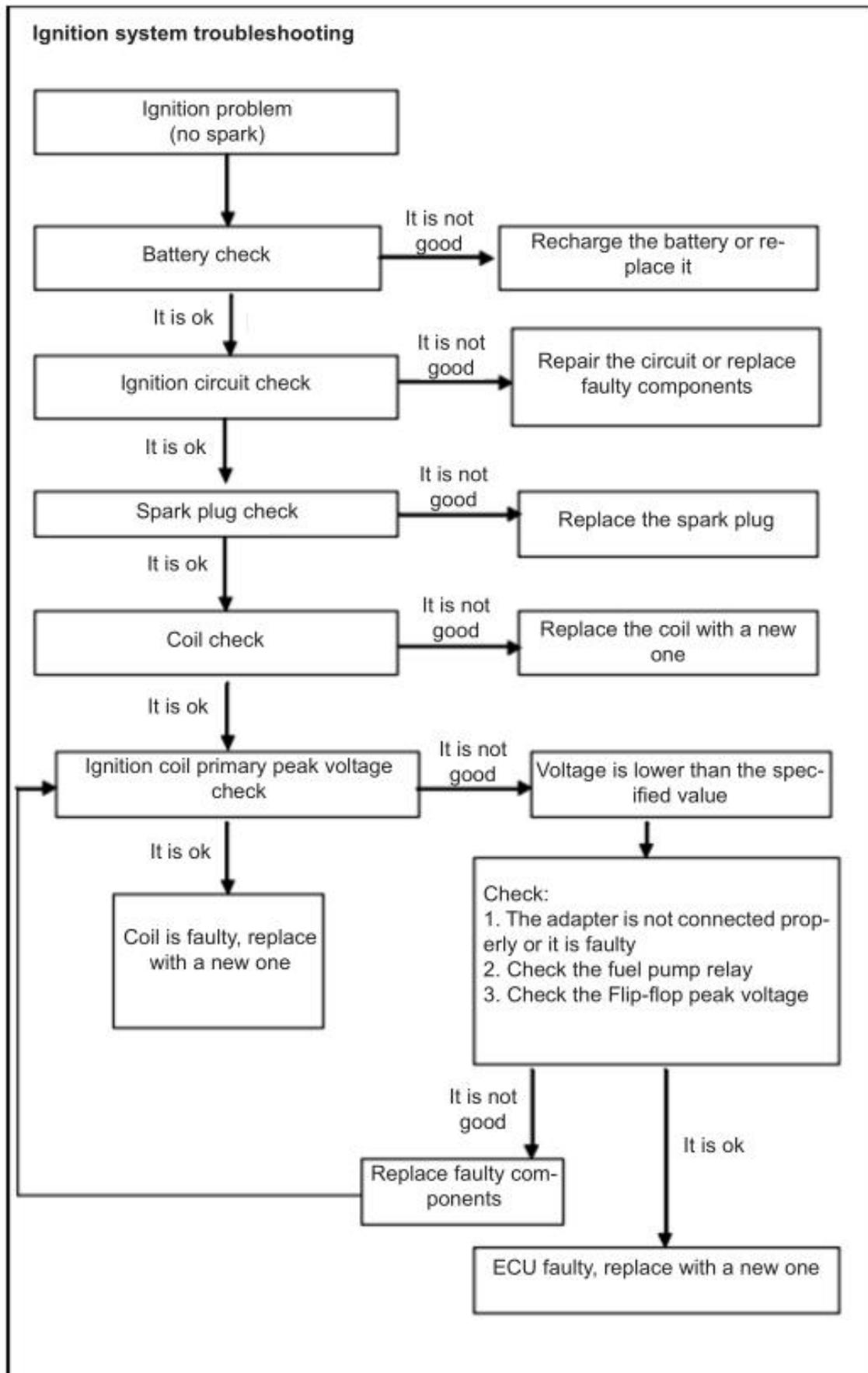
If the engine does not stop, check the gear switch and the side stand switch.

If the components are OK, replace the ECU.

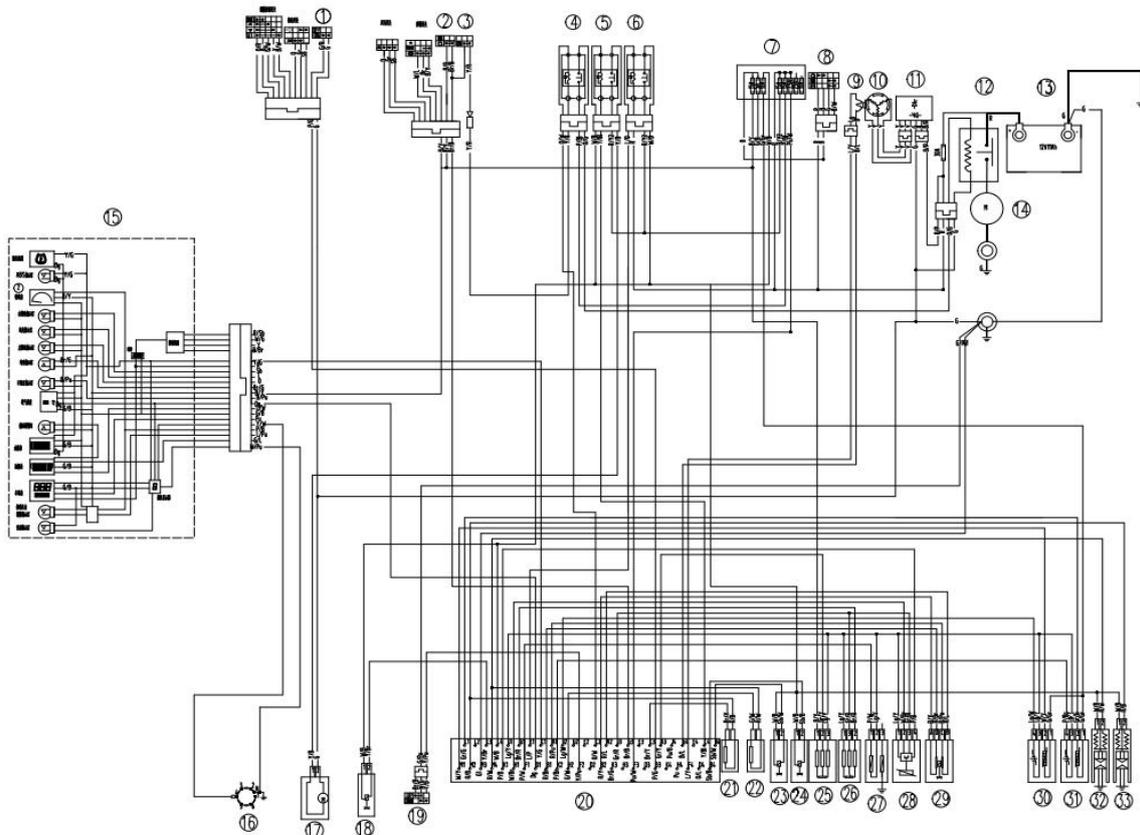
ECU ignition module

- The ignition IC is incorporated in the ECU control unit[A].
- Check the safety devices, the troubleshooting table of the ignition system and the ECU control unit supply.



Ignition system troubleshooting table


Ignition circuit diagram

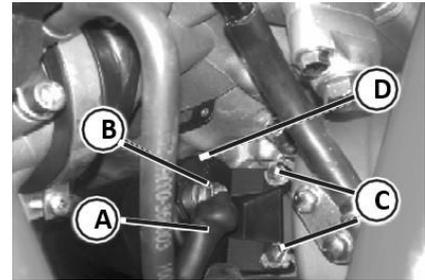


- | | |
|------------------------------|--|
| 1. Clutch switch | 21. Ignition diagnostic sampling Resistance1 |
| 2. Engine shut down switch | 22. Ignition Diagnostic Sampling Resistance2 |
| 3. Starter switch | 23. 1-Cylinder Injector |
| 4. Starter auxiliary relay | 24. 2-cylinder injector |
| 5. Fuel pump relay | 25. Side tilt sensor |
| 6. Main relay | 26. Throttle position sensor |
| 7. Fuse box | 27. Coolant temperature sensor |
| 8. Ignition switch block | 28. Intake pressure, temperature sensor |
| 9. Ignition coil | 29. idle speed stepper engine |
| 10. Three-phase magnet | 30. 2-cylinder Lambda sensor |
| 11. Voltage regulator | 31. 1-cylinder Lambda sensor |
| 12. Ignition relay and fuse | 32. 2-cylinder Ignition coil and spark plug |
| 13. Battery | 33. 1-cylinder ignition coil and spark plug |
| 14. Starter motor | |
| 15. Instruments | |
| 16. Gear switch | |
| 17. Fuel pump | |
| 18. Fuel tank solenoid valve | |
| 19. Side stand switch | |
| 20. ECU | |

Ignition system

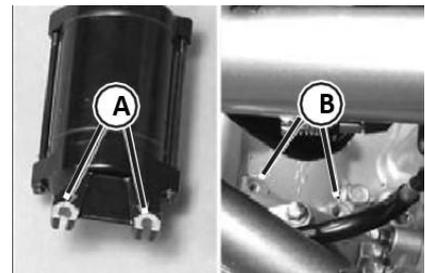
Starter motor removal

- Remove the rubber cap[A].
- Unscrew the power cable nut [B].
- Remove the mounting screws[C].
- Remove starter motor [D].



Assemble the starter motor

- When installing the starter motor, clean the starter motor through-hole surface [A] and the crankcase screws holes[B].



- Apply grease to the O-ring [A].
- Tighten the screws
Torque - motor fastening screw: 10 Nm
- Fix the feeding cable.
Torque - power cable end nut: 6.0 Nm



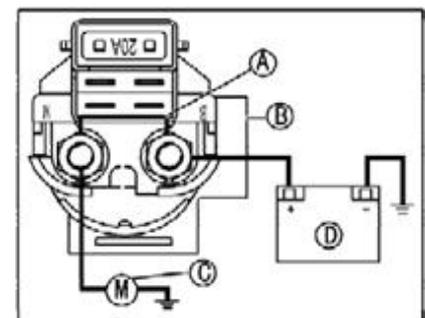
Starter motor test

- Use a wire of equal or greater thickness than the starter motor wire[A].
- Connect the two ignition relay contacts[B].
Starter motor [C]
Battery [D]

Battery must be fully charged

- If the starter motor runs, it is OK.
- If the starter motor does not run, it is defective.

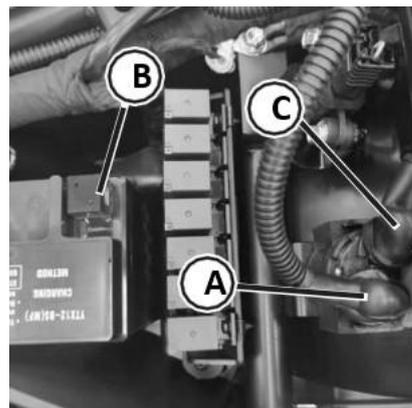
Replace the starter motor with a new one.



Ignition relay

Ignition relay removal

- Remove the seat.
- Disconnect the contactor cable[C] and the positive cable of the battery (+) [B] from the ignition contactor[A].



Ignition relays On/off measurement

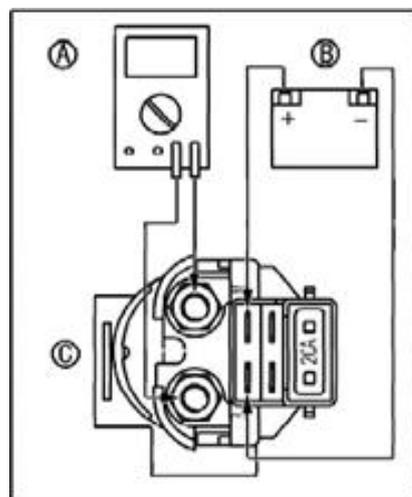
- Test the ignition relay [C] with a multimeter [A] and a 12V battery [B] connected according to the diagram.

Warning

The battery's positive terminal (+) is connected directly to the ignition relay, even if the motorbike is switched off or the ignition key is turned off, there is still voltage; avoid short circuits.

Values.

- Multimeter resistance when the battery is connected: 0Ω
 - Multimeter resistance when the battery is disconnected: $\infty\Omega$
- If the relay does not operate as specified, the relay is faulty. Replace the relay.



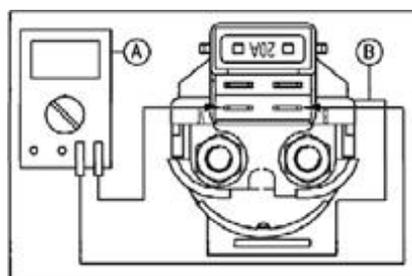
Ignition relay resistance measurement

- Connect a multimeter [A] to the ignition relay [B] according to the diagram.

Ignition relay resistance: 3 to 5 Ω (20 °C)

If the relay is not within the specified value, the relay is defective. Replace the relay.

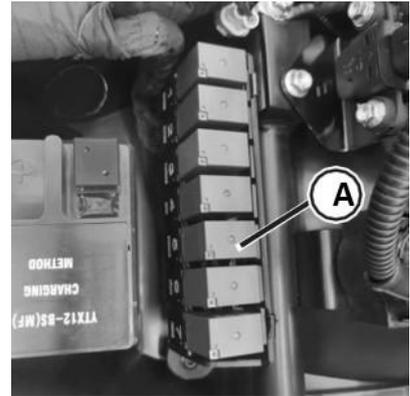
It is more reliable to use the ignition relay on-off check method to determine whether the ignition relay is good or faulty, rather than measuring the resistance of the ignition relay.



Auxiliary ignition relay

Auxiliary ignition relay removal

- Remove the seat.
- Disconnect the auxiliary ignition relay [A] from the connector (the auxiliary relay must be removed to disconnect the connector).



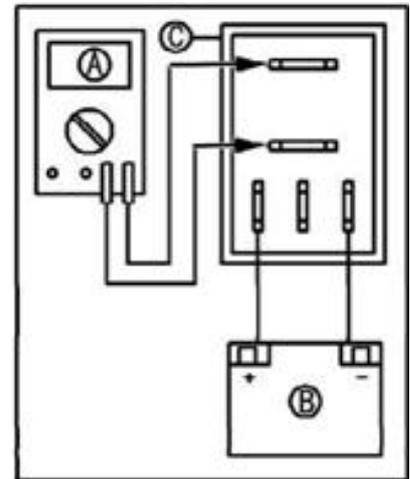
Auxiliary ignition relay on/off measurement

- Test the ignition relay [C] with a multimeter [A] and a 12V battery [B] connected according to the diagram.

Multimeter resistance when the battery is connected: 0 Ω

Multimeter resistance when the battery is disconnected: $\infty \Omega$

If the relay does not operate as specified, the relay is faulty. Replace the relay.



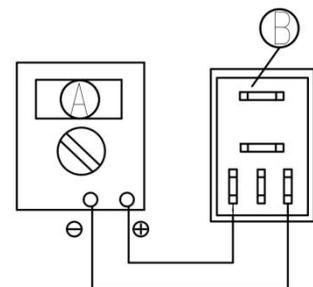
Auxiliary ignition relay resistance measurement

- Connect a multimeter [A] and a ignition relay [B] as shown in the diagram.

- Auxiliary ignition relay resistance: 78 to 95 Ω (2 0°C)

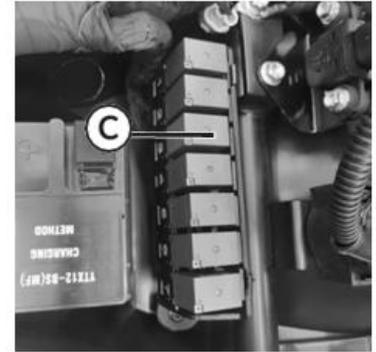
If the relay is not within the specified value, the relay is defective. Replace the relay.

It is more reliable to use the auxiliary ignition relay on-off test method to determine whether the ignition relay is good or faulty than measuring the auxiliary ignition relay resistance.



