



SERVICE STATION MANUAL

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RS 660



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RS 660

THE VALUE OF SERVICE

Due to continuous updates and technical training programmes specific to Aprilia products, only **Aprilia** Official Network mechanics know this vehicle fully and have the specific tools necessary to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before riding it, performing maintenance correctly and using only **original Aprilia spare parts** are essential factors for the reliability of your vehicle!

For information on the nearest **Official Dealer and/or Service Centre** consult our website:

www.apriliausa.com

Only by requesting original Aprilia spare parts can you be of purchasing products that were developed and tested during the design and development of the vehicle itself. All Aprilia original spare parts undergo quality control procedures to guarantee reliability and durability.

The descriptions and images in this publication are given for illustrative purposes only.

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Piaggio & C. S.p.A. Viale Rinaldo Piaggio, 25 - 56025 PONTEDERA (PI), Italy

www.piaggio.com

SERVICE STATION MANUAL

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This manual provides the main information to carry out regular maintenance operations on your vehicle. This manual is intended to **Aprilia Dealers** and their qualified mechanics; several concepts have been deliberately omitted as they are considered unnecessary. As it is not possible to include complete mechanical notions in this manual, users should have basic mechanical knowledge or minimum knowledge about the procedures involved when repairing scooters. Without this knowledge, repairing or checking the vehicle may be inefficient or even dangerous. As the vehicle repair and check procedures are not described in detail, be extremely cautious so as not to damage components or injure individuals. In order to optimise customer satisfaction when using our vehicles, **Piaggio & C. S.p.a.** commits itself to continually improve its products and the relative documentation. The main technical modifications and changes in repair procedures are communicated to all **Aprilia Sales Outlets and its International Subsidiaries**. These changes will be introduced in the subsequent editions of the manual. In case of need or further queries on repair and check procedures, consult **Aprilia CUSTOMER DEPARTMENT**, which will be prepared to provide any information on the subject and any further communications on updates and technical changes related to the vehicle.

NOTE Provides key information to make the procedure easier to understand and carry out.

IMPORTANT Refers to specific procedures to carry out for preventing damages to the vehicle.

WARNING Refers to specific procedures to carry out to prevent injuries to the repairer.



Personal safety Failure to completely observe these instructions will result in serious risk of personal injury.



Protecting the environment Sections marked with this symbol indicate the correct use of the vehicle to prevent damaging the environment.



Vehicle condition The incomplete or lack of observance to these regulations can lead to risk of serious damage to the vehicle and may even invalidate the warranty.



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PRE DE

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- Turn indicators and their warning lights
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- Instrument cluster warning lights
- Horn
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- Engine stop via emergency stop switch and side stand
- Through the diagnostic tool, check that the last mapping version is present in the control unit/s and, if required, program the control unit/s again: consult the technical service website to know about available upgrades and details regarding the operation.

IMPORTANT



TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. THE LACK OF AN ADEQUATE BATTERY CHARGE BEFORE THE FIRST USE WILL CAUSE A PREMATURE FAILURE OF THE BATTERY.

IMPORTANT



WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE, AND PERFORM THE REVERSE OPERATION DURING REMOVAL.

IMPORTANT



NEVER USE FUSES WITH A CAPACITY HIGHER THAN THAT RECOMMENDED. THE USE OF A FUSE OF UNSUITABLE CAPACITY MAY RESULT IN SERIOUS DAMAGES TO THE WHOLE VEHICLE OR EVEN CAUSE A FIRE.

- Check the battery charge by holding down the TEST button on the BATTERY CAPACITY INDICATOR located between the terminals on the top of the battery.

Depending on the present indication and consulting the table, if necessary charge the battery.



CHARGE LEVEL

ACTION	NUMBER OF BARS
Ready for use	5 - 6
Charging recommended	3 - 4
Charging necessary	1 - 2
Fault	0

RECHARGE

- Always use a specific charger for lithium batteries to recharge the battery.
- To avoid damage to the battery, the charging voltage must NEVER be higher than 15 volts.
- Do not charge the battery with a charger with automatic DESULPHATION MODE using a voltage higher than 15 volts.
- Always remove the battery from the vehicle before connecting it to the charger.
- Stop charging if the battery feels warm to the touch. Allow the battery to cool before resuming charging.
- After recharging the battery, leave it to stand for 1 hour before pressing the TEST button on the BATTERY CAPACITY INDICATOR. If the indicator is between 1 and 4 notches, the battery should be further charged.

CHARGE MODES

Normal recharge

- Electric current: 2,0 A
- Time: 2 hours

Quick charge

- Electric current: 8 A
- Time: 0,5 hours

WARNING

THE CHARGE VOLTAGE MUST NEVER EXCEED 15V.

WARNINGS

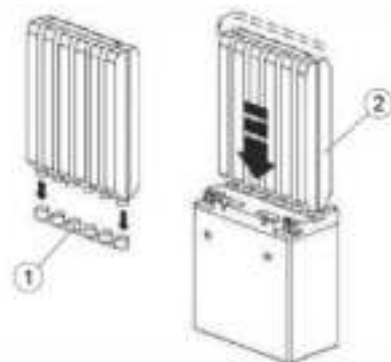
- Do not knock, throw or subject the battery to violent shocks.
- Do not carry the battery together with flammable, explosive or sharp objects.
- NEVER attempt to open the battery.
- Keep the connecting poles clean and firmly secured at all times.
- Do not immerse the battery in water, or leave it exposed to moisture.
- Do not connect the battery directly to wall outlets.
- Do not subject the battery to short circuit by connecting cables or other metallic objects to the positive and negative terminals.
- Do not pierce the battery casing with nails or other sharp objects, do not try to forcibly open it or step on it.
- Do not perform welds on the battery terminals.
- Do not use the battery in combination with primary batteries (such as dry batteries) or batteries of different capacity, type and brand.
- Do not use the battery if it emits a strange odour, emits heat, changes colour or deforms, or if it presents any anomaly. Stop use immediately if the battery is in use or under charge.

THE BATTERY DOES NOT CONTAIN HARMFUL POLLUTANTS, CORROSIVE ACIDS OR TOXIC HEAVY METALS

(IF AVAILABLE)

TRADITIONAL BATTERY ACTIVATION PROCEDURE

- Place the battery on a flat surface.
- Remove the cell's protective sticker.
- Take the acid container.
- Remove the cap 1 of the container 2.
- Place the container upside down, perpendicularly above the battery, aligning the outlets with the battery cells.
- Apply pressure to the container to break the seals. The liquid will begin to flow into the cells.



- Check that air bubbles come out of the cells; let the liquid flow into the cells for at least 20 minutes.
- If no air bubbles escape and the liquid does not flow, tap lightly on the bottom of the container until the liquid begins to flow into the cells. Never remove the container from the battery, pierce it or cut it to facilitate the exit of the liquid.
- Make sure the liquid container is completely empty before removing it.
- Allow the battery to stand for at least 1 hour, before starting the charging process, without closing the six cells. This operation is extremely important in order to have the best battery performance over time.
- Recharge the battery following the specifications indicated on the battery (see photo) and using a suitable battery charger.

**NOTE**

IN THE SHOWN EXAMPLE IT IS IMPORTANT TO USE A BATTERY CHARGER WITH 1.2 AMPERE (CHARGING TIME 5-10 HOURS) OR 5 AMPERE (CHARGING TIME 1 HOUR).

Levels check

- Hydraulic braking system fluid level
- Clutch system fluid level
- Engine coolant level
- Engine oil level

Road test

- Cold start
- Instrument operations
- Response to throttle control
- Stability on acceleration and braking
- Front and rear brake efficiency
- Front and rear suspension efficiency

- Abnormal noise
-

Static test

Static control after the test drive:

- Restarting when warmed up
 - Idling
 - Uniform turning of the steering
 - Possible leaks
 - Radiator electric fans operation
-

Functional inspection

- Hydraulic braking system
 - Brake and clutch lever travel
 - Clutch - Check for correct operation
 - Engine - Check for correct general operation and absence of abnormal noise
 - Other
 - Documentation check:
 - Check the chassis and engine numbers
- Check included tools (where applicable)
- Licence plate fitting
 - Locks checking
 - Tyre pressure check
 - Fitting of mirrors and possible accessories



NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES SINCE THE TYRES MAY BURST.

IMPORTANT



CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

INDEX OF TOPICS

CHARACTERISTICS

CHA

Rules

Safety rules

Carbon monoxide

If you need to keep the engine running while working on the vehicle, please ensure that you do so in an open or very well ventilated area. Never run the engine in an enclosed area. If you do work in an enclosed area, make sure to use a fume extraction system.

IMPORTANT



EXHAUST EMISSIONS CONTAIN CARBON MONOXIDE, A POISONOUS GAS WHICH CAN CAUSE LOSS OF CONSCIOUSNESS AND EVEN DEATH.

Fuel

IMPORTANT



FUEL USED TO DRIVE EXPLOSION ENGINES IS HIGHLY INFLAMMABLE AND CAN BECOME EXPLOSIVE UNDER SPECIFIC CONDITIONS. IT IS THEREFORE RECOMMENDED TO CARRY OUT REFUELLING AND MAINTENANCE PROCEDURES IN A VENTILATED AREA WITH THE ENGINE SWITCHED OFF. DO NOT SMOKE DURING REFUELLING OR NEAR FUEL VAPOUR. AVOID ANY CONTACT WITH NAKED FLAME, SPARKS OR OTHER HEAT SOURCES WHICH MAY CAUSE IGNITION OR EXPLOSION.

**DO NOT ALLOW FUEL TO DISPERSE INTO THE ENVIRONMENT.
KEEP OUT OF THE REACH OF CHILDREN.**

Hot parts

The engine and the exhaust system components get very hot and remain in this condition for a certain time interval after the engine has been switched off. Before handling these components, make sure that you are wearing insulating gloves or wait until the engine and the exhaust system have cooled down.

Coolant

The coolant contains ethylene glycol which, under certain conditions, can become flammable.

When it burns, ethylene glycol produces an invisible flame which however can cause burns.

IMPORTANT



TAKE PARTICULAR CARE NOT TO SPILL COOLANT ONTO HOT PARTS OR THE ENGINE AND EXHAUST SYSTEM; THE FLUID MAY CATCH FIRE AND BURN WITH INVISIBLE FLAMES. WHEN CARRYING OUT MAINTENANCE OPERATIONS, IT IS ADVISABLE TO WEAR LATEX GLOVES. WHILE POISONOUS, COOLANT HAS A SWEET TASTE WHICH MAKES IT EXTREMELY APPEALING TO ANIMALS. NEVER LEAVE COOLANT IN OPEN CONTAINERS WHERE IT MAY BE REACHED AND DRUNK BY AN ANIMAL.

KEEP OUT OF THE REACH OF CHILDREN.

NEVER REMOVE THE RADIATOR CAP WHILE THE ENGINE IS STILL HOT. COOLANT IS UNDER PRESSURE AND MAY CAUSE BURNS.

Used engine oil and transmission oil

IMPORTANT



WHEN CARRYING OUT MAINTENANCE OPERATIONS, IT IS ADVISABLE TO WEAR PROTECTIVE IMPERMEABLE GLOVES.

THE ENGINE OR GEARBOX OIL MAY CAUSE SERIOUS INJURIES TO THE SKIN IF HANDLED FOR PROLONGED PERIODS OF TIME AND ON A REGULAR BASIS.

WASH YOUR HANDS CAREFULLY AFTER HANDLING OIL.

HAND THE OIL OVER TO OR HAVE IT COLLECTED BY THE NEAREST USED OIL RECYCLING COMPANY OR THE SUPPLIER.

DO NOT DISPOSE OF OIL IN THE ENVIRONMENT

KEEP OUT OF THE REACH OF CHILDREN.



BRAKE FLUID CAN DAMAGE PAINT FINISH, PLASTIC AND RUBBER. WHEN SERVICING THE BRAKING SYSTEM, PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE EYEWEAR WHEN WORKING ON THE BRAKE SYSTEM. BRAKE FLUID IS EXTREMELY HARMFUL FOR THE EYES. IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THE EYES IMMEDIATELY WITH PLENTY OF COOL, CLEAN WATER AND SEEK IMMEDIATE MEDICAL ATTENTION.

KEEP OUT OF THE REACH OF CHILDREN.

Battery electrolyte and hydrogen gas (WHERE REQUIRED)

IMPORTANT



THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND, AS IT CONTAINS SULPHURIC ACID, MAY CAUSE BURNING IF IT COMES INTO CONTACT WITH THE SKIN. WHEN HANDLING BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IN THE EVENT OF SKIN CONTACT WITH THE ELECTROLYTIC FLUID, RINSE WELL WITH PLENTY OF CLEAN WATER. IT IS PARTICULARLY IMPORTANT TO PROTECT YOUR EYES BECAUSE EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IN THE EVENT OF CONTACT WITH THE EYES, RINSE WITH PLENTY OF WATER FOR FIFTEEN MINUTES AND CONSULT AN EYE SPECIALIST IMMEDIATELY. THE BATTERY RELEASES EXPLOSIVE GASES; KEEP IT AWAY FROM FLAMES, SPARKS, CIGARETTES OR ANY OTHER HEAT SOURCES. ENSURE ADEQUATE VENTILATION WHEN SERVICING OR RECHARGING THE BATTERY.

KEEP OUT OF THE REACH OF CHILDREN.

BATTERY LIQUID IS CORROSIVE. DO NOT POUR OR SPILL ON PLASTIC COMPONENTS IN PARTICULAR. ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY BEING ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

When repairs, disassembly and reassembly of the vehicle is carried out, follow the following recommendations strictly.

BEFORE DISASSEMBLING COMPONENTS

- Remove the dirt, mud, dust and foreign objects from the vehicle before disassembling components. Wherever required, use the special tools designed for this vehicle.

DISASSEMBLING COMPONENTS

- Do not loosen and/or tighten the screws and nuts using pliers or other tools, but always use the specific wrench.
- Mark the positions on all the connection joints (hoses, cables, etc.) before separating them and identify them with different distinctive marks.
- Each piece should be clearly marked in order to be identified during the installation phase.
- Carefully clean and wash the disassembled components with detergents with a low flammability grade.
- Keep the coupled parts together because they have "adapted" to one another following normal wear.
- Some components must be used together or replaced entirely.
- Keep away from heat sources.

REASSEMBLING THE COMPONENTS

IMPORTANT

THE BEARING MUST ROTATE FREELY, WITHOUT JAMMING AND/OR NOISE, OTHERWISE THEY MUST BE REPLACED.

- Use only aprilia ORIGINAL SPARE PARTS.
- Always use the recommended lubricants and consumable material.
- Lubricate the parts (when possible) before reassembling them.
- When tightening screws and nuts, begin with the larger diameter or internal ones, proceeding diagonally. Tighten with subsequent steps before applying the prescribed torque.
- Always replace the locknuts, gaskets, seal rings, snap rings, O-Rings (OR), cotter pins and screws if they have damaged thread, with new ones.
- When disassembling the bearings, lubricate them abundantly.
- Ensure that each component has been assembled correctly.
- After a repair or periodic maintenance operation, carry out the preliminary checks and test the vehicle on private property or in an area with light traffic.
- Clean all coupling surfaces, oil seal rims and gaskets before refitting them. Smear a light layer of lithium-based grease on the oil seal rims. Reassemble oil seals and bearings with the brand or lot number facing outward (visible side).

ELECTRICAL CONNECTORS

The electrical connectors should be disconnected as follows. Failure to observe these procedures will cause irreparable damage to the connector and the wiring:

If present, press on the specific safety catches.

- Grip the two connectors and unplug them, pulling them apart in opposite directions.

- If there is dirt, rust, moisture, etc., carefully clean the inside of the connector using pressurised air.
- Ensure that the cables make correct contact with the terminals inside the connectors.
- Then plug in the two connectors, ensuring correct coupling (if the specific catches are present, you will hear a typical "click").

IMPORTANT

TO UNPLUG THE TWO CONNECTORS, DO NOT PULL ON THE CABLES.

NOTE

THE TWO CONNECTORS CAN BE PLUGGED IN ONLY IN ONE DIRECTION, THEREFORE JOIN THEM TOGETHER IN THE RIGHT DIRECTION.

TIGHTENING TORQUE**IMPORTANT**

IN THE EVENT THAT A SELFBRAKING NUT IS UNSCREWED, IT IS NECESSARY TO REPLACE IT WITH A NEW ONE.

IMPORTANT

REMEMBER THAT THE TIGHTENING TORQUE FOR ALL THE FIXING ELEMENTS LOCATED ON WHEELS, BRAKES, WHEEL AXLES AND OTHER SUSPENSION COMPONENTS PLAY A FUNDAMENTAL ROLE IN GUARANTEEING THE SAFETY OF THE VEHICLE AND MUST BE KEPT AT THE PRESCRIBED VALUES. REGULARLY CHECK THE TIGHTENING TORQUE OF THE FIXING ELEMENTS AND ALWAYS USE A TORQUE WRENCH WHEN REFITTING. IF THESE WARNINGS ARE NOT OBSERVED, ONE OF THESE COMPONENTS COULD LOOSEN AND COME OFF, BLOCKING A WHEEL OR CAUSING OTHER PROBLEMS THAT WOULD COMPROMISE MANOEUVRABILITY, LEADING TO A CRASH WITH THE RISK OF SERIOUS INJURY OR EVEN DEATH.

Running-in

Running the engine in correctly is essential for ensuring engine longevity and functionality. Twisty roads and gradients are ideal for running in the engine, brakes and suspension effectively. Vary your riding speed during the running in period. This ensures that components operate in "loaded" conditions and then "unloaded" conditions, allowing the engine components to cool.

IMPORTANT

THE FULL PERFORMANCE OF THE VEHICLE IS ONLY AVAILABLE AFTER THE SERVICE AT THE END OF THE RUNNING IN PERIOD.

Follow these guidelines:

- Do not fully open the throttle grip abruptly at low engine speeds, either during or after the running in period.
- During the first 100 Km (62 miles) use the brakes gently, avoiding sudden or prolonged braking. This allows the brake pad friction material to bed in correctly with the brake discs.
- Preferably do not exceed 7500 rpm during the first 1000 km (621 mi) and 9500 rpm from 1000 to 2000 km (1243 mi).



AFTER THE SPECIFIED MILEAGE, TAKE YOUR VEHICLE TO AN Official Aprilia Dealer FOR THE CHECKS INDICATED IN THE "RECOMMENDED PRODUCTS" TABLE IN THE SCHEDULED MAIN-

TENANCE SECTION TO AVOID INJURING YOURSELF, OTHERS AND /OR DAMAGING THE VEHICLE.

Vehicle identification

SERIAL NUMBER LOCATION

These numbers are necessary for vehicle registration.

NOTE

ALTERING IDENTIFICATION NUMBERS MAY BE SERIOUSLY PUNISHABLE BY LAW. IN PARTICULAR, MODIFYING THE CHASSIS NUMBER IMMEDIATELY VOIDS THE WARRANTY.

This number consists of numbers and letters, as in the example shown below.

ZD4KSA000YSXXXXXX

KEY:

ZD4: WMI (World Manufacturer Identifier) code;

KS: model;

A00: Europe; **UA0:** USA

0: digit free;

Y: year of manufacture;

S: production plant (S= Scorzè);

XXXXXX: serial number (6 digits);

CHASSIS NUMBER

The chassis number is stamped on the RH side of the headstock.

Chassis No.



ENGINE NUMBER

The engine number is stamped on the engine crankcase, at the rear near the shock absorber.

Engine No.



Dimensions and mass

DIMENSIONS AND MASS

Specification	Desc./Quantity
Max. length	1995 mm (78.54 in)
Max. width (at handlebar)	745 mm (29.33 in)
Max. height (to top fairing)	1,150 mm (45.27 in)
Wheelbase	1370 mm (53.93 in)
Kerb weight	183 kg (403.44 lb)
Weight fully loaded	258 kg (568.79 lb)

Engine

ENGINE

Specification	Desc./Quantity
Type	2 cylinder in line (transverse), 4 stroke, 4 valves per cylinder, double overhead camshafts
Engine capacity	40.21 cu in (659 cc)
Bore / stroke	3.19 in / 2.52 in (81 mm / 63.93 mm)
Compression ratio	13.5 +/- 0.5: 1
Intake valve clearance	0.10 - 0.15 mm (0.0039 - 0.0059 in)
Exhaust valve clearance	0.20 - 0.25 mm (0.0078 - 0.0098 in)
Idle engine speed	1400 +/- 100 rpm
Engine revs at maximum speed	10500 +/- 100 rpm
Clutch	Multi plate wet clutch with mechanical control lever on left side of the handlebar. Anti-juddering and slipper clutch systems
Starting	Electric
Timing system	Morse chain on intake and exhaust camshafts, bucket tappets and valve clearance adjustment with calibrated pads
Lubrication system	Wet sump with heat exchanger coaxial with oil filter
Oil pump	Trochoidal pump
Oil filter	With external cartridge filter
Cooling	Liquid
Cooling system	3-way thermostatic valve, cooling radiator with electric fan and expansion tank
Coolant pump	Centrifugal bearingless aspirating pump with integrated aluminium gasket
Air filter	Polyester

Transmission

DRIVE RATIOS

Specification	Desc./Quantity
Primary drive ratio	39 / 80 (with gears)
Drive ratio, 1st gear	17 / 46 (secondary)
Drive ratio, 2nd gear	16 / 33 (secondary)
Drive ratio, 3rd gear	24 / 39 (secondary)
Drive ratio, 4th gear	19 / 26 (secondary)
Drive ratio, 5th gear	21 / 25 (secondary)
Drive ratio, 6th gear	22 / 23 (secondary)
Final drive ratio	17 / 43

ELECTRONIC CONTROL SYSTEMS

Specification	Desc./Quantity
a-PRC system	(Aprilia Performance Ride Control) which includes: AEM (engine map management system), AEB (engine brake map management system), ABS (anti-lock braking system), ATC (traction control), AWC (wheelie control), AQS (assisted shift

Specification	Desc./Quantity
	system for clutchless upshifts and downshifts), PIT (pit lane speed limiter) (where applicable).

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel tank capacity (including reserve)	15 l (3.30 UK gal; 3.96 US gal)
Fuel tank reserve capacity	3.5 l (0.77 UK gal; 0.92 US gal)
Engine oil	oil change and oil filter replacement: 2700 cc in (164.76 cu in)
Coolant	1.8 +/- 0.2 l (0.39 +/- 0.04 UK gal; 0.47 +/- 0.05 US gal)
Seats	2
Maximum weight limit	393 kg (866.41 lb)

Drive chain

DRIVE CHAIN

Specification	Desc./Quantity
Type	Regina 110 links With sealed master link
Model	520 - 135 - ZRA

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Spark plugs	NGK IR MR9DI-7
Electrode gap	0.7 - 0.8 mm (0.027 - 0.031 in)
Battery	BS BATTERY BSLi-04 LITHIUM, 12V 48Wh 280A Alternative solution: YUASA YTZ10S, 12V 8.6 Ah
Coils	Stick coil
Recharging system	Flywheel with rare earth magnets
Alternator	360 W
Main fuses	30A
Secondary fuses	2A, 5A (5) - 7.5A (3) - 15A - 20A

INDICATOR LAMPS

Specification	Desc./Quantity
Neutral	LED
High beam light	LED
Cruise control	LED
ABS	LED
MI	LED
Turn indicators	LED
Overspeed threshold/shift light	LED
Immobilizer	LED
Fuel reserve	LED
a-PRC	LED
General warning	LED
DRL	LED
Side stand	LED

Frame and suspensions

FRAME

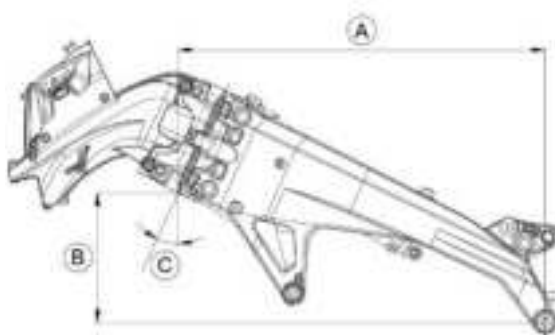
Specification	Desc./Quantity
Type	Adjustable composite structure aluminium frame with cast elements.
Steering rake angle	24.1° (measurements with respect to bare chassis)

SUSPENSIONS

Specification	Desc./Quantity
Front fork	Adjustable upside-down hydraulic fork with 41 mm (1.61 in) stanchions
Front stroke	120 mm (4.72 in)
Rear shock absorber	Piggyback shock absorber with adjustable spring pre-load, length and hydraulic rebound damping.
Rear stroke	52 mm (2.05 in)

DIMENSIONS A AND B

Specification	Desc./Quantity
Size "A"	655.5 mm (25.80 in) (measurements refer to the bare chassis)
Size "B"	337.5 mm (13.28 in) (measurements refer to the bare chassis)
Angle "C"	24.1° (measurements with respect to bare chassis)



Brakes

BRAKES

Specification	Desc./Quantity
Front	320 mm (12.60 in) discs, four-piston callipers - with 32 mm (1.26 in) pistons and 2 pads - radial master cylinder and steel braided brake hose.
Rear	220 mm (8.66 in) disc, two-piston calliper - with 34 mm (1.34 in) pistons - master cylinder with integrated reservoir and steel braided brake hose.

Tightening torques

If the following tables do not expressly indicate the tightening torque values, refer to the table with the generic torque values indicated below.

GENERAL TIGHTENING TORQUES

	M4	M5	M6	M8	M10	M12
Metric tightening torque: TE - TEFL - SHC - TBEI - TCC - TS	3 Nm (2.21 lb ft)	6 Nm (4.43 lb ft)	10 Nm (7.38 lb ft)	25 Nm (18.44 lb ft)	50 Nm (36.88 lb ft)	80 Nm (59.00 lb ft)

GENERAL TIGHTENING TORQUES FOR SELF TAPPING SCREWS FOR PLASTIC

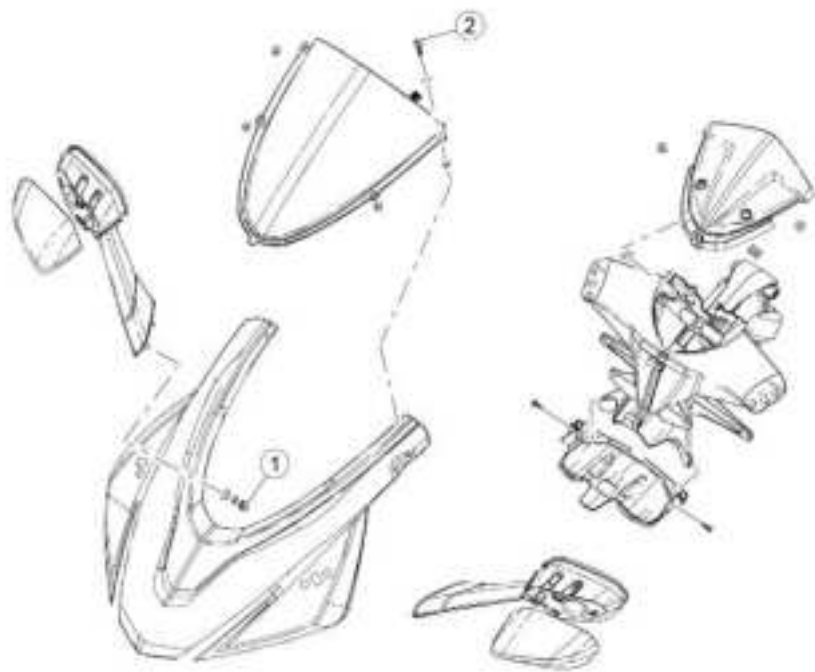
	2.9 mm	3.9 mm	4.2 mm	5 mm
Tightening torque	2 Nm (1.48 lb ft)	2 Nm (1.48 lb ft)	3 Nm (2.21 lb ft)	3 Nm (2.21 lb ft)

IMPORTANT

THE SCREWS WITH THREAD-LOCK SEALANT (PRE-IMPREGNATED) MUST BE REPLACED WITH NEW SCREWS AFTER THEY HAVE BEEN LOOSENED.
BEFORE FITTING THE NEW SCREWS, CLEAN THE THREADED HOLES CAREFULLY, MAKING SURE THAT ALL TRACES OF THE OLD THREAD-LOCK SEALANT HAVE BEEN ELIMINATED.

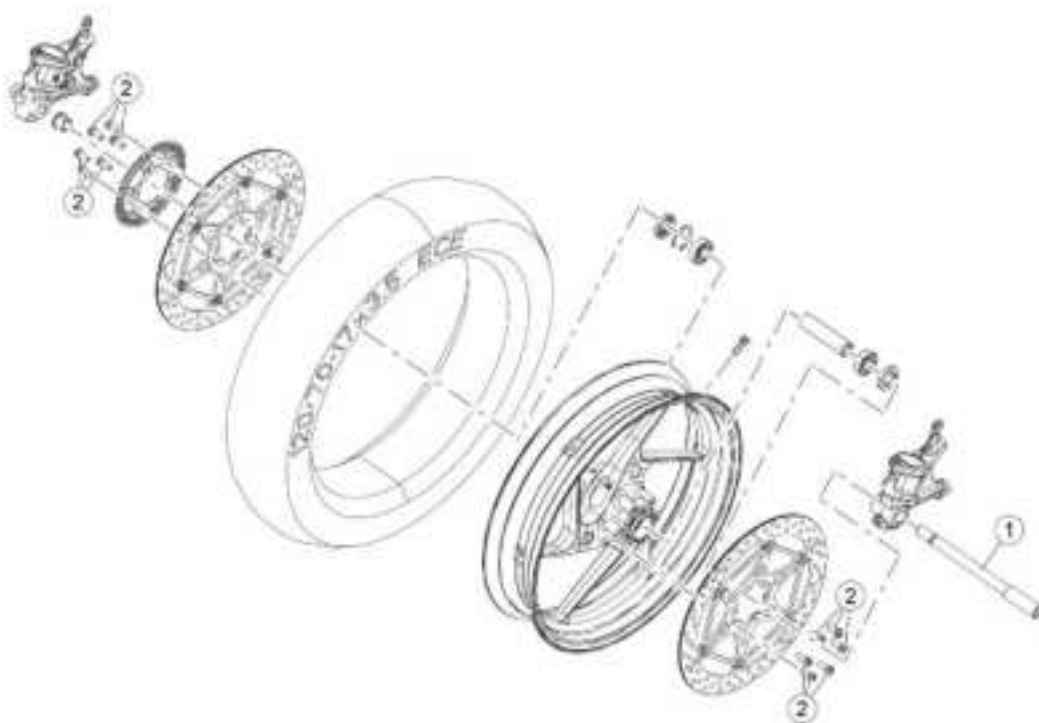
Chassis

Front side



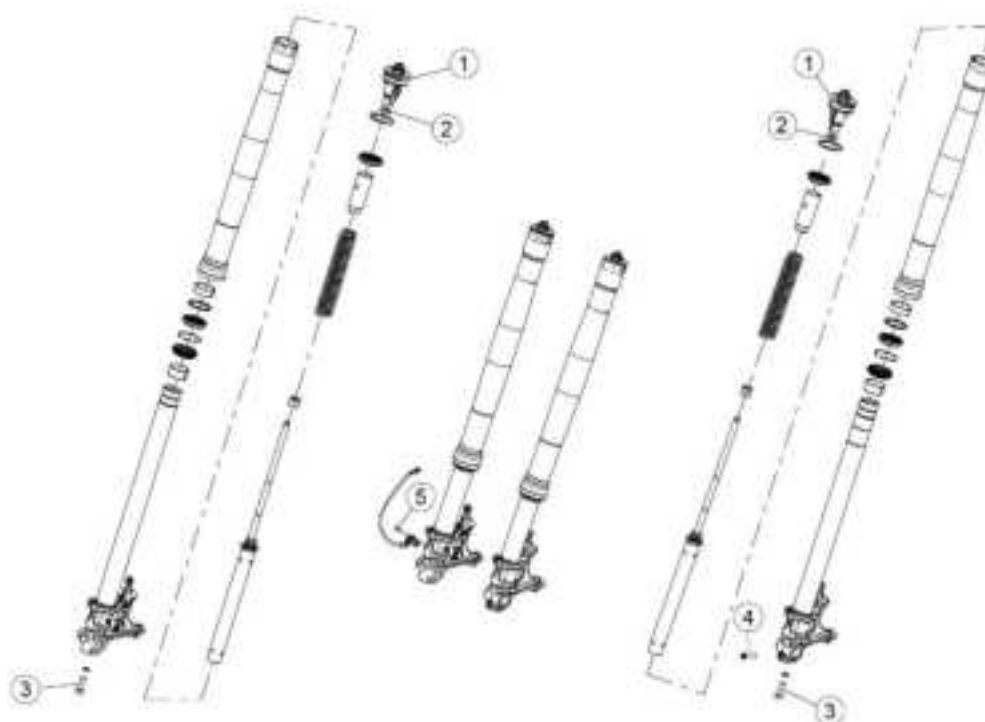
FAIRING FRONT

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged nut fastening rear-view mirror	M6	4	4 Nm (2.95 lb ft)	-
2	Top fairing fastener TBEI screw	M4	4	0.5 Nm (0.36 lbf ft)	-



FRONT WHEEL

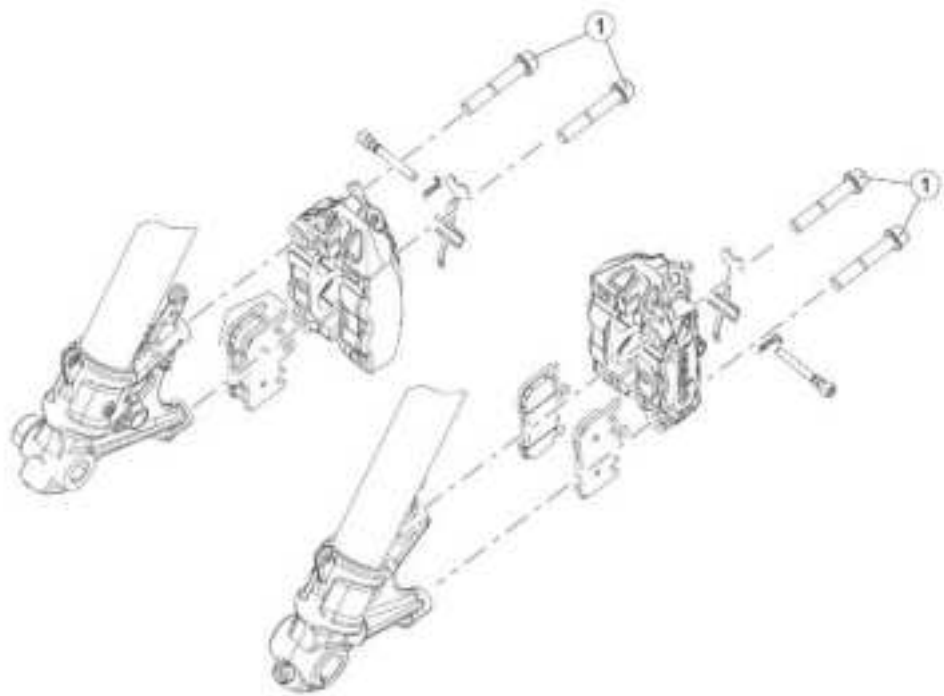
Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle	M16	1	65 Nm (47.94 lb ft)	-
2	Front brake disc flanged hex fixing screw	M8x20	12	25 Nm (18.43 lb ft)	-