Light switching relay**Removal of the light switching relay**

- Remove the seat.
- Disconnect the auxiliary starting relay [C] from the connector (disconnecting the connector requires removing the auxiliary relay)

**On-off measurement of light switching relays**

- Connect a multimeter [A] and a 12V battery[B] to test the light switching relay [C] according to the diagram.

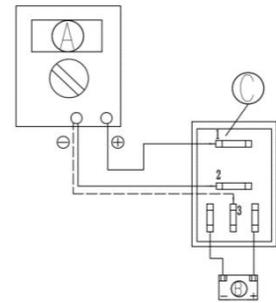
When the battery is connected to the relay, the resistance of the multimeter: between 1-2: $0\ \Omega$

Between 1-3: $\infty\ \Omega$

When the battery is disconnected from the relay, the resistance of the multimeter: between 1-2: $\infty\ \Omega$

Between 1-3: $0\ \Omega$

If the relay does not work as specified, the relay is faulty. Replace the relay.

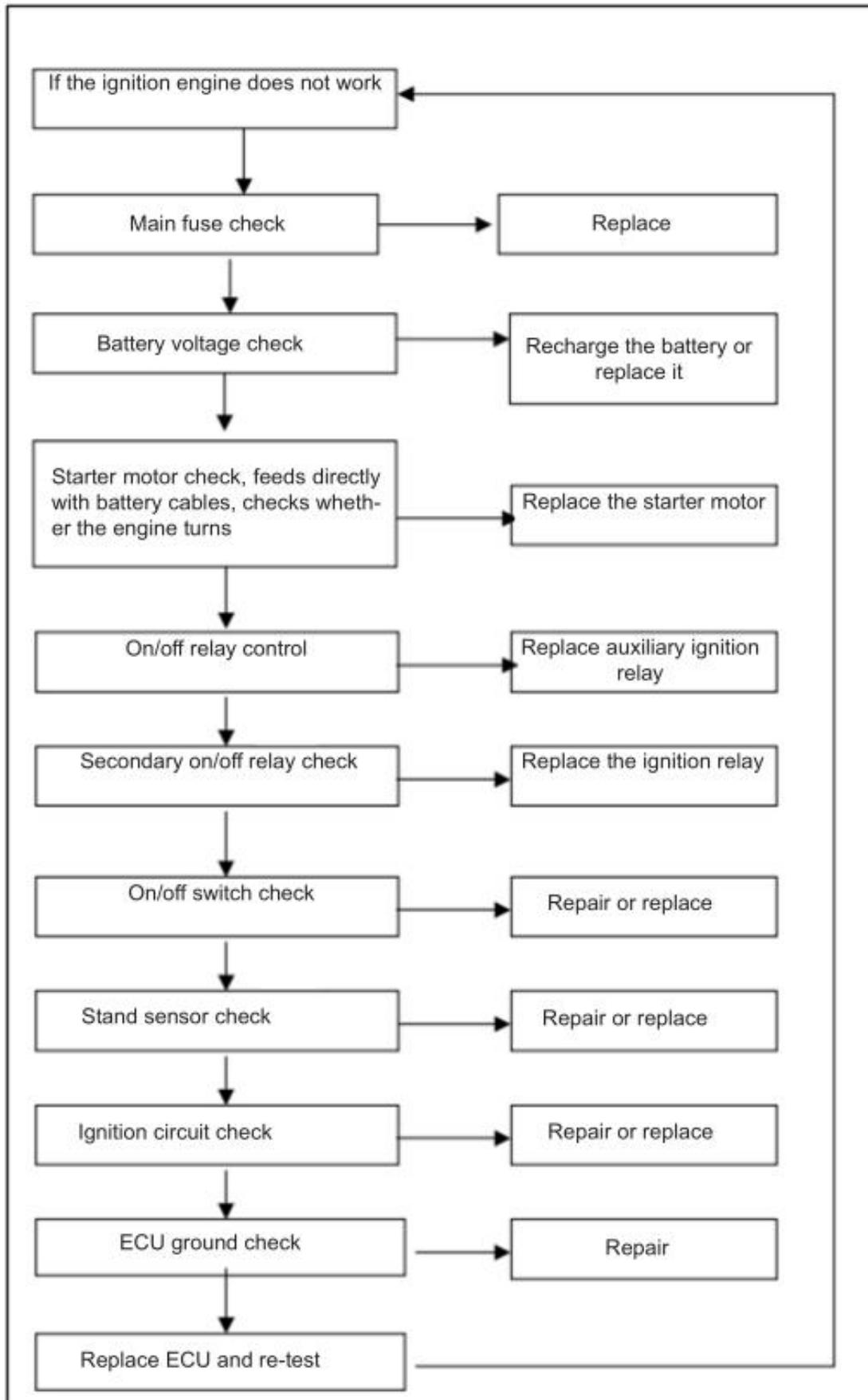


ECU starter system - Table of logical relations

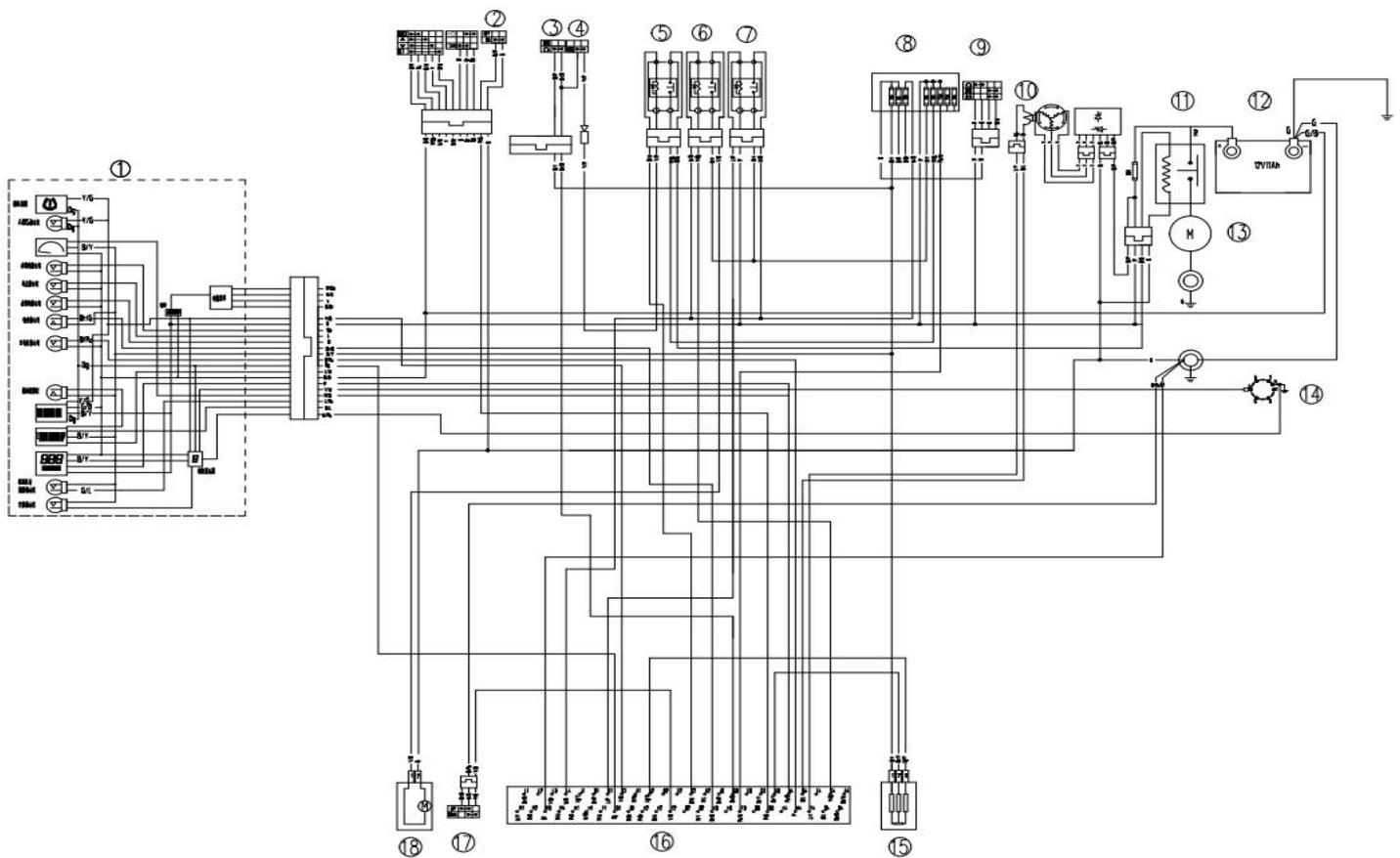
Side stand switch		Gear condition		Clutch lever		Ignition condition
Closed	Grounded	Neutral	Grounded	Loose	Not grounded	On
Closed	Grounded	Neutral	Grounded	Pulled	Grounded	On
Closed	Grounded	Not neutral	Not grounded	Loose	Not grounded	Off
Closed	Grounded	Not neutral	Not grounded	Pulled	Grounded	On
Open	Not grounded	Neutral	Grounded	Loose	Not grounded	On
Open	Not grounded	Neutral	Grounded	Pulled	Grounded	On
Open	Not grounded	Not neutral	Not grounded	Loose	Not grounded	Off
Open	Not grounded	Not neutral	Not grounded	Pulled	Grounded	Off

- When the engine is started, it must be used according to the table of the logical relationships, otherwise the engine cannot be started.
- The logical relationship is controlled directly by the ECU.
- If the engine still does not start according to the table of logical relations, the engine cannot be started, check the side stand switch and the gear position, the clutch switch, the shutdown switch, the ignition switch, the start button, ECU, protection Fuse, ignition relay, one-way engine clutch, dual gear, etc.

Ignition system troubleshooting table



Ignition system circuit connection diagram



1. Dashboard
2. Clutch switch
3. Flame out switch
4. Start button
5. Auxiliary start relay
6. Oil pump relay
7. Main relay
8. Fuse box
9. Ignition lock
10. Trigger
11. Start relay
12. Battery
13. Starter motor
14. Gear sensor
15. Roll sensor
16. ECU
17. Side stand flame out switch
18. Fuel pump

Lighting systems

The motorbike is equipped with a LED light headlight controlled by a special relay.

When the ignition key is turned to ON, the headlights turn on. At this point you can turn on the high beam lights and turn back to the low beam lights.

Headlight level adjustment

See the headlight check in the Periodic maintenance chapter.

Headlight beam vertical adjustment

See the headlight check in the Regular maintenance chapter.



Front light assembly replacement

If the front light does not work, the complete headlight assembly must be replaced, the light source cannot be replaced.



Parking light bulb replacement

The parking light LED light source cannot be replaced, so replace the headlight assembly directly.

Headlight Removal/Installation

- Remove the windshield assembly;
- Remove the front cover, left/right fairing, dashboard cover;
- (See Front Body Assembly Removal and Installation)
- Remove the 6 bolts [A] of the headlight and the trim cover under the headlight and 2 screws [B];
- Disconnect the connector;

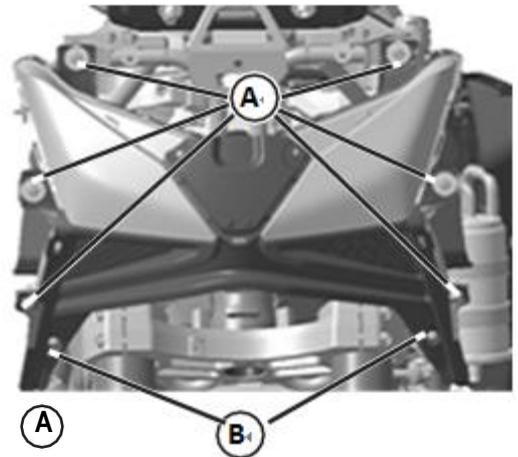
Headlight Specifications:

LED 12V23W (high beam), LED 12V11W low beam)

Front position light: LED 12V1.5W

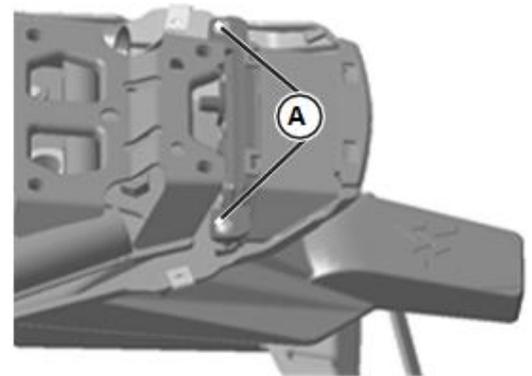
DRL: LED 12V 12W

- Install in the reverse order of removal.



Tail light/brake light removal/installation

- Remove the passenger seat;
 - Remove the rear armrest;
 - Remove the rear fender lower tail cover and rear fender tail;
 - Remove left/right body cover and rear center cover;
 - Disconnect the tail light/brake light connector;
 - Remove 2 tail lamp assembly screws [A];
- Tail light/brake light specification: LED 12V 0.78W/2.1W
- Install in the reverse order of removal.

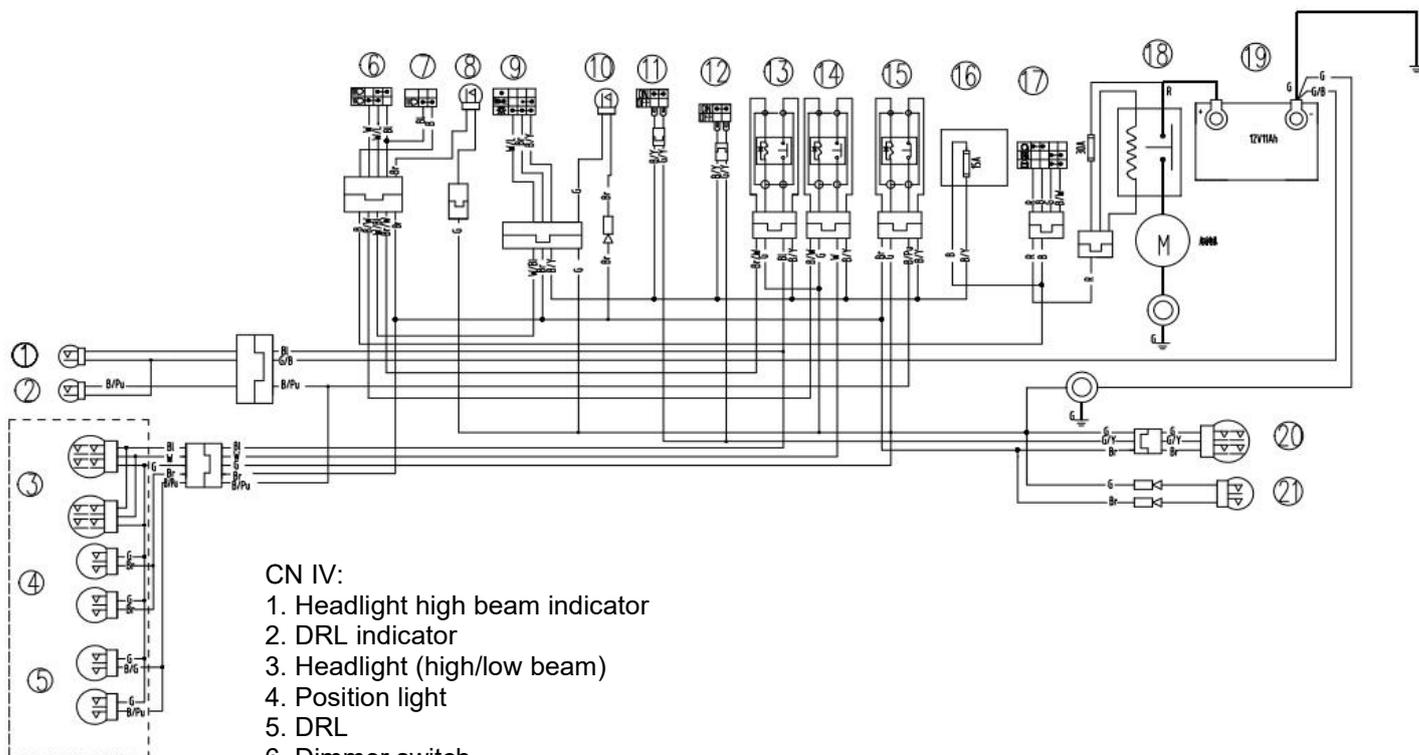


License plate light replacement

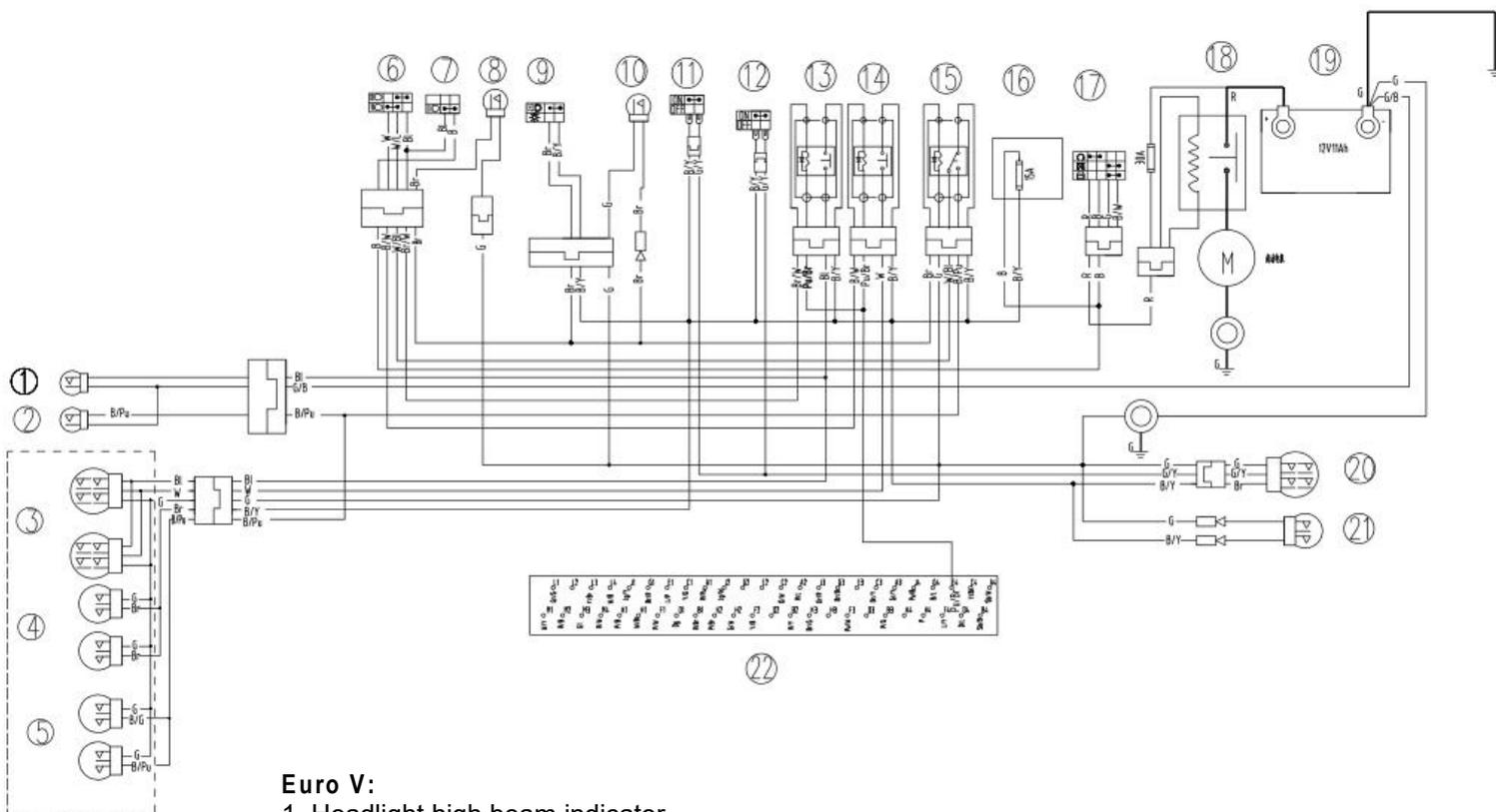
- Remove the passenger seat;
 - Remove the rear armrest;
 - Remove the rear fender lower tail cover and rear fender tail;
 - Disconnect the license plate light connector;
 - Remove the 4 screws [A] at the lower end of the license plate light.
 - Replace new license plate lights
- License plate light specification: LED 12V 0.6W
- Install in reverse order of removal



Light circuit wiring diagram



- CN IV:
1. Headlight high beam indicator
 2. DRL indicator
 3. Headlight (high/low beam)
 4. Position light
 5. DRL
 6. Dimmer switch
 7. Pass switch
 8. Left combination switch backlit
 9. Lighting switch
 10. Right combination switch backlit
 11. Front brake switch
 12. Rear brake switch
 13. High beam relay
 14. Low beam relay
 15. Light switching relay
 16. Fuse Box
 17. Ignition switch lock
 18. Start Relay
 19. Battery
 20. Tail light/Brake Light
 21. Rear license plate light



Euro V:

1. Headlight high beam indicator
2. DRL indicator
3. Headlamps (high/low beam)
4. Position light
5. DRL
6. Dimmer switch
7. Pass switch
8. Left combination switch backlit
9. Lighting switch
10. Right combination switch backlit
11. Front brake switch
12. Rear brake switch
13. High beam relay
14. Low beam relay
15. Light switching relay
16. Fuse Box
17. Ignition switch lock
18. Start relay
19. Battery
20. Tail light/brake light
21. Rear license plate light
22. ECU

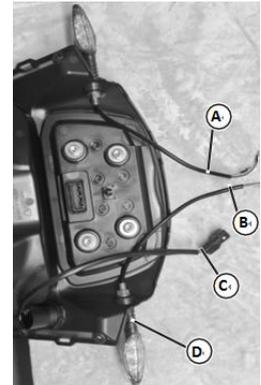
Turning signal**Replacement of right front turning signal assy**

- Remove the windshield assy;
 - Remove the front cover and left/right fairing;
(See Front Body Assembly Removal and Installation)
 - Disconnect connector [A][B];
 - Remove the turning signal fixing nut [E];
 - Remove the right front turning signal assy;
- Turning signal specification: LED 12V 1.7W

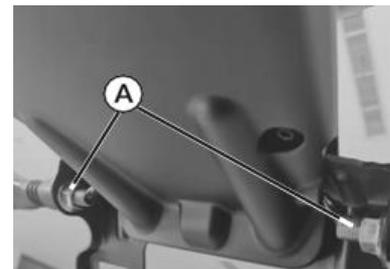
**Replacement of left front turning signal assy**

- The replacement of the left front turning signal is the same as that of the right front turning signal replace.

- Install in reverse order of removal.

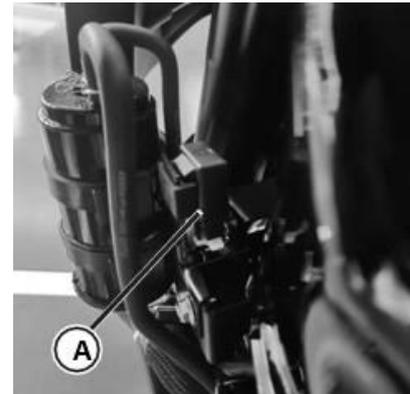
**Removal/installation of rear turning signals**

- Remove the bolt [A].
 - Disconnect the turning signal assy connector.
 - Replace the turning signal.
- Turning signal specification: LED 12V 1.7W
- Install in the reverse order of removal.



Direction indicator relays

- Remove the front cover
- Remove the left fairing(see removal of the fairing in the chapter on the chassis).
- Remove the intermittent direction indicator relay[A].


Inspection of the blinker

- Connect the 12V battery and turning signal according to the diagram

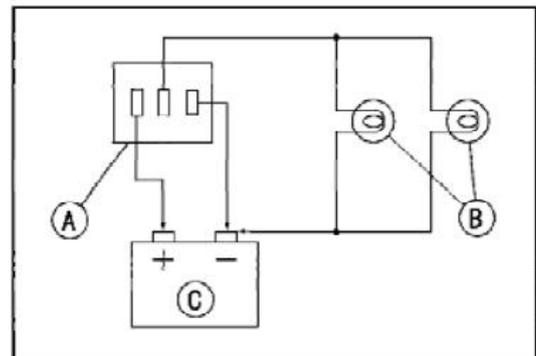
And count the number of flashes within one minute.

Blinker [A]

Turning Signal [B]

12V battery[C]

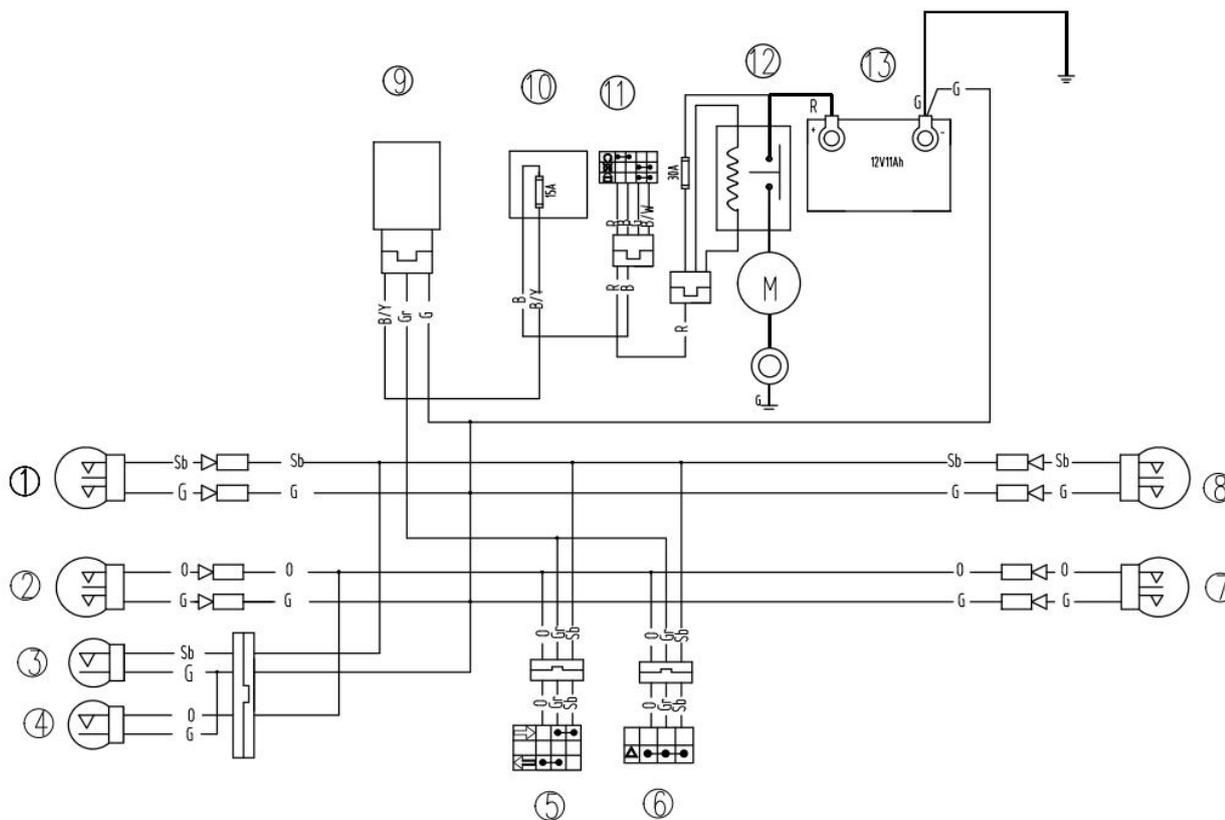
If the light does not flash as specified, replace the blinker.


Test the blinker:

Number of turning signals and Flashing frequency (times/min)

- 1: Connect only one turning signal, more than 150 times
- 2: Connect two turning signals, 60~120 times

Direction indicators wiring circuit diagram



1. Front left direction indicator
2. Left direction indicator LED
3. Right direction indicator LED
4. Front right direction indicators
5. Direction indicators relay
6. Direction indicators switch
7. Hazard lights switch
8. Rear right direction indicator
9. Rear left direction indicator
10. Battery
11. Ignition relay
12. Fuse box
13. Ignition switch lock

Radiator fan cooling system

Fan motor

Fan motor inspection

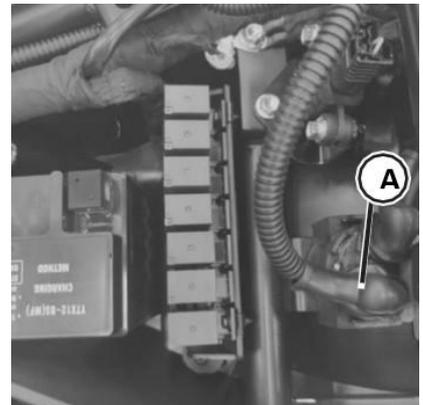
- Disconnect the connector[A].
 - Connect the battery power to the fan motor using the auxiliary cable.
- If the fan engine does not rotate, replace the fan



Fan relay

Fan relay inspection

- Remove the seat.
- Remove the auxiliary ignition relay [A] from the main wiring harness socket.



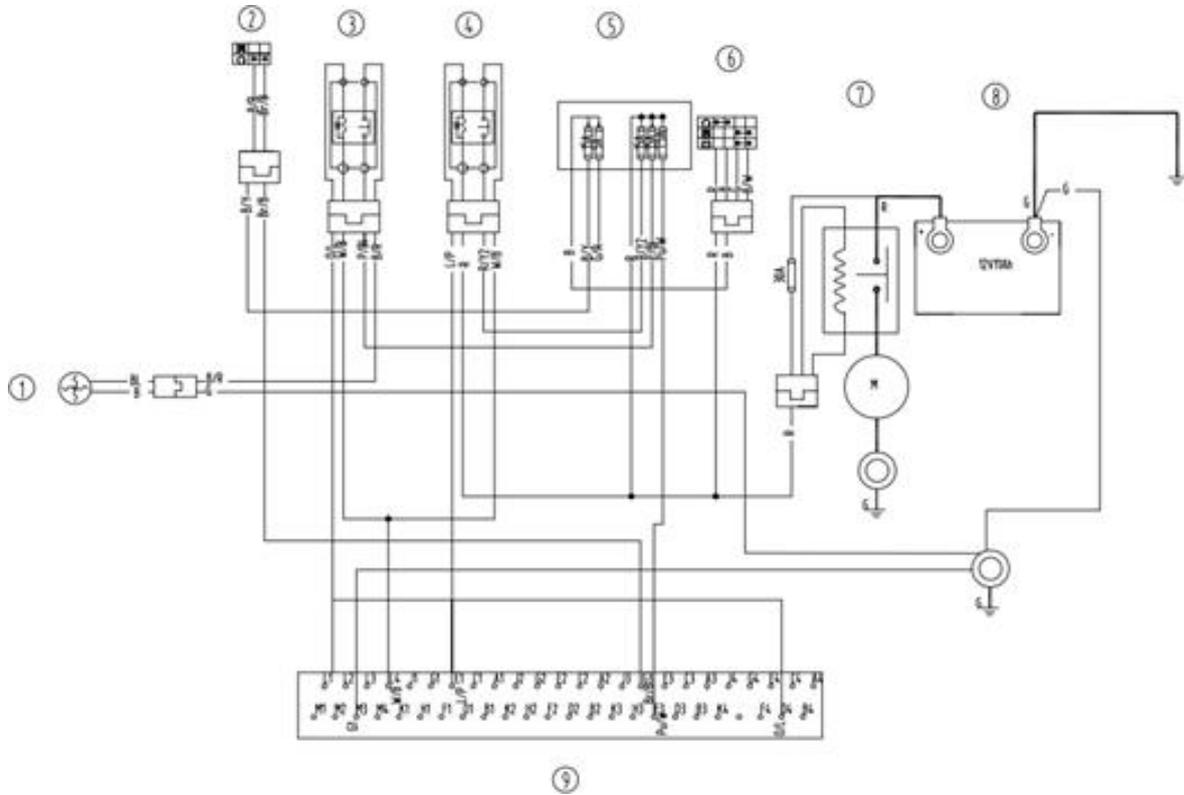
Fan relay on/off test

- See the auxiliary ignition relay on-off measurement.