FRONT FORK

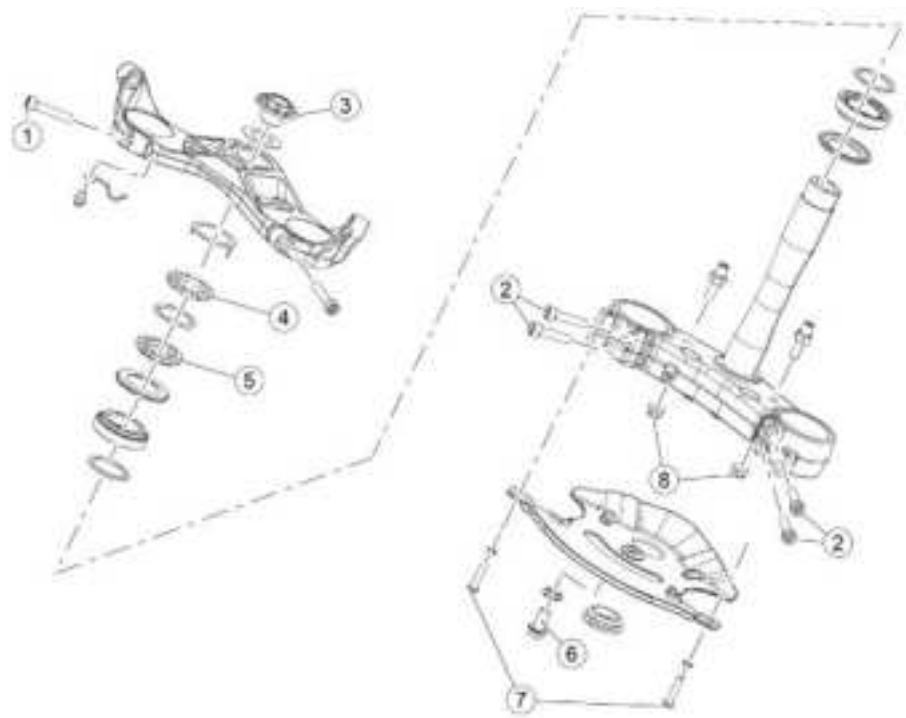
Pos.	Description	Type	Quantity	Torque	Notes
1	Cap	-	2	22.5 Nm (16.60 lbf ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
2	Cap locknut	-	2	15 Nm (11.06 lbf ft)	-
3	Plunger fastening screw	-	2	22.5 Nm (16.60 lbf ft)	-
4	Wheel pin safety locking screw	M8	1	18 Nm (13.27 lbf ft)	-
5	ABS sensor screw	M5	1	6 Nm (4.42 lb ft)	-



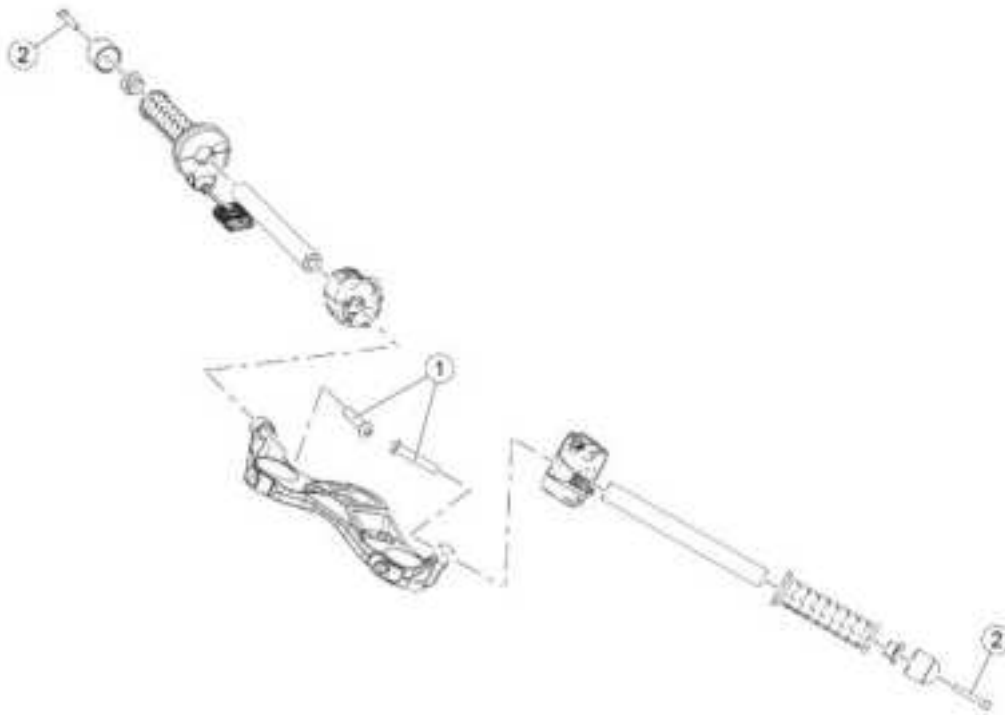
FRONT BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	TCC screw fastening brake calliper	M10x55	4	50 Nm (36.87 lb ft)	-

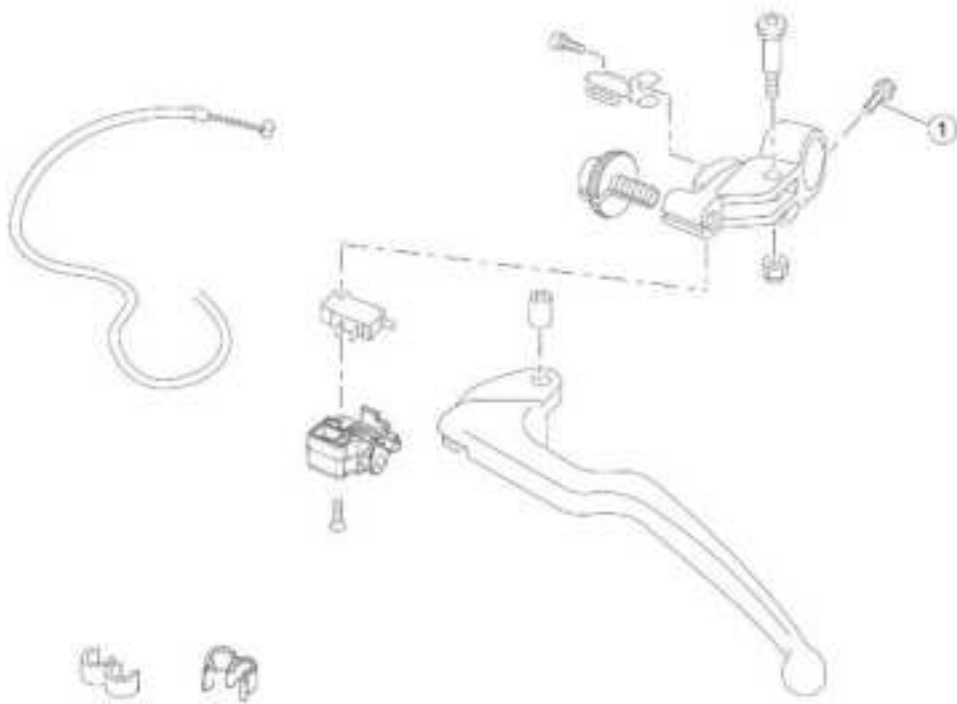


STEERING

Pos.	Description	Type	Quantity	Torque	Notes
1	SHC screw fastening upper plate to stanchion	M8x40	2	25 Nm (18.43 lb ft)	-
2	SHC screw fastening lower plate to stanchion	M8x35	4	25 Nm (18.43 lb ft)	-
3	Upper yoke fixing cap	-	1	100 Nm (73.75 lb ft)	-
4	Headstock tightening counter-lock ring	-	1	Manual tightening	-
5	Steering headstock tightening ring nut	-	1	60 Nm (44.25 lb ft)	Pre-tightening
5	Steering headstock tightening ring nut	-	1	40 +/- 5 Nm (29.50 +/- 3.68 lb ft)	Tightening
6	Steering yoke lower closure central hex fixing screw	-	1	... Nm (... lb ft)	-
7	Steering yoke lower closure side fixing TBEI screw	M6x30	2	... Nm (... lb ft)	-
8	Self-locking nuts fastening steering end of the stroke pins	M8	2	25 Nm (18.43 lb ft)	-

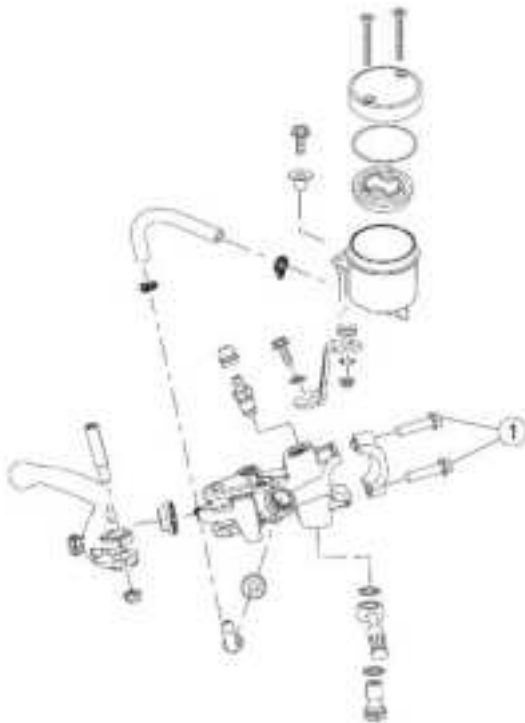
**HANDLEBAR-CONTROLS**

Pos.	Description	Type	Quantity	Torque	Notes
1	Domed head torx screw fastening semi-handlebar	M10x55	2	46 Nm (33.92 lbf ft)	-
2	SHC screw fastening anti-vibration weight	M5x50	2	... Nm (... lb ft)	-
-	Right hand light switches fixing screw	M5	1	4 Nm (2.95 lb ft)	-
-	Left hand light switches fixing screw	M5	1	4 Nm (2.95 lb ft)	-



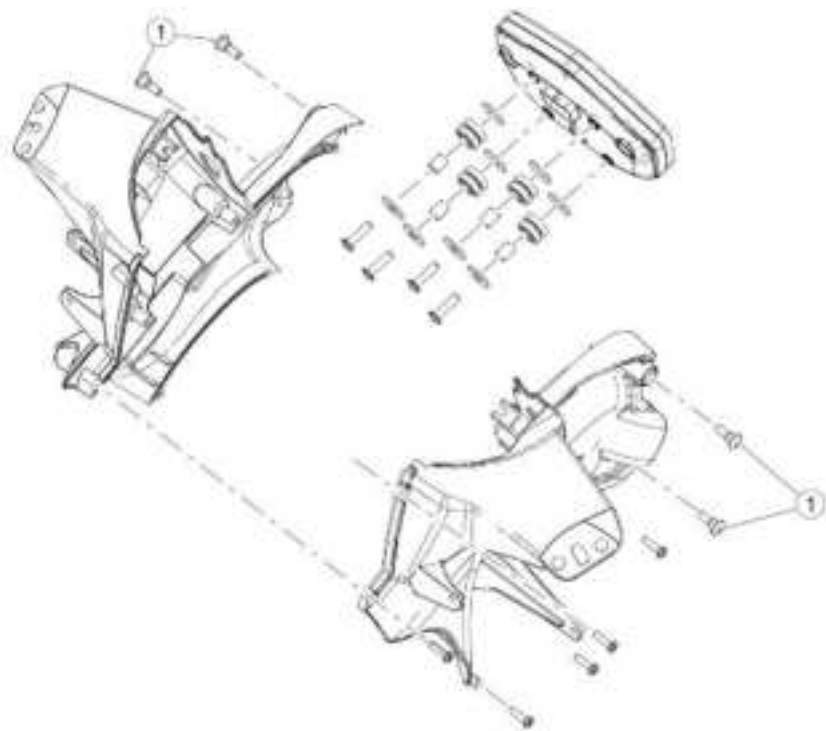
CLUTCH CONTROL

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch control fastener screw	M6	1	10 Nm (7.37 lb ft)	-



FRONT BRAKE MASTER CYLINDER

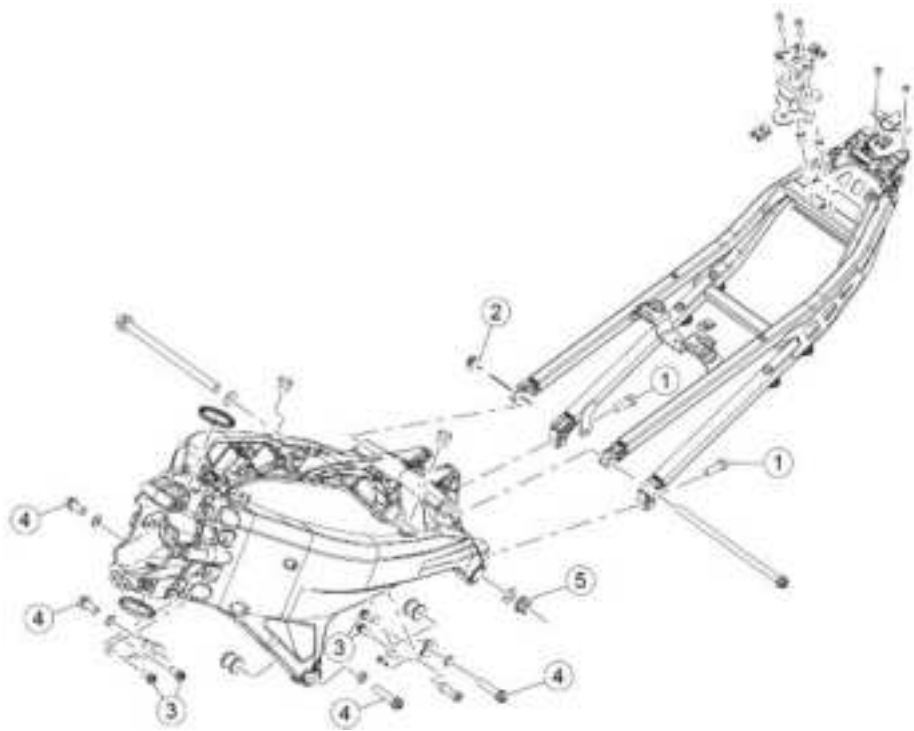
Pos.	Description	Type	Quantity	Torque	Notes
1	Screw fastening front brake master cylinder	M6	2	10 Nm (7.37 lb ft)	-



INSTRUMENTS

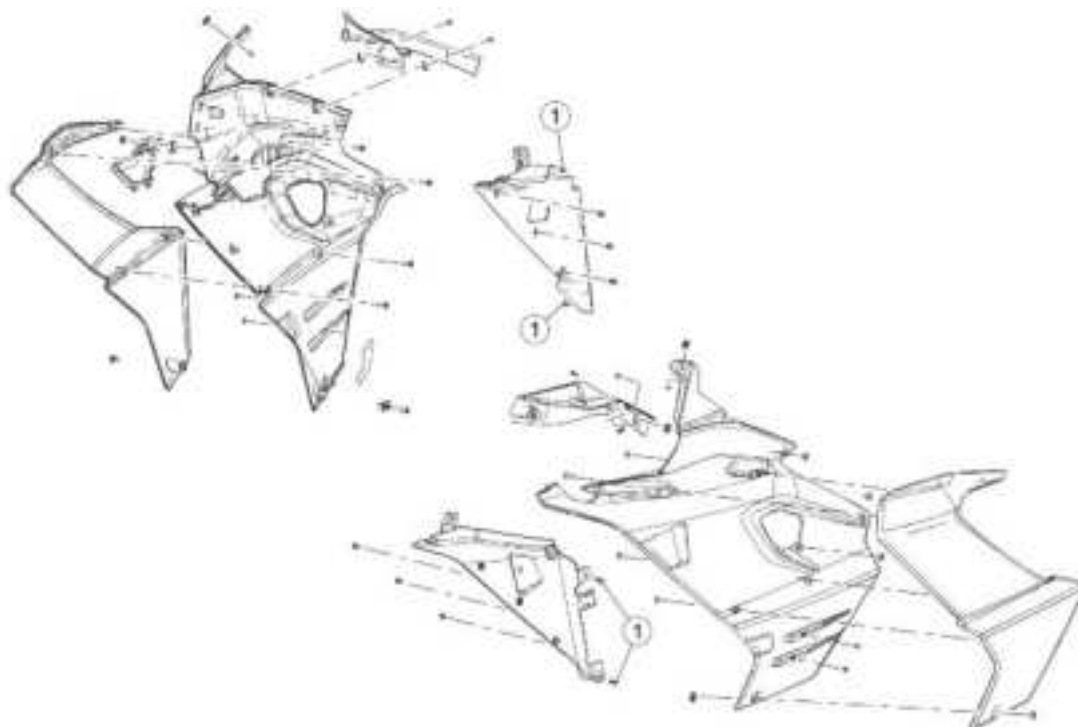
Pos.	Description	Type	Quantity	Torque	Notes
1	TCCIC screw fastening instrument cluster support to chassis	M6x20	4	6.5 Nm (4.79 lb ft)	-

Central part

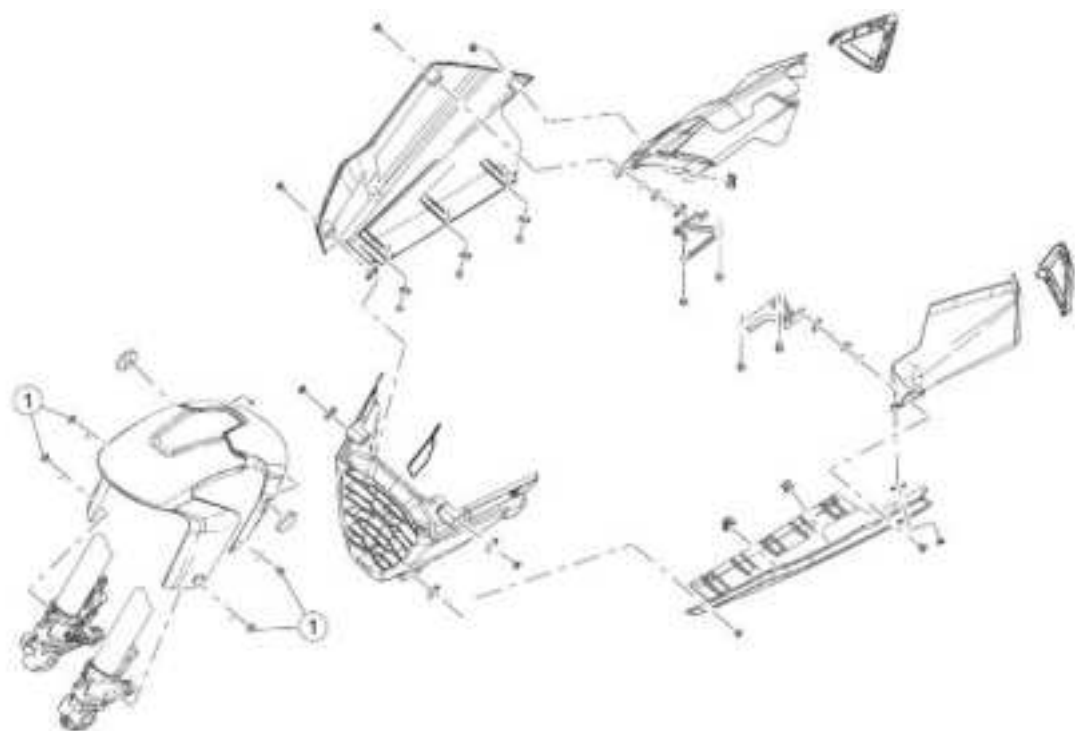


FRAME

Pos.	Description	Type	Quantity	Torque	Notes
1	SHC screws fastening the saddle mounting frame	M10x30	2	50 Nm (36.87 lb ft)	-
2	Self-locking nut for locking the fastening pin of the saddle mounting frame	M10	1	50 Nm (36.87 lb ft)	-
3	Hex screw fixing engine bracket to chassis	M8x20	4	25 Nm (18.43 lb ft)	-
4	Hex screw fixing engine bracket to chassis	M10	4	50 Nm (36.87 lb ft)	-
5	Nut fixing engine pin to chassis	M12	1	50 Nm (36.87 lb ft)	-

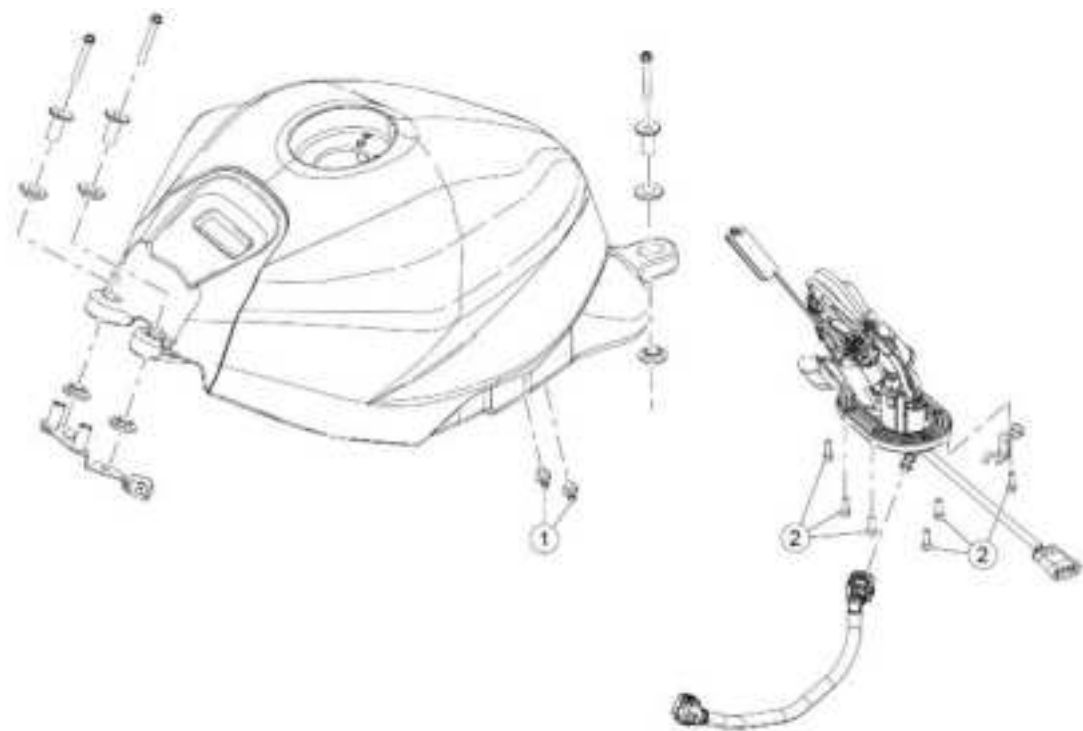
**SIDE FAIRINGS**

Pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing inner fairing to radiator	M5	4	18 Nm (13.27 lbf ft)	-



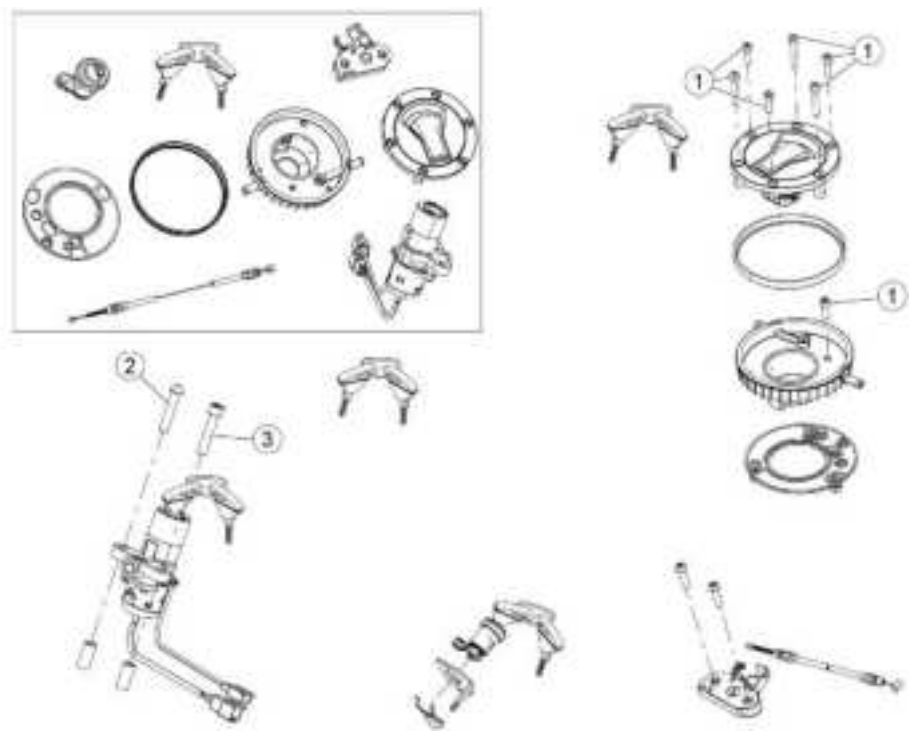
FRONT MUDGUARD - ENGINE FAIRING

Pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screw	M5	4	3 Nm (2.21 lbf ft)	-



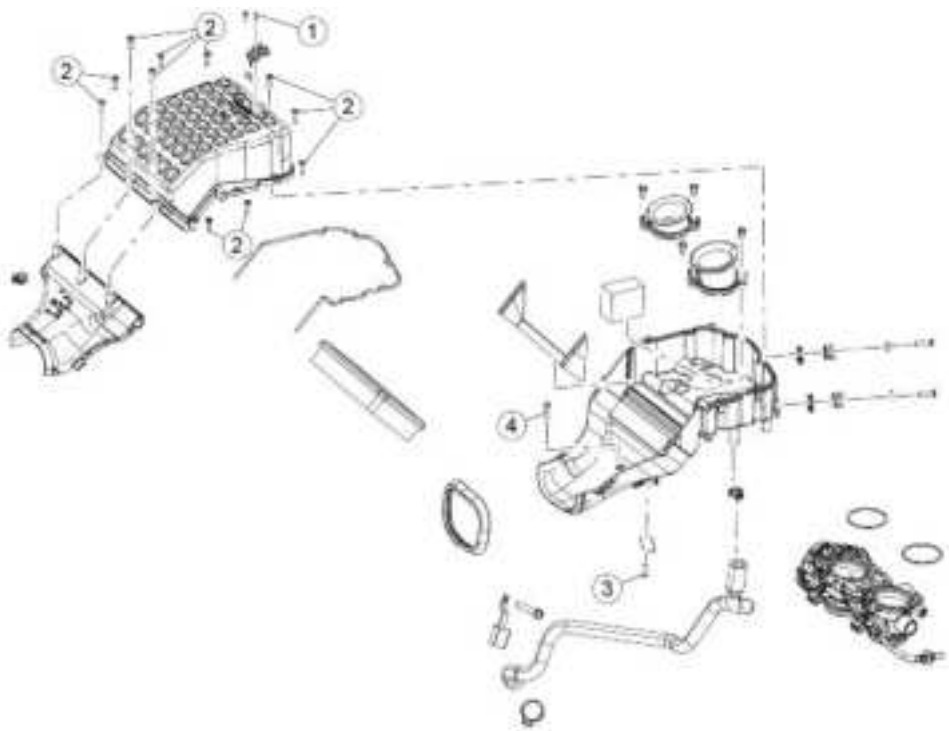
TANK

Pos.	Description	Type	Quantity	Torque	Notes
1	Tank breather couplings	M7	2	3 Nm (2.21 lbf ft)	-
2	Flanged screw fastening fuel pump	M5x15	6	4 Nm (2.95 lb ft)	-



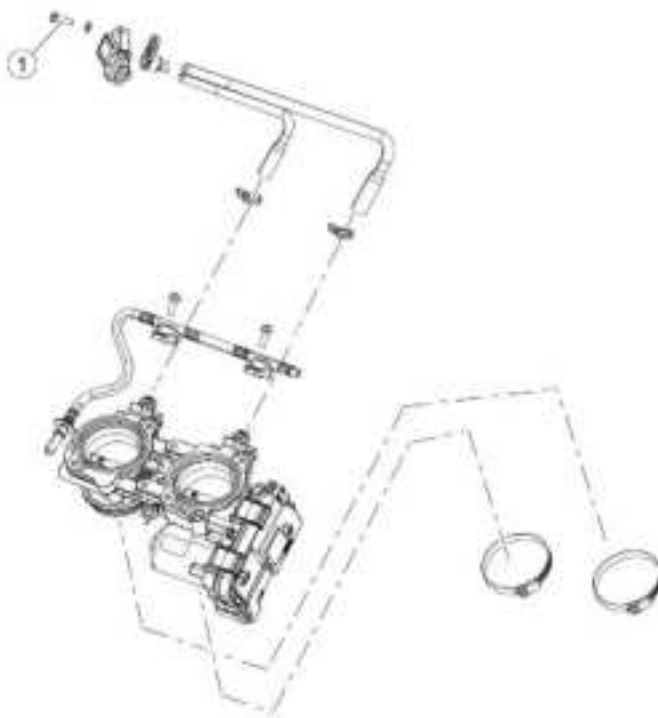
Locks

Pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening cap and tray	M5	7	4 Nm (2.95 lb ft)	-
2	Ignition switch assembly fixing shear head screw	M8x40	1	Bring to break	-
3	SHC screw fastening ignition switch assembly	M8x40	1	20 Nm (14.75 lbf ft)	-

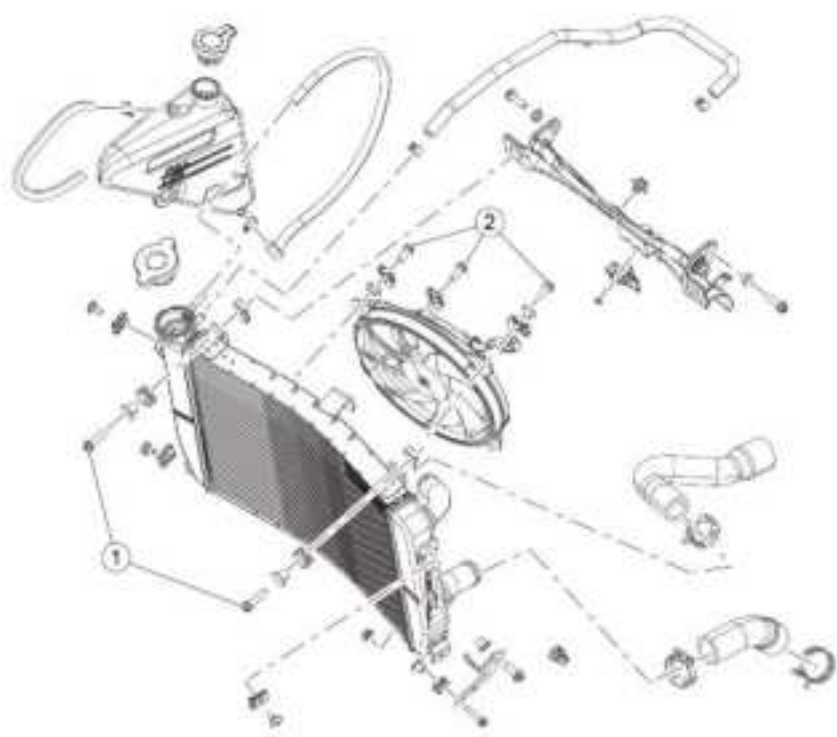


FILTER BOX

Pos.	Description	Type	Quantity	Torque	Notes
1	SWP self-tapping screws fixing temperature sensor	-	2	0.5-0.8 Nm (0.36-0.59 lb ft)	-
2	TCB flanged screws fastening filter box lid	M5x20	11	1-1.2 Nm (0.73-0.88 lb ft)	-
3	SWP TCB flanged screw fastening bleed valve bracket	M5x20	1	1-1.2 Nm (0.73-0.88 lb ft)	-
4	Special TBEI screw fastening the base of the filter box to the canister bracket	M5x25	1	1-1.2 Nm (0.73-0.88 lb ft)	-

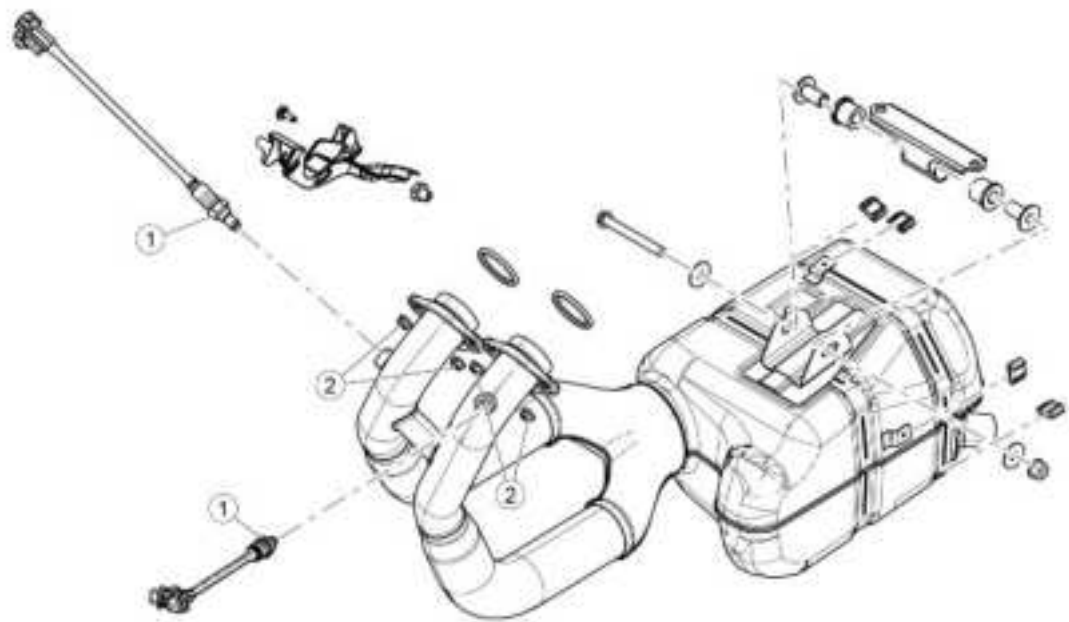
**THROTTLE BODY**

Pos.	Description	Type	Quantity	Torque	Notes
1	Self-tapping TCB screw fixing air pressure sensor	-	1	1-1.2 Nm (0.73-0.88 lb ft)	-