Fan relay resistance measurement

- See the auxiliary ignition relay resistance measurement.
- Use the diagnostic tool test section to test the fan relay and the fan.
- If the fan rotates, the fan relay and the fan motor are not defective.

Radiator fan cooling circuit connection diagram



- 1. Fan motor
- 2. Ignition switch
- 3. Fan relay
- 4. Main relay
- 5. Fuse box
- 6. Ignition switch block
- 7. Ignition relay
- 8. Battery
- 9. ECU

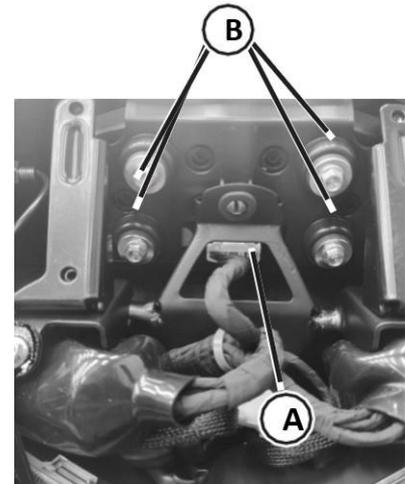
Instrument assembly

Instrument cluster removal

- Disassemble the front cover.
- Remove the connector[A].
- Unscrew the fixing screws [B] and remove the instrument cluster.

Warning

Place the instrument cluster face up to avoid scratching the LCD display.

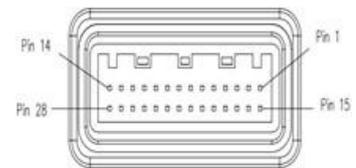


Instrument cluster inspection

- Remove the instrument cluster

Warning

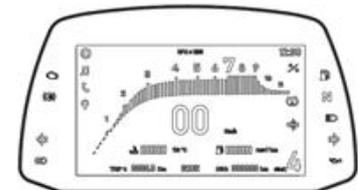
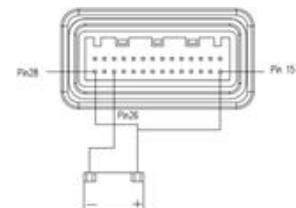
Do not drop the instrument cluster and place it face up. Do not short-circuit any terminals.



Pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Color	Black													
Function	+	-	12V											
Pin	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Color	Black													
Function	12V													

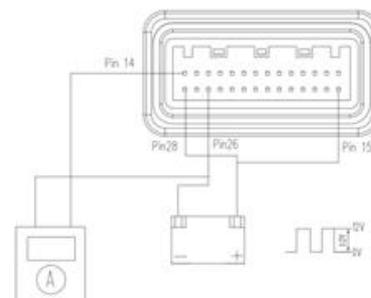
Liquid crystal display (TFT) section check

- Connect the 12V battery to the instrument cluster connector using the auxiliary wiring according to the diagram.
- Connect the positive battery terminal to the terminal [15][28].
- Connect the negative battery terminal to the terminal [26].
- The instrument self-test and all the indicators will turn on and then off.
- The instrument enters the normal display screen.
- The first and eighth fuel gauge cells will flash red.
- If you can't see the meter, replace the meter assembly.



Speedometer check

- Connect the 12 V battery and the terminal as specified in “TFT Control”.
- Input the square wave generated by the signal generator A (as shown in the illustration) to the terminal [14], equal to the speed of the input frequency.
- With an input frequency close to 428Hz, the speed is close to 60km/h. If a signal generator is not available, check the Speedometer as follows.
- Install the instrument cluster on the complete vehicle.
- Turn the ignition key.
- Start the motorbike or push it forward.
- Check the speedometer speed on the display.
- If the speedometer does not work, check the ABS wheel speed sensor and the ABS control unit.
- If the control unit and the speed sensor are normal, replace the instrument cluster.

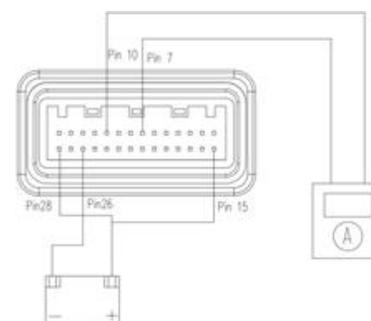


Odometer check

- Check the odometer in the same way as the speedometer.
- If the value indicated by the odometer does not increase, replace the instrument cluster.

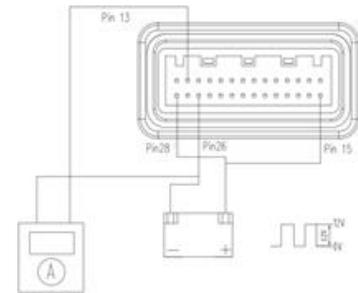
Fuel gauge check

- Connect the 12 V battery and the terminals as specified in the “Liquid Crystal Display check” section(TFT)”.
- Connect the resistance A(0-600Ω-1kΩ) to the terminal[7] and the terminal [10] as shown in the illustration.
- When the connection resistance is 0Ω, all 8 cells of the fuel gauge are displayed.
- When the connection resistance is 600Ω, 1 cell of the fuel gauge is displayed and the fuel warning lamp turns on.
- When the connection resistance is 1kΩ, the fuel gauge is not displayed and the fuel warning lamp turns on.



Speedometer check

- Connect the 12V battery and the terminals as specified in "TFT check".
- Connect the 12V battery and the terminals as specified in "LCD (TFT) check".
- Input the square wave generated by the signal generator A (as shown in the illustration) to the terminal [13].
At an input frequency of 100 Hz, the speed is 6000 RPM.



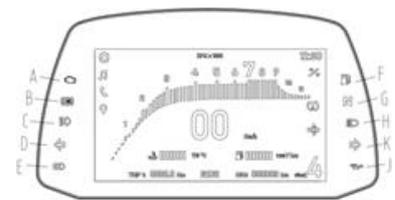
If no signal generator is available, check the speedometer as follows.

- Connect the 12V battery and terminals as specified in the "Liquid Crystal Display (TFT) check" section.
- Using the auxiliary wiring, disconnect and connect the terminal [13] to the terminal [26] repeatedly and quickly.
- The tachometer should indicate a value.

If the tachometer does not respond, replace the instrument cluster.

Warning lights check

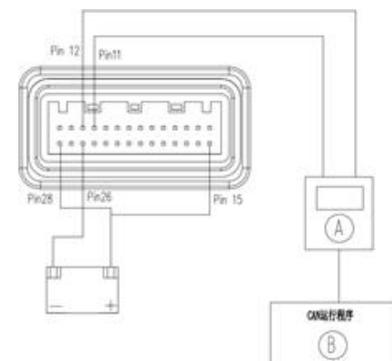
- Connect the 12 V battery and the terminals as specified in the "Liquid Crystal Display (TFT) check" section.
- Neutral warning light (LED)[G]
- Fault warning light (LED)[A]
- ABS warning light (LED)[B]
- Right direction indicator (LED)[K]
- Left direction indicator (LED)[D]
- High beam indicator (LED)[H]
- Oil pressure warning light (LED)[J]
- Fog light indicator (LED)[C]
- Daytime running light indicator (LED)[E]
- Fuel level warning light (LED)[F]



Using the auxiliary cable, connect the battery to the connector of the instrument unit according to the illustration.

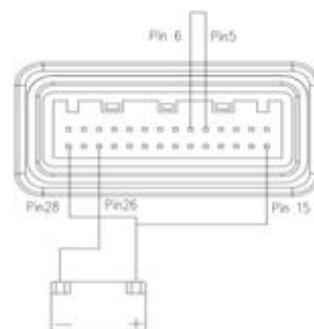
Use the CAN card reader and insert its controls into the device.

- ABS Warning Indicator (L E D)
- Use the auxiliary cable to connect pin 11 to CANL of the CANA board and pin 12 to CAN H of the CAN board.
- Run the CAN program, enter ID=00002b, send data 000000440000, the ABS warning light will be on.
- If it does not illuminate, replace the instrument cluster.

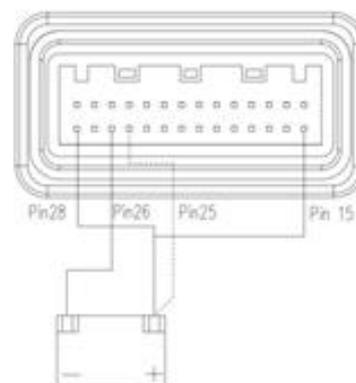


Neutral warning light (LED) [G]

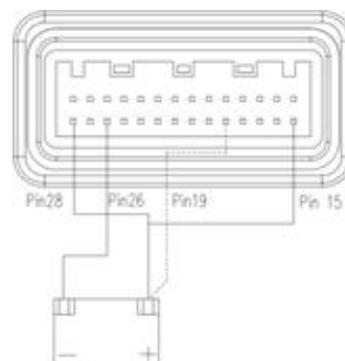
Connect the meter terminal [5] to the meter terminal [6], the neutral warning light should turn on, disconnect the meter terminal [5] from the meter terminal [6], the neutral warning light should turn off. If it does not meet the requirements, replace the meter assembly.


High Beam Warning Light (LED) [H]

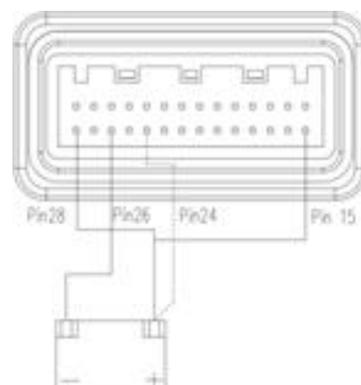
The battery terminal (+) is connected to the meter terminal [25]. When the battery terminal (+) is connected to the device terminal [25], the high beam indicator should be on, when the battery terminal (+) is disconnected from the device terminal [25], the high beam indicator should not be on. If it does not meet the requirements, replace the instrument cluster.


Left direction indicator (LED) [K]

Battery (+) terminal connected to the device terminal [24]. The left direction indicator should turn on when the battery terminal(+) is connected to the instrument terminal [24], and it should turn off when the battery terminal(+) is disconnected from the instrument terminal [24]. If it does not meet the requirements, replace the instrument cluster.


Right direction indicator (LED) [D]

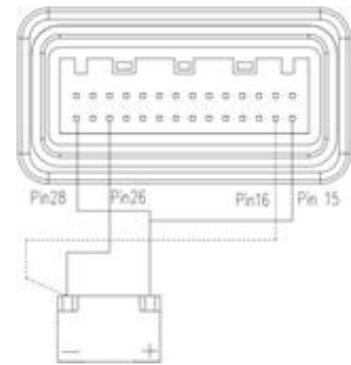
Battery terminal (+) connected to the meter terminal [19]. The left indicator should turn on when the battery terminal(+) is connected to the instrument terminal [19], and it should turn off when the battery terminal(+) is disconnected from the instrument terminal [19]. If not, replace the instrument cluster



Fault warning light (LED) [A]

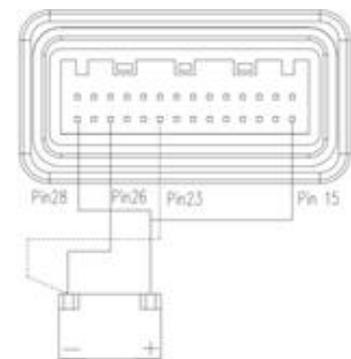
Negative battery terminal (-) to the instrument terminal [16].

The failure warning light should light up when the battery terminal (-) is connected to the instrument terminal [16] and turn off when the battery terminal(-) is disconnected from the instrument terminal[16]. If it does not meet the requirements, replace the instrument assembly.

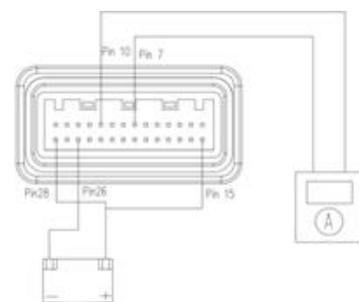

Oil pressure warning light (LED) [J]

Negative battery terminal (-) to the instrument terminal [23].

When the battery terminal (-) is connected to the instrument terminal [23], the oil pressure warning light should turn on, when the battery terminal (-) is disconnected from the instrument terminal [23], the oil pressure warning light should turn off. If it does not meet the requirements, replace the instrument assembly.

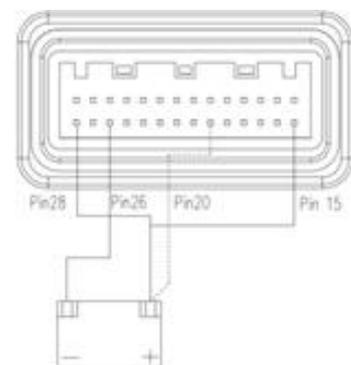

Fuel Level Warning Light (LED) [F]

Connect the resistor A (400 Ω) to the terminal [7] and to the terminal [10] as shown in the diagram, the fuel level warning light should turn on, if it does not, replace the gauge. replace the instrument assembly.


Daytime running light warning light (LED) [E]

Battery terminal (+) connected to the instrument terminal [20].

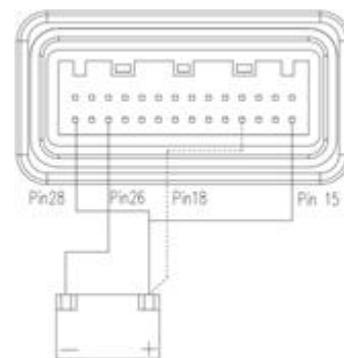
The daylight indicator light should turn on when the battery terminal(+) is connected to the instrument terminal [20], and it should turn off when the battery terminal(+) is disconnected from the instrument terminal[120]. If it does not meet the requirements, replace the instrument cluster.



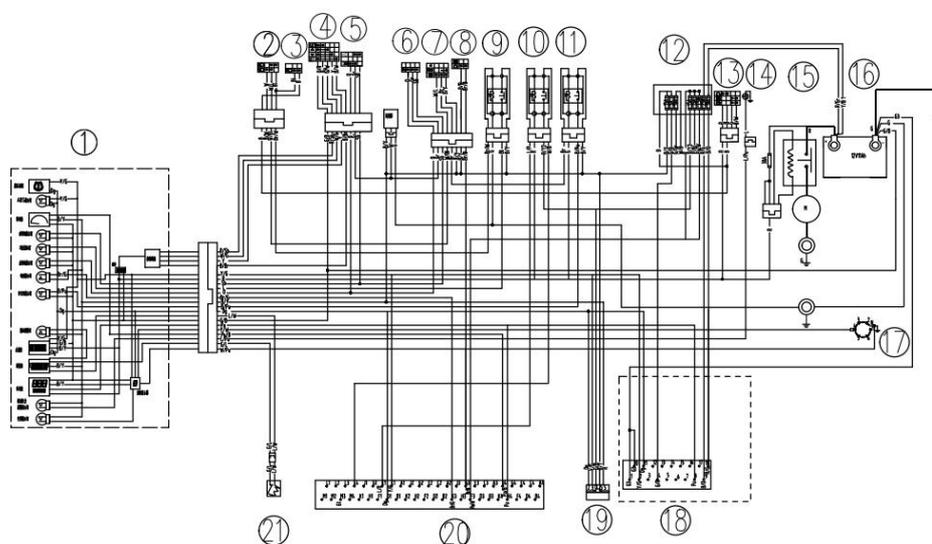
Fog light indicator (LED) [C]

Battery terminal (+) connected to the instrument terminal [18].

The fog light indicator should turn on when the battery terminal(+) is connected to the instrument terminal [18], and turn off when the battery terminal (+) is disconnected from the instrument terminal [18]. If it does not meet the requirements, replace the instrument cluster.



Instrument cluster circuit connection diagram



1. Switch instrument assembly
2. Variable light switch
3. Override
4. Select the button combination
5. Steering switch
6. Double flash switch
7. Lighting switch
8. Engine shutdown switch
9. High beam relay
10. Main relay
11. Light switching relay
12. Safety box
13. Ignition switch lock
14. Oil pressure alarm switch
15. Ignition relay
16. Buffer batteries
17. Gear switch
18. ABS system central check
19. Tyre pressure central check
20. ECU
21. Fuel sensor

Switches and sensors

Brake light timing check

Brake light timing check

- See the brake light switch operation check in the periodic maintenance chapter.

Brake light timing adjustment

- See the brake light switch operation check in the periodical maintenance chapter.

Switch check

- Using a multimeter, check the connector connection (approximately zero ohms) as shown in the indicators table.
- See the following diagram for the connection and the switch on/off relation. If the switch is open or short circuited, repair it or replace it with a new one.

Front/rear brake light switch connection		
Colour	B/Y	G/Y
When the brake pedal is pressed (ON)	O-----	----O
When the brake pedal is released (OFF)		

Side stand switch connection			
Colour	Black/white	Green	White/ green
When the stand is raised (UP)	O-----	-----O	
When the stand is lowered (DOWN)		O-----	-----O

Neutral switch connection		
Colour	Black	Grounding
When the gear is in neutral	O-----	----O
When the gear is engaged		

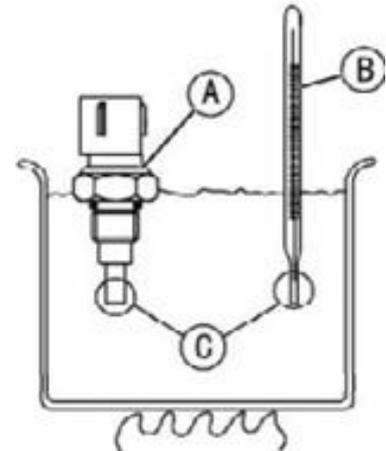
Oil pressure warning switch connection (if the engine lubrication system is good)		
Colour	Blue	Grounding
When the engine is switched off	O-----	----O
When the engine is operating		

Clutch switch		
Socket (ON)	O-----	----O
Release (OFF)		

Water temperature sensors

Water temperature sensor inspection

- Water temperature sensor removal(see EFI chapter,Removal/Installation).
- Insert the sensor[A] into the coolant container so that the sensor head [C] and the threaded part [C] are immersed in the coolant.
- Place an immersed thermometer [B] at the same depth as the water temperature sensor head.

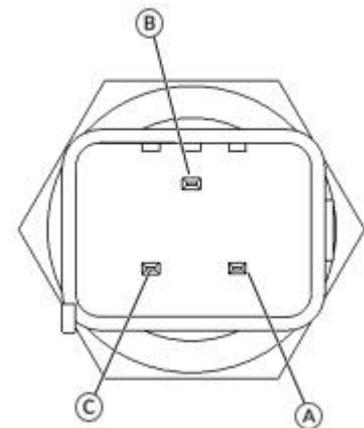


Note

The sensor and thermometer must not touch the side or the bottom of the container.

- Place the container in a heat source and slowly increase the coolant temperature while gently stirring the coolant.
- Using a multimeter, measure the sensor's internal resistance.

If the multimeter does not show the specified value, replace the sensor.



Water temperature sensor resistance

See table below for the specific values

A. Resistance C-Terminal

Temperature (°C)	Resistance (kΩ)
-20	12-18
0	5-7
20	2-3
80	0.3 - 0.35
100	0.12 - 0.18

Ground resistance at the terminal B

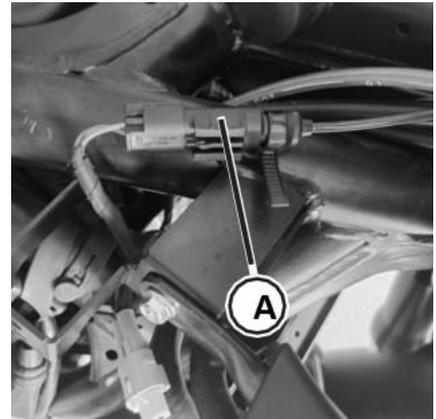
Temperatura (°C)	Resistenza (Ω)
50	135-220
120	16-20

Speed sensors

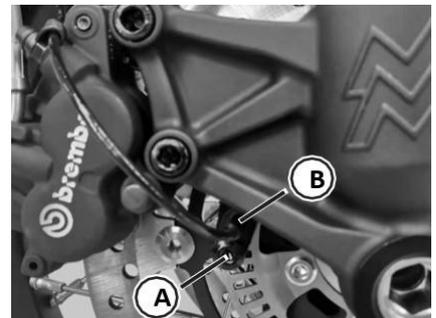
Speed sensor removal

Front wheel speed sensor

- Front wheel speed sensor removal
- Disconnect the front wheel speed sensor cable connector[A].



- Remove the screw[A].
- Remove the front wheel speed sensor[B].



Front wheel speed sensor installation

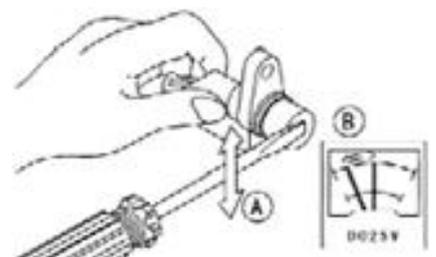
- The installation is carried out in the reverse order of removal.
- Speed sensor fastening screw torque: 8Nm

Note

Take care to correctly position the possible present spacers.

Front wheel speed sensor inspection

- Remove the front wheel speed sensor (see Removing the front wheel speed sensor).
- Connect the front wheel speed sensor connector [A] and the battery [B], the 10k Ω resistance [C] and the multimeter [D] according to the diagram.
- Set the multimeter [D] to the frequency setting
- Slide a screwdriver [A] up and down against the surface of the speed sensor.
- The corresponding frequency can be read by a multimeter.
- If the multimeter does not read the data,replace the front wheel speed sensor.

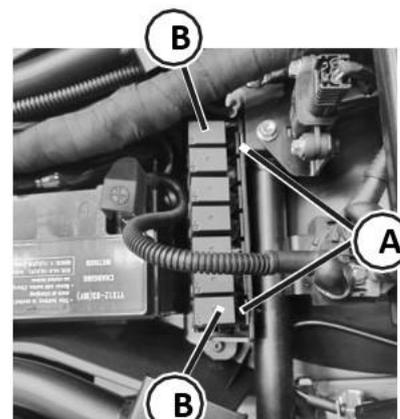


Relays and fuses

High/Low beam relay

High beam relay removal

- Remove the rider's seat.
- Remove the screws[A].
- Disconnect the connector[B].



High beam relay installation

Installation in the opposite direction to removal.

High beam relay on/off measurement

See the auxiliary ignition relay for on-off measurements

High beam relay resistance measurement

See the auxiliary ignition relay resistance measurement

Low beam relay

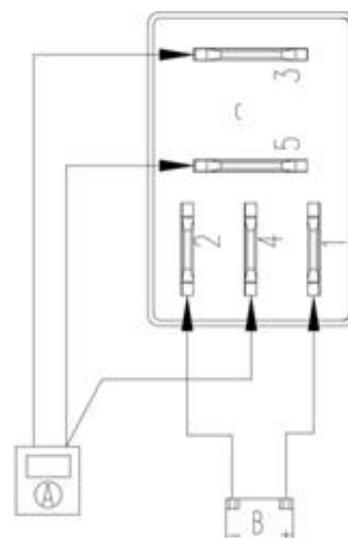
Carry out the same checks as for the high beam relay

Low beam / high beam switching relays

Removal and installation method as for the high beam relay

Light switching relay on/off measurement

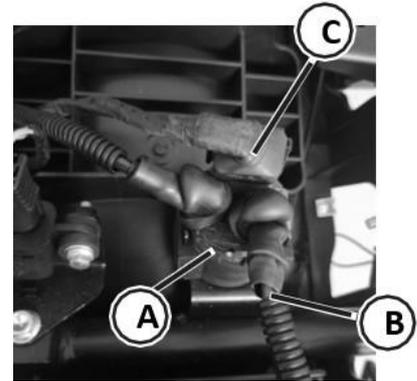
- Test the light switching relay [C] with a multimeter [A] and a 12 V battery [B], connected according to the diagram.
Multimeter A connected to the pins 3 and 5 of the C relay. Multimeter resistance when the battery is connected :0Ω, when the battery is disconnected: ∞ Ω
- If the relay does not operate as specified, the relay is faulty. Replace the relay.
- Multimeter A is connected to pins 3 and 4 of the C relay. When the battery is connected, the multimeter resistance is ∞ Ω. When the battery is disconnected, the multimeter resistance is 0Ω.
- If the relay does not operate as specified, the relay is faulty. Replace the relay.



Main fuse

Main fuse removal

- Remove the seat.
- Remove the ignition relay[A].
- Disconnect the fuse connector[B].
- Remove the main fuse[C]

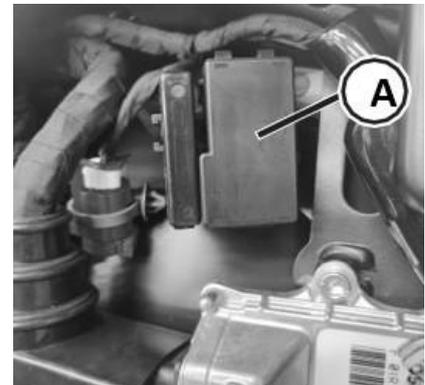


Main Fuse assembly

- Install in the reverse order of removal.

Fuse removal from the fuse box

- Remove the seat
- Open the fuse box cover[A].
- Remove the fuse[B].
- Spare fuse [C]



Fuse assembly from the fuse box

Install in the reverse order of removal.

Fuse Inspection

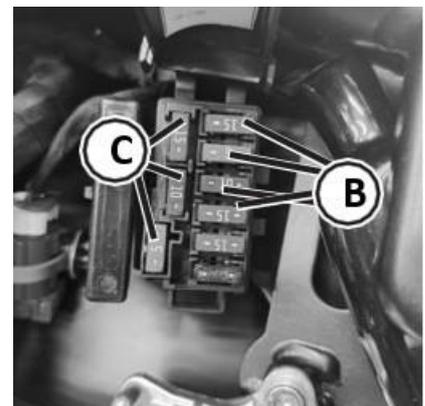
Remove the fuse.

Inspect the fuse assembly

If it is blown, replace the fuse. Before replacing a blown fuse, check the current value of the affected circuit. If the current value is equal to 0, replace it.

If the current value is equal to or greater than the fuse rating, check the wiring and the related parts for a possible short circuit.

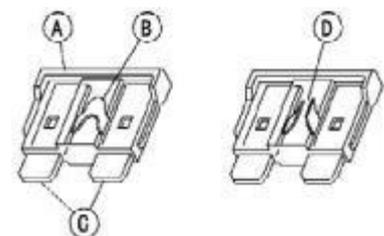
- Housing[A]
- Fuse assembly[B]
- Terminal[C]
- Blown assembly[D]



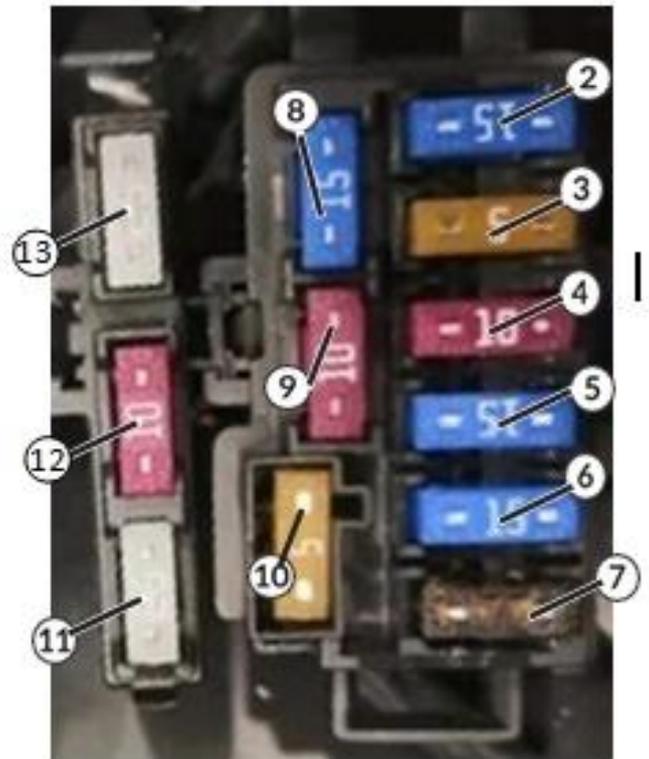
Important

When replacing a fuse, make sure the new fuse matches the fuse in the specified circuit.

Installing a high-value fuse may result in damage to wiring and components.



No.	Ah	Functions
2	15	Headlight and Signal Systems
3	5	ABS system
4	10	Oxygen sensor heating
5	15	Oil pump relay, main relay
6	15	Fan Relay/Start Auxiliary Relay
7	7.5	ECU
8	15	backup fuse
9	10	backup fuse
10	5	backup fuse
11	25	backup fuse
12	10	ABS system
13	25	ABS system



Chapter 13

Diagnostics



Vehicle diagnostics

For a correct reading of the diagnosis rely on the most reliable and widespread instruments on the market.

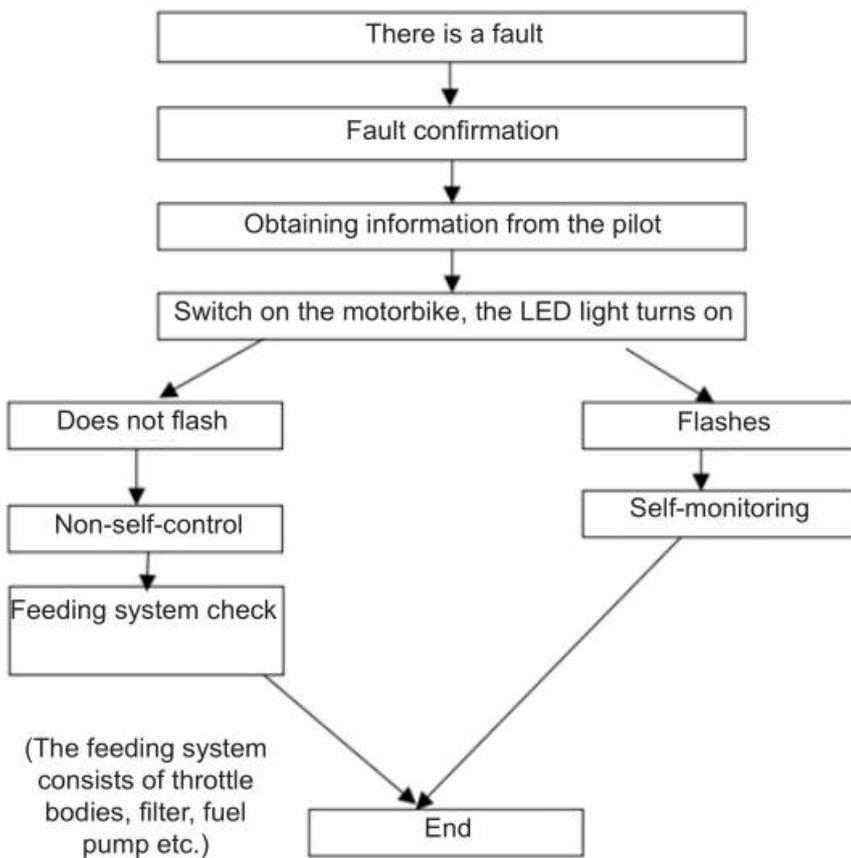
The company declines all responsibility for any damage that may occur due to the use of unsuitable equipment for this type of intervention..

Maintenance instructions

On-Board Diagnostic (OBD) is the abbreviation for On-Board Diagnostic. When there is a fault in the EFI system, the fault warning light (MIL) turns on, reminding the user to repair and remove the fault in time. At the same time, the OBD system stores fault information in the memory, which can be read in the form of fault codes through standard diagnostic tools and diagnostic interfaces. Based on the fault codes, the service personnel can quickly and accurately determine the nature and the location of the fault.

Special note:Please use original parts,otherwise the normal operation of the EFI system cannot be guaranteed. Some EFI parts are similar in shape and mounting dimensions, but have completely different performance parameters.

Diagnostic flowchart



Fault diagnostics tool connection and use

Diagnostics tool functions: reading fault codes, deleting fault codes, displaying and recording the data stream, displaying the status situation, etc.