COOLING SYSTEM

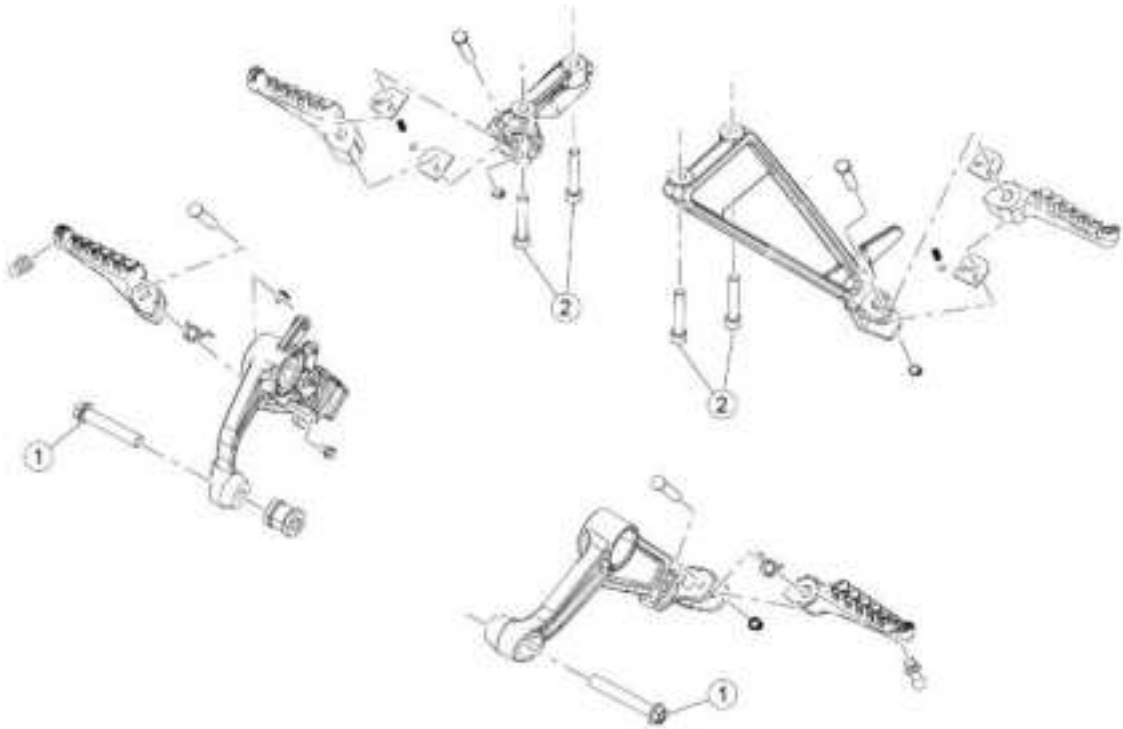
Pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing radiator to support	M6	2	6 Nm (4.42 lb ft)	-
2	Screw fixing the electric fan to the radiator	M6	3	7.5 Nm (5.53 lb ft)	-



SILENCER

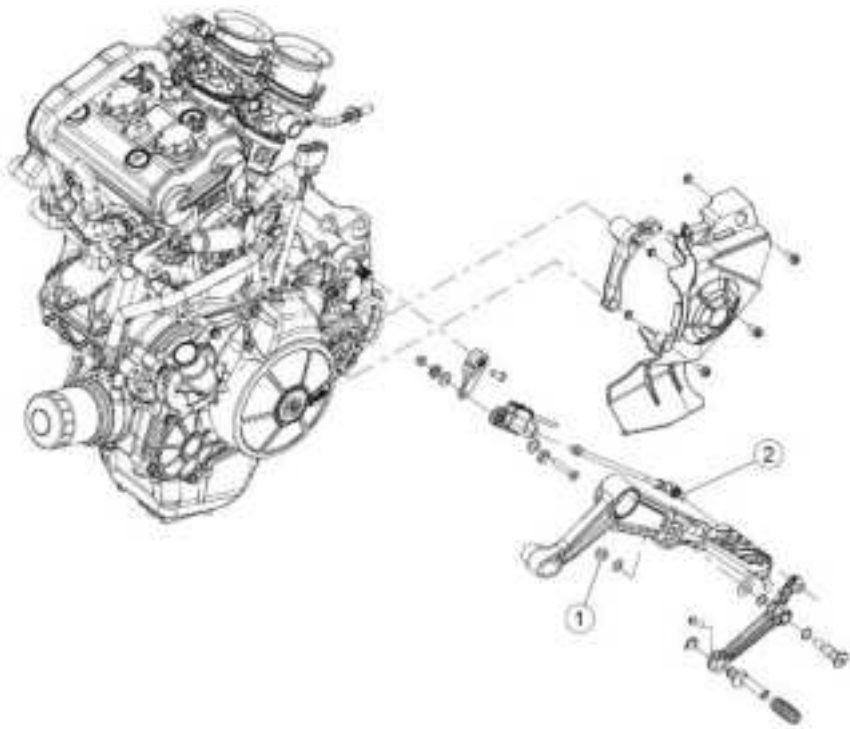
Pos.	Description	Type	Quantity	Torque	Notes
1	Lambda probe	M12	2	25 Nm (18.43 lb ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
2	Exhaust manifold flange fastening nuts	M7	4	13 Nm (9.58 lbf ft)	-



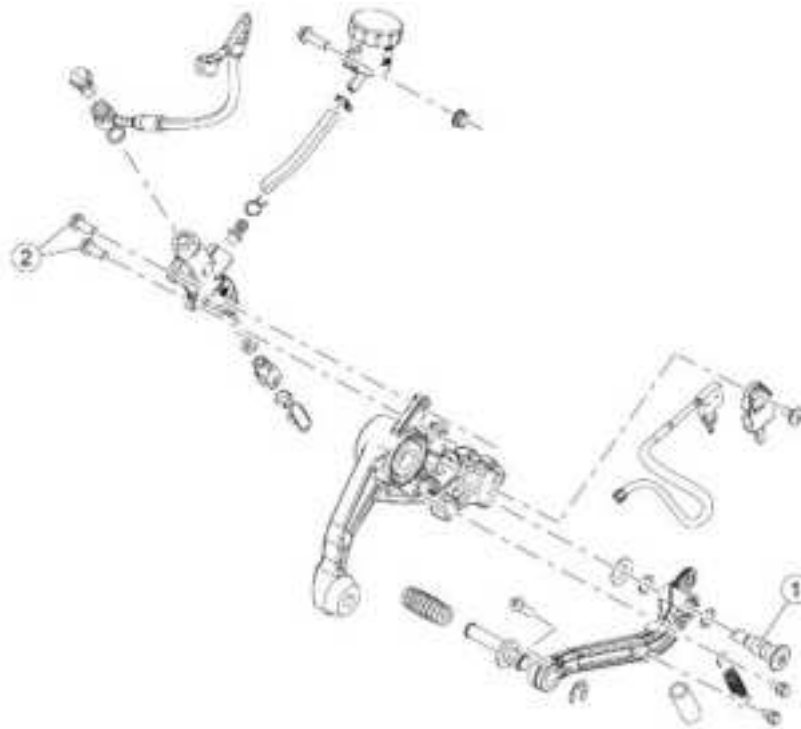
FOOTRESTS

Pos.	Description	Type	Quantity	Torque	Notes
1	TE flanged screws fixing footpegs to the crankcase	M10	2	45 Nm (33.19 lb ft)	-
2	SHC screws fixing passenger footpegs	M8x45	4	25 Nm (18.43 lb ft)	-

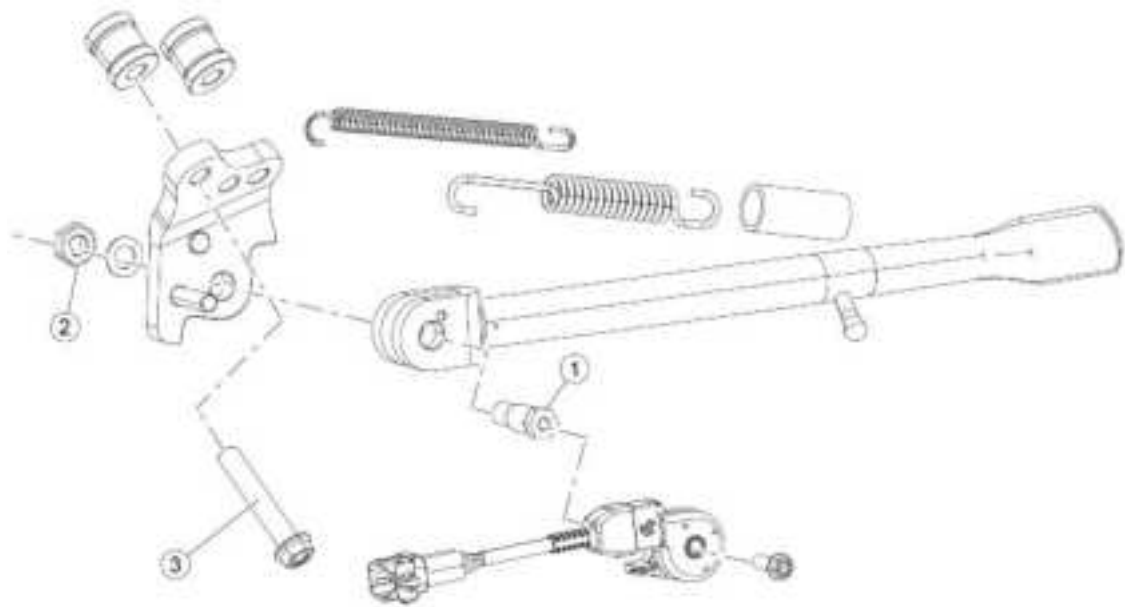


LINKAGE

Pos.	Description	Type	Quantity	Torque	Notes
1	Gearbox lever pin fixing nut	M8	1	25 Nm (18.43 lb ft)	-
2	Spherical pin fixing tie rod to gear lever	M6	1	8.5 Nm (6.26 lbf ft)	Loct. 243

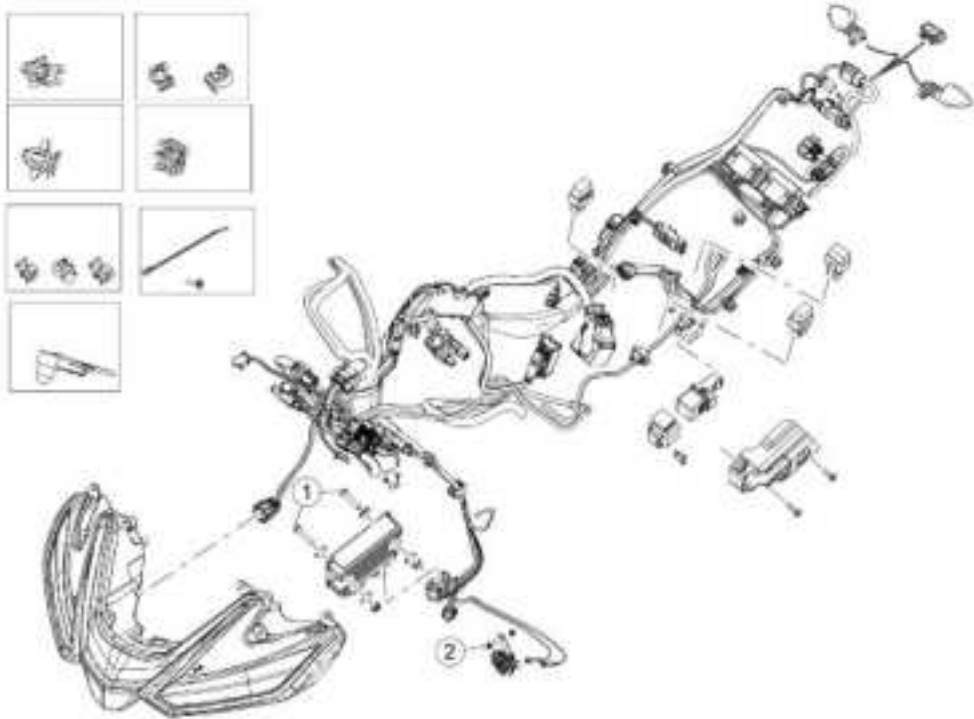
**REAR BRAKE PUMP**

Pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake lever fixing pin	M8	1	25 Nm (18.43 lb ft)	With thread-lockers
2	TE flanged screws fastening rear brake master cylinder	M6x16	2	8 Nm (5.90 lb ft)	With thread-lockers



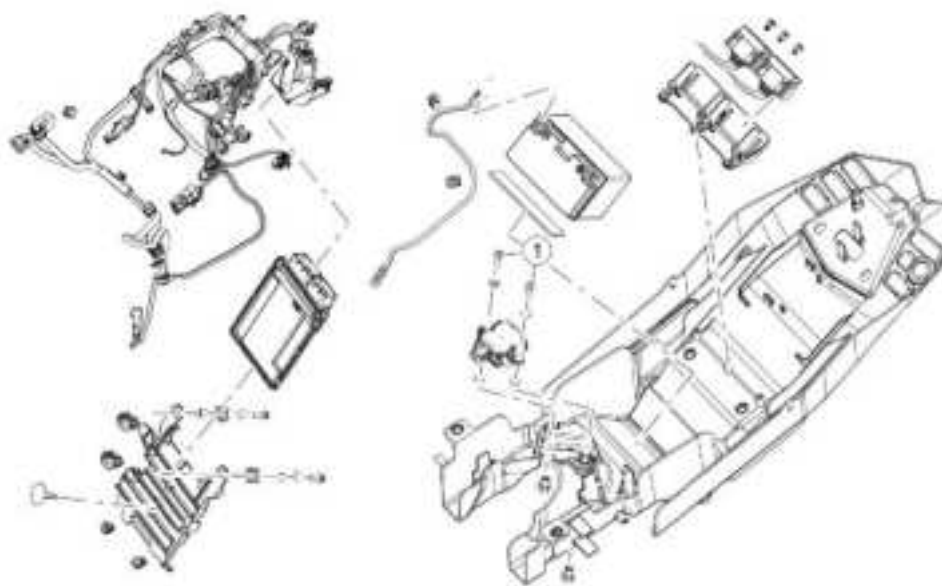
STAND

Pos.	Description	Type	Quantity	Torque	Notes
1	Pin fixing side stand to support	-	1	12 Nm (8.85 lbf ft)	Loct. 243
2	Nut fixing stand pin to bracket	M10	1	30 Nm (22.12 lb ft)	Loct. 243
3	Screws fixing the stand to the engine crankcase	M10	2	45 Nm (33.19 lb ft)	-



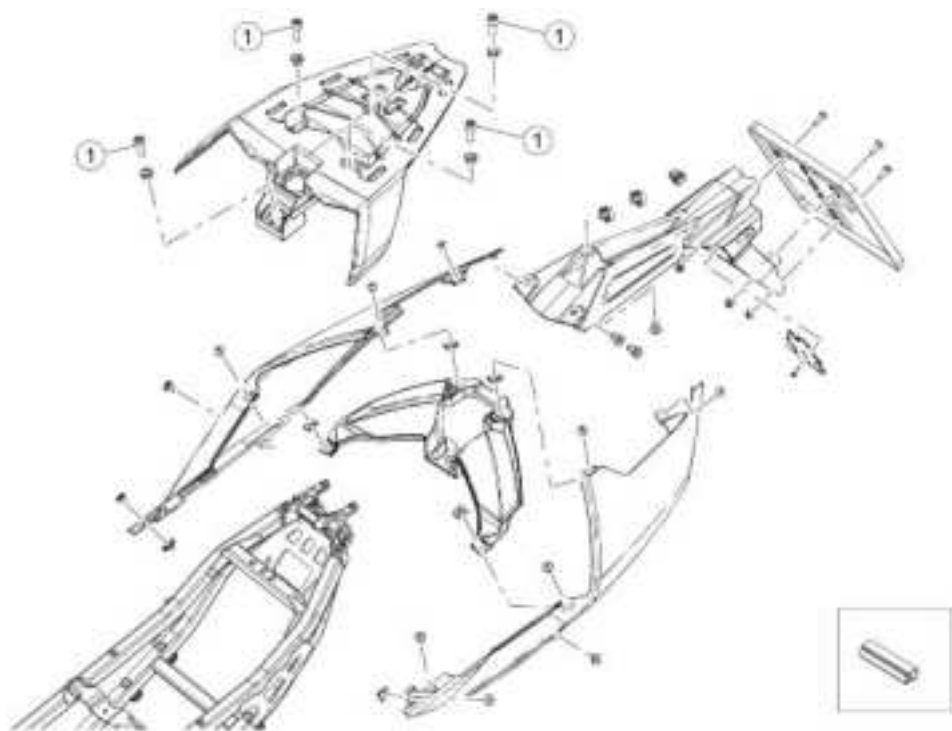
FRONT ELECTRICAL SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Button head, hex. socket voltage regulator fixing screws	M6x30	2	6 Nm (4.42 lb ft)	-
2	Flanged hex screw for horn fixing	M8	1	15 Nm (11.06 lbf ft)	-
-	Starter relay cables fastening screws	M5	2	4 Nm (2.95 lb ft)	-
-	Screw fastening ground cable to the engine	M6	2	10 Nm (7.37 lb ft)	-

**CENTRAL ELECTRICAL SYSTEM**

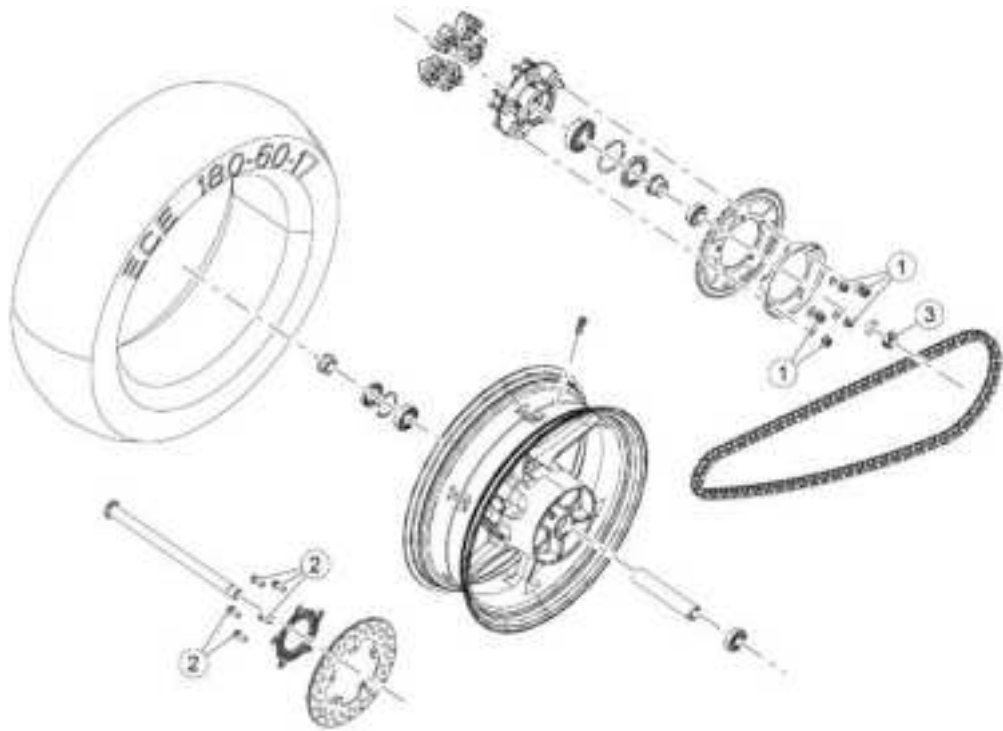
Pos.	Description	Type	Quantity	Torque	Notes
1	Inertial platform TEFL fixing screws	M6x25	2	7.5 Nm (5.53 lb ft)	-

Back side



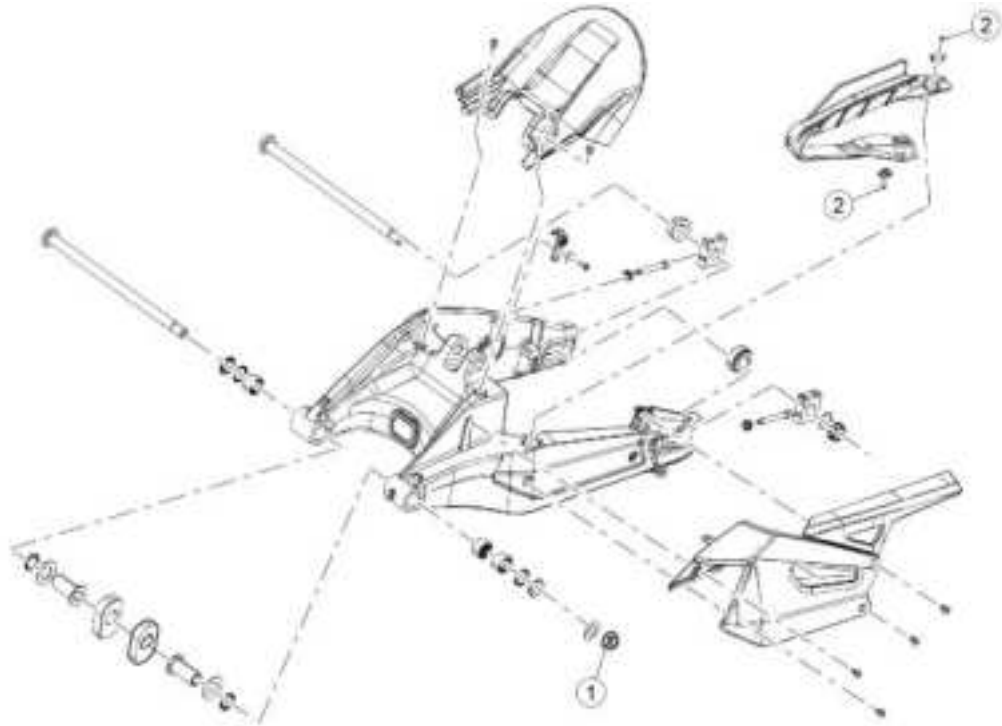
REAR BODYWORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Handle fixing screws	M8	4	18 Nm (13.27 lbf ft)	-

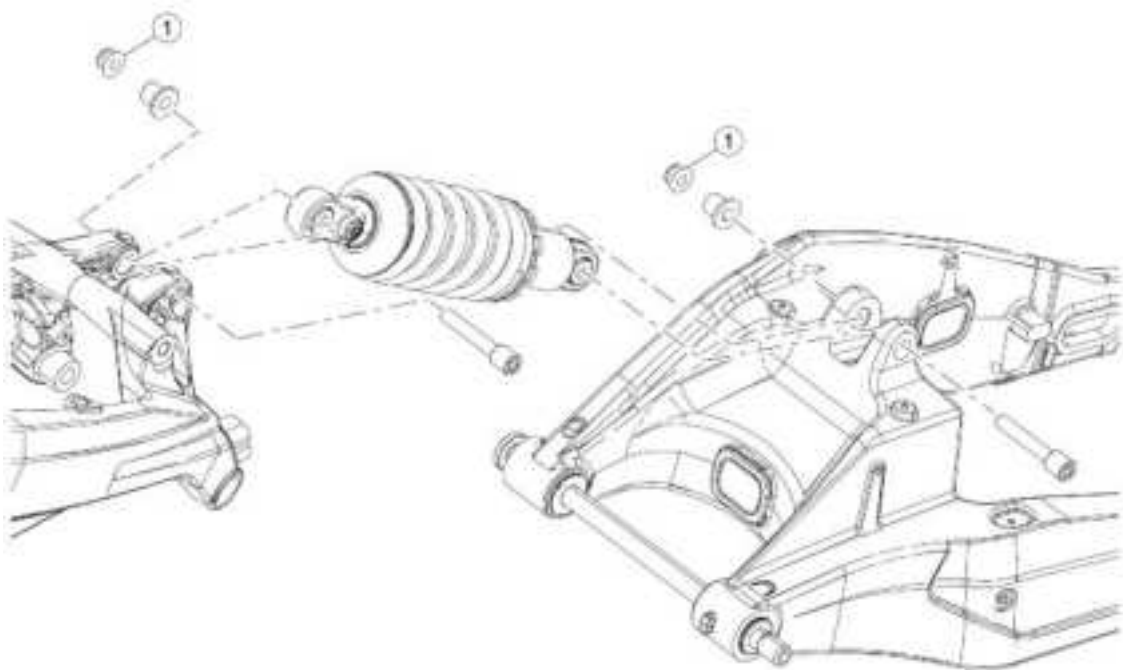


REAR WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Sprocket fixing nuts	M10	5	50 Nm (36.87 lb ft)	-
2	TE flanged screws fastening rear brake disc	M8x20	5	25 Nm (18.43 lb ft)	-
3	Rear wheel axle nut	M20	1	120 Nm (88.50 lbf ft)	-

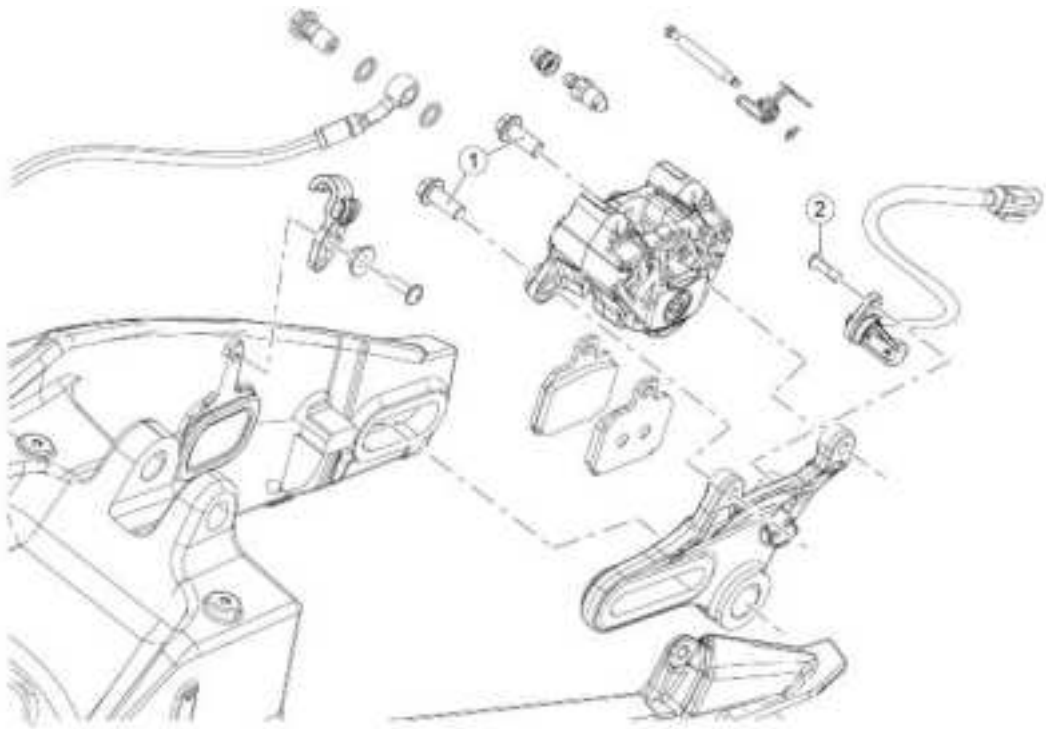
**SWINGARM**

Pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pivot bolt self-locking nut	M16	1	110 Nm (4.33 lbf ft)	-
2	Chain feeder shoe SHC flanged fastening screws	M5x16	2	2 Nm (1.47 lb ft)	-



SHOCK ABSORBER

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, self-locking shock absorber fastening nuts	M10	2	50 Nm (36.87 lb ft)	-

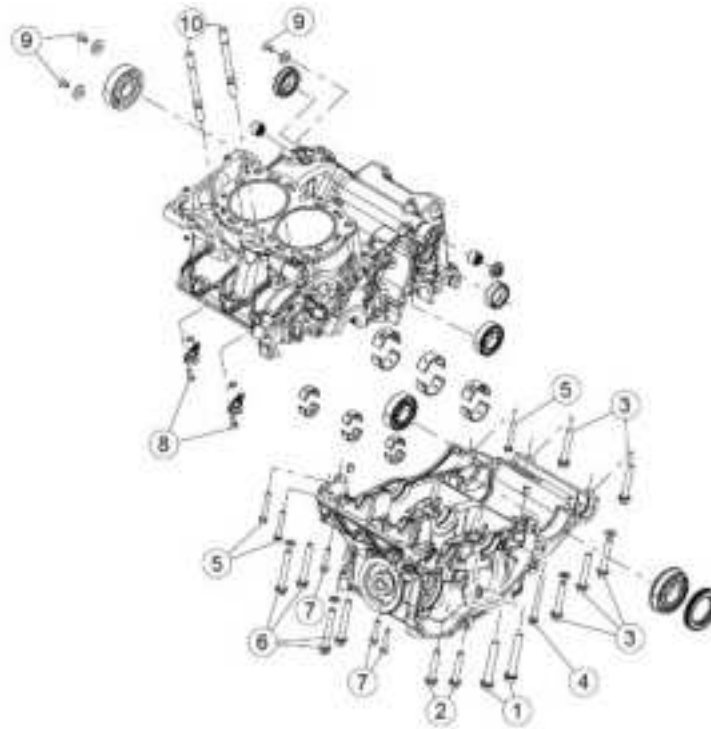


REAR BRAKE CALLIPER

Pos.	Description	Type	Quantity	Torque	Notes
1	TE flanged screws fastening rear brake calliper	M8	2	25 Nm (18.43 lb ft)	With thread-lockers

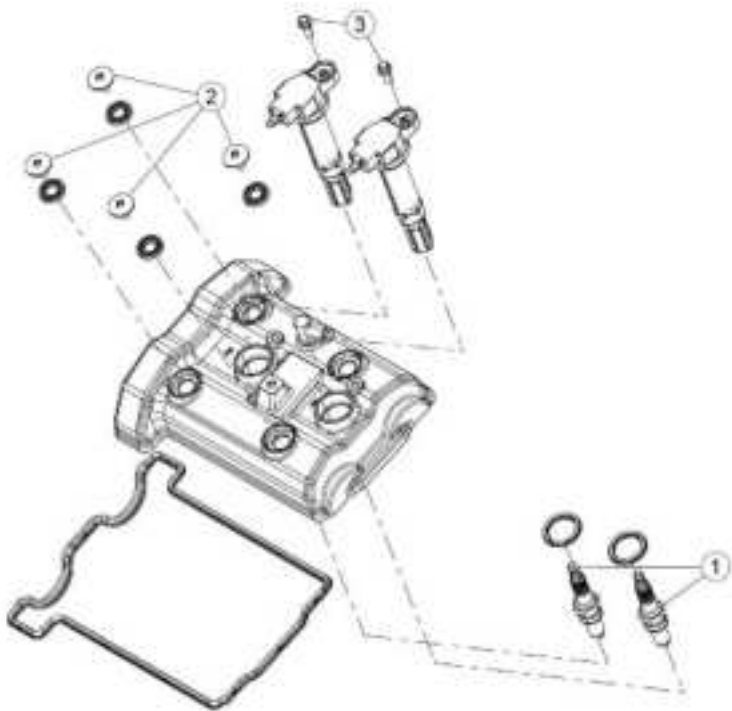
Pos.	Description	Type	Quantity	Torque	Notes
2	Rear ABS sensor fastening TBEI screw	M5x16	1	6 Nm (4.42 lb ft)	With thread-lockers

Engine



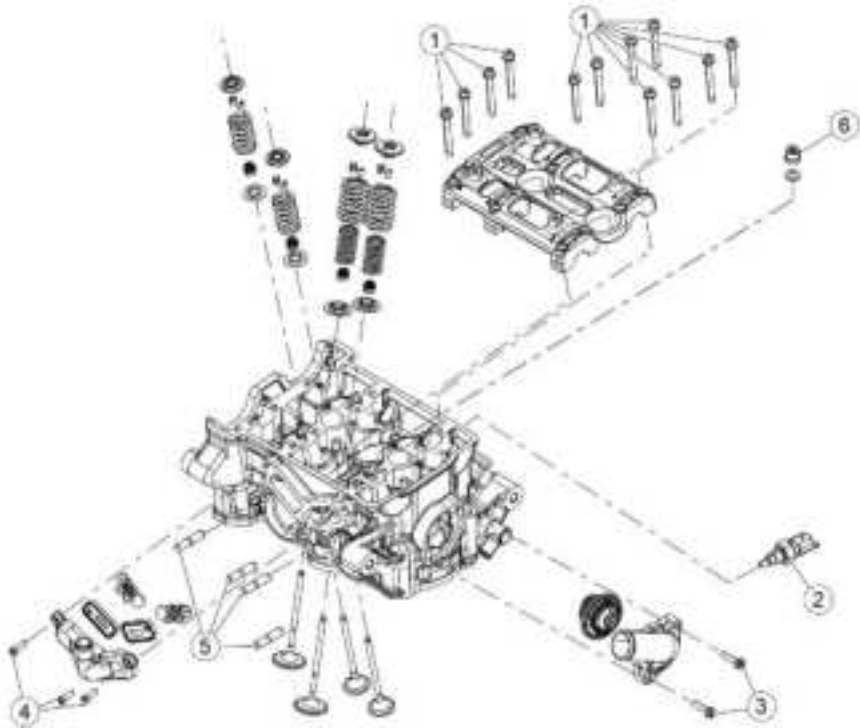
CRANKCASE

Pos.	Description	Type	Quantity	Torque	Notes
1	Crankcase halves mating screws	M10x65	6	1) 15 Nm (11,06 lbf ft) - 2) 20 Nm+30° (14,75 lbf ft+30°) - 3) 30° (resulting torque approx 65 Nm (47,94 lbf ft)	Lubricate with oil
2	Crankcase halves mating threaded hex screws	M8x45	2	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
3	Crankcase halves mating screws	M8x50	9	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
4	Crankcase halves mating screws	M6x70	1	10,8-13,2 Nm (7,97-9,74 lb ft)	-
5	Crankcase halves mating flanged hex screws	M6x40	3	10,8-13,2 Nm (7,97-9,74 lb ft)	-
6	Crankcase halves mating flanged hex screws	M8x60	4	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
7	Crankcase halves mating threaded hex screws	M6x30	4	10,8-13,2 Nm (7,97-9,74 lb ft)	-
8	Pistons lubrication jets SHC fixing screw	M5x14	2	5,4-6,6 Nm (3,98-4.87 lb ft)	-
9	Bearings stopper countersunk hex head screws	-	3	9-11 Nm (6.64-8.11 lb ft)	Pre-impregnated
10	Stud bolts	M10	6	18-22 Nm (13.28-16.23 lbf ft) - H 63,5 +/-0,5 mm (2.50 +/- 0.02 in)	Pre-impregnated



HEAD COVER

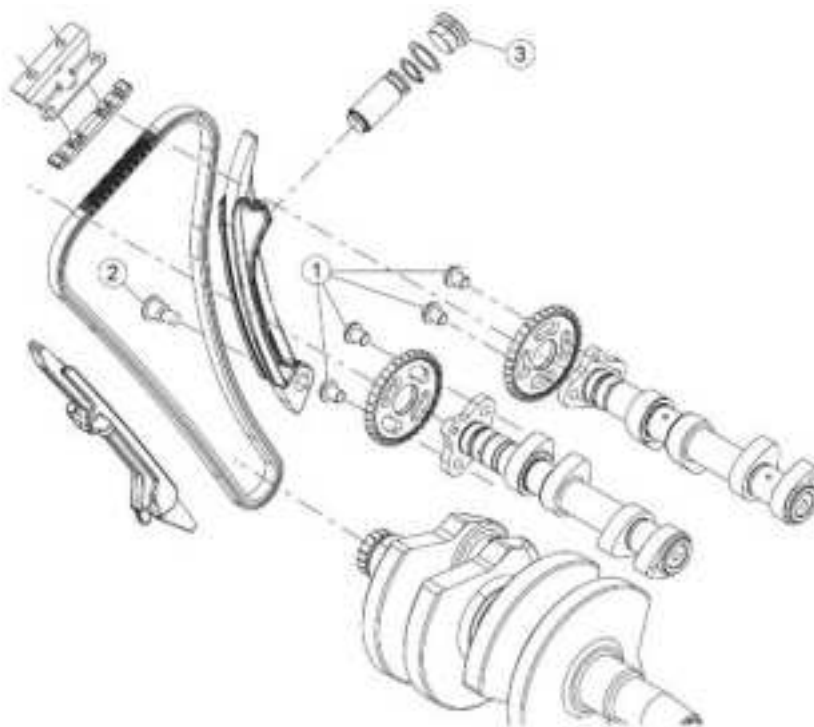
Pos.	Description	Type	Quantity	Torque	Notes
1	Spark plugs	-	2	12 Nm (8.85 lbf ft)	-
2	Head cover fastening screws	-	4	10 Nm (7.38 lbf ft)	-
3	TE flanged coil fixing screw	M6x16	2	12 Nm (8.85 lbf ft)	-