- 1) Connect the diagnostics tool to the complete vehicle diagnostics interface.
- 2) Turn on with the key and the ignition switch.
- 3) Read fault codes; query the fault code list; develop a maintenance plan based on query information and on experience.
- 4) After troubleshooting, delete historic fault codes with a fault diagnostics device.

Recording error messages

The ECU constantly checks sensors, actuators, associated circuits, fault indicators and battery voltage, as well as the ECU itself. It also checks sensor output signals, actuator activation signals and internal signals such as λ closed-circuit check, coolant temperature, idle speed check and battery voltage check. As soon as a fault is detected in one of the segments, or a signal value is not credible, the ECU completes a recording of the fault message in the memory and illuminates a warning light. Fault information is recorded in the form of fault codes. Fault codes that have always existed at the time are called current fault codes; transient faults caused by poor contact etc. that have since disappeared are recorded as historical fault codes; faults that have been removed but for which no clearing operation has been carried out are stored in memory as historical fault codes.

Error codes list

If the EFI system reports an anomaly, please compare the following table:

Component	Fault code	Cause of the problem
Cylinder 1 oxygen sensor	P0030	Cylinder oxygen sensor heating cable disconnection
	P0031	Cylinder oxygen sensor heating cable shorted-circuited to ground
	P0032	Cylinder oxygen sensor heating cable short circuited at 12V
	P0053	Insufficient heating of the cylinder oxygen sensor
	P0130	Cylinder oxygen sensor signal heating cable short-circuited with the signal cable
	P0131	Oxygen sensor signal cable to ground (Voltage less than 30mV)
	P0132	Oxygen sensor signal cable short-circuited (Voltage higher than 1000 mV)
	P0133	Slow response of the oxygen sensor
	P0134	The cylinder oxygen sensor is not responding
	P00D1	Low input current
	P2195	The O2 signal is consistently lower than 400mv when the "PE" mode is enabled
	P014D	O2 signal passing from "lean" to "fat" status is longer than calibrated value
	P014C	O2 signal passing from "fat" to "lean" status is longer than calibrated value
Ignition coil check	P2301	The corresponding feedback is different from the command
	P2300	The corresponding feedback is different from the command

Component	Fault code	Cause of the problem
Cylinder 2 oxygen sensor	P0050	Cylinder oxygen sensor heating cable disconnection
	P0051	Oxygen sensor signal cable to ground (Voltage less than 30mV)
	P0052	Oxygen sensor signal cable short-circuited (Voltage higher than 1000 mV)
	P0059	Insufficient heating of the oxygen sensor
	P0150	Cylinder oxygen sensor signal heating wire short-circuited with the signal cable
	P0151	Cylinder oxygen sensor signal cable disconnection
	P0152	Cylinder oxygen sensor signal cable short-circuited
	P0153	Slow response of the cylinder oxygen sensor
	P0154	The cylinder oxygen sensor is not responding
Throttle position sensor	P0122	Ground throttle position sensor cable (Voltage less than 0.25V)
	P0123	Short circuit in the throttle position sensor signal cable (Voltage higher than 4.75V)
Intake air absolute pressure sensor	P0105	MAP signal change is less than 10kpa
	P0106	Anomaly of the intake air absolute pressure sensor
	P0107	Grounded inlet air absolute pressure sensor cable (Voltage less than 0.1V)
	P0108	Short circuit in the intake air absolute pressure sensor cable (Voltage higher than 4.9V)

Component	Fault code	Cause of the problem
Intake air temperature sensor	P0111	Intake air temperature sensor malfunction (Intake air temperature variation cold/hot engine less than 2 degrees)
	P0112	Grounded intake air temperature sensor cable (Voltage less than 0.1V)
	P0113	Short circuit in the intake air temperature sensor cable (Voltage higher than 4.9V)
	P0114	The rate of erratic change of the intake air temperature sensor signal is greater than 3.2 degrees centigrade
Cylinder 1 injectors	P0201	Disconnection of the cylinder 1 injector line
	P0261	Cylinder 1 injector wiring short circuited to ground
	P0262	Cylinder 1 injector wiring short circuited to 12V
Cylinder 2 injectors	P0202	Disconnection of the cylinder 1 injector line
	P0264	Cylinder 1 injector wiring short circuited to ground
	P0265	Cylinder 1 injector wiring short circuited to 12V
Cylinder 1 high-voltage circuit	P2300	Disconnection of the cylinder high voltage line
Cylinder 2 high-voltage circuit	P2303	Disconnection of the cylinder high voltage line
Engine	P0301	Ignition failure
CDI	P0322	No speed signal
Crankshaft position sensor	P0335	The corresponding feedback is different from the command
ECM	P0601	CVN check
Canister solenoid valve	P0458	Interruption of the solenoid valve circuit
	P0459	Short-circuited solenoid valve wiring
Cooling fan	P0480	Disconnection in the fan wiring
	P0691	Fan line short-circuited
	P0692	Fan wiring short circuited at 12V
Battery	P0560	System voltage failure
	P0562	Low system voltage
	P0563	High system voltage
Idle control system	P0505	Engine revs 500rpm higher than normal when the engine is hot

Component	Fault code	Cause of the problem
Water temperature sensor	P0116	Anomaly in the water temperature sensor (Cold/hot engine temperature variation lower than 20 degrees)
	P0117	Water temperature sensor signal grounded cable (Voltage less than 0.1V)
	P0118	Short circuit in the water temperature sensor signal cable (Voltage higher than 4.9V)
	P0119	Water temperature sensor signal anomalies
	P1116	Anomaly in the water temperature sensor (Coolant temperature when the engine is cold is 60 degrees above the room temperature)
Fault light	P0650	MIL light fault
Stepping engine	P0506	Low idling speed
	P0507	High idling speed
Lambda Probe	P2177	Cylinder 1 burning too lean
	P2178	Cylinder 1 burning too fat
	P2179	Cylinder 2 burning too lean
	P2180	Cylinder 2 burning too fat
Fuel pump	P0627	Break in the fuel pump line
	P0628	Short-circuited fuel pump line
	P0629	Fuel pump wiring short circuited at 12V
	P0232	The corresponding feedback is different from the command
	P0231	The corresponding feedback is different from the command

MIL warning light description and check strategy

The MIL is a warning light that can be displayed on the instrument and it is set to meet the regulatory standard requirements. It indicates the engine faults according to its status: off, steady light or flashing light.

The instructions of the fault indicator are as follows:

1) Warning light off, no fault code

Turn the ignition key, the ECU initialises and the fault warning light turns on, then turns off immediately after starting the engine, indicating that the engine is operating correctly.

2) Permanent warning light, presence of a fault code

If a fault occurs during the engine operation, the fault warning light changes from off to on to warn the driver that a fault has occurred. The fault code is stored in the ECU memory. To read the error code, connect the diagnostic tool to the OBD socket on the motorbike, retrieve the code and compare it with the error code table and act accordingly.

3) Warning light flashing

If the warning light is flashing when the engine is running, it indicates a malfunction due to a failure to ignite one of the cylinders, recognised by the EFI system. When the cause of the event returns, the warning light turns off without any intervention by the technician, however it is possible to check the error code recorded and compare it with the error code table. If the problem recurs, investigate the cause of the engine malfunction.

4) Fault clearance

The fault warning light is always illuminated when the engine is running, indicating the presence of a fault (either a current fault or a historical fault); if it is a historical fault (a fault that has been cleared), the engine can be started and run for 2 to 3 minutes, then shut down the engine and wait more than 10 seconds before starting it again, and so on for 4 times before the fault warning light turns off; If it is a current fault, the entire motorbike must be checked, and after clearing the current fault, operate as a historical fault to make the fault warning light turn off.

It is recommended that the diagnostic tool be used to clear historical fault codes directly after the fault has been found. The fault warning light will return to normal immediately after clearing, and at the same time it will facilitate subsequent fault recurrence without the interference of fault codes remaining from the last repair.

5) Error code for maintenance

If the error code is described as open circuit, short circuit and component failure, first check whether the corresponding connector is installed in place, whether the connector pin order meets the system requirements, whether the connector insert is oxidised, bent resulting in poor contact or even line failure, if the fault is still present after eliminating it then replace the corresponding sensor or the ECU.

Common faults and troubleshooting methods

Note

This is a simple guide to solve the most common problems and it is not a complete list of possible causes for each problem listed.

1) If, when the ignition is turned, the power supply is present but the fuel pump does not work, carry out the following checks in sequence:

- Check the fuel pump relay pins for poor contact
- Check the fuel pump relay for damage
- Check if the battery voltage is less than 12V
- Check that the fuel pump connector is in good condition and that the pins are not bent or oxidised
- Check with a multimeter that the fuel pump pin and the relay circuit are continuous and that the sequence of the wires is correctly arranged
- With the ignition switched on, check that the fuel pump connector pos-

itive voltage is 12V.

- Check that the control unit is properly connected to the wiring harness,
- move the control unit connector to disprove any false contact
- Replace the ECU and observe if the fuel pump works
- Replace fuel pump

2) If, when turning the ignition switch, the power supply is present but the starter motor does not work, carry out the following checks in sequence:

- Check that there is no gear engaged
- Check with a multimeter that there are 12V at the starter motor input
- Check whether the battery voltage exceeds 12V
- Check that the ignition relay is properly grounded
- Check that the ignition relay control has 12V when the starter button is pressed
- Check the starter auxiliary relay C2 wire for power supply
- Check that the ignition relay has 12V when the starter button is pressed
- Replace the ignition relay and the starter auxiliary relay
- Check that the ECU is properly connected to the wiring harness, move the ECU connector to disprove any false contact
- Replace the ECU
- Check that the motor is correctly assembled and that it is not blocked
- Replace the starter motor

3) If the ECU and the starter motor work normally, but the motorbike does not start, carry out the following checks in sequence:

- Check that the starter motor speed is >300rpm at start-up
- Check that the battery voltage does not fall below 10V during start-up
- Check that the engine speed monitored by the ECU is the same as the actual engine speed
- Check that the gear lever is in neutral
- Check if the cylinder 1 injection and the cylinder 2 injection are normal
- Turn the key several times to ensure sufficient petrol pressure
- Disconnect the rollover sensor
- Check the correct cylinder compression
- Check the correct fuel pressure
- Check the correct valve clearance
- Replace the ECU

4) If the idle speed is low and the vehicle shuts down, carry out the following checks in sequence:

- Using a diagnostic tool, check whether the atmospheric pressure reported by the vehicle is the same as the local atmospheric pressure
- Check that the intake air temperature/engine temperature is the same as the actual temperature
- Check whether the lambda sensor voltage, the wire sequence, the on/off and the pins are correct
- Check the correct fuel pressure
- Inspect the throttle valve for dirt build-up
- Check the stepper engine action at idle
- Check injectors and spark plugs for correct operation
- Check the exhaust pipe for internal fractures and foreign objects

- Check the valve clearance
- Check that the control unit is well connected to the wiring harness, move the control unit connector to disprove any false contact

5) If the idle speed is high and the vehicle shuts down shortly afterwards, carry out the following checks in sequence:

- Using a diagnostic tool, check that the air pressure and the throttle position are correct.
- Check that the actual throttle position is at zero and that the idle adjustment screw has not been adjusted by the user
- Check the throttle body and the manifold assembly for any air intake
- Replace the throttle valve assembly

6) If there is no engine response when the throttle is turned, perform the following checks in sequence:

- Use diagnostics to check if the throttle position is synchronised with the rotation of the knob
- Check if the engine intake pressure is correct
- Use a multimeter to check if the pressure sensor / intake temperature, the throttle valve position sensor wire sequence, on/off and pins are normal
- Check for the correct fuel pressure

7) If the cooling fan does not start when the set engine temperature is reached, perform the following checks in sequence:

- Use a multimeter to check that the fan connector ground, the fan wire sequence, on/off and that the pins are correct.
- Check the fan relay
- Check the wire sequence and the fan relay on/off
- Check that the ECU connections are normal and that the pins are not bent, deformed or making false contact
- Replace the fan relay
- Check that the ECU is properly connected to the wiring harness, move the ECU connector to disable any false contact
- Replace the fan

8) If the cooling fan is always running, carry out the following checks in sequence:

- Using a diagnostic tool, check that the engine temperature is the same as the actual temperature
- Check that the water temperature sensor wire sequence, on/off and pins are correct
- Check the fan relay
- Replace the temperature sensor
- Check that the control unit is properly connected to the wiring harness, move the control unit connector to disprove any false contact.

Chapter 14

Attachments



Inspection
Marzocchi fork Ø50
Cod.1311488 Moto Morini X-Cape
Version: January 2022



General notes

This document is for the exclusive use of the vehicle manufacturer for the suspension's use and maintenance activities, which remain under his responsibility. In order to avoid any malfunctions, please follow the instructions in this document scrupulously. At the time of writing, this instruction complies with the product in question. No changes will be made to this document in the event of any changes to the product.

The fork layout has a compression pump on the left leg and an extension pump on the right leg.

The fork pumps are not revisable, but they are identical in shape and size.

As follows, the removal and reassembly procedures for one leg only will be described. The topics discussed will therefore apply to both fork legs.

Required tools

In addition to a suitably sized bench vise, fitted with grips made of a suitable material to preserve the components' integrity, the following commercial tools will be required:

- Torque wrench with 14mm socket and 6mm Allen key
- 17mm open-end spanner
- 14mm closed-end spanner
- Medium flat-blade screwdriver
- Graduated oil container
- Adhesive paper tape
- Millimetre rod

The following specific tools will also be required:

- Spanner for octagonal cap cod.R5294
- Beater for seals Ø50 cod.R5101AC
- Rod for pumping device M12x1,25 cod R5051AC

Preliminary operations

Before starting disassembly, it is important:

- To record the compression and rebound adjustment screws positions in relation to the "fully closed" position.
- To record the two spring preload adjustment positions in relation to the "fully open" position.

Disassembly

- Completely loosen the preload adjustment(A) with the 14 mm spanner
- Fully tighten the hydraulic adjustment (B) with the screwdriver
- After having clamped the wheel holder in a vice with the appropriate precautions, unscrew the cap (C) with the special R5294 spanner, keeping the stem vertical to prevent oil leakage.

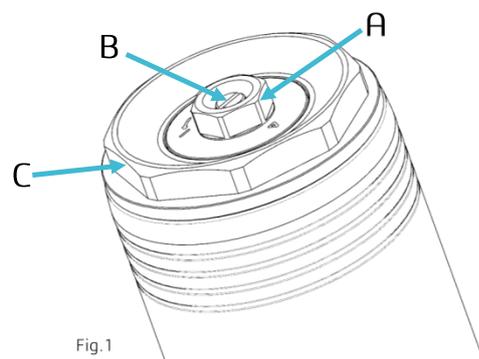


Fig.1

- Lower the scabbard and then the plastic spacer (E), compressing the spring as in Fig. 2 to insert the 17 mm spanner in the lock nut(D) on the pumping rod.
- Unlock the cap by acting on the preload adjustment (A) with a 14mm spanner and on the lock nut (D) with a 17mm spanner.

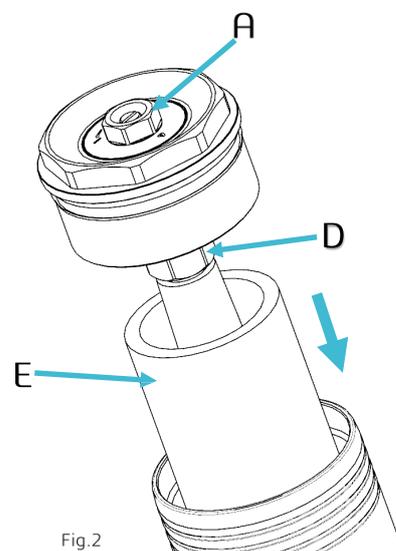
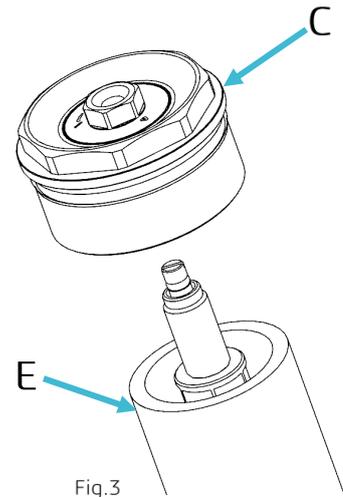
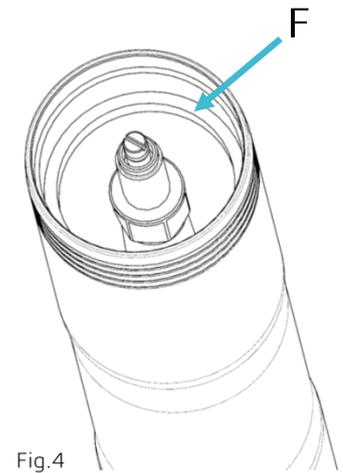


Fig.2

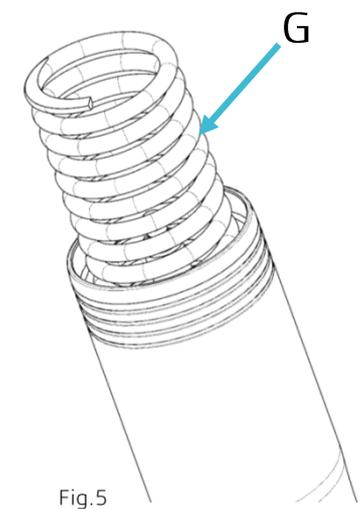
- Unscrew the cap (C) by hand and remove it from the pump rod
- Remove the 17mm spanner from the lock nut and slide off the plastic spacer (E)



- Remove the rubber bumper ring (F) located in the scabbard under the cap thread.



- Remove the spring (G)
- Release the stem from the vice and pour the oil into a container.



- Re-tighten the wheel holder in the vice, taking the necessary precautions.
- Unscrew the screw (H) using a 6 mm Allen key and remove it, taking care to remove the sealing washer (I) from its seat.
- Extract the pumping unit

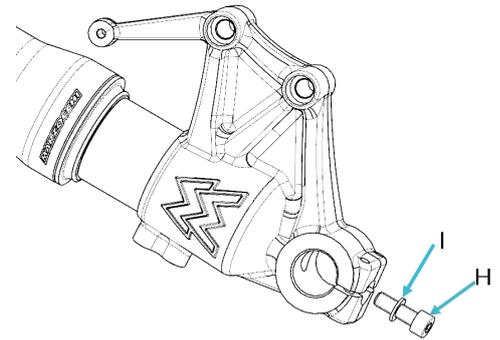


Fig.6

- Using the screwdriver, remove the dust scraper (L) from its seat, levering it into the slot between the dust scraper and the scabbard, taking care not to damage the components.
- Using the same screwdriver, remove the retaining ring (M) from its seat, taking care not to damage the barrel.
- By pulling it out as far as it will go with a vigorous movement it is now possible to free the scabbard from the bushing and the retaining ring.

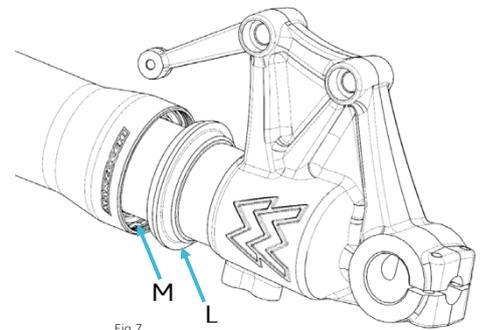


Fig.7

- Using the screwdriver, expand the cut in the upper bushing (Q) and remove it from its seat.
- Then remove the lower bushing (P), the spacer (O), the oil seal (N), the retainer ring (M) and the dust scraper(L)
- Pay attention to the spacer (O) and oil seal (N) assembly direction. It is essential that these components are fitted in the correct direction when reassembling.

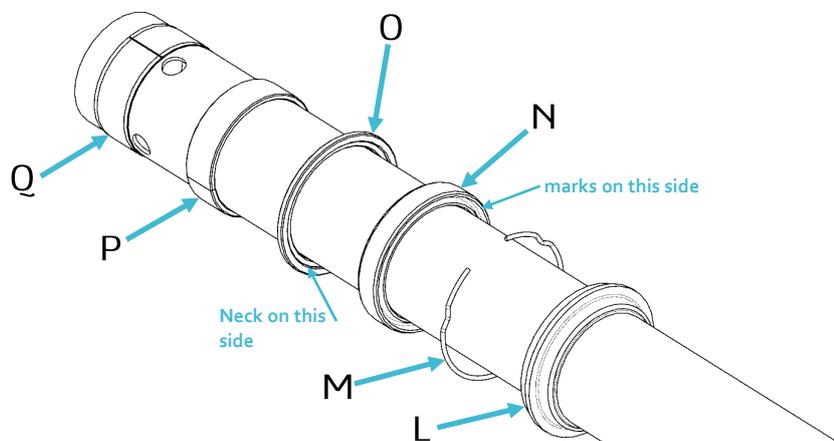
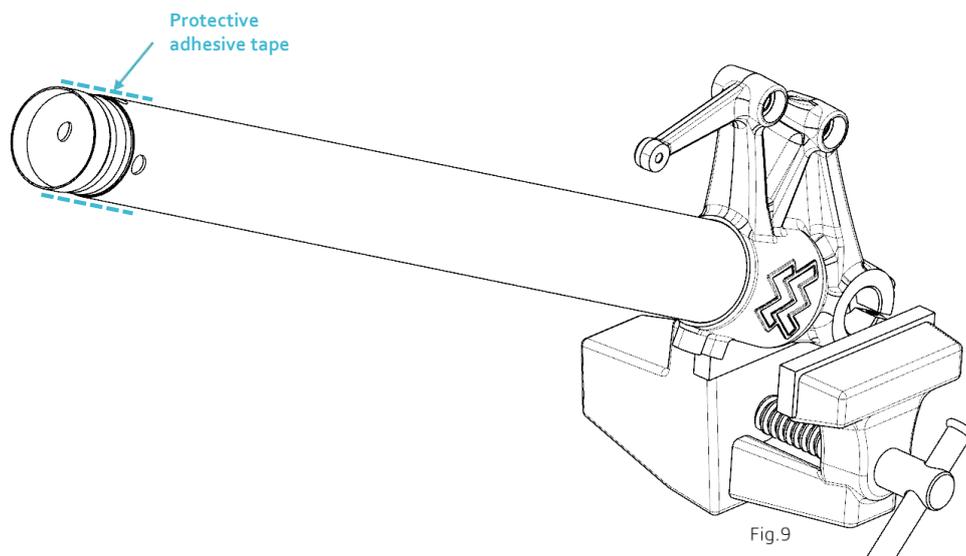


Fig.8

- Carefully clean the barrel and check the working surface for signs of damage requiring replacement.
- Carefully clean the inside of the scabbard and check the working surface and the sealing ring seat for signs of damage.
- During assembly, in addition to components that show obvious damage or signs of wear, all the components listed below must be replaced:
 - Upper bushings Ref.(Q)Fig.8
 - Lower bushings Ref.(P)Fig.8
 - Oil seal Ref.(N)Fig.8
 - Dust scraper Ref.(L)Fig.8
 - Hydraulic oil

- Tighten the wheel holder in a vice with appropriate precautions
 - Wrap the barrel end with adhesive paper tape
- Covering the holes and the bushing seat as shown in Fig.9 will ensure the integrity of the new seals during assembly.



- Insert the dust scraper(L) and the oil seal(N) with the utmost care and respecting the assembly direction indicated in Fig.10.
- Remove the protective tape applied previously and check that there are no residues.
- Insert the spacer (O) respecting the assembly direction as shown in Fig. 11.
- Insert the lower bushing (P) and then insert the upper bushing (O) into its seat.

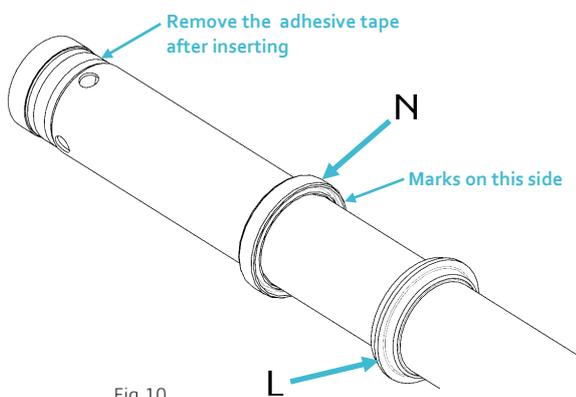


Fig.10

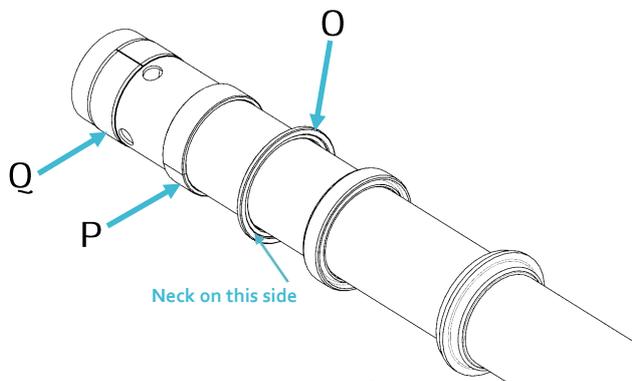


Fig.11

- Insert the two shells of the R5101AC beater on the barrel as shown in Fig.12.
- Insert the scabbard on the barrel.
- Lubricate the oil seal outer surface (N) and place the oil seal (N), the spacer (O) and the lower bushing (P) in the scabbard seat, using the beater.

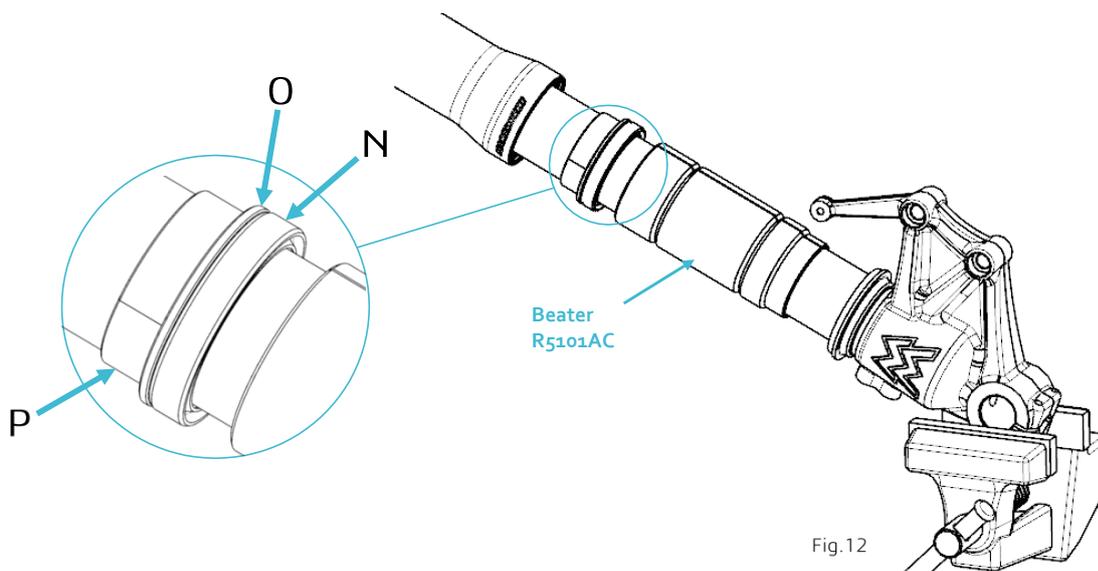
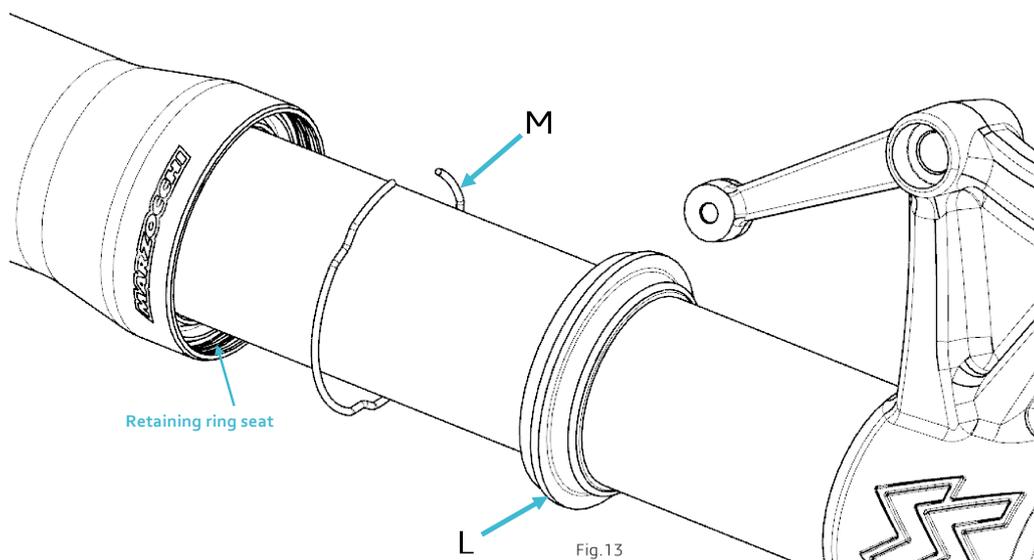
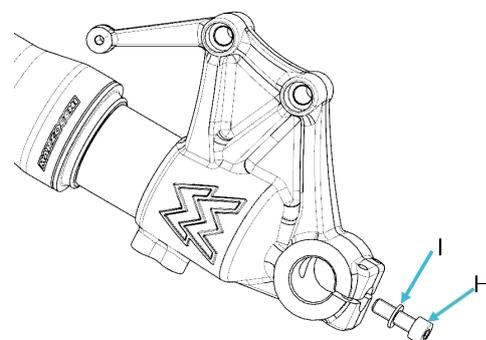


Fig.12

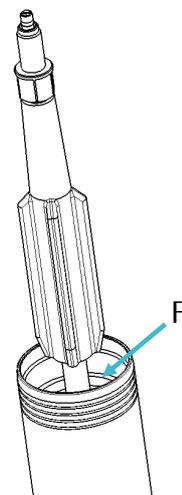
- Insert the retaining ring (M) into the barrel by slightly widening the ends, taking care not to damage the surface.
- Insert the retaining ring into the seat as shown in Fig.13 using the screwdriver. Make sure that it is positioned correctly and that the components are not damaged.
- Finally, insert the dust scraper (L) into the seat on the scabbard.



- Insert the pumping system inside the barrel, making sure that the lower part is correctly placed in the seat on the bottom of the wheel holder.
- Insert the screw (H) and the new washer (I) as shown in Fig.14 and secure the pumping unit by tightening to 2.5 Nm torque with a torque spanner.



- Insert the rubber bumper ring (F) into the scabbard seat under the cap thread as shown in Fig.15.
- While keeping the leg in a vertical position, introduce approximately $\frac{3}{4}$ of the specified amount of oil. For oil type, quantity and level refer to the latest version of the overall drawing.



- Pump several times with full rod travel to ensure that the pumping device is completely filled with oil.
- Complete filling by adding the remaining oil.
- Check the correct oil level by keeping the leg in a perfectly vertical position and following the indications in Fig.17.