HEAD - VALVES

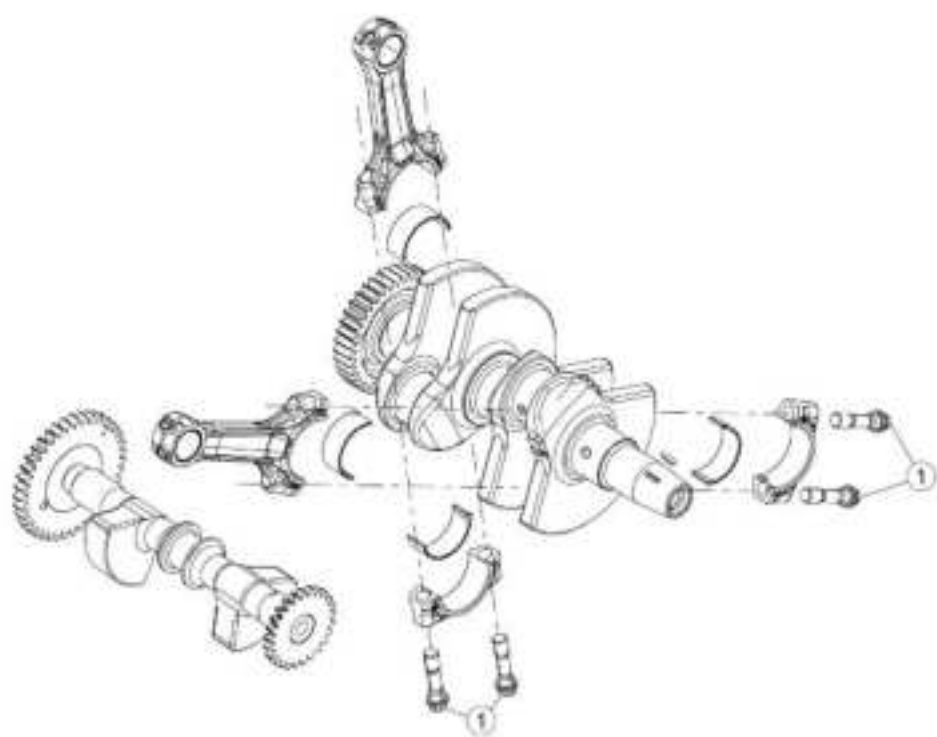
Pos.	Description	Type	Quantity	Torque	Notes
1	Cam tower fixing screws	-	12	11 Nm (8.11 lbf ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
2	Water temperature sensor	-	1	20 Nm (14.75 lbf ft)	-
3	Thermostat cover flanged hex fixing screw	M5	5	6 Nm (4.43 lbf ft)	-
4	Secondary air cover fixing screws	M5x16	3	6 Nm (4.43 lbf ft)	-
5	Stud bolts	M10	4	10 Nm (7.38 lbf ft)	-
6	Flanged nut fixing cylinder head	M10	6	30 Nm (22.12 lb ft)	Pre-tightening
6	Flanged nut fixing cylinder head	M10	6	180°	Tightening



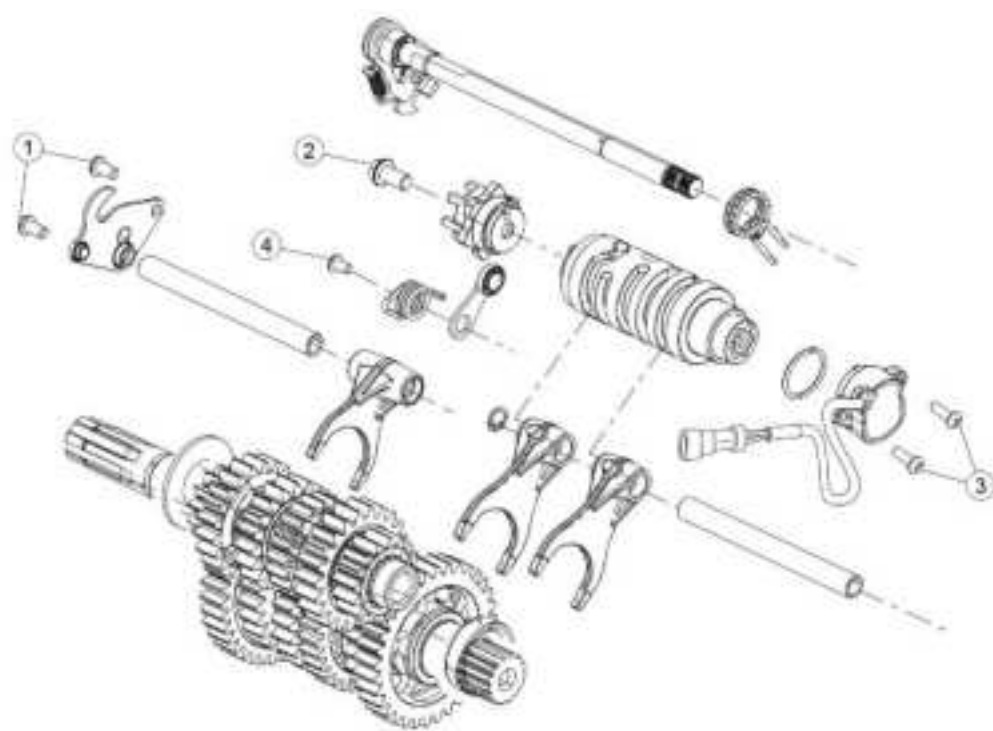
TIMING SYSTEM

Pos.	Description	Type	Quantity	Torque	Notes
1	Timing gears Torx button head fixing screws	-	4	30 Nm (22,13 lbf ft)	-
2	Chain tensioner slider support screw	M8	1	18.5 Nm (13.64 lbf ft)	Pre-permeated
3	Cap	-	1	20 Nm (14.75 lbf ft)	-



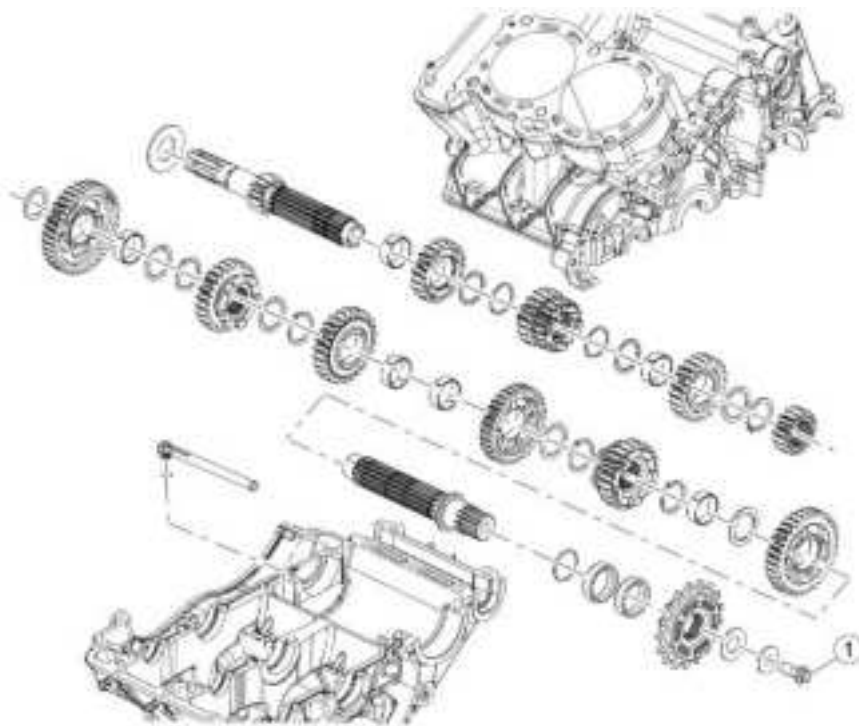
CRANKSHAFT

Pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	M	4	1) 15 Nm (11,06 lbf ft) - 2) 20 Nm+110° (14,75 lbf ft+110°)	Lubricate with Pankl oil

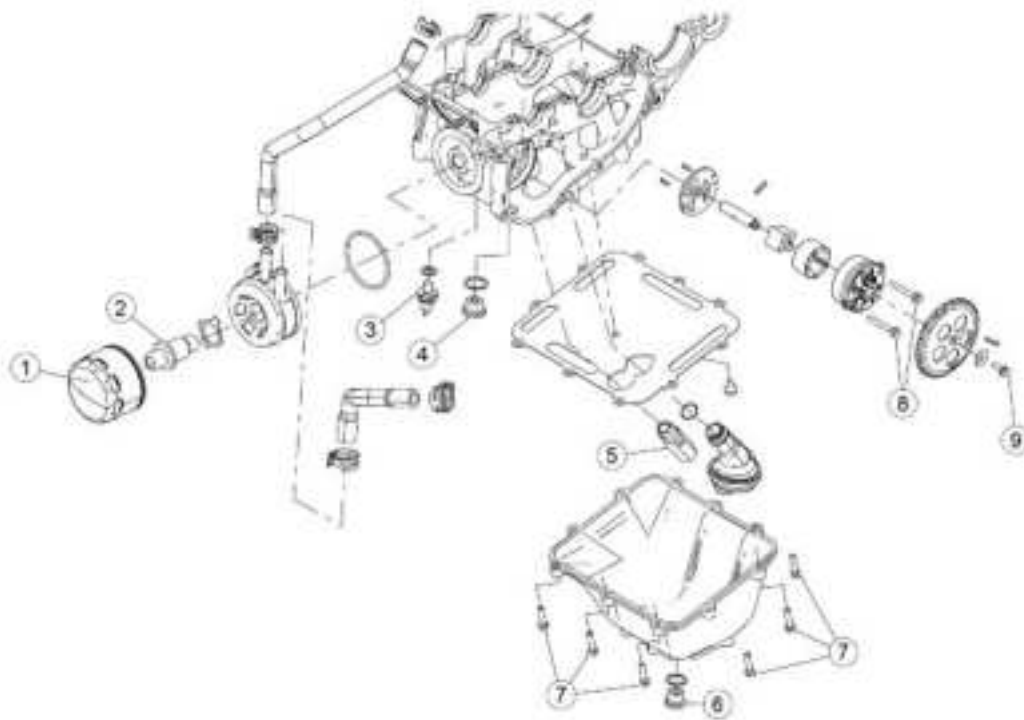


COMPLETE GEAR - SELECTOR - DESMODROMIC

Pos.	Description	Type	Quantity	Torque	Notes
1	Retention plate fixing hex socket screws	-	2	12 Nm (8.85 lbf ft)	Pre-impregnated
2	Gear selector drum fixing flanged hex screw	-	1	25 Nm (18.44 lbf ft)	-
3	Gear sensor fixing round headed screws	-	2	6 Nm (4.43 lbf ft)	-
4	Special screw	-	1	12 Nm (8.85 lbf ft)	-

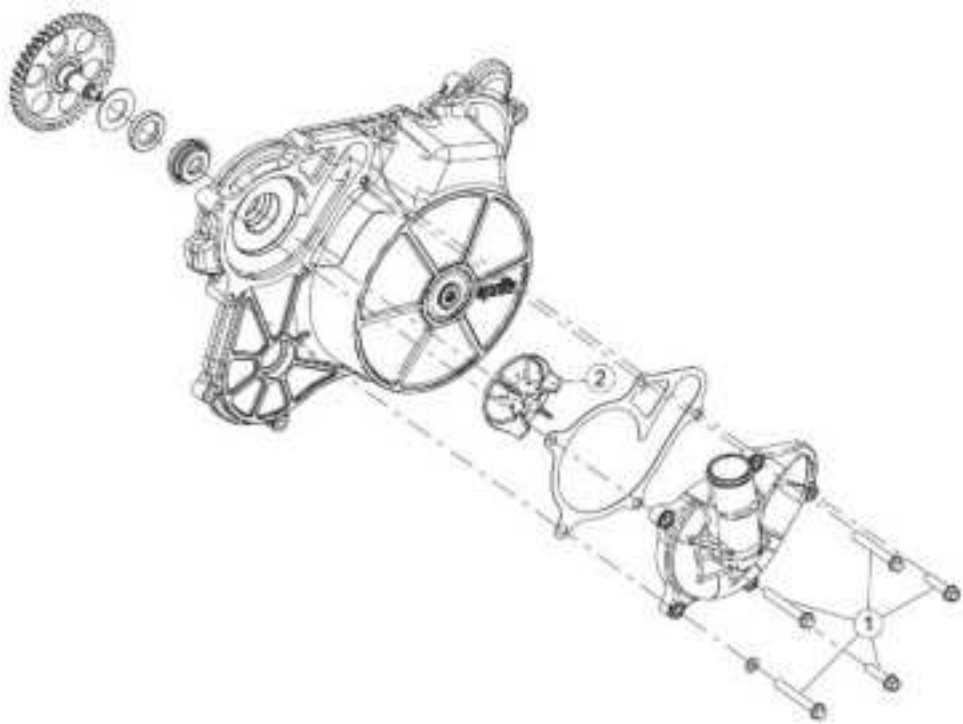
**GEARBOX COMPONENTS**

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, hex. head screw used for fastening the pinion	M10x25	1	50 Nm (36.87 lb ft)	With thread-lockers



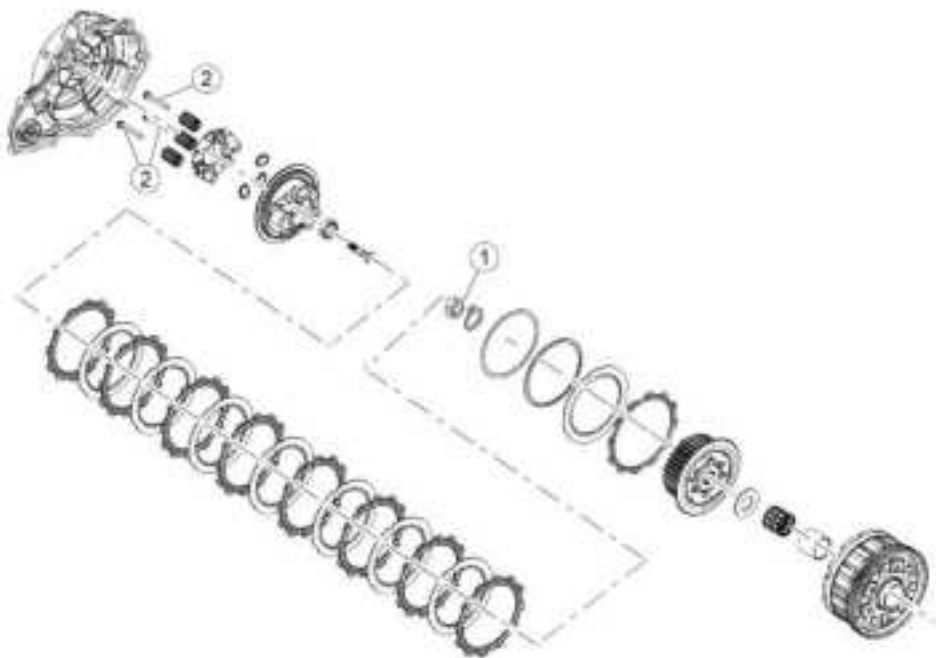
LUBRICATION

Pos.	Description	Type	Quantity	Torque	Notes
1	Oil filter	-	1	15 Nm (11.06 lbf ft)	-
2	Oil filter joint	-	1	28.5 Nm (21.02 lbf ft)	-
3	Oil pressure sensor	-	1	13 Nm (9.59 lbf ft)	-
4	Crankcase cap	-	1	20 Nm (14.75 lbf ft)	-
5	Oil pressure regulation valve	-	1	42 Nm (30.98 lbf ft)	-
6	Drainage plug	-	1	20 Nm (14.75 lbf ft)	-
7	Sump fixing flanged hex screw	M6	10	12 Nm (8.85 lbf ft)	-
8	Oil pump fastening screws	M5	2	6 Nm (4.43 lbf ft)	-
9	Oil pump gear fastener screw	-	1	12 Nm (8.85 lbf ft)	-



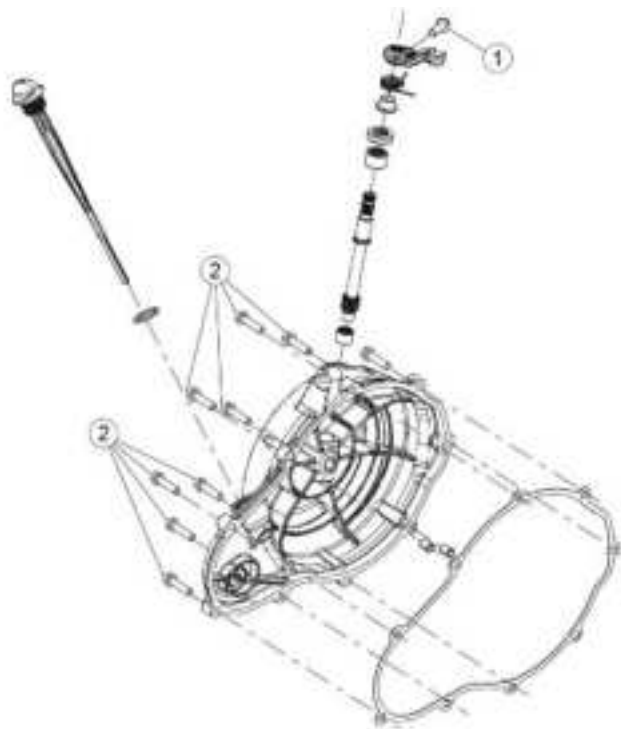
WATER PUMP

Pos.	Description	Type	Quantity	Torque	Notes
1	Water pump cover fixing screws	M6	5	12 Nm (8.85 lbf ft)	-
2	Water pump impeller	-	1	4.5 Nm (3.32 lbf ft)	-



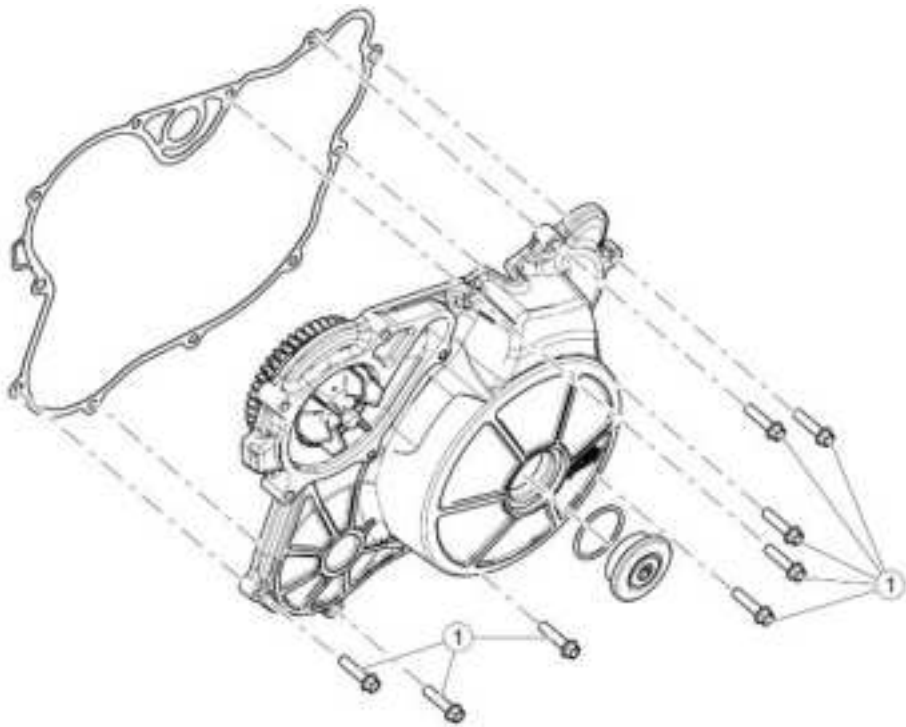
CLUTCH

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch fastening nut	-	1	175 Nm (129.07 lbf ft)	-
2	Screws for springs	M6	3	10 Nm (7.37 lb ft)	-



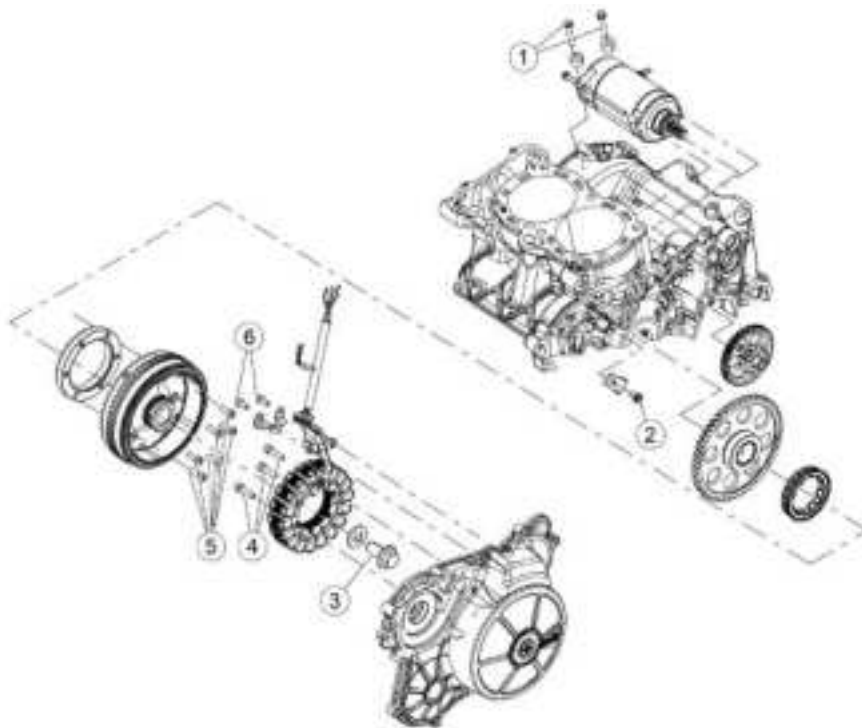
CLUTCH COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch control lever flanged hex fixing screw	M6x20	1	10 Nm (7.38 lbf ft)	-
2	Clutch cover flanged hex fixing screw	-	8	12 Nm (8.85 lbf ft)	-



FLYWHEEL COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Flywheel cover flanged hex fixing screw	M6	8	12 Nm (8.85 lbf ft)	-

**FLYWHEEL - IGNITION**

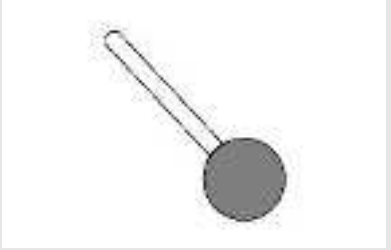
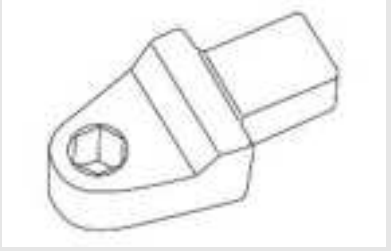
Pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fastening screws	M6x35	2	12 Nm (8.85 lbf ft)	-
2	Starter ring gear containment plate fastening screw	M6x35	1	12 Nm (8.85 lbf ft)	-
3	Rotor fastening screw	M14x30	1	195 Nm (143.82 lbf ft)	-
4	Stator SHC fixing screws	M6x30	3	10 Nm (7.38 lbf ft)	Pre-impregnated
5	Free wheel on rotor SHC fixing screws	M6x18	3	14 Nm (10.33 lbf ft)	Pre-impregnated
6	Stator wiring harness support plate fixing screws	M5x14	2	3 Nm (2.21 lbf ft)	Pre-impregnated

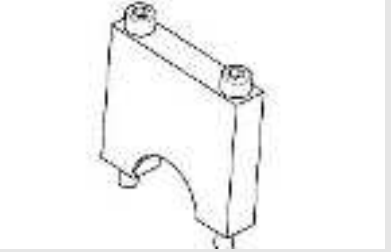
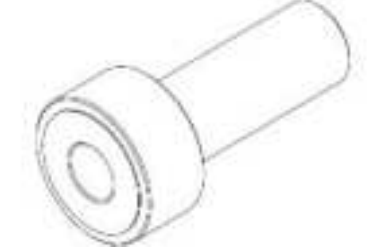
INDEX OF TOPICS

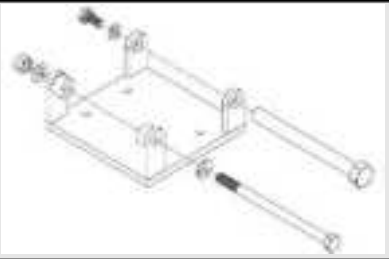
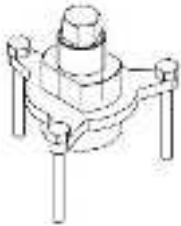
SPECIAL FEATURES

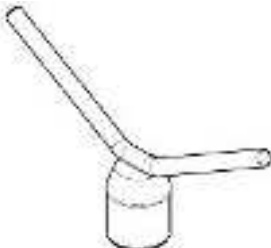
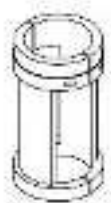
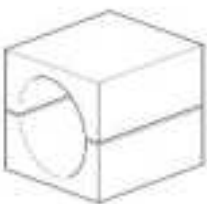
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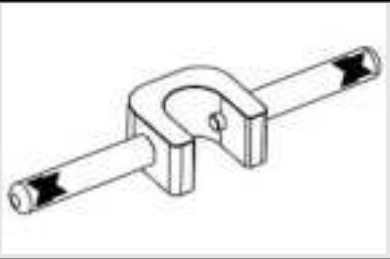
SPECIAL TOOLS

Stores code	Description	
021044Y	Intake camshaft disarming lever	
021043Y	Camshaft timing pin (2 pieces)	
020851Y	Camshaft timing pin	
669N/5 (BETA)	Ratchet torque wrench, rectangular attachment	
736/10.10-1 (STAHLWILLE)	Insert holder for torque wrench with rectangular attachment	
9100896	Clutch bell stopper	

Stores code	Description	
021036Y	Flywheel side crankshaft locking tool	
021037Y	Water pump seal insertion tool	
021038Y	Crankshaft support U-bolt	
020431Y	Valve oil seal extractor	
021039Y	Pick-up distance template	
021040Y	Transmission shaft oil seal press-fit punch on front sprocket side	

Stores code	Description	
021041Y	Engine fixing bracket to mount	
021042Y	Oil seal and clutch shaft bearing and gear shaft punch	
020980Y	Piston assembly ring	
AP8140179	Valve fitting/removal support	
020853Y	Compresses intake valve springs	
020854Y	Compresses exhaust valve springs	
020713Y	Flywheel extractor	

Stores code	Description	
020376Y	Adaptor handle	
020414Y	28 mm punch	
020712Y	Handle for removing the flywheel cover	
AP8140190	Steering tightening tool	
AP8140145	Tool oil seal installation tool	
AP8140146	Weight	
AP8140149	Guard for assembly operations	

Stores code	Description	
020888S	Pre-load tube clamp	
020922Y	Diagnostic tool	
021017Y	OBD cable for E5 vehicles	

INDEX OF TOPICS

MAINTENANCE

MTN

Maintenance chart

NOTE

HALVE THE SERVICE INTERVALS INDICATED IF THE VEHICLE IS USED IN PARTICULARLY RAINY OR DUSTY CONDITIONS, ON POOR ROADS OR FOR HIGH PERFORMANCE RIDING.

NOTE

THE TIMES LISTED ON THE SCHEDULED MAINTENANCE TABLE INCLUDE TIME DEDICATED TO MANAGEMENT ACTIVITIES.

I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE, IF NECESSARY

C: CLEAN, R: REPLACE, A: ADJUST, L: LUBRICATE

(1) Check and clean and adjust or replace, if necessary, before every journey.

(2) Check and clean, adjust or replace if necessary every 1,000 km (621.37 mi).

(3) Replace at whichever of the following occurs first: 40,000 km (24,854.85 mi) or 4 years.

SCHEDULED MAINTENANCE TABLE

Km x 1,000 (mi x 1,000)	1 (0.6)	10 (6.2)	20 (12.4)	30 (18.6)	40 (24.9)	EVERY 12 MONTHS	EVERY 24 MONTHS
Rear shock absorber (bearings - linkage mechanisms)			I		I	I	I
Motorcycle set up	I	I	I	I	I		
Spark plug			R		R		
Drive chain (2)	I - L	I - L	I - L	I - L	I - L	I	I
Clutch cable	L	L	L	L	L	L	L
Front sprocket - rear sprocket - Chain slider		I	I	I	I		
Steering bearings and steering play	I	I	I	I	I	I	I
Wheel bearings - Wheels	I	I	I	I	I	I	I
Diagnosis by tool	I	I	I	I	I	I	I
Brake discs - Brake pads wear (1)	I	I	I	I	I	I	I
Air filter		I	R	I	R		
Engine oil filter	R	R	R	R	R	R	R
Raked			I		I	I	I
Vehicle general operation	I	I	I	I	I	I	I
Valve clearance			A		A		
Cooling system		I	I	I	I		
Brake systems	I	I	I	I	I	I	I
Safety switches (stand, stop, clutch, extra negative stroke, gas control)	I	I	I	I	I	I	I
Brake Fluid	I	I	I	I	I	I	R
Coolant	I	I	I	I	I	I	R
Fork oil (3)					R		
Engine oil	R	R	R	R	R	R	R
Headlight aiming		I	I	I	I		
Fork oil seals		I		I			
Tyres - pressure / wear (1)	I	I	I	I	I	I	I
Nut/bolt tightness	I	I	I	I	I		
Labour time (minutes)	90	110	190	110	280	80	130

NOTE

AT EACH SCHEDULED MAINTENANCE MUST BE VERIFIED WITH THE DIAGNOSTIC TOOL IF THERE ARE ERRORS AND THE IF THE PARAMETERS ARE CORRECT.
ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOSTIC TOOL.

SCHEDULED MAINTENANCE TABLE RESERVED FOR THE US-LATAM MARKET

I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE, IF NECESSARY

C: CLEAN, R: REPLACE, A: ADJUST, L: LUBRICATE

- (1) Check and clean and adjust or replace, if necessary, before every journey.
- (2) Check and clean, adjust or replace if necessary every 621 mi (1,000 km).
- (3) Replace at whichever of the following occurs first: 25.000 mi (40,000 Km) or 4 years.

SCHEDULED MAINTENANCE TABLE

mi x 1,000 (km x 1,000)	0.6 (1)	6.2 (10)	12.4 (20)	18.6 (30)	24.9 (40)
Rear shock absorber (bearings - linkage mechanisms)			I		I
Motorcycle set up	I	I	I	I	I
Spark plug			R		R
Drive chain (2)	I - L	I - L	I - L	I - L	I - L
Clutch cable	L	L	L	L	L
Front sprocket - rear sprocket - Chain slider		I	I	I	I
Steering bearings and steering play	I	I	I	I	I
Wheel bearings - Wheels	I	I	I	I	I
Diagnosis by tool	I	I	I	I	I
Brake discs - Brake pads wear (1)	I	I	I	I	I
Air filter		I	R	I	R
Engine oil filter	R	R	R	R	R
Raked			I		I
Vehicle general operation	I	I	I	I	I
Valve clearance			A		A
Cooling system		I	I	I	I
Brake systems	I	I	I	I	I
Safety switches (stand, stop, clutch, extra negative stroke, gas control)	I	I	I	I	I
Brake Fluid	I	I	I	I	I
Coolant	I	I	I	I	I
Fork oil (3)					R
Engine oil	R	R	R	R	R
Headlight aiming		I	I	I	I
Fork oil seals		I		I	
Tyres - pressure / wear (1)	I	I	I	I	I
Nut/bolt tightness	I	I	I	I	I
Labour time (minutes)	90	110	190	110	280

NOTE

AT EACH SCHEDULED MAINTENANCE MUST BE VERIFIED WITH THE DIAGNOSTIC TOOL IF THERE ARE ERRORS AND THE IF THE PARAMETERS ARE CORRECT. ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOSTIC TOOL.

Recommended Products

Piaggio Group recommends the use of products from its Castrol official partner for the scheduled maintenance of its vehicles.

Only use lubricants and fluids which meet or exceed the performance characteristics specified.

This also applies when topping up only.



TABLE OF RECOMMENDED PRODUCTS

Product	Description	Specifications
Engine oil 10W -50	Synthetic-based lubricant for high performance four-stroke engines.	SAE 10W 50; API SL; JASO MA2

Product	Description	Specifications
Lithium-based grease	Lithium-calcium soap based grease	colour - black, contains EP (Extreme Pressure) additives, excellent water-repellent properties
Anti-freeze liquid, ready to use, colour red	Ethylene glycol antifreeze liquid with organic inhibition additives. Red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16
DOT 4 brake fluid	Synthetic brake fluid.	SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4
Fork oil 7.5W	Fork oil.	SAE 7.5W

Spark plug

To remove the spark plugs, the fuel tank and the complete filter box must first be removed. Then proceed as described:

- After releasing the coil connectors from the supports, disconnect them.



- Disconnect the corrugated pipe from the cable glands and unscrew the screw that secures the earth cable and the canister support to the head cover.



- Remove the canister complete with support.



- After removing the screws holding the coils, disconnect them from the spark plugs and remove them.



- Using a special spark plug wrench, unscrew and remove them.



- Check the efficiency and check the electrode gap. If they are not within the parameters, replace them.

Engine oil

Check



THE OIL LEVEL MUST BE CHECKED WHEN THE ENGINE IS WARM.

IMPORTANT

DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT A STANDSTILL TO WARM UP THE ENGINE AND OBTAIN THE OPERATING TEMPERATURE OF ENGINE OIL. PREFERABLY CHECK THE OIL AFTER A JOURNEY OF AFTER TRAVELLING APPROXIMATELY 15 Km (10 miles) IN EXTRA-URBAN CONDITIONS (ENOUGH TO WARM UP THE ENGINE OIL TO OPERATING TEMPERATURE).

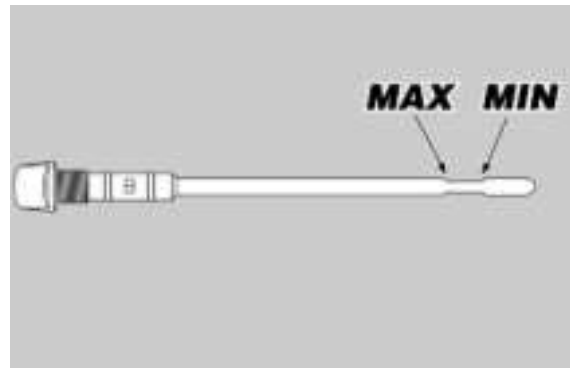
- Shut off the engine and wait a few seconds
- Keep the vehicle upright with both wheels on the earth
- Ensure that you are on a flat surface
- Unscrew the engine oil level dipstick (1)



- Clean the engine oil level dipstick (1) and put it back in without screwing it in
- Remove it again and check the engine oil level
- The level is correct if it reaches the "MAX" level approximately. Otherwise top off the engine oil

IMPORTANT

THE OIL LEVEL MUST NEVER DROP BELOW THE MINIMUM MARKING OR EXCEED THE MAXIMUM MARKING; AN OIL LEVEL NOT WITHIN THE MINIMUM AND MAXIMUM MARKINGS MAY CAUSE SEVERE ENGINE DAMAGE



Replacement

NOTE

HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY.

- Place a container with suitable capacity under the drainage plug.
- Unscrew and remove the drainage plug.



- Unscrew and remove the filler cap.



- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and, if necessary, replace the drainage plug sealing washers.
- Remove the oil filter.
- Spread a thin layer of oil on the sealing ring of the new engine oil filter.
- Insert and screw the new engine oil filter in the seat, filling the filter to 1/3 of its capacity with engine oil before fitting.



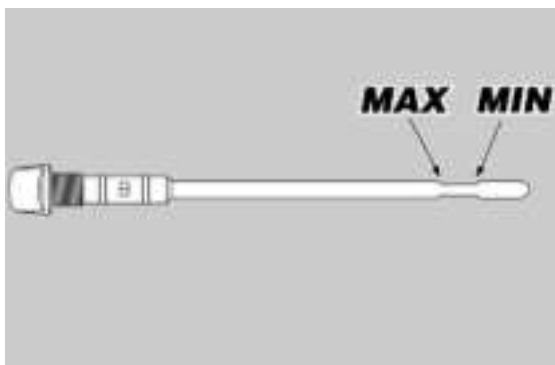
- Screw and tighten the drainage plug.
- Add 2700 cc (164.76 cu in) of new engine oil of the specified type.
- Screw on the filler cap.



- Warm up the engine up by running it for a few minutes, then switch it off. After thirty seconds, check the level with a oil level dipstick. Top up if necessary.

IMPORTANT

THE OIL LEVEL MUST NEVER DROP BELOW THE MINIMUM MARKING OR EXCEED THE MAXIMUM MARKING; AN OIL LEVEL NOT WITHIN THE MINIMUM AND MAXIMUM MARKINGS MAY CAUSE SEVERE ENGINE DAMAGE



Engine oil filter

Replace the engine oil filter each time you change the engine oil.

- Drain the engine oil completely.
- Unscrew and remove the engine oil filter from its seat.

NOTE

NEVER REUSE AN OLD FILTER.



- Spread a thin layer of oil on the sealing ring of the new engine oil filter.
- Insert and screw the new engine oil filter in the seat, filling the filter to 1/3 of its capacity with engine oil before fitting.

See also

[Replacement](#)

Air filter

- Remove the fuel tank.
- Disconnect the intake air temperature sensor connector.



- Remove the eleven filter box lid fastening screws.



- Remove the filter box cover.



- Remove the filter retainer..



- Remove the filter.



Corpo farfallato

Rimozione corpo farfallato

To remove the throttle body, the fuel tank and the complete filter box must first be removed.

Then proceed as described:

- Having removed the canister, using pliers remove the metal clamp (1) and disconnect the vacuum valve (2).



- Disconnect the two vacuum pipes (3) from the air pressure sensor (4).



- Disconnect the injector connectors (5).



- Release the metal clamps (6) which hold the throttle body to the manifolds.



- After having removed the throttle body from the manifolds and unhooked the safety hook of the connector (7), disconnect it.



- Disconnect the fuel hose from the fitting (8).



Cassa filtro aria

Rimozione cassa filtro aria

To remove the filter housing, firstly remove the fuel tank and then proceed as described:

- Disconnect the intake air temperature sensor connector (1).



- Remove the eleven fixing screws (2) of the filter box cover.



- Remove the filter box cover (3).



- Remove the filter retainer (4).



- Remove the filter (5).



- If it needs cleaning, remove the blow-by filter (6).



- Remove the two screws (7) securing the filter box to the cable support of the main wiring harness.



- Remove the two fixing screws (8) of the ECU support to the filter housing.



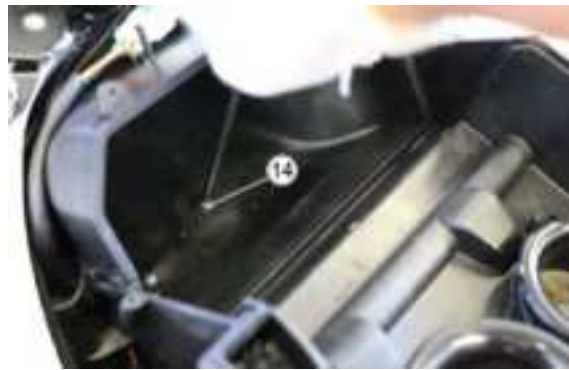
- Remove the fixing screw (9) and relative bush (10) of the sensor (11).



- After removing the two springs (12) from the breather pipes (13), disconnect them.



- Remove the central screw (14) inside the filter box which is fixed on the canister support below.



- Remove the 4 screws (15) securing the intake duct.



- Remove the 2 intake ducts (16).



- Disconnect the two connectors (17) of the ignition switch assembly from the filter box.



- Disconnect the vacuum valve (18) from the support.



- Remove the complete filter box (19).



- If necessary, it is possible to separate the upper duct from the filter box base.

Checking the ignition timing

To proceed with the engine timing check, it is necessary to first remove the fuel tank, the side fairings, the complete filter box, the throttle body, the canister, the ignition switch assembly and clutch housing.

Then proceed as described:

COMPONENTS DISASSEMBLY

- Working from the left side of the motorcycle, having removed the inspection cap, rotate the engine clockwise until the top dead centre of cylinder 1 is reached.
- Rotate a further +20° to intercept the hole in the crankcase on the right side of the vehicle near the crankshaft timing gear.
- Insert the first centring pin (1).



Special tools

020851Y Camshaft timing pin

- Insert the second pin (2) through the holes in the timing gear of the exhaust camshaft.
- Insert the third pin (3) through the holes in the timing gear of the intake camshaft.
- In this way block the rotation of the engine.



Special tools

021043Y Camshaft timing pin (2 pieces)

- Using the special tools and a T40 torx insert, loosen the two fixing screws (4) of the intake camshaft timing gear.



Special tools

669N/5 (BETA) Ratchet torque wrench, rectangular attachment

736/10.10-1 (STAHLWILLE) Insert holder for torque wrench with rectangular attachment

- Complete the removal by working from the outside using a ball end torx wrench.



- Working on the chain tensioner, remove the plug (5) complete with copper washer (6).



- Unscrew and remove the fitting (7) complete with metal washer (8).



- Using a magnet, extract the chain tensioner (9).



- Undo and remove the two screws (10) and the plate (11) complete with slider.



- Remove the third pin (3).



- Remove the timing gear (4) from the intake camshaft by sliding it off the chain.



- Position the specific tool (5) on the external cam of the intake shaft as shown and rotate the intake camshaft forward to free the valves.



Special tools

021044Y Intake camshaft disarming lever

- Remove the second pin (2).



- Completely unscrew the ten fixing screws (6) of the cam tower.



- Remove the cam tower (7) complete with screws.



- Depending on which valve needs adjustment, remove the intake camshaft (8) or the exhaust camshaft.



- Remove the bucket tappet (9) of the valve requiring adjustment.



- Remove the calibrated pad (10) and replace it with the one needed to obtain the correct valve clearance.



COMPONENTS INSTALLATION

- After lubricating the bucket tappets, the rotation seats of the camshafts and the shafts themselves, position them on the head. The exhaust camshaft has two grooves in the indicated point. (lubricate with MOLYKOTE G-RAPID PLUS).

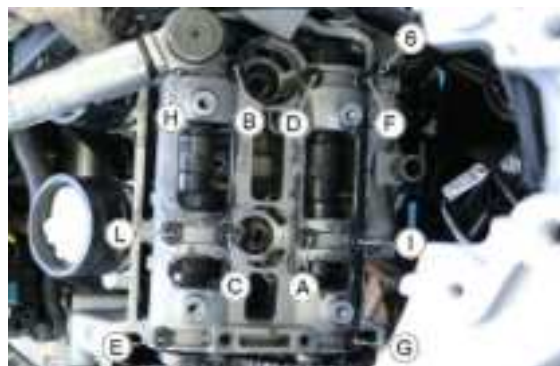
- The correct positioning is determined by the holes, for the insertion of the pins, facing upwards.



- Position the cam tower (7) complete with fixing screws, with the exception of the two that will subsequently fix the upper slider.



- Tighten the ten fixing screws (6) of the cam tower to the prescribed torque following the indicated sequence.



- Insert the second centring pin (2) on the exhaust camshaft at the point shown.

Special tools

021043Y Camshaft timing pin (2 pieces)



- Position the timing gear (4) complete with chain on the intake camshaft.



- Position the specific tool (5) on the external cam of the intake camshaft as shown and rotate the intake camshaft to intercept the insertion point of the third pin (3) on the cam tower.



Special tools

021044Y Intake camshaft disarming lever

021043Y Camshaft timing pin (2 pieces)

- Using a punch, simulate the tension of the transmission chain and check that the holes of the fixing screws of the timing gears are centred with respect to the slotted holes of the gears themselves.



- Insert and hand tighten one screw of the timing gear.



- Position the plate (11) complete with sliding block and relative screws (10).
- Tighten the two screws to the prescribed torque.



- After verifying correct operation, use a rubber hammer to arm the chain tensioner.



- Insert the chain tensioner (9) complete with a new O-Ring.



- Insert the fitting (7) complete with a new metal washer (8) and tighten it to the prescribed torque.



- Disarm the chain tensioner by using a punch through the hole in the fitting.



- Insert the plug (5) complete with a new copper washer (6) and tighten it to the prescribed torque.



- Using the special tools and a T40 torx insert, having inserted the missing screw, tighten the two fixing screws (4) of the intake camshaft timing gear to the prescribed torque.



Special tools

669N/5 (BETA) Ratchet torque wrench, rectangular attachment

736/10.10-1 (STAHLWILLE) Insert holder for torque wrench with rectangular attachment

- Complete the reassembly procedure by repositioning the valve cover.

Checking the valve clearance

To proceed with the valve clearance check, it is necessary to first remove the fuel tank, the side fairings, the complete filter box, the throttle body and the canister.

Then proceed as described:

- Working from the left side of the motorcycle, having removed the inspec-



tion cap, rotate the engine clockwise until the valve to be measured is freed.

- Using a feeler gauge, measure the distance between the cam of the camshaft and the valve bucket tappet.

Characteristic

Intake valve clearance

0.10 - 0.15 mm (0.0039 - 0.0059 in)

Exhaust valve clearance

0.20 - 0.25 mm (0.0078 - 0.0098 in)

If the valve clearance is not within the tolerance range, proceed with the adjustment, referring to paragraph "timing check"

See also

[Checking the ignition timing](#)

Spessore pastiglie calibrate



Pad thickness for adjusting valve clearance correctly:

1.75 mm (0.0689 in)

1.77 mm (0.0697 in)

1.80 mm (0.0709 in)

1.82 mm (0.0716 in)

1.85 mm (0.0728 in)

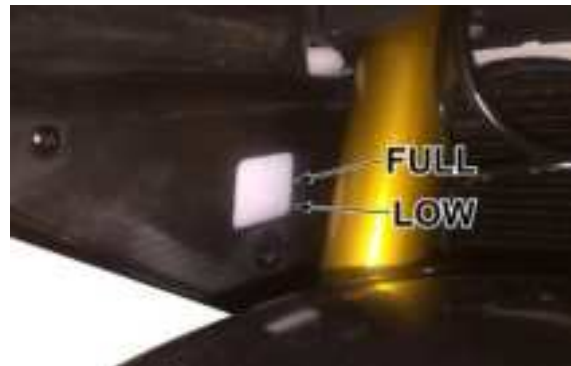
1.87 mm (0.0736 in)
1.90 mm (0.0748 in)
1.92 mm (0.0756 in)
1.95 mm (0.0768 in)
1.97 mm (0.0775 in)
2 mm (0.0787 in)
2.02 mm (0.0795 in)
2.05 mm (0.0807 in)
2.07 mm (0.0815 in)
2.1 mm (0.0827 in)
2.12 mm (0.0835 in)
2.15 mm (0.0846 in)
2.17 mm (0.0854 in)
2.2 mm (0.0866 in)
2.22 mm (0.0874 in)
2.25 mm (0.0886 in)
2.27 mm (0.0894 in)
2.3 mm (0.0905 in)
2.32 mm (0.0913 in)
2.35 mm (0.0925 in)
2.37 mm (0.0933 in)
2.4 mm (0.0945 in)
2.42 mm (0.0953 in)
2.45 mm (0.0964 in)
2.47 mm (0.0972 in)
2.50 mm (0.0984 in)
2.52 mm (0.0992 in)
2.55 mm (0.1004 in)
2.57 mm (0.1012 in)
2.6 mm (0.1024 in)
2.62 mm (0.1031 in)
2.65 mm (0.1043 in)
2.67 mm (0.1051 in)
2.7 mm (0.1063 in)
2.72 mm (0.1071 in)
2.75 mm (0.1083 in)
2.77 mm (0.1090 in)
2.8 mm (0.1102 in)

2.82 mm (0.1110 in)
2.85 mm (0.1122 in)
2.87 mm (0.1129 in)
2.9 mm (0.1142 in)
2.92 mm (0.1150 in)
2.95 mm (0.1161 in)
2.97 mm (0.1169 in)
3 mm (0.1181 in)
3.02 mm (0.1189 in)
3.05 mm (0.1201 in)
3.07 mm (0.1209 in)
3.10 mm (0.1220 in)
3.12 mm (0.1228 in)
3.15 mm (0.1240 in)

Cooling system

Level check

- Shut off the engine and wait until it cools off.
- Keep the vehicle in a vertical position, with both wheels resting on the flat ground.
- Make sure, looking from the left side of the vehicle through the specific slit on the right inner fairing that the level of the liquid contained in the expansion tank lies between "FULL" (maximum) and "LOW" (minimum).



WARNING

CARRY OUT THE CHECK AND TOP UP THE REFRIGERANT LIQUID WITH THE ENGINE SWITCHED OFF AND COLD.

Top-up

- From the right hand side of the motor-cycle, remove the fastener screw (1) of the inspection cover (2);



- Remove the cap (3) and top up the system.



Braking system

Level check

Checking brake fluid

- Rest the vehicle on its stand.
- For the front brake, turn the handlebar all the way to the left.
- For the rear brake, keep the vehicle upright so that the fluid in the reservoir is at the same level as the plug.
- Make sure that the fluid level in the reservoir is above the "MIN" reference mark:



MIN = minimum level

MAX = maximum level

If the fluid does not reach at least the "**MIN**" reference mark:

- Check brake pads and discs for wear.

- If the pads and/or the disc do not need replacing, top up the fluid.
- If the pads and/or the disc have to be replaced, check the brake fluid and top up if necessary.



Top-up



RISK OF BRAKE FLUID SPILLING. DO NOT OPERATE THE BRAKE LEVER IF THE BRAKE FLUID RESERVOIR CAP IS LOOSE OR HAS BEEN REMOVED.

IMPORTANT



AVOID PROLONGED AIR EXPOSURE OF THE BRAKE FLUID. BRAKE FLUID IS HYGROSCOPIC AND ABSORBS MOISTURE WHEN IN CONTACT WITH AIR. LEAVE THE BRAKE FLUID RESERVOIR OPEN ONLY FOR THE TIME NEEDED TO COMPLETE THE TOPPING-UP PROCEDURE.



TO AVOID SPILLING FLUID WHILE TOPPING UP, KEEP THE LEVEL OF THE FLUID IN THE RESERVOIR PARALLEL WITH THE EDGE OF THE RESERVOIR ITSELF (IN HORIZONTAL POSITION). DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID. FUNNELS OR ANY OTHER IMPLEMENTS USED MUST BE PERFECTLY CLEAN.



BRAKE FLUID IS HIGHLY CORROSIVE. AVOID CONTACT WITH THE SKIN, EYES AND PARTS OF THE MOTORCYCLE.

WHEN TOPPING UP, PROTECT PARTS OF THE MOTORCYCLE IN THE VICINITY OF THE RESERVOIR WITH ABSORBENT MATERIAL.

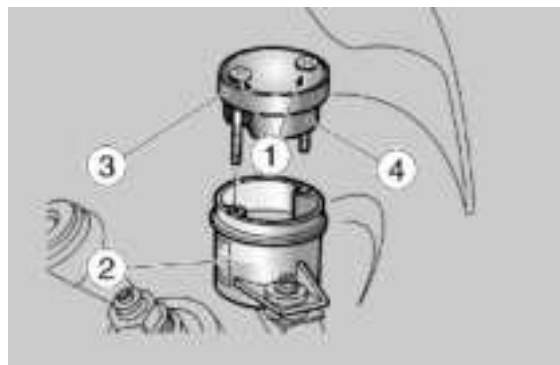
Recommended products

DOT 4 brake fluid Synthetic brake fluid.

SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4

Front braking system

- Use a short cross-head screwdriver to undo the screws (1) of the front braking system fluid reservoir (2).
- Lift and remove the cover (3), complete with screws (1) and the gasket (4).



- Top up the reservoir (2) with recommended brake fluid to above the minimum level marking "MIN".

IMPORTANT

ONLY FILL TO THE "MAX" LEVEL AFTER FITTING NEW BRAKE PADS. DO NOT FILL TO THE "MAX" LEVEL WITH WORN PADS, AS THIS WILL CAUSE FLUID TO ESCAPE WHEN REPLACING BRAKE PADS.

CHECK BRAKING EFFICIENCY.

IF THE DEAD ZONE OF THE BRAKE PEDAL OR BRAKE LEVER IS TOO LONG, OR IN CASE OF FLUID LOSS, IT MAY BE NECESSARY TO BLEED THE AIR TRAPPED IN THE SYSTEM.

Rear braking system

In order to top up the rear braking system, the rear side fairing panel must be removed.

- Unscrew the fastener screw (5) of the rear brake reservoir while restraining the nut to prevent it from turning.
- Free the rear brake fluid reservoir (6).



- Unscrew the cap (7) and remove together with the gasket (8).
- Top up the reservoir (6) with recommended brake fluid to above the minimum level marking "MIN".

IMPORTANT

ONLY FILL TO THE "MAX" LEVEL AFTER FITTING NEW BRAKE PADS. DO NOT FILL TO THE "MAX" LEVEL WITH WORN PADS, AS THIS WILL CAUSE FLUID TO ESCAPE WHEN REPLACING BRAKE PADS.

CHECK BRAKING EFFICIENCY.

IF THE DEAD ZONE OF THE BRAKE PEDAL OR BRAKE LEVER IS TOO LONG, OR IN CASE OF FLUID LOSS, IT MAY BE NECESSARY TO BLEED THE AIR TRAPPED IN THE SYSTEM.



Adjusting the levers

FRONT BRAKE LEVER

It is possible to adjust the distance between the end of the lever (1) and the grip (2), turning the adjuster (3).

- Push the control lever (1) forwards and turn the adjuster (3) until the lever (1) is at the desired distance.
- Turning the adjuster anticlockwise, the lever (1) gets closer to the grip (2).



REAR BRAKE LEVER

The control lever is set to the correct ergonomic position during assembly of the vehicle.

To change the position of the lever:

- Rest the vehicle on its stand.
- Partially undo the screw (4).
- Turn the cam (5) finding the best position for the pedal (3).
- Tighten the screw (4) and check the cam is stable in position.



IMPORTANT

TO ADJUST THE PLAY OF THE GEAR LEVER, PLEASE CONTACT AN Official Aprilia Dealer. IF YOU ARE ADEQUATELY TRAINED AND EXPERIENCED, REFER TO THE INSTRUCTIONS IN THE WORKSHOP BOOKLET AVAILABLE ALSO AT ANY Official Aprilia Dealer.

Clutch system

Regolazione leva frizione

Adjust the clutch when the engine stops or the vehicle tends to move forward even when clutch lever is operated and the gear engaged, or if the clutch "slides", resulting in acceleration delay considering the engine revs.

Minor adjustments can be realized by acting on the clutch lever adjuster operating as follows:



- Turn the set screw (3) toward the direction of motion to increase the lever play (1) and check operation of the guide using the knob (2) as in riding position.
- Ensure that the play is between 1 and 3 mm (0.039 and 0.12 in).

In the event that the adjustment of the adjuster on the lever is not sufficient, act on the register located on the right side of the vehicle:

- Loosen the nut (4)
- Turn the adjuster (5) until the play is between 1 and 3 mm (0.039 and 0.12 in).
- Tighten the nut (4), locking the adjuster (5).
- Check the play on the clutch lever.
- Start the engine.
- Fully engage the clutch and engage first gear.
- Make sure that the engine does not stop or that the vehicle does not tend to move, or that the clutch does not "slip" during acceleration or while riding.

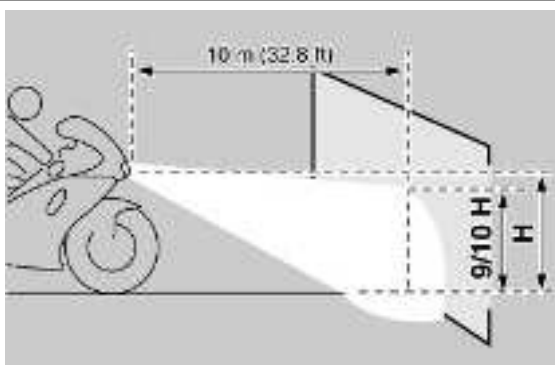


Headlight adjustment

NOTE

IN COMPLIANCE WITH LOCAL LEGISLATION, SPECIFIC PROCEDURES MUST BE FOLLOWED WHEN ALIGNING THE LIGHTS.

To quickly check if the headlamp is aimed correctly, place the vehicle on a level surface 10 m (32.8 ft) from a vertical wall. Turn on the low beam light, sit on the vehicle and check that the light beam projected to the wall is a little below the horizontal straight line of the headlight (about 9/10 of the total height).



To carry out vertical adjustment of the light beam:

(LOW BEAM HEADLIGHTS)

- Operating from the rear side of the fairing, under the internal bodywork, act on the adjuster ("1" left side / "2" right side). TIGHTEN (clockwise) to raise the beam UNSCREW it (anticlockwise) to lower the light beam.
- These two adjuster screws may be used to adjust the vertical alignment of the low beam headlight beam.

NOTE

CHECK THAT THE VERTICAL ALIGNMENT OF THE BEAM IS CORRECT.



(HIGH BEAM HEADLIGHT)

- Operating from underneath the headlamp unit, turn the adjuster screw (3). TIGHTEN (clockwise) to lower the light beam; LOOSEN (anticlockwise) to raise the beam.
- This adjuster screw may be used to adjust the vertical alignment of the high beam headlight beam.



NOTE

CHECK THAT THE VERTICAL ALIGNMENT OF THE BEAM IS CORRECT.

Anti-evaporation system

Removing system components

NOTE

IF THE FILTERING EFFECTIVENESS IS COMPROMISED, REPLACE THE COMPLETE CANISTER.

To disassemble the components of the evaporative system, first remove the fuel tank, the complete filter box and then proceed as described:

- Disconnect the connectors (1) of the coils from the canister support.



- Disconnect the corrugated pipe (2) from the two cable glands (3) on the canister support.



- Remove the fixing screw (4) and free the earth cable (5), taking care to recover the bush below.



- Extract the complete canister (6).



- Using pliers for metal clamps, remove the two clamps (7) and disconnect the pipes (8).



- Cut the two clamps (9) to be able to separate the canister from the support.



- If the vacuum valve (10) needs to be replaced, after removing the metal clamps (11) and disconnecting the pipes (12), disconnect the connector (13) and proceed with the replacement.



- If it is necessary to replace the safety valve (14), after removing the clips (15) and disconnecting the pipes (16), proceed with the replacement.



INDEX OF TOPICS

ELECTRICAL SYSTEM

ES

Electrical system installation

Scope and applicability

This document defines the position of the vehicle wiring harness, how it is routed and fixed to the chassis, instrument holder arch brace and saddle post, any problems and special checks to be made on the cable connections and routing in order to achieve vehicle reliability.

Materials used and corresponding quantities

The electrical system consists of the following wiring harnesses and parts:

Vehicle side:

- 1 x Main vehicle wiring harness
- 1 x License Plate Holder wiring harness
- 1 x Engine-Battery Earth Cable
- 8 x Edge clip Sheet Ø10mm
- 1 x Edge clip Sheet Ø20mm
- 2 Connector supports. AMP
- 1 x ABS sensor support
- 1 x Horn cables grommet
- 1 x Instrument Cluster cable grommets clamp

Engine side:

- 1 x Engine cable harness.
- 4 x Edge clip Sheet Ø10mm.
- 2 x Edge clip Sheet Ø20mm.
- 1 x Tyco connector support.

Small parts and mountings

Vehicle side:

- 3 x Small black 160x2.5 clamps

Engine side:

- 1 x Large black 290x4 clamps.

Motorcycle division

The wiring harnesses on the vehicle are subdivided into three main sections, as indicated in the figure.

1. Front of vehicle
2. Centre of vehicle
3. Rear section



Special checks for the correct connection and routing of cables

It is extremely important that any security-locks for the following connectors are properly connected and correctly tightened to ensure proper engine, and therefore proper vehicle, operation.

Vehicle side:

- License plate led light connector.
- Check ECU connection for both engine and vehicle.
- Check the side stand connection.
- Check objectification and quick shift link.
- Check that the engine oil cap is correctly inserted.
- Check the starter motor positive fastening and relative cap and fastening on the starter relay.
- Check the taillight connection.
- Check the connection between the number plate holder wiring harness and the main wiring harness.
- Check fuel pump connection and right saddle support side positioning.
- Check the regulator connection.
- Check fastening of vehicle ground cable with battery ground cable to engine.
- Check the Flywheel-Regulator connection.
- Lambda connection check (1 and 2).
- Check that lambda probe cable (1 and 2) is correctly connected.
- Check that the "ABS" connector is correctly inserted.
- Check that the "ABS" sensors are correctly connected (Front and Rear).
- Check the fan connector connection.
- Check the starter relay connection with the main wiring harness.
- Check that the cables on the starter relay are connected correctly and the torque cable fastening screws are tightened correctly.
- Check the rear stop switch connection.
- Check R&W connector connection.
- Check the RH and LH rear indicator connections (only for USA version).
- Check that all the connectors inside the instrument support arch have been connected correctly.

Engine side:

- Check the engine ECU connection.
- Check the gear connector connection.
- Check connection and insertion of the secondary air cap.
- Check throttle valve connection.
- Check engine water temperature connection.
- Check filter case temperature connection.
- Check injectors 1 and 2 connection.

- Check coils 1 and 2 connection.
- Check Purge Valve connection.
- Check Map Sensor connection.

IMPORTANT

THESE CONNECTORS HAVE BEEN LISTED AS THEY ARE MORE CRITICAL THAN OTHERS, AND THEIR DISCONNECTION MAY CAUSE VEHICLE BREAKDOWN OR MALFUNCTION. NATURALLY, IT IS ALSO NECESSARY THAT ALL OTHER CONNECTORS CONNECTED CORRECTLY TO ENSURE THAT THE VEHICLE FUNCTIONS CORRECTLY. THE INSTRUCTIONS FOR ROUTING AND FASTENING THE WIRING HARNESS THROUGHOUT THE VEHICLE MUST BE FOLLOWED PRECISELY TO ENSURE THAT THE VEHICLE FUNCTIONS CORRECTLY AND RELIABLY.

Front side

TABLE A - PRE-ASSEMBLY OF THE EXTERNAL AIR TEMPERATURE SENSOR

- Using a small clamp (1) fasten the external air temperature sensor (2) to the right instrument support, at the point indicated.



TABLE B - FRONT ABS SENSOR

- Fix the front ABS sensor (1) to the right fork end, pass the wiring (2) inside and lock it with a clamp (3) in the indicated point.

**TABLE B1 - FRONT ABS SENSOR**

- Fasten the wiring of the front ABS sensor to the brake pipe using 3 cable clamps (4).

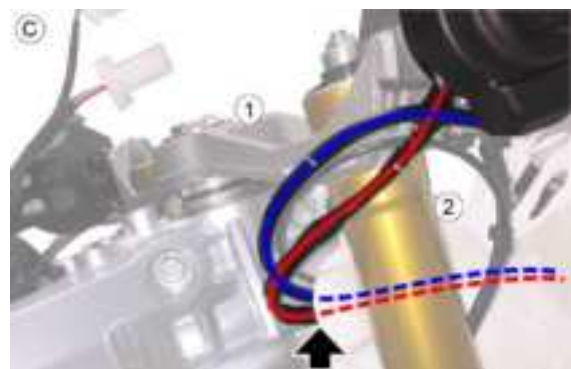


TABLE B2 - FRONT ABS SENSOR

- Fasten the wiring of the front ABS sensor to the brake pipe using 3 other cable clamps (5).
- Place the connector inside the instrument support.

**TABLE C - RIGHT HANDLEBAR ZONE**

- The wiring of the throttle control (1) and of the right light switch (2) must be inserted inside the instrument support passing through the point indicated.

**TABLE D - LEFT HANDLEBAR ZONE**

- The wiring of the clutch switch (1) and of the left light switch (2) must be inserted inside the instrument support passing through the point indicated.

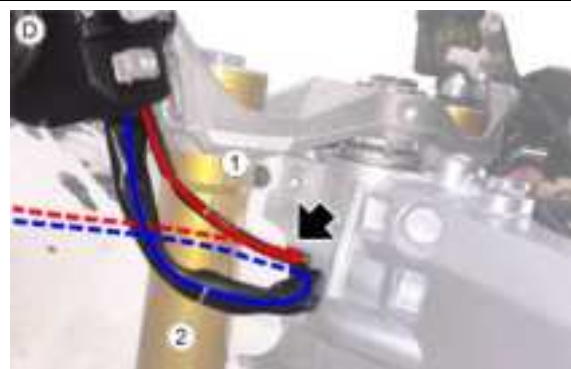


TABLE E - INSTRUMENT CLUSTER SUPPORT ZONE

- The grouped wiring must be blocked with a clamp (1) on the support located inside the instrument cluster support and with an additional clamp (2) in the indicated point.

**TABLE E1 - INSTRUMENT CLUSTER SUPPORT ZONE**

- Place the wiring in the clip (3).

**NOTE****THE CLIP IS OPTIONAL**

Parte centrale

TABLE A - REAR STOP SENSOR PRE-ASSEMBLY

- Lock the rear stop sensor (1) to the pedal support and pass the wiring through the cable grommet (2) as shown.



TABLE B - PRE-ASSEMBLY OF VOLTAGE REGULATOR ON THE LEFT INNER SIDE

- Fix the voltage regulator (1) using the two screws with the relative bolts and insert a clamp (2) in the indicated point.



TABLE C - HORN PRE-ASSEMBLY

- Fix the horn (1) using the special bracket to the support as indicated and position the cable grommet clip (2).

**TABLE D - ELECTRIC FAN PRE-ASSEMBLY**

- Fix the electric fan to the radiator and lock the wiring using a clamp (1) in the indicated point.

**TABLE E - MAIN WIRING HARNESS**

- Pass the main wiring as shown.

**TABLE E1 - MAIN WIRING HARNESS**

- Pass the main wiring as shown.

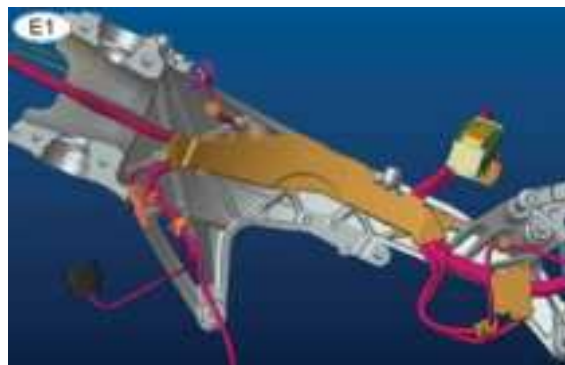


TABLE E2 - MAIN WIRING HARNESS

- Pass the main wiring as shown.

E2

**TABLE E3 - MAIN WIRING HARNESS**

- Pass the main wiring as shown.

E3

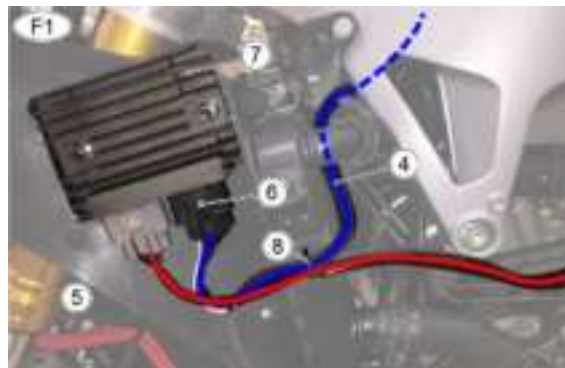


FIGURE F - FLYWHEEL

- The alternator wiring (1) must pass behind the support (2) of the brake pipes and through the cable grommet (3).

**TABLE F1 - FLYWHEEL**

- Pass the wiring (4) of the voltage regulator behind the radiator pipe.
- Connect the connectors (5) (6) to the voltage regulator (7) and lock the wiring using a clamp (8).

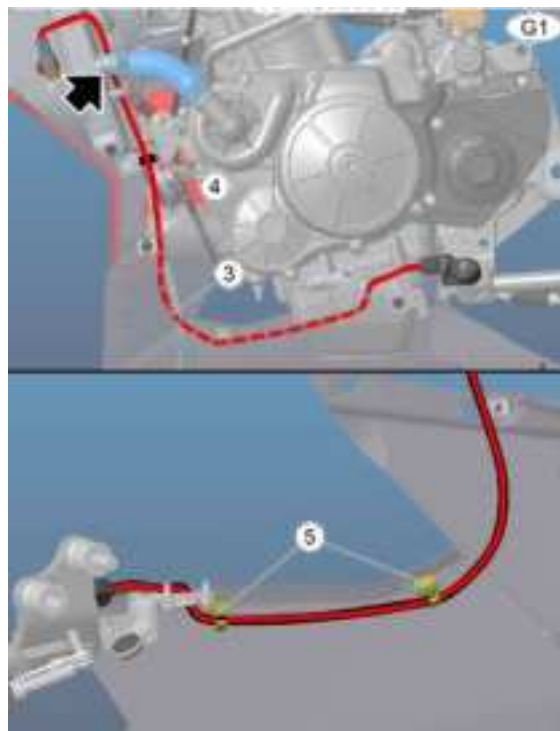
**TABLE G - HORN AND STAND SENSOR**

- The horn wiring (1) must pass behind the radiator pipe and fastened to the cable grommet (2).

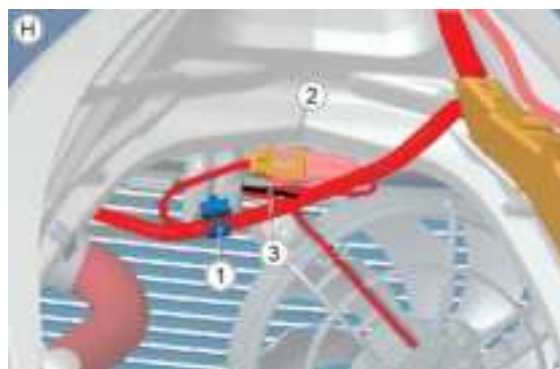


TABLE G1 - HORN AND STAND SENSOR

- The wiring of the stand sensor (3) must pass behind the radiator pipes, fastened to the cable grommet (4) on the radiator support bracket and the two cable grommets (5) located inside the lower left fairing.

**TABLE H - ELECTRIC FAN**

- Fasten the main wiring to the cable grommet (1) located on the radiator support and connect the connector (2) to the clip as indicated.
- Secure the wiring of the electric fan using a clamp (3) as indicated.

**TABLE I - IGNITION SWITCH ASSEMBLY**

- Connect the two connectors of the ignition switch assembly and place them on the filter box in the appropriate housings.