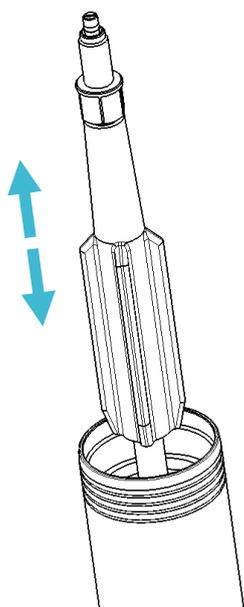


Fig.16

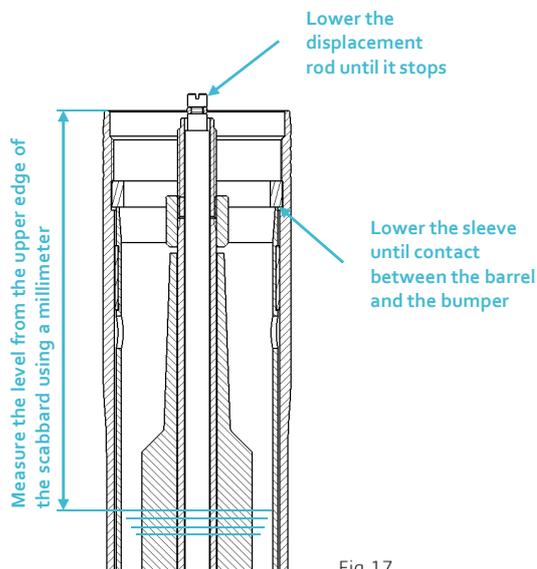


Fig.17

- Make sure that the lock nut (D) is fully tightened.
- Screw the rod R5051RC on the pumping rod as in Fig.18
- Insert the spring (G) and the spacer (E) in the leg as in Fig.19.

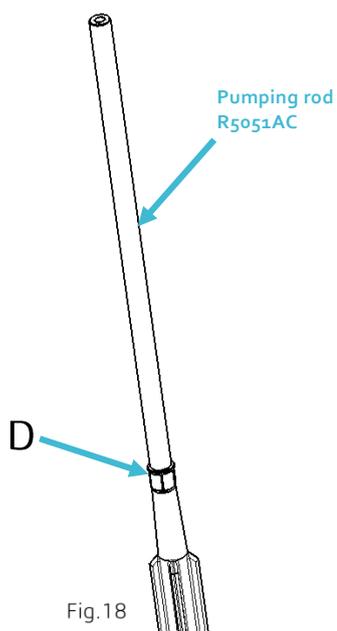


Fig.18

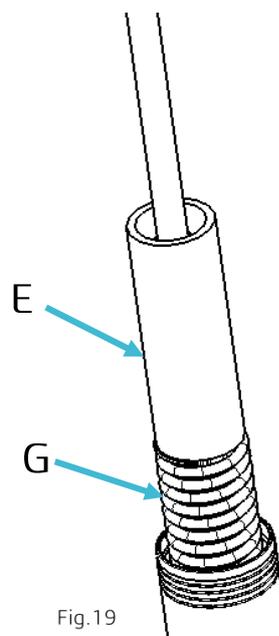
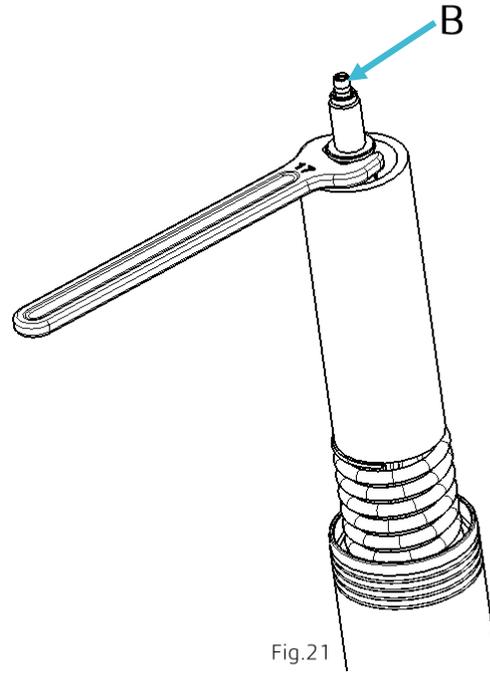
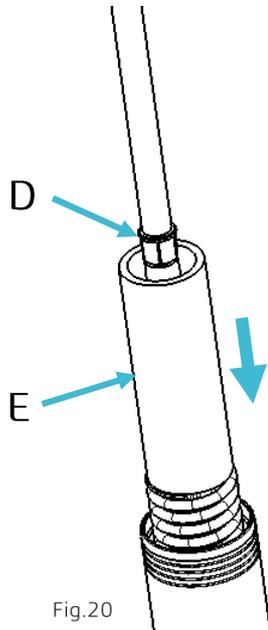
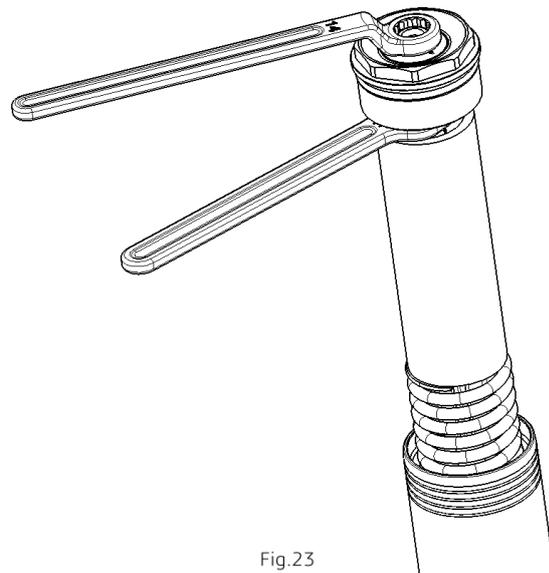
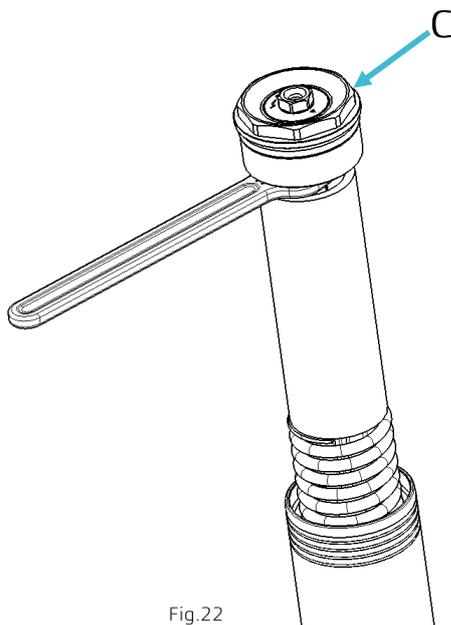


Fig.19

- By gripping the R5051AC rod, lower the plastic spacer(E), compressing the spring as in Fig.20 to insert the 17mm spanner in the lock nut (D) on the pump rod.
- Remove the R5051AC rod from the pumping unit as in Fig.21 and make sure that the hydraulic adjustment (B) is completely screwed in.



- Screw the cap (C) by hand onto the pump rod as far as it will go as shown in Fig.22.
- Lock the cap by acting on the preload adjustment with the 14mm spanner and on the lock nut with the 17mm spanner as shown in Fig.25. Check the tightening with a torque spanner, which must be done at a torque of 15Nm.



- Remove the keys and make sure that the plastic spacer (E) is correctly seated in the seat on the cap lower part.
- Lift the scabbard and tighten the cap (C) using the special R5294 spanner.
- Set the preload adjustment (A) with the 14mm spanner and the hydraulic adjustment (B) with the screwdriver, restoring the values measured before disassembly.

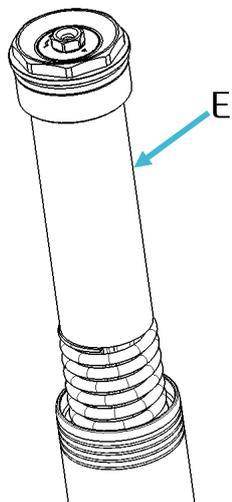


Fig.24

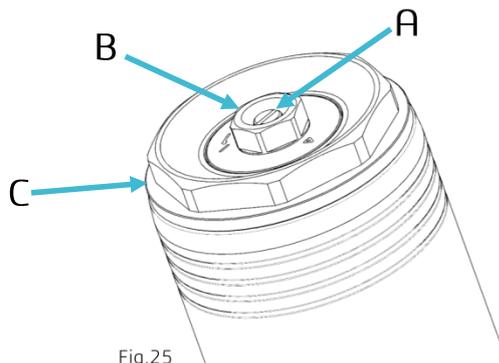
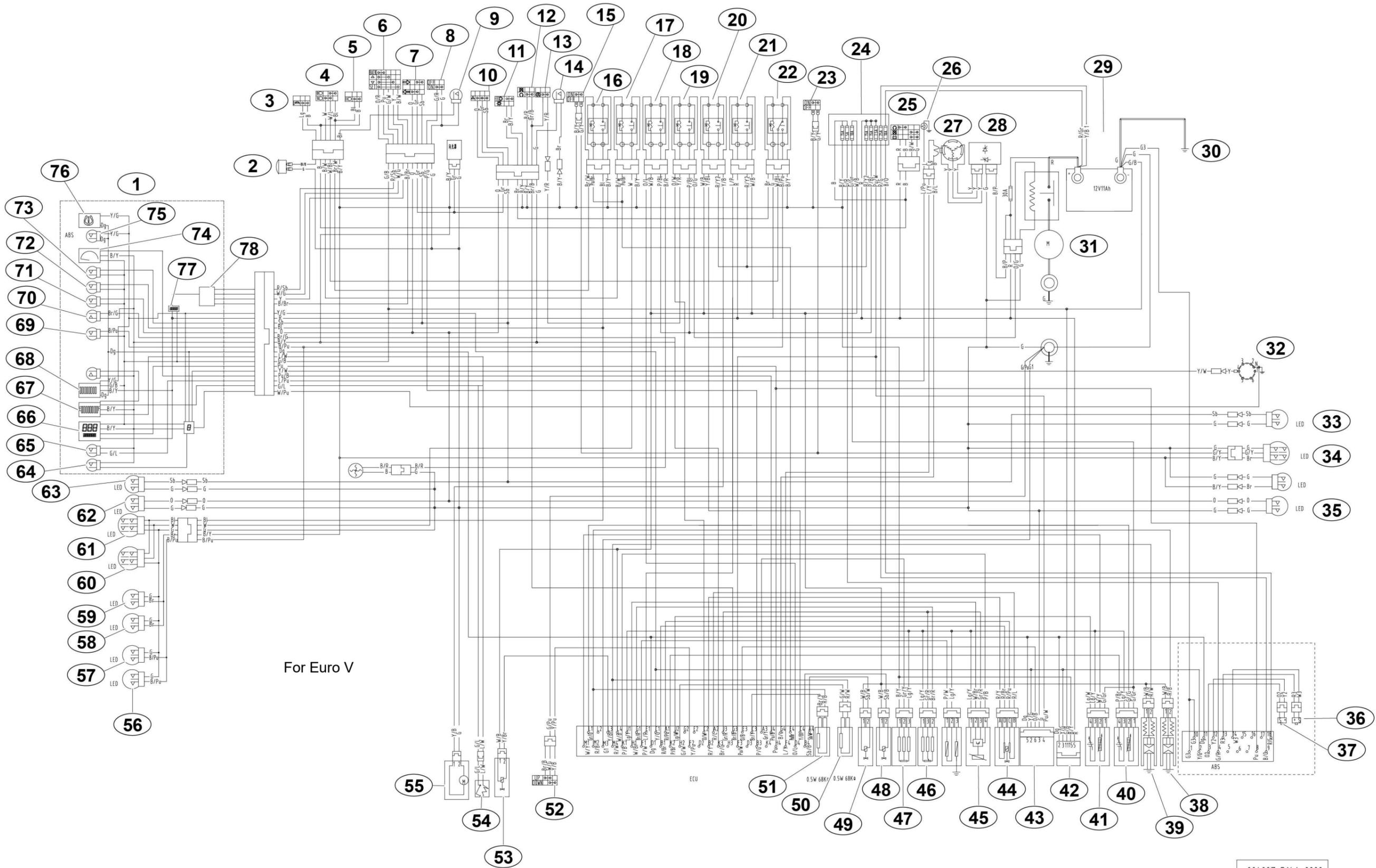


Fig.25



For Euro V

00400Z-P14A-0000

Electric diagram key

		Wiring color table	
1. Dashboard	46. TPS		Br. Brown
2. Horn	47. TILT	R. Red	Br/R. Brown / Red
3. Horn button	48. Injector cylinder 2	R/Br. Red / Brown	Br/Y. Brown / Yellow
4. High beam & low beam switch	49. Injector cylinder 1	R/Y. Red / Yellow	Br/G. Brown / Green
5. Pass	50. Ignition diagnostic sampling resistor 2	R/G. Red / Green	Y/Br. Yellow / Brown
6. Back & Set	51. Ignition diagnostic sampling resistor 1	R/L. Red / Blue	Br/W. Brown / White
7. Steering	52. Side stand sensor	R/Pu. Red / Purple	Br/B. Brown / Black
8. Friction	53. Canister valve	R/Gr. Red / Grey	Pu. Purple
9. Right handlebar button kit backlight	54. Fuel level sensor	R/W. Red / White	Pu/B. Purple / Black
10. Emergency light	55. Fuel pump	R/B. Red / Black	Gr. Grey
11. Illumination	56. DRL	O. Orange	Gr/R. Grey / Red
12. Switch off	57. DRL	O/Br. Orange / Brown	Gr/G. Grey / Green
13. Switch on	58. Position lamp	O/R. Orange / Red	Gr/W. Grey / White
14. Left handlebar button kit backlight	59. Position lamp	O/G. Orange / Green	Gr/B. Grey / Black
15. Left brake	60. High & low beam	O/L. Orange / Blue	W. White
16. High beam relay	61. High low beam	O/W. Orange / White	W/Br. White / Purple
17. Low beam relay	62. Front left turn signal	O/B. Orange / Black	W/R. White / Red
18. Cooling fan relay	63. Front right turn signal	Y. Yellow	W/Y. White / Yellow
19. Ignition auxiliary relay	64. Neutral indicator	Y/R. Yellow / Red	W/G. White / Green
20. Fuel pump relay	65. Oil pressure warning	Y/Bl. Yellow / Blue	W/Bl. White / Blue
21. Principle relay	66. Speed	Y/W. Yellow / White	W/Pu. White / Purple
22. Front beam relay	67. Fuel level indicator	Y/B. Yellow / Black	W/B. White / Black
23. Rear brake	68. Liquid temperature	G. Green	B. Black
24. Fuse box	69. DRL indicator	G/R. Green / Red	B/Br. Black / Brown
25. Ignition lock	70. Check engine light	G/Y. Green / Yellow	B/R. Black / Red
26. Oil pressure alarm switch	71. Right turn signal indicator	G/L. Green / Blue	B/Y. Black / Yellow
27. Stator	72. High beam indicator	G/W. Green / White	B/L. Black / Blue
28. Voltage regulator	73. Right turn signal indicator	G/B. Green / Black	B/W. Black / White
29. Battery	74. RPM indicator	P/Br. Pink / Brown	Lg. Light green
30. Grounding	75. ABS Indicator	P/B. Pink / Black	Lg/Br. Light yellow / Brown
31. Starter motor	76. Tire pressure	Gr/Y. Grey / Yellow	Lg/R. Light green / Red
32. Gear sensor	77. Clock	O/L. Orange / Blue	Lg/Y. Light green / Yellow
33. Right rear turn signal	78. Menu	L/Y. Blue / Yellow	Lg/W. Light green / White
34. Taillight		L/G. Blue / Green	P/W. Pink / White
35. Left rear turn signal		L/W. Blue / White	Y/Pu. Yellow / Purple
36. Rear wheel speed sensor		Bl/B. Blue / Black	Sb. Light blue
37. Front wheel speed sensor		LR. Pink	Sb/W. Light blue / White
38. Ignition coil of cylinder 1		Sb/B. Light blue / Black	Dg. Dark green
39. Ignition coil of cylinder 2		Y/G. Yellow / Green	Bl. Blue
40. Oxygen sensor of cylinder 1		R/Sb. Red / Light blue	L/Pu. Blue / Purple
41. Oxygen sensor of cylinder 2		B/Pu. Black / Purple	Pu/Br. Purple / Brown
42. Tire pressure control		P/G. Pink / Green	L/P. Blue / Pink
43. EPI diagnosis		P/Bl. Pink / Blue	Pu/W. Purple / White
44. Stopper		G/Gr. Green / Grey	B/P. Black / Pink
45. Throttle body temperature & pressure sensor		B/O. Black / Orange	