TABLE J - PROCEDURE FOR THE CORRECT FITTING OF THE ABS CONTROL UNIT CONNECTOR

- Pass the ABS modulator wiring as indicated.

Components present:

- 1) ABS modulator wiring
- 2) ABS modulator connector

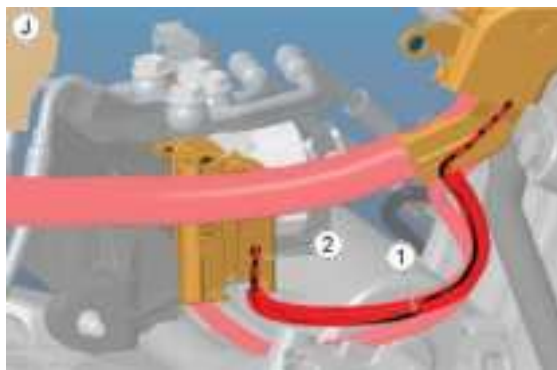


TABLE J1 - PROCEDURE FOR THE CORRECT FITTING OF THE ABS CONTROL UNIT CONNECTOR

- The initial position of the connector coupling lever must be as indicated in the figures.



TABLE J2 - PROCEDURE FOR THE CORRECT FITTING OF THE ABS CONTROL UNIT CONNECTOR

- Place the connector on the opposite side of the control unit and lower the driving lever until the "click" that signals the end of the stroke is heard.



TABLE J3 - PROCEDURE FOR THE CORRECT FITTING OF THE ABS CONTROL UNIT CONNECTOR

- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm.



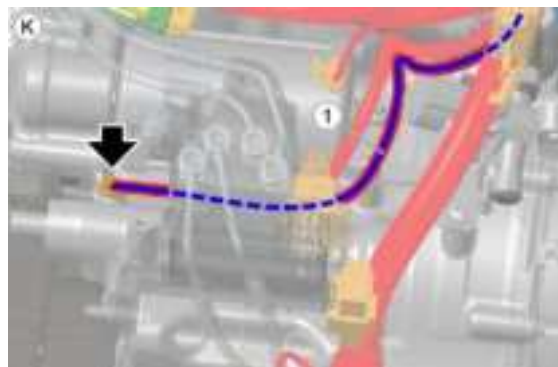
TABLE J4 - PROCEDURE FOR THE CORRECT FITTING OF THE ABS CONTROL UNIT CONNECTOR

- If the initial position of the lever is not as indicated in the "TABLE L1", the connector will not couple correctly and the distance measurement will be greater (approx. 12 mm).
- In this case, repeat the operation described in "TABLES L2/L3".
- We recommend creating a template in order to ensure that the connector is inserted correctly.



TABLE K - VEHICLE GROUND

- The wiring of the vehicle ground cable (1) must pass under the ABS modulator as indicated and fixed to the engine with a special screw with washer, together with the battery ground cable.



IMPORTANT

ENSURE THE CORRECT FIXING OF THE SCREW TO THE PRESCRIBED TORQUE

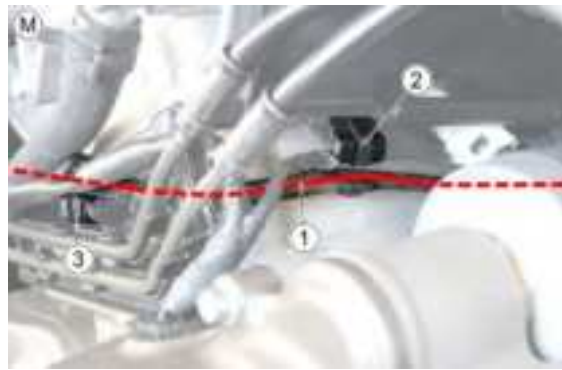
TABLE L - ECU

- The wiring (1) of the "vehicle" connector to be connected to the ECU (2) must be positioned as shown and locked with a clamp (3) in line with the grey taping.



TABLE M - OIL PRESSURE SENSOR

- The wiring (1) of the oil pressure sensor must pass through the cable grommet (2) on the control unit support and in the cable grommet (3) on the brake pipe support, left side.

**TABLE M1 - OIL PRESSURE SENSOR**

- The wiring (1) of the oil pressure sensor must pass behind the cooling system pipes and must be fastened to one of these using a special cable grommet (4).

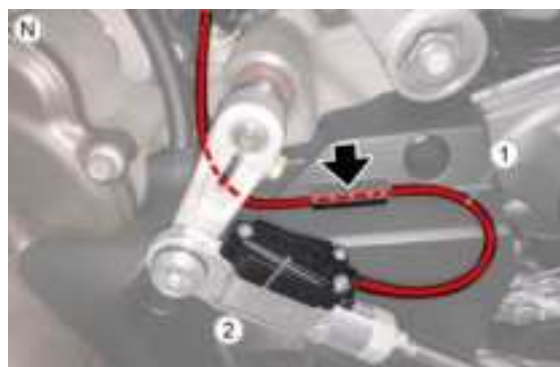


TABLE M2 - OIL PRESSURE SENSOR

- The wiring (1) of the oil pressure sensor must pass behind the pipe fitting of the cooling system and after connecting the connector to the sensor, lock the wiring with a clamp (5) as indicated.

**TABLE N - QUICK SHIFT**

- The wiring (1) of the quick shift (2) must pass through the special groove in the sprocket cover as shown and behind the gear lever.

**TABLE N1 - QUICK SHIFT**

- The wiring (1) of the quick shift must pass through the internal part of the frame/seat sub-frame and then the connector, located inside the compartment under the saddle on the right side, must be connected.



TABLE O - LAMBDA PROBES**Lambda probe 1**

- Insert the lambda probe 1 (1) in its seat, pass the wiring (2) on the right side.
- Pass the vehicle-side wiring inside the frame, as indicated, connect the connector (3) and fasten it to the clip on the radiator support.

**TABLE O1 - LAMBDA PROBES****Lambda probe_2**

- Insert the lambda probe 2 (4) in its seat, pass the wiring (5) behind the exhaust manifold and on the appropriate support and after connecting the connector (6) fasten it to the clip on the support.

**Back side****TABLE A - PRE-ASSEMBLY OF THE CABLE GROMMET CLIP ON THE LOWER SADDLE SUPPORT CLOSURE**

- Place the clips (1) (2) (3) in the points indicated.

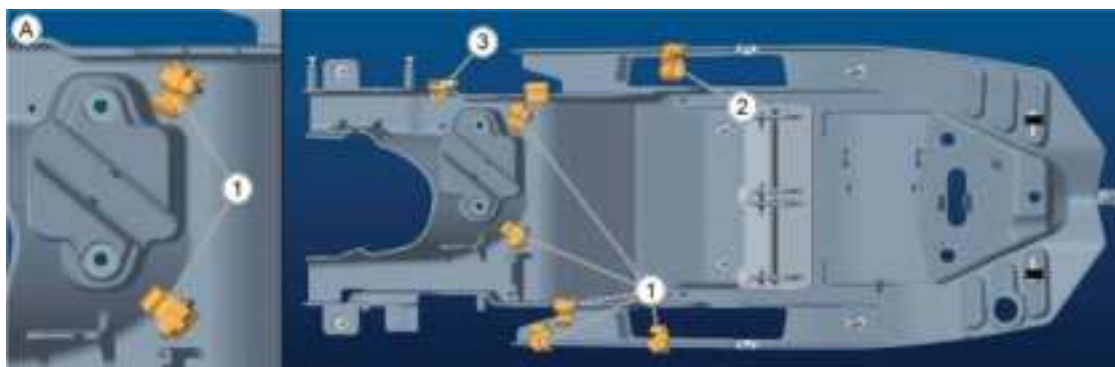


TABLE A1 - PRE-ASSEMBLY OF THE CABLE GROMMET CLIP ON THE LOWER SADDLE SUPPORT CLOSURE

- Position a clamp (3) as shown.

**TABLE B - BATTERY GROUND AND STARTER MOTOR POSITIVE**

Pass the wiring as indicated and through the cable grommets Components present:

- 1) Starter motor positive wiring harness.
- 2) Battery ground cable wiring harness.

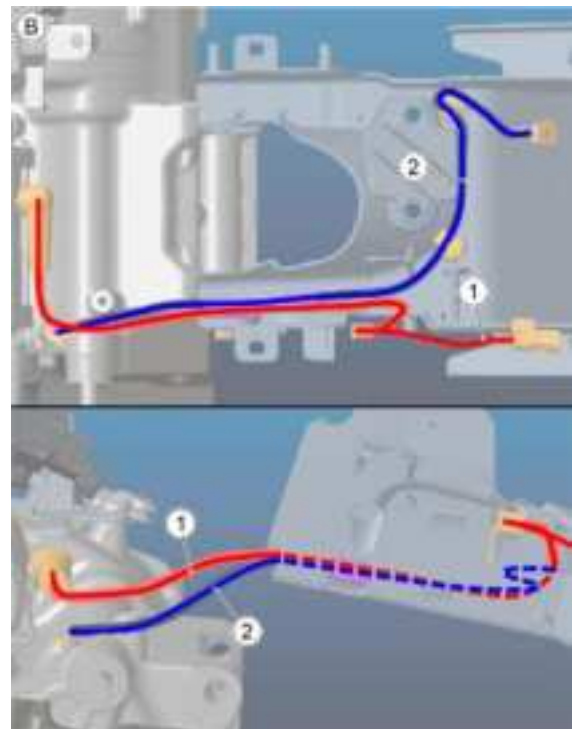
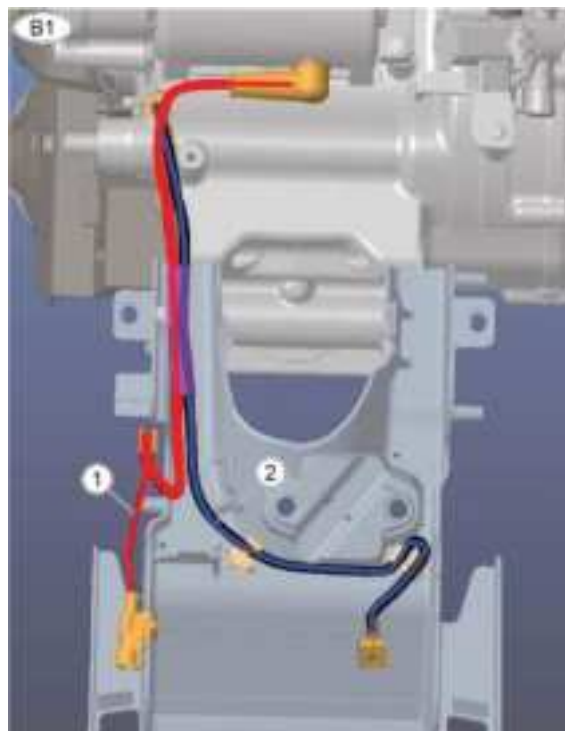


TABLE B1 - BATTERY GROUND AND START-ER MOTOR POSITIVE

Pass the wiring as indicated and through the cable grommets Components present:

- 1) Starter motor positive wiring harness.
- 2) Battery ground cable wiring harness.

**TABLE B2 - BATTERY GROUND AND START-ER MOTOR POSITIVE**

Pass the wiring harness as indicated.

The battery ground cable must be positioned under the vehicle ground cable. Ensure that the screw is provided with a washer and that it is correctly fixed to the prescribed torque.

Components present:

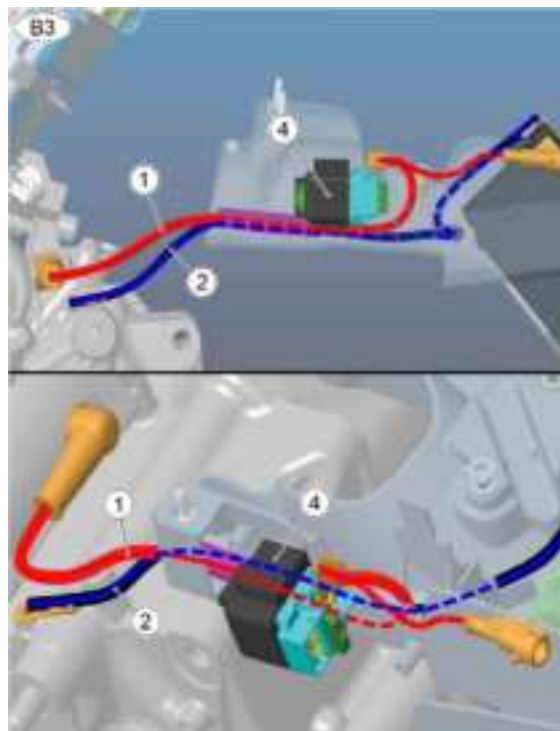
- 1) Starter motor positive wiring harness.
- 2) Battery ground cable wiring harness.
- 3) Vehicle ground cable wiring harness.



TABLE B3 - BATTERY GROUND AND START-ER MOTOR POSITIVE

Pass the wiring harness as indicated.

- The positive wiring (1) of the starter motor is fixed on the upper screw of the starter relay (4).
- The negative ground wiring (2) is fixed on the connection point on the engine and on the negative pole of the battery.

**TABLE B4 - BATTERY GROUND AND START-ER MOTOR POSITIVE**

Pass the wiring harness as indicated.

- The positive wiring (1) of the starter motor is fixed on the upper screw of the starter relay (4).
- The positive wiring (5) coming from the positive pole of the battery is fixed on the lower screw of the starter relay (4), while the wiring (6) coming from the positive pole of the battery goes to the secondary fuse box (7).

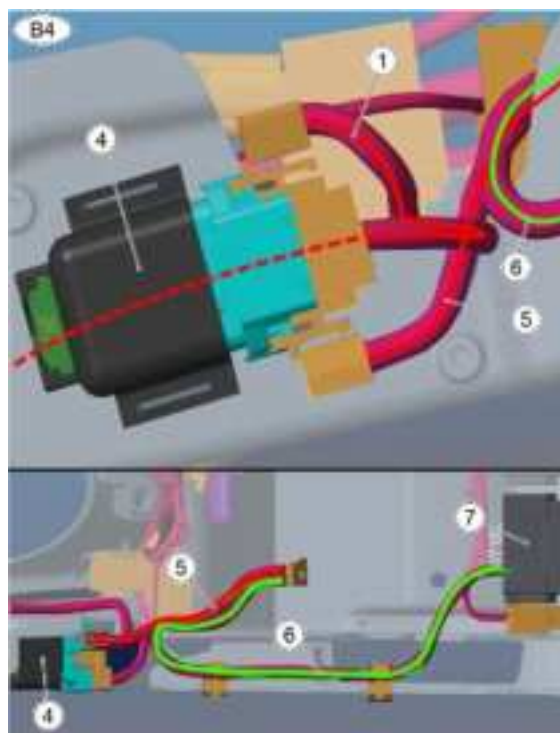


TABLE C - CABLE GROMMET UNDER SADDLE SUPPORT

Pass the cables as indicated.

The main wiring must pass under the inertia platform in the special groove on the lower saddle support closure.

Components present:

- 1) Battery.
- 2) Inertia platform.
- 3) Relay.
- 4) Main fuse.
- 5) Auxiliary fuses.

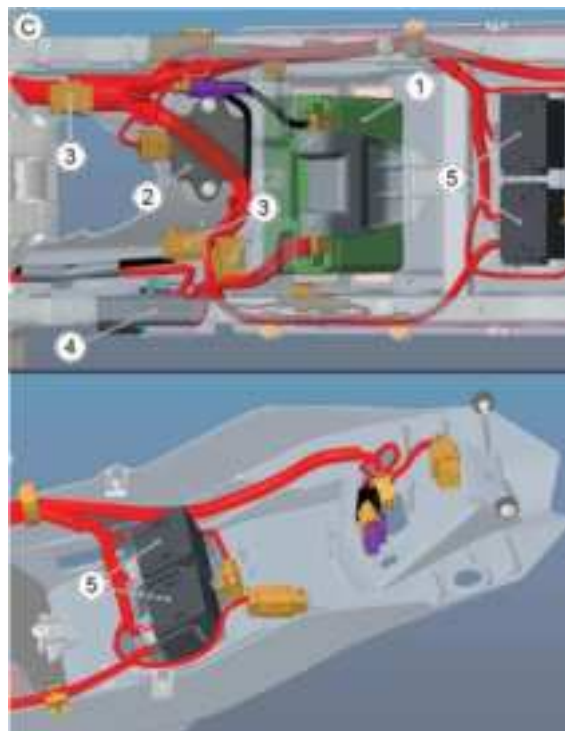


TABLE C1 - CABLE GROMMET UNDER SADDLE SUPPORT

- Pass the cables as indicated.
- Position the edge protector to prevent damage to the wiring.

Components present:

- 5) Auxiliary fuses.

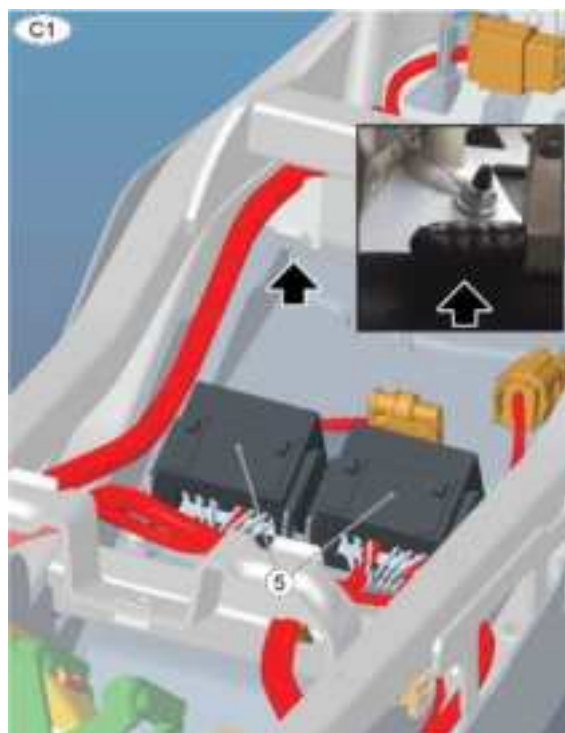
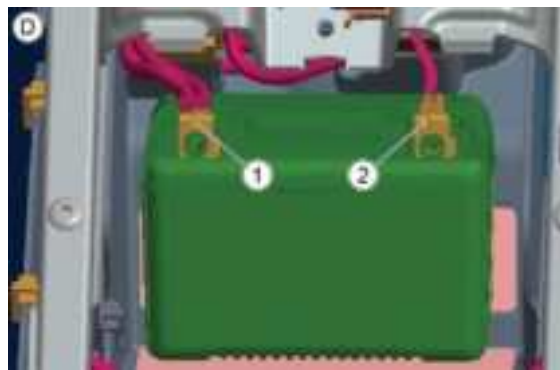


TABLE D - BATTERY

- The wiring connected to the eyelet (1), must be connected to the positive pole of the battery located on the left side of the vehicle and identified with the plus sign "+".
- The wiring connected to the eyelet (2), must be connected to the negative pole of the battery on the right side of the vehicle and identified by the minus sign "-".

**TABLE E - SADDLE SUPPORT COMPONENTS**

- 1) Main injection relay.
- 2) Fan relay.
- 3) Fuel pump relay.
- 4) Inertia platform.
- 5) AMP control unit (if present).

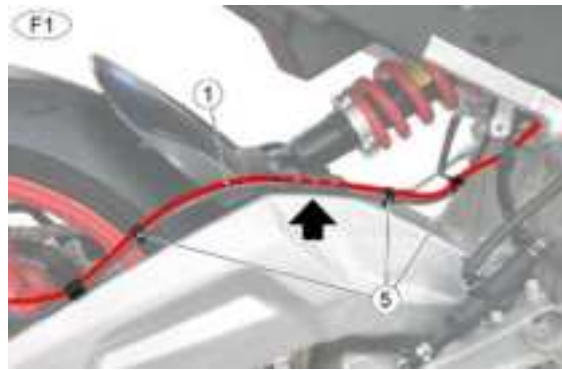
**TABLE F - REAR ABS SENSOR**

- The wiring (1) of the rear ABS sensor (2) must be locked to the brake pipe with a rubber clamp (3) and the passed through the cable grommet (4) fixed to the swingarm.

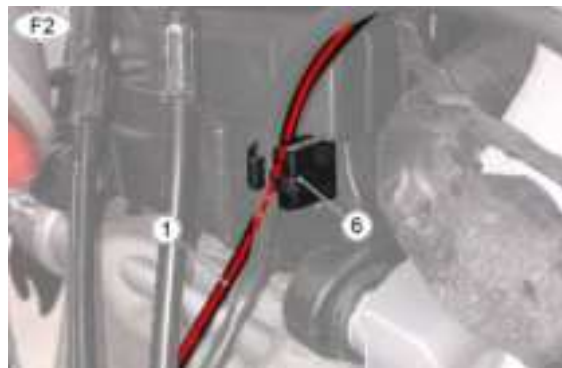


TABLE F1 - REAR ABS SENSOR

- The wiring (1) of the rear ABS sensor must pass under the rear mudguard and locked to the ABS brake pipe with 3 cable grommets (5).

**TABLE F2 - REAR ABS SENSOR**

- The wiring (1) of the rear ABS sensor must pass through the cable grommet (6) connected to the ABS modulator support and then inside the saddle support.

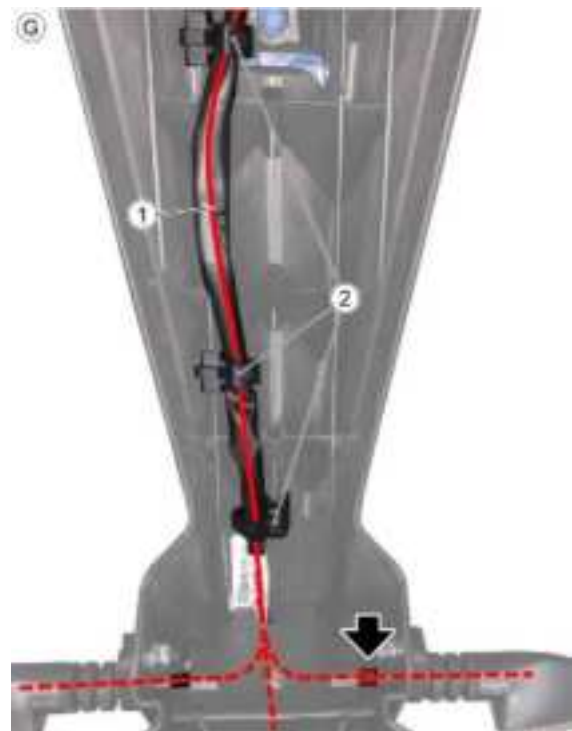
**TABLE F3 - REAR ABS SENSOR**

- Operating on the right side of the motorcycle, after connecting the connector (7) of the rear ABS sensor, hook it to the clip (8).



TABLE G - LICENSE PLATE SUPPORT

- Pass the rear wiring (1) through the three clips (2).
- Ensure that the wiring with the red tapping goes to the left arrow.

**TABLE H - REAR SECTION**

- 1) Main wiring harness.
- 2) Rear wiring harness connector.
- 3) Auxiliary fuses.
- 4) Diagnostic socket connector.
- 5) USB socket connector (if present).
- 6) Connector ...

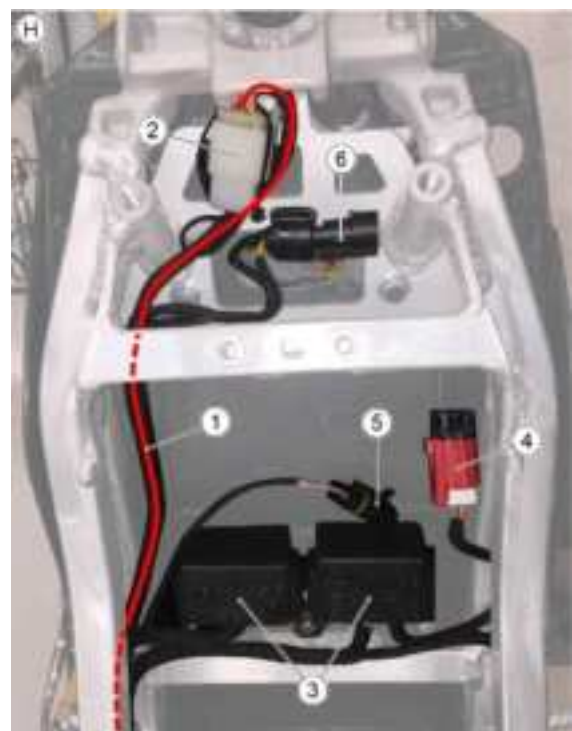
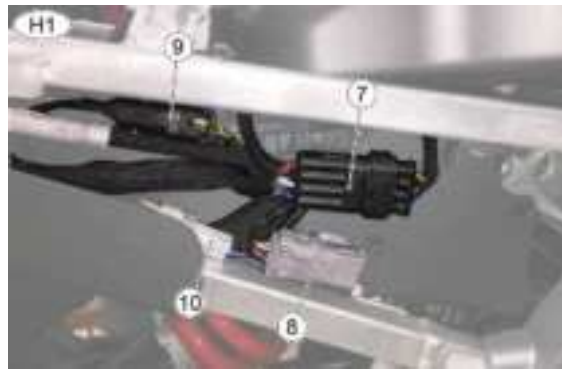


TABLE H1 - REAR SECTION

- 7) Connector ...
- 8) Aprilia MIA control unit connector (if present)
- 9) Connector ...
- 10) Connector ...

**Motore****TABLE A - CONTROL UNIT SUPPORT PRE-ASSEMBLY**

- Pre-assemble the four cable grommets (1) (2) on the control unit support (3).



TABLE B - CABLE ARRANGEMENT IN THE CONTROL UNIT ZONE

- The connector (1) must be correctly hooked to the control unit (2).

**TABLE B1 - CABLE ARRANGEMENT IN THE CONTROL UNIT ZONE**

- The rubber block (3) of the secondary valve (4) must be facing as in the image.
- Check that the connector (5) and the safety hook of the throttle body motor are correctly inserted.

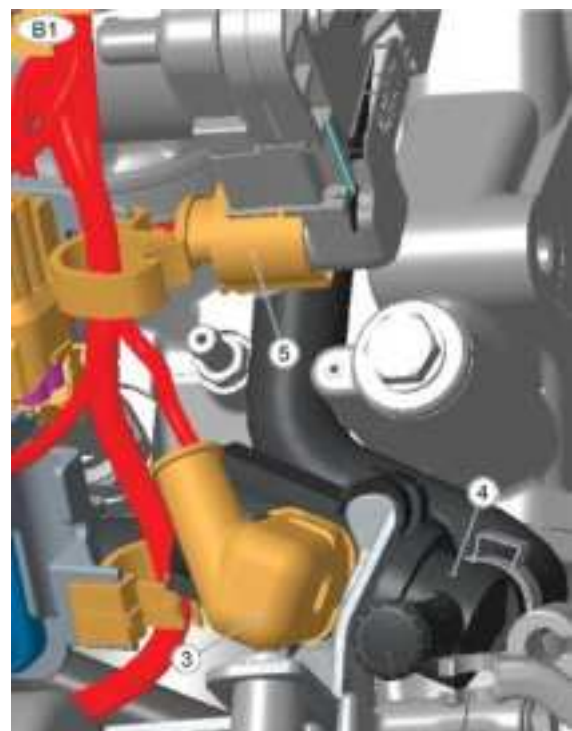


TABLE B2 - CABLE ARRANGEMENT IN THE CONTROL UNIT ZONE

- Check that the engine oil temperature sensor connector (6) and the gear sensor connector (7) are correctly inserted.

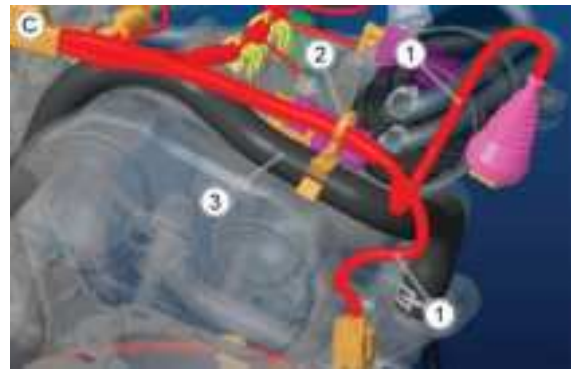
**TABLE B3 - CABLE ARRANGEMENT IN THE CONTROL UNIT ZONE**

- Secure the gear sensor connector to the control unit support with a clamp (8).

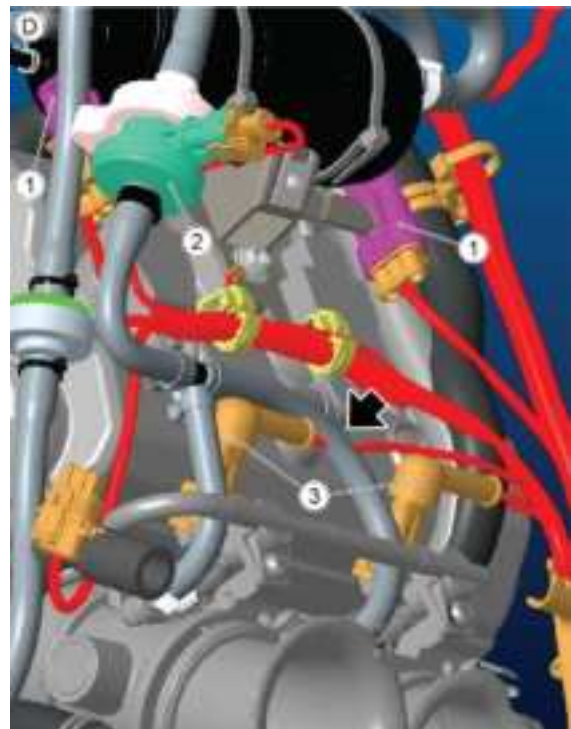


TABLE C - LAMBDA PROBE PASSAGE

- Both wiring (1) of the lambda sensors must pass through the cable grommet (2) connected to the secondary air pipe (3).

**TABLE D - HEAD ZONE PASSAGES**

- 1) Coil connectors (must be attached to the canister support).
- 2) Purge valve (check the correct connection of the connector).
- 3) Injector connectors (the wiring must pass under the canister pipe).

**TABLE E - FILTER BOX ZONE PASSAGES**

- Check the correct insertion of the intake air temperature sensor connector.

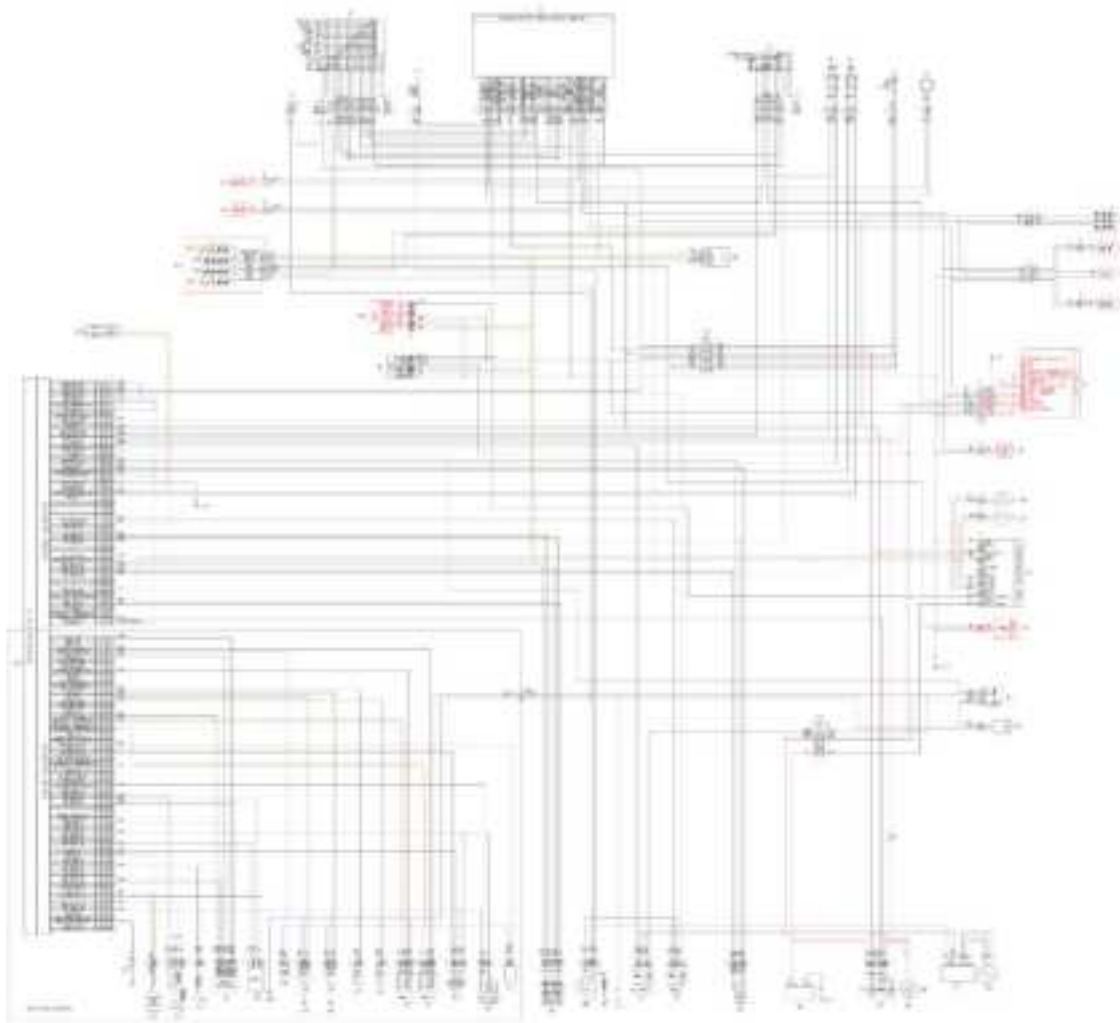


TABLE E1 - FILTER BOX ZONE PASSAGES

- Check the correct insertion of the air pressure sensor connector.



General wiring diagram



Key:

1. Multiple connectors
2. Horn
3. LH light switch

4. ambient air temperature sensor
5. Instrument cluster
6. RH Column light switch
7. Starter motor sensor connector
8. Rear brake switch
9. Clutch switch
10. Ignition switch
11. Immobilizer antenna
12. Taillight
13. Right rear turn indicator
14. Licence plate light
15. Rear turn indicator LEFT
16. Anti-theft system (not standard)
17. Anti-theft system antenna (not standard)
18. Anti-theft system LED
19. Front ABS sensor
20. Rear ABS sensor
21. ABS control unit
22. USB power socket (not standard)
23. Fan relay
24. Fan
25. Auxiliary fuses 2 (2 fuses)
26. Alternator
27. Voltage regulator
28. Starter motor
29. Main starter relay
30. Main fuse
31. Battery
32. Stand switch
33. Auxiliary fuses 1 (1 fuse)
34. Inertial sensor platform (fall sens.)
35. Fuel pump relay
36. Injection relay
37. Fuel level sensor
38. Fuel pump
39. Purge valve
40. GAS R&W hand grip
41. Secondary air system

- 42.Quick Shift switch (UP/DOWN)
- 43.Neutral/gear sensor
- 44.Lambda cylinder 2
- 45.Lambda cylinder 1
- 46.Injector cylinder 2
- 47.Injector cylinder 1
- 48.Coil cylinder 2
- 49.Coil cylinder 1
- 50.MAP sensor
- 51.Motorised throttle valve
- 52.Intake air temperature sensor
- 53.Engine water temperature T sensor
- 54.Engine speed sensor
- 55.Oil pressure sensor
- 56.GEN 11 engine control unit
- 57.OBD connector
- 58.AMP provision (not standard)
- 59.Left front turn indicator (USA)
- 60.Front LED headlight
- 61.DRL + right turn indicator
- 62.High beam LED module
- 63.Low beam LED module
- 64.DRL + left turn indicator
- 65.Right front turn indicator (USA)
- 66.Engine/vehicle wiring harness conn.
- 67.Engine ground point
- 68.Engine head ground point
- 69.Diagnostics (CAN 2)

Fuses

To check the fuses it is necessary to remove the seats to access the auxiliary fuses and the left side panel to access the main fuse

It is necessary to check the fuses whenever an electrical component fails to operate or malfunctions or when the engine does not start.

Start by checking the secondary fuses in order of size (from the lowest amperage fuse to the highest), and then check the 30A main fuse.

IMPORTANT



DO NOT ATTEMPT TO REPAIR FAULTY FUSES.

NEVER USE A FUSE THAT IS DIFFERENT THAN WHAT IS SPECIFIED TO PREVENT DAMAGES TO THE ELECTRICAL SYSTEM OR SHORT CIRCUITS, AND THE RISK OF FIRE.

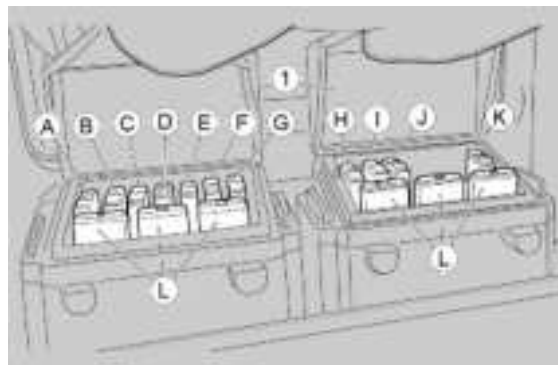
IMPORTANT

A FUSE THAT BLOWS FREQUENTLY MAY INDICATE A SHORT CIRCUIT OR OVERLOAD. CONTACT AN authorised aprilia Dealer.

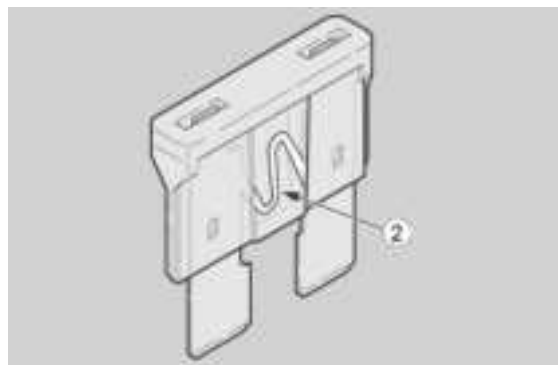
To check:

- To avoid an accidental short-circuit, place the power switch to "OFF".

- Remove the passenger and rider saddles.
- Open the covers of the secondary fuse boxes (1).



- Take out one fuse at a time and check whether the filament (2) is broken.
- Before replacing the fuse, find and solve, if possible, the reason that caused the problem.
- If the fuse is damaged, replace it with one of the same current rating.

**NOTE**

IF THE SPARE FUSE IS USED, REPLACE WITH ONE OF THE SAME TYPE IN THE CORRESPONDING FITTING.

AUXILIARY FUSES DISTRIBUTION

Specification	Desc./Quantity
A) 7.5A fuse	Rear running light, horn, license plate light, blacklight (if applicable)
B) 5A fuse	Instrument panel power feed, turn indicators
C) 5A fuse	Positive key-on power for ECU, positive key-on power for ABS, positive key-on power for instrument panel, positive key-on power for left hand handlebar control set, main start relay, positive key-on power for inertial sensor platform
D) 7.5A fuse	ECU permanent positive lead
E) 5A fuse	Positive key-on power for AMP, positive key-on power for ODB, positive key-on power for anti-theft system
F) 5A fuse	Positive key-on power for headlamp (load)
G) 2A fuse	Positive key-on power for USB
H) 15A fuse	Fan relay power feed, ECU power feed, fuel pump relay power feed, RH and LH lambda probe power feed, RH and LH injector power feed, RH and LH coil power feed, secondary air system valve power feed.
I) 5A fuse	Power feed for provision for anti-theft system, OBD power feed
J) 7.5A fuse	Fan power feed
K) 20A fuse	ABS power feed
L) spare fuses	

Auxiliary fuses are placed in the central part of the motorcycle, under the rider saddle.

Main fuse:

- After removing the side panel, to access the main fuse (M), it is necessary to disconnect the connector (3).
- Remove the fuse and check whether the filament (2) is broken.
- Before replacing the fuse, find and solve, if possible, the reason that caused the problem.
- If the fuse is damaged, replace it with one of the same current rating.

LOCATION OF MAIN FUSE

Specification	Desc./Quantity
M) 30 fuse	Battery charging, all vehicle utilities
N) spare fuse	

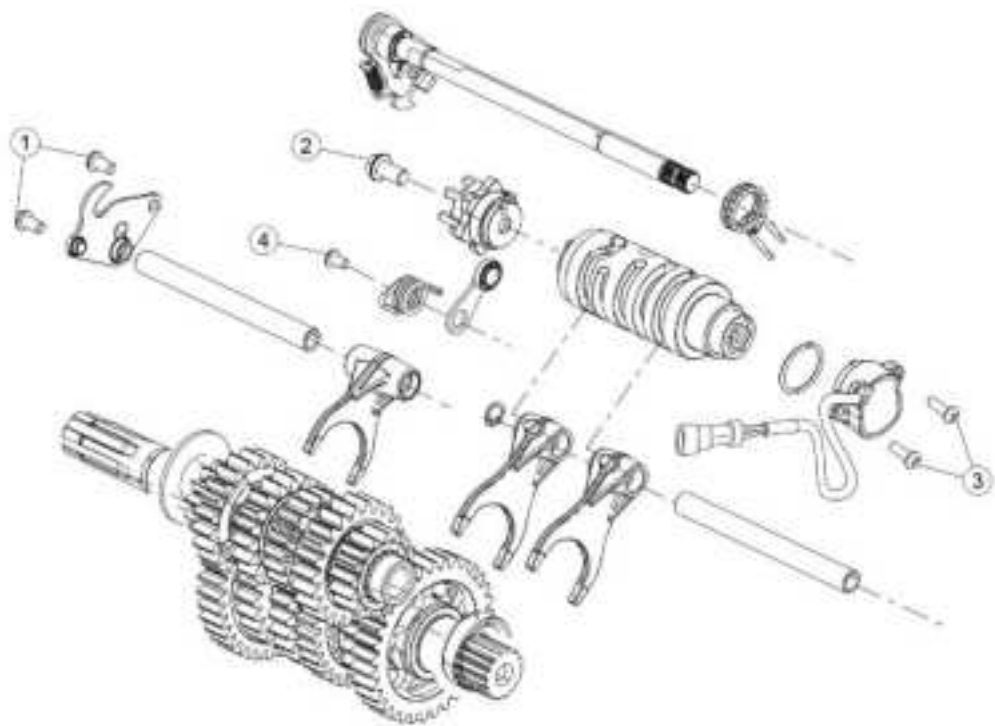
The main fuse is located behind the left hand side fairing of the motorcycle, under the rider saddle.

INDEX OF TOPICS

ENGINE

ENG

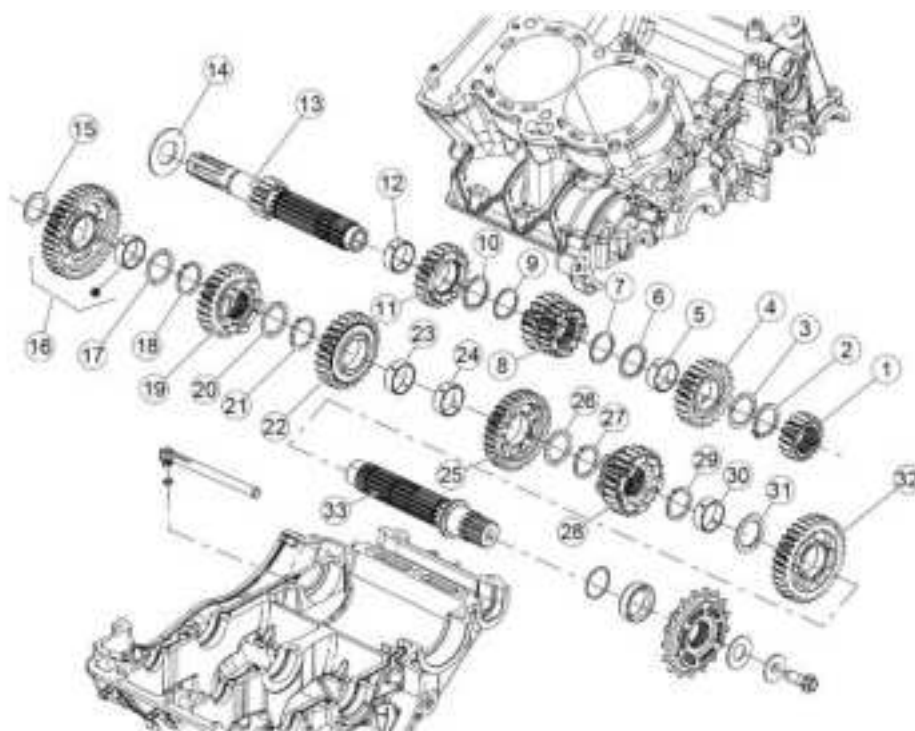
Gearbox



COMPLETE GEAR - SELECTOR - DESMODROMIC

Pos.	Description	Type	Quantity	Torque	Notes
1	Retention plate fixing hex socket screws	-	2	12 Nm (8.85 lbf ft)	Pre-impregnated
2	Gear selector drum fixing flanged hex screw	-	1	25 Nm (18.44 lbf ft)	-
3	Gear sensor fixing round headed screws	-	2	6 Nm (4.43 lbf ft)	-
4	Special screw	-	1	12 Nm (8.85 lbf ft)	-

Diagram



Key:

1. Second gear.
2. Circlip.
3. Toothed thrust washer.
4. Sixth gear.
5. Floating bushing for sixth gear.
6. Toothed thrust washer.
7. O-ring.
8. Third-fourth gear.
9. O-ring.
10. Toothed thrust washer.
11. Fifth gear.
12. Floating bushing for fifth gear.
13. Gear primary shaft.
14. Flat washer.
15. thrust washer.
16. First gear.
17. Toothed thrust washer.
18. Circlip.
19. Fifth gear.

- 20.Toothed thrust washer.
- 21.Circlip.
- 22.Fourth gear.
- 23.Floating bushing for fourth gear.
- 24.Floating bushing for third gear.
- 25.Third gear.
- 26.Toothed thrust washer.
- 27.Circlip.
- 28.Sixth gear.
- 29.Circlip.
- 30.Floating bushing for second gear.
- 31.Toothed thrust washer.
- 32.Second gear.
- 33.Transmission shaft.

Gearbox shafts

Disassembling the gearbox

To proceed with the disassembly of the gearbox it is necessary to remove the upper crankcase and then proceed as follows:

- Remove the transmission shaft (1) along with the oil seal.
- Remove the two screws (2) that fasten the retention plate of the selector shaft.



- Extract the complete selector shaft (3) from the crankcase.



- Unscrew the fixing screw (4) of the index lever.



- Remove the fixing screw (4) along with the spring (5) and index lever (6).



- Remove the fixing screw (7) and extract the selector drum (8) from the seat of the desmodromic shaft.



- Remove the fixing screw (9) of the shaft which fastens the forks for the transmission shaft.



- Remove the guide shaft (10) from the crankcase and remove both forks (11) of the transmission shaft command.



- Remove the guide shaft (12) of the primary control fork, which will be removed later, from the crankcase.



- Remove the screw (13) with relative countersunk retaining washer (14) of the desmodromic shaft bearing.



- Remove the desmodromic shaft (15) from the crankcase and remove the bearing (16).



- Remove the fork (17) from the primary shaft.



- Remove the screws (18) and respective countersunk retaining washers (19) of the primary shaft bearing.



- Partially extract the primary shaft (20) and remove the bearing (21) from the shaft itself.



- Turn the primary shaft (20) outwards and then extract it as indicated.



Removing the primary shaft

IMPORTANT

FIT NEW CIRCLIPS WHEN REASSEMBLING

- After removing the main shaft from its seat on the crankcase, proceed with the disassembly operating from the second gear side.



- Remove the second speed gear (1).



- Remove the circlip (2) securing the sixth gear.



- Remove the toothed thrust washer (3).



- Remove the sixth speed gear (4) along with the floating bushing (5).



- Remove the toothed thrust washer (6).



- Remove the circlip (7) securing the third-fourth gear.



- Remove the third-fourth speed gear (8).



- Remove the circlip (9) securing the fifth gear.



- Remove the toothed thrust washer (10).



- Remove the fifth gear (11) along with the floating bushing (12) from the primary shaft (13).



Removing the secondary shaft

IMPORTANT

FIT NEW CIRCLIPS WHEN REASSEMBLING

- After removing the transmission shaft from its seat on the crankcase, proceed with the disassembly operating from the first gear side.



- Remove the thrust washer (1).



- Remove the first speed gear (2).



- Remove the toothed thrust washer (3).



- Remove the circlip (4) securing the fifth gear.



- Remove the fifth speed gear (5).



- Remove the circlip (6) securing the fourth gear.



- Remove the toothed thrust washer (7).



- Remove the fourth speed gear (8) along with the floating bushing (9).



- Remove the third speed gear (10) along with the floating bushing (11).



- Remove the toothed thrust washer (12).



- Remove the circlip (13) securing the sixth gear.



- Remove the circlip (14) securing the second gear.



- Remove the toothed thrust washer (15).



- Remove the second gear (16) along with the floating bushing (17).



- Remove the spacer (18).



- Remove the oil seal (19).



- Remove the O-ring (20).



- Remove the bearing (21) from the transmission (22).



Checking the primary shaft

Characteristic

Maximum wear limit for selector gear splines

5.3 mm (0.21 in)

Minimum wear limit for primary shaft seat, clutch side

24.97 mm (0.98 in)



Checking the secondary shaft

Characteristic**Maximum wear limit for selector gear splines**

5.3 mm (0.21 in)

Minimum wear limit of the pinion side secondary shaft seat

29.97 mm (1.18 in)

Minimum wear limit for primary and secondary shaft seats, clutch side

19.97 mm (0.79 in)



Checking the desmodromic drum

- Check the gearbox drum for any signs of damage, scratches or wear, and change the desmodromic unit if necessary.
- Check the desmodromic segment for any signs of damage and wear, and replace it if necessary.
- Check the desmodromic drum bearing for any signs of damage or pitting, and change the drum if necessary.

Characteristic**Maximum selector shaft eccentricity**

0.2 mm (0.0079 in)

Checking the forks

The purpose of the springs at the end of the gearbox control rods is to reduce vibration and make it easier to engage the gears.

Characteristic**Maximum endfloat of selector forks**

0.05 mm (0.0020 in)

Minimum wear limit of selector fork guide pins

6.8 mm (0.27 in)

Maximum eccentricity of the two fork guide shafts

0.05 mm (0.0020 in)

NOTE**THE FOLLOWING PROCEDURE IS VALID FOR ALL THE GEARBOX FORKS.**

- Check for damage, deformation and/or signs of wear on the roller of the gear fork cam and on the gear fork tooth.
- Replace the gearbox fork if necessary.

- Check the gearbox fork's movement, and replace the gearbox forks if it is irregular.

Assembling the gearbox

To proceed with the assembly of the gearbox, after checking that all the components are intact and do not show wear beyond the limits, proceed as follows:

- Insert the primary shaft (1) into the hole in the crankcase and then rotate it inwards as indicated.



- Position the primary shaft (1) in the bearing (2) present in the crankcase as far as it will go.



- Insert the bearing (3) on the primary shaft.



- Position the two screws (4) complete with countersunk washers (5) and tighten to the prescribed torque.



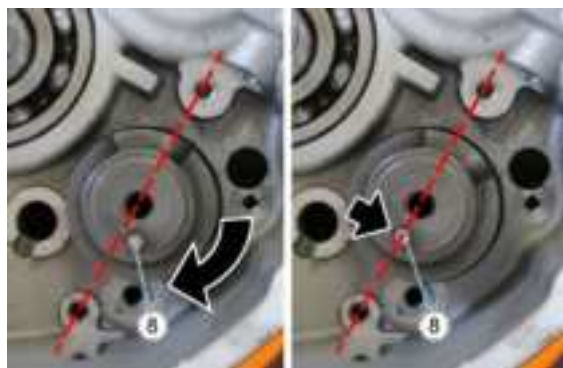
- Position the fork (6) on the primary shaft between the third and fourth gear.



- Insert the desmodromic shaft (7) through the hole in the crankcase and up to the stop on the bearing.



- Rotate the desmodromic shaft to align the centring pin (8) in the indicated point and facilitate the insertion of the fork sliding shaft in the following phases. In this way it is possible to intercept the neutral.



- Insert the sliding shaft (9) into the crankcase thus intercepting the fork of the primary shaft.



- Insert the bearing (10) on the desmodromic shaft.



- Position the screw (11) with counter-sunk washer (12) and tighten it to the prescribed torque.



- After inserting the guide shaft (13) of the forks for the transmission shaft into the crankcase, position the forks (14) making sure that the teeth are in the grooves of the desmodromic shaft.



- Position and tighten to the prescribed torque the locking screw (15) of the sliding shaft of the forks that control the gears on the transmission shaft.



- Position the spring (16) and index lever (17) in the seat on the crankcase.
- Secure both using the appropriate screw (18) tightened to the prescribed torque.



- Using a screwdriver, move the index lever to allow the drum (19) to be inserted into the seat on the desmodromic shaft, paying attention to correct centring, using the pin on the shaft itself.



- Position and tighten the fixing screw (20) of the drum to the prescribed torque.



- Insert the gear selector shaft (21) into the crankcase up to the stop.



- Position the two screws (22) that fasten the retention plate and tighten them to the prescribed torque.



- Position the transmission shaft (23) paying attention to the correct insertion of the forks in it.



- Correct assembly must be as shown.



- Rotate both ends of the transmission shaft to ensure that jamming does not occur with the primary shaft.



Gear selector

After removing the gear selector shaft from its seat, it can now be broken down as described:

- Remove the retaining plate (1) by sliding it off the selector shaft (2) after turning it.



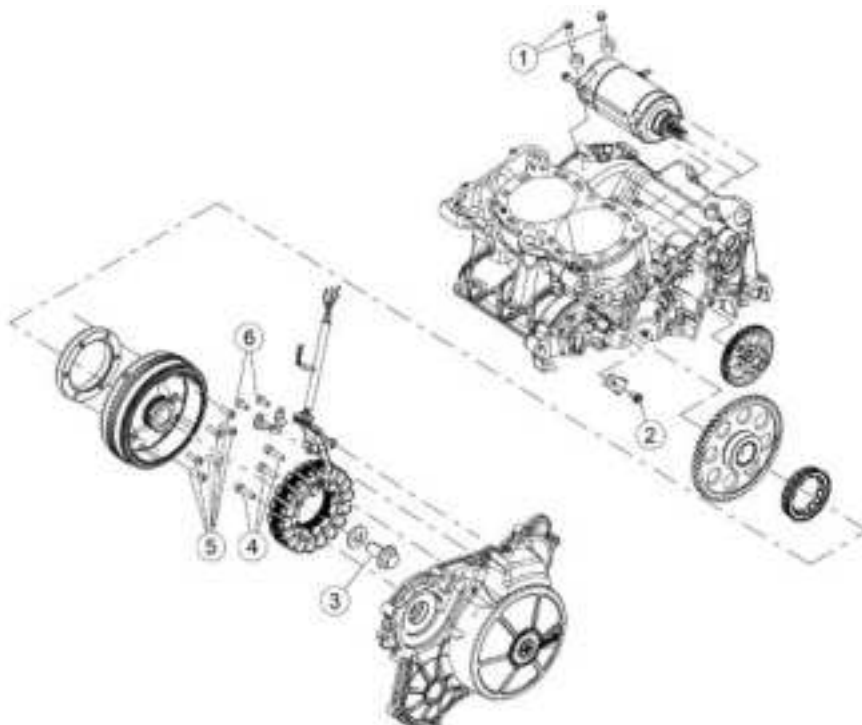
- Remove the spring (3).

IMPORTANT

PAY PARTICULAR ATTENTION TO THE CORRECT POSITIONING DURING THE REASSEMBLY PHASE.



Starter motor



FLYWHEEL - IGNITION

Pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fastening screws	M6x35	2	12 Nm (8.85 lbf ft)	-
2	Starter ring gear containment plate fastening screw	M6x35	1	12 Nm (8.85 lbf ft)	-
3	Rotor fastening screw	M14x30	1	195 Nm (143.82 lbf ft)	-
4	Stator SHC fixing screws	M6x30	3	10 Nm (7.38 lbf ft)	Pre-impregnated
5	Free wheel on rotor SHC fixing screws	M6x18	3	14 Nm (10.33 lbf ft)	Pre-impregnated
6	Stator wiring harness support plate fixing screws	M5x14	2	3 Nm (2.21 lbf ft)	Pre-impregnated

Removing the starter motor

To remove the starter motor it is necessary to first remove the control unit complete with support, proceeding as described:

- Disconnect the connectors (1) from the control unit.



- Remove the control unit (2) from the support.



- Remove the four screws (3) that fasten the control unit support.



- Remove the clamp (4) of the neutral sensor connector.



- Slightly lift the control unit support to allow the oil pressure sensor wiring (6) and the pick-up wiring (7) to be disconnected from the cable grommets (5).



- Disconnect the wiring from the side cable grommet (8) on the control unit support.



- Remove the control unit support (9).



- Undo the fastening nuts (10) and disconnect the clutch cable (11) from the lever.



- Remove the SAS valve (12) from its support, disconnect the connector (13) and lock it laterally using rubber bands.



- Unscrew the fixing screw of the support bracket (14) of the blow-by pipe and remove it.



- Unhook the brake pipes (15) from the support.



- Extract the starter motor (16) from its seat and slide it off the left side.



- Remove the protective cap (17), unscrew the fastening nut (18) of the wiring (19) and remove the starter motor.



Installing the starter motor

To install the starter motor, proceed as described:

- Place the wiring (1) parallel to the starter motor, insert the nut (2) and tighten it to the prescribed torque.



- Cover the nut with the special rubber protection (3).



- Insert the starter motor (4) in its seat and position the two spacers (5) in line with the fixing holes operating from the right side of the vehicle.



- Insert the two screws (6) making sure to intercept the spacers and tighten them to the prescribed torque.



- Fit the support bracket (7) of the blow-by pipe, insert the screw (8) and tighten it to the prescribed torque.



- Connect the connector (8) to the SAS valve (9) and insert it on the corresponding support.



- Connect the brake pipes (10) to the support.



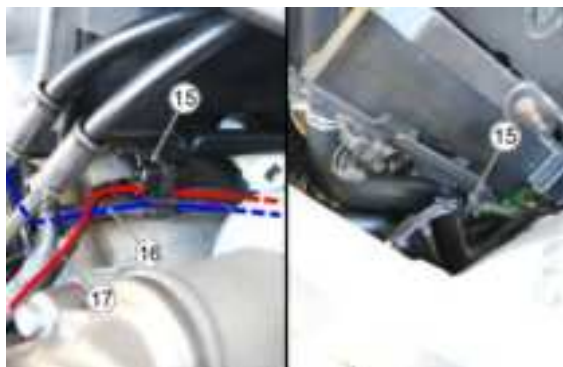
- Connect the clutch cable (11) to the lever and lock the two adjustment nuts (12).

**IMPORTANT****CHECK THAT THE CLUTCH FUNCTIONS CORRECTLY**

- Insert the control unit support (13) and connect the cables on the cable grommet (14).



- Connect the oil pressure sensor wiring (16) and the pick-up wiring (17) to the cable grommets (15).



- Connect the neutral sensor connector and using a clamp (18) lock it to the support.



- Lock the control unit support by tightening the four screws (19).



- Insert the control unit (20) in the support and connect the "vehicle" and "engine" connectors (21).



Removing the idle gear

To proceed with the removal of the intermediate gear, it is necessary to first remove the flywheel and the starting ring gear.

- Then remove the intermediate gear from its seat.



Fitting the idle gear

To install the intermediate gear correctly, proceed as follows:

- Generously lubricate the gear rotation pin with engine oil



- Insert the intermediate gear in its seat and rotate it at both ends to check its correct sliding.



Removing the starter gear

To proceed with the removal of the starting ring gear, it is necessary to first remove the flywheel and the proceed as follows:

- Using a hot air gun, heat the fixing screw (1) of the safety plate (2) and remove it.



- Remove the safety plate (2).



- Remove the starting ring gear (3).



Installing the starter gear

To carry out a correct installation of the starting ring gear, proceed as follows:

- Generously lubricate the crankshaft with engine oil.



- Generously lubricate the inner track of the starting ring gear with engine oil.



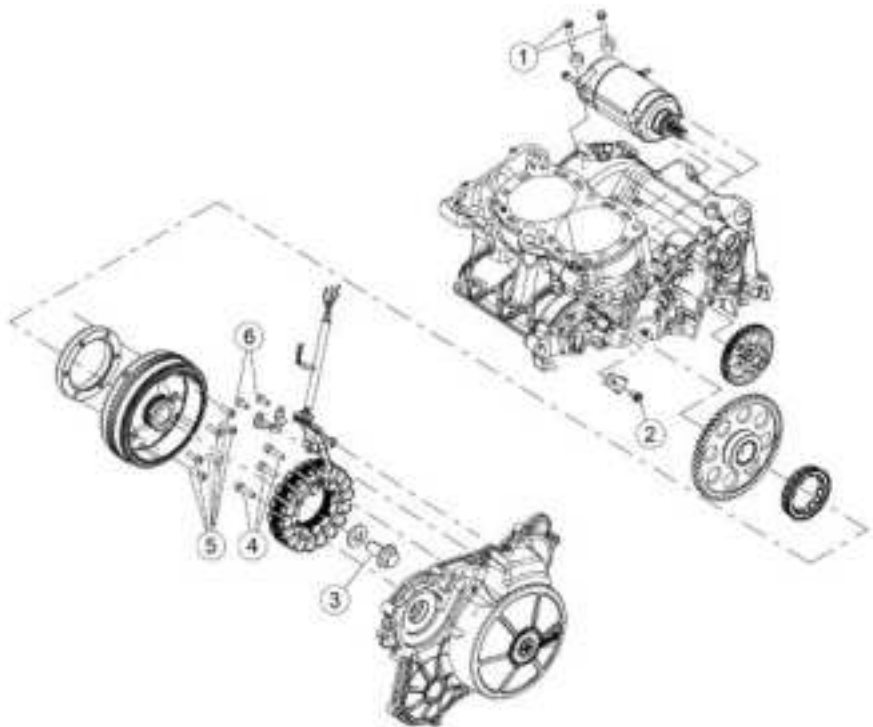
- Insert the starter ring gear on the crankshaft and rotate it on both ends to check correct sliding.



- Position the safety plate with the relative screw and tighten it to the prescribed torque.



Generator side



FLYWHEEL - IGNITION

Pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fastening screws	M6x35	2	12 Nm (8.85 lbf ft)	-
2	Starter ring gear containment plate fastening screw	M6x35	1	12 Nm (8.85 lbf ft)	-
3	Rotor fastening screw	M14x30	1	195 Nm (143.82 lbf ft)	-
4	Stator SHC fixing screws	M6x30	3	10 Nm (7.38 lbf ft)	Pre-impregnated
5	Free wheel on rotor SHC fixing screws	M6x18	3	14 Nm (10.33 lbf ft)	Pre-impregnated
6	Stator wiring harness support plate fixing screws	M5x14	2	3 Nm (2.21 lbf ft)	Pre-impregnated

Removing the flywheel cover

To proceed with the removal of the flywheel cover, proceed as described:

- Remove the inspection cap (1).



- Remove the 5 screws (2) used to fasten the water pump cover.



- Remove the water pump cover (3) complete with gasket (4).



- Remove the 8 screws (5) used to fasten the flywheel cover.



- Using the appropriate tool, remove the flywheel cover (6).



Special tools

020712Y Handle for removing the flywheel cover

- Remove the gasket (7) of the flywheel cover.



Rimozione rotore

To proceed with the removal of the rotor, proceed as described:

- Using the special tool (1) block the rotation of the rotor and unscrew the locking screw (2).

Special tools

021036Y Flywheel side crankshaft locking tool



- After removing the rotor rotation locking tool, remove the locking screw (2) complete with washer (3).



- Position the specific tool (4) on the rotor and by screwing the left-hand screw (5) on the tool itself, it will be possible to extract the rotor from the crankshaft.

Special tools

020713Y Flywheel extractor



- Before extracting the rotor (6), position the engine vertically to prevent the spline on the crankshaft from falling in to the engine itself.



- After removing the rotor, remove the spline (7).



Removing the stator

To proceed with the removal of the stator, proceed as described:

- Remove the two pick-up fixing screws (1).



- Remove retainer plate (2) of the stator wiring harness.



- Remove the three fixing screws (3) of the stator.



- Remove the stator (4).



- Disconnect the wiring harness from the cover to complete the removal.

Freewheel removal

To proceed with the removal of the free wheel, proceed as described:

- Remove the six fixing screws (1) of the free wheel to the rotor.



- Remove the flange (2) including the free wheel.



- Separate the free wheel (3) from the flange (2).



Flywheel components check

- Verificare l'integrità dei magneti.
- Verificare che la gabbietta di supporto dei magneti non presenti deformazioni o rotture.
- Verificare che la chiodatura del volano non presenti allentamenti.



Checking the starter clutch

Remove the free wheel from its housing and check the rollers for signs of wear.

Check if the outer spring is sufficiently preloaded to hold the rollers in place.

Check for wear on the sliding surface of the free wheel inside its housing.



IT IS NECESSARY TO REPLACE THE HOUSING OF THE FREE WHEEL IF DEFORMATIONS OR DEEP GROOVES ARE PRESENT ON THE SLIDING SURFACE.



Installing the flywheel

To proceed with the installation of the rotor, proceed as described:

- Position the spline (1) on the crankshaft.



- Insert the rotor (2) on the crankshaft paying attention to align the milling on the rotor, with the spline previously inserted on the crankshaft.



- Position the specific tool (3) and block the rotation of the rotor.
- Insert the screw (4) with washer (5).



Special tools

021036Y Flywheel side crankshaft locking tool

- Tighten the rotor fixing screw to the prescribed torque.



- Remove the specific tool.

Special tools

021036Y Flywheel side crankshaft locking tool

Stator installation

To proceed with the installation of the stator, proceed as described:

- Position the stator (1) on the seat in the flywheel cover.



- Screw and tighten the three stator fixing screws (2) to the prescribed torque.



- Position the pick-up (3) and the retain-er plate (4) of the stator wiring harness.



- Fully screw the screws (5) without tightening them.



- Position the specific tool (6) on the stator to obtain the correct distance of the pick-up.
- Push the pick-up at the point indicated, towards the specific tool and tighten the screws (5) to the prescribed torque.



Flywheel cover installation

To proceed with the installation of the flywheel cover, proceed as described:

- If removed during the disassembly phase, position the two centring pins (1) on the crankcase.



- Position the gasket (2) on the crankcase.



- Position the cover (3) on the crankcase.



- Insert the eight fixing screws (4) of the flywheel cover, screwing them in by hand.



- Position the gasket (5) and the cover (6) of the water pump.



- Insert the four screws (7) and the screw (8) complete with washer (9) for the fixing of the water pump cover.



- Screw the cover fixing screws of the flywheel cover/water pump cover to the prescribed torque.



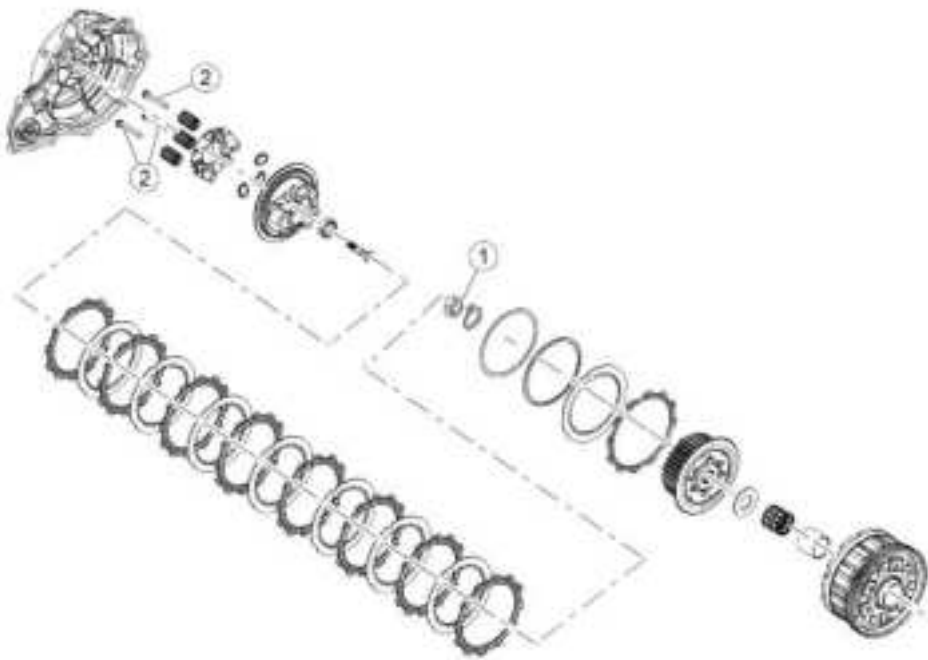
- Insert the inspection cap (10) complete with O-ring on the flywheel cover.



- Tighten the inspection cap to the prescribed torque.



Clutch side



CLUTCH

Pos.	Description	Type	Quantity	Torque	Notes
1	Clutch fastening nut	-	1	175 Nm (129.07 lbf ft)	-
2	Screws for springs	M6	3	10 Nm (7.37 lb ft)	-

Removing the clutch cover

To proceed with the removal of the clutch cover, proceed as follows:

- Remove the cap/dipstick (1) for checking the engine oil level.



- Remove the nine screws (2) used to fasten the clutch cover.



- Remove the clutch cover (3).



- Remove the gasket (4) of the clutch cover.



- Take care when recovering the two centring pins of the clutch cover.

To remove the components on the cover:

- Remove the three screws (5) fixing the blow-by cover.



- Remove the blow-by cover (6) and the gasket (7).



- Operating in the inside of the cover, remove the circlip (8).



- Remove the washer (9).



- Remove the oil seal (10).



Disassembling the clutch

To disassemble the clutch, proceed as follows:

- Unscrew the three screws (1) fastening the thrust plate.



- Remove the thrust plate (2).



- Remove the three screws (3).



- Remove the thrust plate (4).



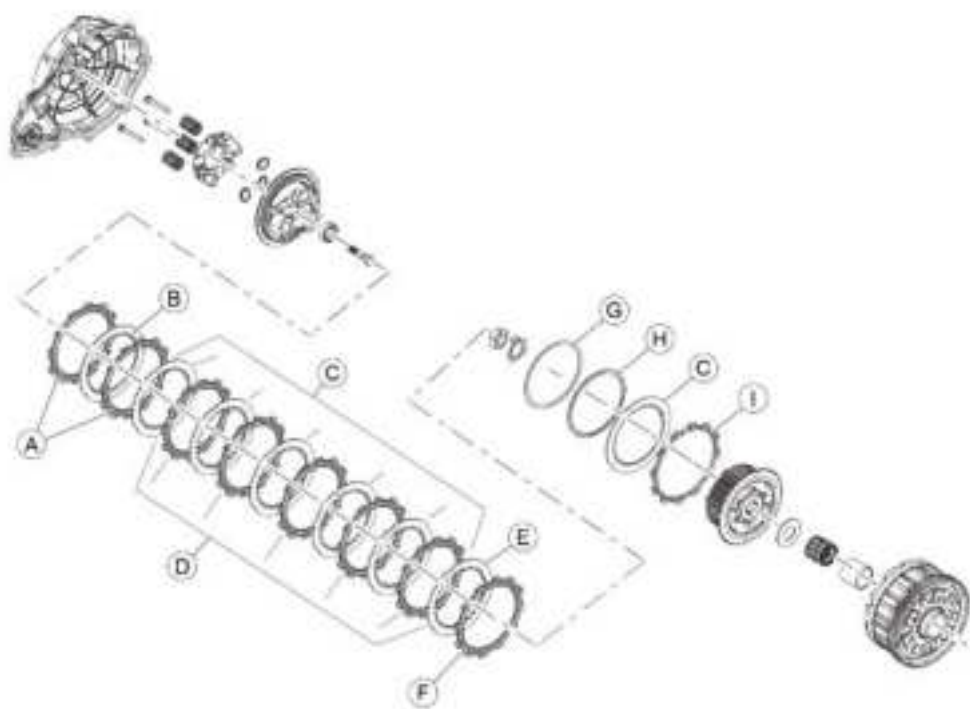
- Extract the clutch rod (5).



- Extract the three spring retainers (6).



- Remove the first drive disc (A) with reduced friction material.
- Remove the driven plate (B).
- Remove the second drive disc (A) with reduced friction material.
- Remove the five driven discs (C) alternating with the five drive discs (D).
- Remove the nitrided drive disc (E).
- Remove the turned drive disc (F).
- Remove the washer (G).
- Remove the disc spring (H).
- Remove the driven plate (C).
- Remove the drive disc (I).



- Using the specific tool to lock the clutch hub rotation, unscrew the lock nut (7) and remove it.

Special tools

9100896 Clutch bell stopper



- Remove the lock washer (8).



- Remove the clutch hub (9).



- Remove the washer (10).



- Remove the clutch housing (11).



- Remove the roller cage (12) and spacer (13).



- Remove the washer (14).



Checking the clutch plates

Characteristic

Maximum warping of clutch plates (deformation relative to flat surface)

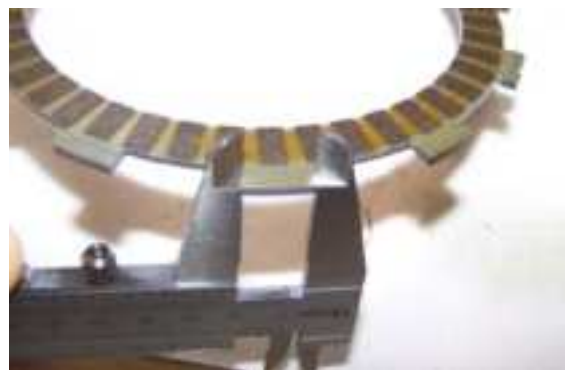
0.15 mm (0.0059 in)

Minimum wear limit of the clutch plate sliding teeth

13.5 mm (0.53 in)

Minimum wear limit of the complete clutch pack thickness (friction discs + steel discs)

47.6 mm (1.87 in)



Checking the clutch housing

Check for any damage or signs of wear on the clutch bell that could lead to irregular clutch functionality. If necessary, replace the bell.

Check the riveted joint between the clutch housing and the primary drive sprocket for correct sealing and evenness.

Check for the presence of any damage or signs of wear on the primary driven gear, and replace the primary transmission's driven gear and the clutch housing, if necessary.

Verify that the noise level is not too high during operation; replace the primary transmission's driven gear and the clutch housing, if necessary.

Checking the pusher plate

Check the thrust plate and the bearing for damage and wear. If necessary, replace the parts.

Characteristic

Maximum permissible deformation of spring carrier plate pressure face

0.15 mm (0.0059 in)

Maximum depth of spring carrier plate

27.3 mm (1.07 in)

Checking the clutch hub

Check the clutch housing for any damage or signs of wear that could lead to clutch malfunctioning. Replace the hub if necessary.



Checking the springs

NOTE

THE FOLLOWING PROCEDURE IS VALID FOR ALL CLUTCH SPRINGS.

- Check the springs for signs of damage, and replace them if necessary.
- Measure the free length of the clutch springs, and replace them if necessary.

Characteristic

Minimum wear limit with individual clutch springs in release position

46.8 mm (1.84 in)



Assembling the clutch

After checking that the discs are within the permitted wear limits, proceed as follows to refit:

- Insert the washer (1) on the primary shaft.



- Insert the roller cage (2) and the spacer (3) on the housing.



- Insert the clutch housing (4) on the gearbox primary shaft complete with roller cage and spacer.



- Insert the washer (5).



- Insert the clutch hub (6).



- Insert the lock washer (7).



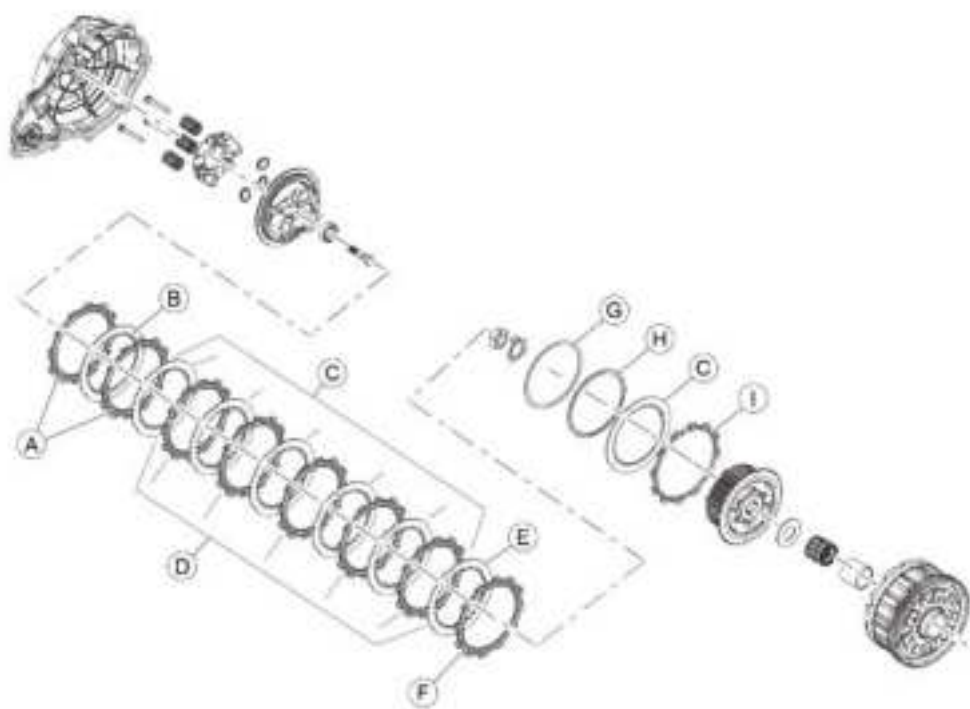
- Insert the nut (8) and tighten it to the specified torque, blocking the hub rotation using the special tool.



Special tools

9100896 Clutch bell stopper

- Insert the drive disc (I).
- Insert the driven disc (C).
- Insert the spring washer (H) paying attention to the correct mounting direction.
- Insert the washer (G).
- Insert the turned drive disc (F).
- Insert the nitrided drive disc (E).
- Insert the five drive discs (D) alternating with the five driven discs (C).
- Insert the second drive disc (A) with reduced friction material.
- Insert the driven disc (B).
- Insert the first drive disc (A) with reduced friction material.



- Insert the three spring retainers (9) on the thrust plate.



- Insert the clutch rod (10) on the thrust plate.



- Insert the thrust plate (11) making sure that the three hub columns are centred with respect to the holes, as indicated.

WARNING

THE WRONG POSITIONING OF THE PLATE WITH THE HUB CAN CAUSE THE BREAKAGE OF THE CLUTCH ITSELF.



- Insert the three springs (12).



- Insert the thrust plate (13) complete with the three locking screws (14).



- Tighten the three screws to the prescribed torque.



Installing the clutch cover

Before installing the clutch cover, if removed during the disassembly phase, restore the cover components as follows:

- Place the gasket (1) of the blow-by system on the crankcase, as indicated.



- Place the cover (2) of the blow-by system complete with the three fixing screws (3) and tighten them to the specified torque.



- Place the oil seal (4) inside of the clutch cover and fully insert it with the special tool.

Special tools

021042Y Oil seal and clutch shaft bearing and gear shaft punch



- Place the washer (5) paying attention to the mounting direction.



- Insert the circlip (6).



- Using a hair dryer, heat the housing seat of the lower clutch control shaft bearing.



- Partially insert the clutch control shaft (7) and position the bearing (8) on the shaft.



- Using a rubber hammer act on the clutch control shaft and fully insert the lower bearing.



- Using a hair dryer, heat the housing seat of the upper clutch control shaft bearing.



- Fully insert the upper bearing (9) using the specific tool after having inserted it on the clutch control shaft.

Special tools

021042Y Oil seal and clutch shaft bearing and gear shaft punch



- Lubricate the inside of the oil seal (10) and insert it on the clutch control shaft.



- Using the special tool, fully insert the oil seal.

Special tools

021042Y Oil seal and clutch shaft bearing and gear shaft punch



To proceed with the installation of the clutch cover, proceed as described:

- If removed during the disassembly phase, position the two centring pins (11) on the crankcase.



- Position the gasket (12) on the crankcase.
- The use of the pins (13) Aprilia cod. AP8121222 is recommended to facilitate the positioning of the cover.



- Rotate the clutch rod bringing the tothing to the left as indicated.



- Position the cover (14) on the crankcase.



- Insert the eight screws (15) indicated for fixing the clutch cover and tighten them to the specified torque.



- After inserting the metal clamp (16) into the blow-by pipe (17), connect it and close the clamp.



- Position the bracket (18) and insert the missing screw (19) fixing the cover and tighten it to the specified torque.



- Insert and screw the engine oil level cap/dipstick (20).



Checks on drive shaft

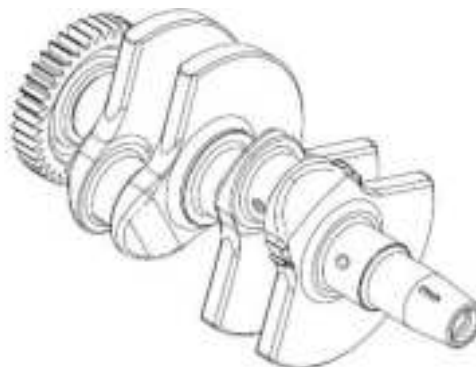
Characteristic

Crankshaft axial clearance - crankcase

0,40 - 0,18 mm (0,0157 - 0,0070 in)

Maximum radial play between main bushings and crankpins

0.07 mm (0.00275 in)



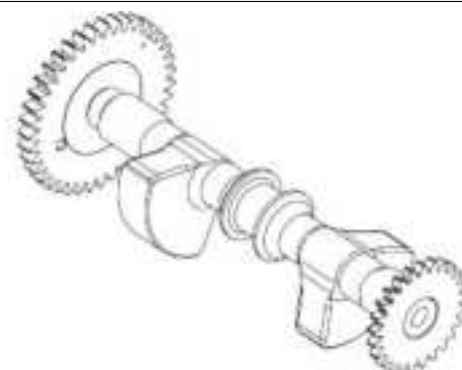
Checks on balance shaft

There are two dimensional classes for the counter-shaft pins: F and G

Characteristic

Maximum counter-shaft axial clearance after closing the crankcase

0,40 - 0,18 mm (0.0157 - 0.0070 in)



Checks on connecting rods

Characteristic

Maximum wear limit of the connecting rod small end

17.03 mm (0.6705 in)

Maximum connecting rod small end radial clearance

0.045 mm (0.0018 in)

Maximum radial play between connecting rod and crankpin

0.3 - 0.5 mm (0.012 - 0.020 in)

Maximum radial play of crankpin

0.08 mm (0.0031 in)

Controllo pistoni

PISTON-CYLINDER COUPLING

	Selection A	B Selection
Cylinder	80.998 - 81.006 mm	81.006 - 81.014 mm
Piston	80.941 - 80.951 mm	80.951 - 80.961 mm
Coupling clearance	0.047 - 0.065 mm	0.045 - 0.063 mm

IMPORTANT

THE MEASUREMENT OF THE PISTON DIAMETER IS PERFORMED AT 6 mm (0.24 in) FROM ITS BASE

Characteristic

Aperture tolerance of the first piston ring mounted on the cylinder

0.10 (0.0039 in)

Aperture tolerance of the second piston ring mounted on the cylinder

0.10 mm (0.0039 in)

Maximum gap between ends of piston ring when installed on piston

0.30 mm (0.0190 in)

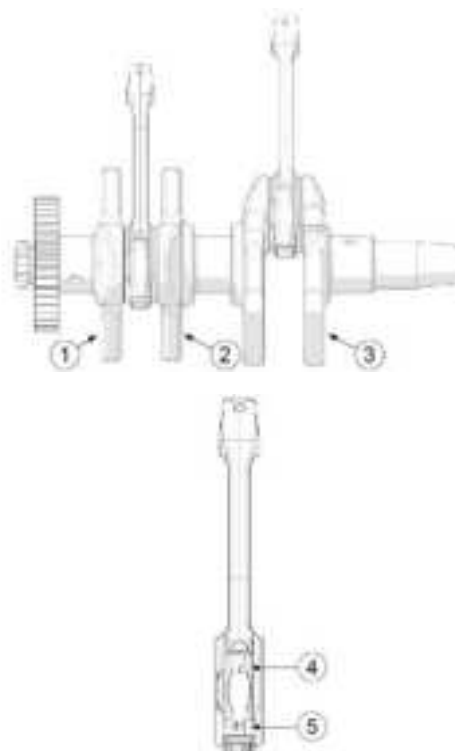
Selezione bielle

SELECTING CRANKSHAFTS AND CONNECTING RODS ACCORDING TO BALANCING CLASS

crankshafts and connecting rods have been introduced which are matched with each other in relation to their balancing class. The class is easily identifiable as it is marked on the component itself.

Key:

- 1) Primary side main journal class; Primary side connecting rod pin class;
- 2) Centre main journal class;
- 3) Flywheel side main journal class; Crankshaft weight class; Flywheel side connecting rod pin class;
- 4) Connecting rod dimensional class;
- 5) Connecting rod weight class.



The weight class of both connecting rods must match the weight class of the crankshaft.

The permitted crankshaft-connecting rod balancing class combinations are listed in the following table:

CRANKSHAFT - CONNECTING ROD BALANCING CLASSES

Crankshaft weight classes	Connecting rod weight classes (marking / weight)
E1	E1 (301.5 g - 304.49 g)
E2	E2 (304.5 g - 307.49 g)
E3	E3 (307.5 g - 310.49 g)
E4	E4 (310.5 g - 313.49 g)
E5	E5 (313.5 g - 316.5 g)

Every single connecting rod, regardless of the weight class can have dimensional class **1** or **2**.

Dimensional class 1: 39.010 mm - 39.016 mm

Dimensional class 2: 39.017 mm - 39.022 mm

CONNECTING ROD - CRANKSHAFT COUPLING BUSHING SELECTION

Once the connecting rods have been selected according to the weight class, the correct bushings must be selected for the connecting rods-crankshaft coupling.

According to:

- Dimensional class of crankpin (X, Y, Z);
- Dimensional class of connecting rods (1, 2);

the bushings for connecting the connecting rods to the crankshaft can be defined according to the following table:

CONNECTING RODS - CRANKSHAFT COUPLING

Crank pin dimensional class	Connecting rod class 1	Clearance	Connecting rod class 2	Clearance
X	BLUE + YELLOW	0.053 - 0.026 mm	YELLOW + YELLOW (alternatively BLUE + GREEN)	0.053 - 0.027 mm
Y	YELLOW + YELLOW (alternatively BLUE + GREEN)	0.054 - 0.026 mm	YELLOW + GREEN	0.054 - 0.027 mm
Z	YELLOW + GREEN	0.054 - 0.026 mm	YELLOW + GREEN	0.054 - 0.028 mm

N.B.

The thicker bushing must be mounted on the side of the connecting rod (upper area).

Construction features

CRANK PINS

Class X	Class Y	Class Z
Min: 35.885 mm	Min: 35.880 mm	Min: 35.874 mm
Max: 35.880 mm	Max: 35.874 mm	Max: 35.869 mm

CONNECTING ROD CLASSES

Class 1	Class 2
Min: 39.010 mm	Min: 39.017 mm
Max: 39.016 mm	Max: 39.022 mm

CONNECTING ROD BUSHINGS

BLUE	YELLOW	GREEN
1.547 mm	1.552 mm	1.557 mm
1.552 mm	1.557 mm	1.562 mm

Selezione bronzine

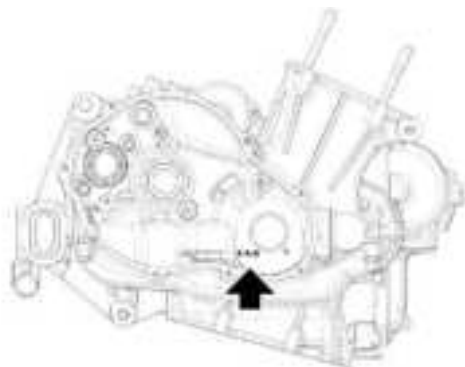
CRANKSHAFT BUSHINGS

Crankcase category

Crankcase selectable in two classes (A - B) for the diameter of the hole on the three main supports of the crankshaft.

The category is marked on the lower crankcase, on the right side, at the crankshaft.

The three main supports may be of different classes (e.g: A - B - B or B - B - B or A - B - A, etc.).

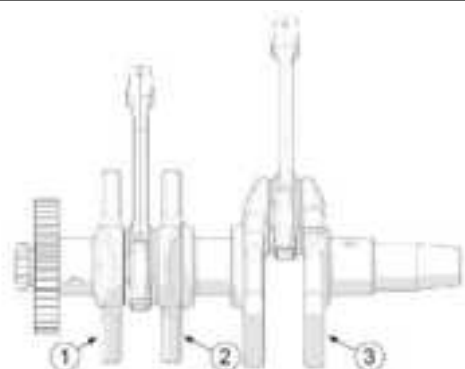


Crankshaft class

The main journal classes useful for the crankcase-crankshaft coupling are stamped on the crankshaft (see figure).

Key:

- 1) Primary side main journal class;
- 2) Centre main journal class;
- 3) Flywheel side main journal class;



Crankshaft-crankcase coupling

CRANKSHAFT-CRANKCASE COUPLING

	Crankcase Class A	Crankcase Class B
Crankshaft Class A	Bushing C (0.052-0.032 mm)	Bushing E (0.050-0.030 mm)
Crankshaft Class B	Bushing B (0.054-0.034 mm)	Bushing C (0.052-0.032 mm)

Construction features

MAIN BUSHINGS (CRANKSHAFT)

RED	BLUE	YELLOW	GREEN	BROWN
A	B	C	E	F
Min: 1.960 mm	Min: 1.964 mm	Min: 1.968 mm	Min: 1.972 mm	Min: 1.976 mm
Max: 1.964 mm	Max: 1.968 mm	Max: 1.972 mm	Max: 1.976 mm	Max: 1.980 mm

The RED and BROWN bushings are for emergency use and are not available as spare parts.

CRANKCASE CATEGORIES (CRANKSHAFT)

Class A	Class B
Min: 39.943 mm	Min: 39.949 mm
Max: 39.949 mm	Max: 39.955 mm

MAIN JOURNAL (CRANKSHAFT)

Class A	Class B
Min: 35.936 mm	Min: 35.992 mm
Max: 35.992 mm	Max: 35.998 mm

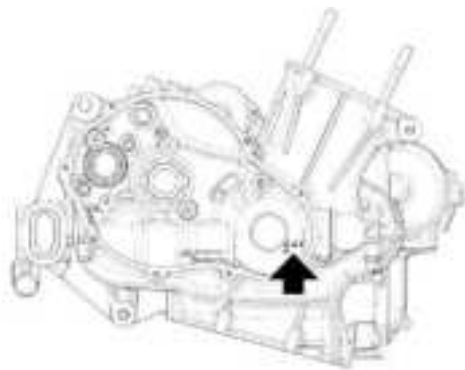
COUNTERSHAFT BUSHINGS

Crankcase category

Crankcase selectable in two classes (F - G) for the diameter of the hole on the three main supports of the countershaft.

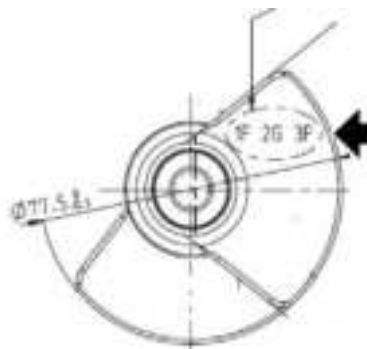
The category is marked on the lower crankcase, on the right side, at the crankshaft.

The three main supports may be of different classes (e.g: F - F - G or G - G - F, etc.).



Countershaft category

The main journal classes and the dimensional classes useful for the countershaft crankcase coupling are stamped on the countershaft (see figure).



Key:

- 1) Primary side;
- 2) Central;
- 3) Flywheel side.

Countershaft-crankcase coupling

COUNTERSHAFT-CRANKCASE COUPLING

	Crankcase Class F	Crankcase Class G
Countershaft Class F	Bushing RED (0.062-0.040 mm)	Bushing BLUE (0.061-0.039 mm)
Countershaft Class G	Bushing BLACK (0.065-0.043 mm)	Bushing RED (0.059-0.042 mm)

Construction features

MAIN BUSHINGS (COUNTERSHAFT)

RED	BLUE	YELLOW	BLACK
Min: 1.992 mm	Min: 1.996 mm	Min: 2.000 mm	Min: 1.988 mm
Max: 1.997 mm	Max: 2.001 mm	Max: 2.005 mm	Max: 1.993 mm

CRANKCASE CATEGORIES (COUNTERSHAFT)

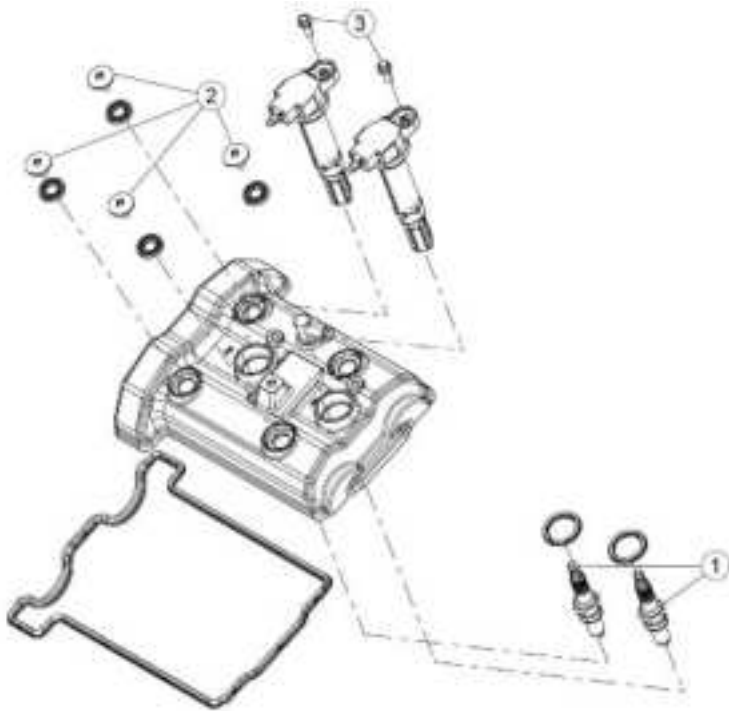
F	G
Min: 27.500 mm	Min: 27.507 mm
Max: 27.507 mm	Max: 27.514 mm

MAIN JOURNALS (COUNTERSHAFT)

F	G
Min: 23.471 mm	Min: 23.476 mm
Max: 23.476 mm	Max: 23.481 mm

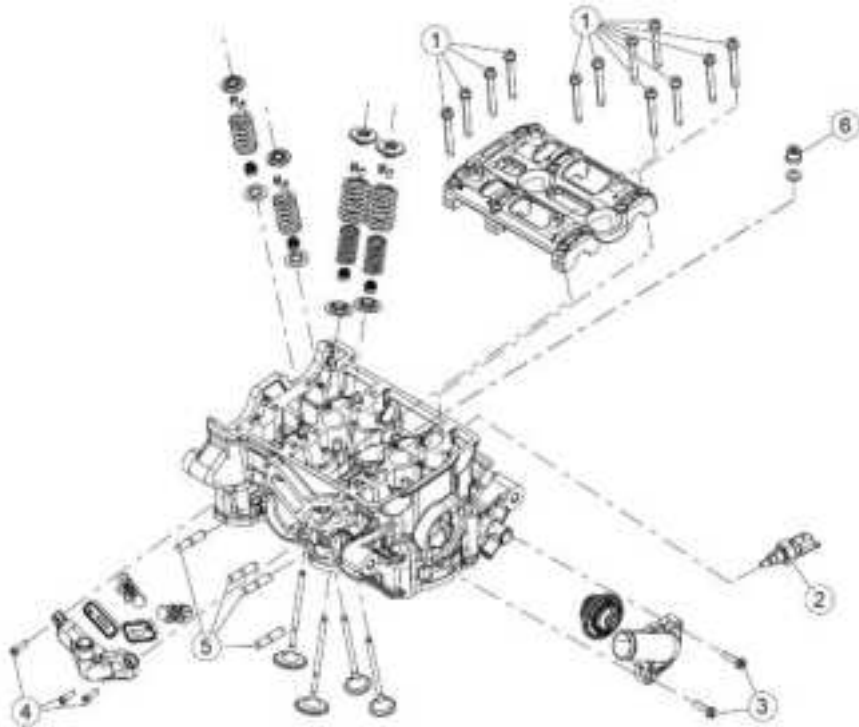
Installation of connecting rods

Head and timing



HEAD COVER

Pos.	Description	Type	Quantity	Torque	Notes
1	Spark plugs	-	2	12 Nm (8.85 lbf ft)	-
2	Head cover fastening screws	-	4	10 Nm (7.38 lbf ft)	-
3	TE flanged coil fixing screw	M6x16	2	12 Nm (8.85 lbf ft)	-



HEAD - VALVES

Pos.	Description	Type	Quantity	Torque	Notes
1	Cam tower fixing screws	-	12	11 Nm (8.11 lbf ft)	-
2	Water temperature sensor	-	1	20 Nm (14.75 lbf ft)	-
3	Thermostat cover flanged hex fixing screw	M5	5	6 Nm (4.43 lbf ft)	-
4	Secondary air cover fixing screws	M5x16	3	6 Nm (4.43 lbf ft)	-
5	Stud bolts	M10	4	10 Nm (7.38 lbf ft)	-
6	Flanged nut fixing cylinder head	M10	6	30 Nm (22.12 lb ft)	Pre-tightening
6	Flanged nut fixing cylinder head	M10	6	180°	Tightening

Removing the head cover

To proceed with removing the head cover, proceed as described:

- Remove the four fixing screws (1) of the head cover and the relative damper pads (2).



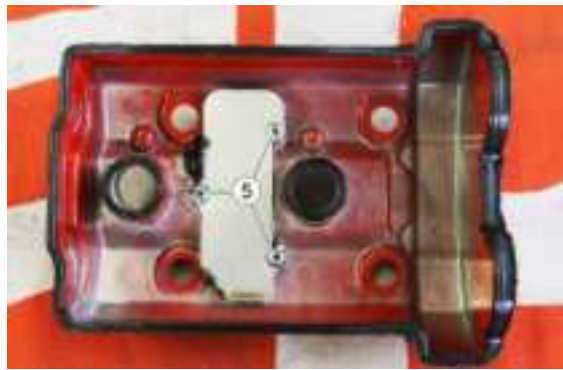
- Remove the head cover (3).



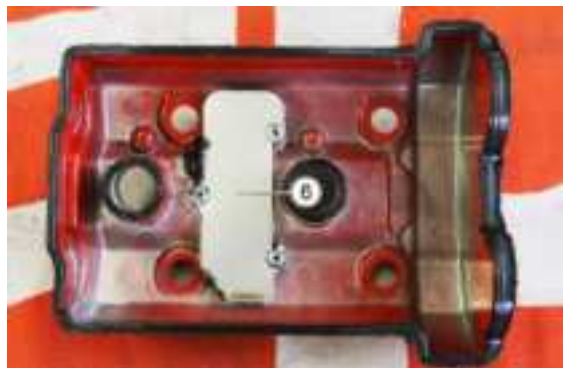
- Remove the gaskets (4).



- Remove the three fixing screws (5) of the membrane cover plate.



- Remove the cover plate (6) of the membrane.



- Remove the membrane (7).

Removing the cylinder head

To proceed with the removal of the head, it is necessary to first remove the timing system complete with the cam tower, camshafts and timing chain.

At this point, proceed as described:

- Remove the two external fixing screws (1) of the head.
- Remove the six fixing nuts (2) of the head.



- Remove the washers (3) in correspondence with the stud bolts.



- Remove the head (4).



- Remove the gasket (4).



Cylinder head

Removing the overhead camshaft

To proceed with the removal of the camshafts it is necessary to rotate the crankshaft so that the valves are not under tension and after removing the head cover, proceed as described:

- Remove the twelve fixing screws (1) of the cam tower (2) and the support plate (3) of the fixed chain slider.



- Remove the cam tower complete with plate.



- After removing the chain tensioner, proceed with the removal of the intake camshaft, removing the timing chain from the gear on the shaft itself.



- After removing the chain tensioner, proceed with the removal of the exhaust camshaft, removing the timing chain from the gear on the shaft itself.

**IMPORTANT**

PROCEED WITH CAUTION DURING THE REASSEMBLY PHASE SINCE THE CAMSHAFTS ARE DIFFERENT.

Removing the valves

To proceed with the removal of the valves, proceed as described:

- Position the head in a vice using the special protective jaws.

INTAKE VALVES

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE INTAKE VALVE BUT ARE VALID FOR BOTH.

- Using a magnet, remove the bucket tappet (1).



- Using a magnet, remove the calibrated pad (2).



- Position the specific tool as indicated on the intake valve.

Special tools

AP8140179 Valve fitting/removal support

020853Y Compresses intake valve springs



- Compress the spring and using a magnet remove the two half-cotters (3) holding the cup.



- Remove the upper cup (4).



- Remove the two springs (5) of the intake valve, marked in orange for the external one and blue for the internal one.



- Remove the valve (6).



- Remove the sealing ring (7).



- Remove the lower cup (8).



EXHAUST VALVES

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE EXHAUST VALVE BUT ARE VALID FOR BOTH.

- Using a magnet, remove the bucket tappet (9).



- Using a magnet, remove the calibrated pad (10).



- Position the specific tool as indicated on the exhaust valve.

Special tools**AP8140179 Valve fitting/removal support****020853Y Compresses intake valve springs**

- Compress the spring and using a magnet remove the two half-cotters (11) holding the cup.



- Remove the upper cup (12).



- Remove the spring (13) of the exhaust valve, marked in yellow.



- Remove the valve (14).



- Remove the sealing ring (15).



- Remove the lower cup (16).



Installing the valves

To proceed with the installation of the valve, proceed as described:

- Position the head in a vice using the special protective jaws.

INTAKE VALVES

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE INTAKE VALVE BUT ARE VALID FOR BOTH.

- Position the lower cap (1).



- Install the sealing ring (2).



- Insert the valve (3).



- Insert the two springs (4) of the intake valve, marked in orange for the external one and blue for the internal one.

IMPORTANT

THE SPRINGS MUST BE POSITIONED WITH THE MORE COMPRESSED PART OF THE SPIRALS FACING THE HEAD



- Position the upper cup (5).



- Position the specific tool as indicated on the intake valve.

Special tools

AP8140179 Valve fitting/removal support

020853Y Compresses intake valve springs



- Compress the springs and using a magnet position the two half-cotters (6) holding the cup.
- Release the springs and remove the tool.



- Using a punch with a rubber mallet, check that the valve is not blocked.



- Position the calibrated pad (7).



- Position the bucket tappet (8).



EXHAUST VALVES

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE EXHAUST VALVE BUT ARE VALID FOR BOTH.

- Position the lower cap (9).



- Install the sealing ring (10).



- Insert the valve (11).



- Insert the spring (12) of the exhaust valve, marked in yellow.

IMPORTANT

THE SPRING MUST BE POSITIONED WITH THE MORE COMPRESSED PART OF THE SPIRALS FACING THE HEAD



- Position the upper cup (13).



- Position the specific tool as indicated on the exhaust valve.

Special tools**AP8140179 Valve fitting/removal support****020853Y Compresses intake valve springs**

- Compress the spring and using a magnet position the two half-cotters (14) holding the cup.
- Release the spring and remove the tool.



- Using a punch with a rubber mallet, check that the valve is not blocked.



- Position the calibrated pad (15).



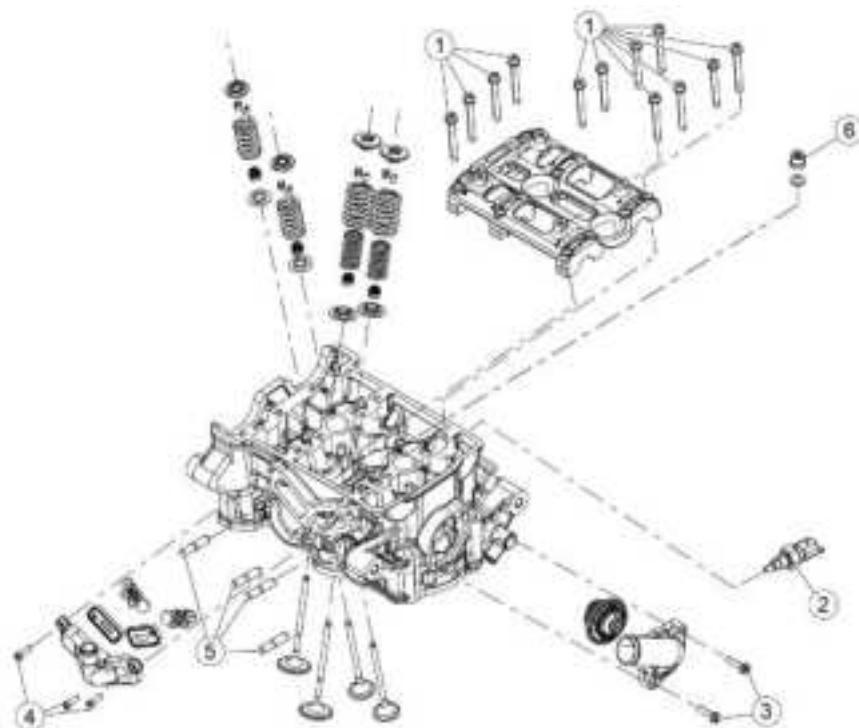
- Position the bucket tappet (16).



Installing the overhead camshaft

The camshaft refitting procedure is described in the "Timing" section.

Timing



HEAD - VALVES

Pos.	Description	Type	Quantity	Torque	Notes
1	Cam tower fixing screws	-	12	11 Nm (8.11 lbf ft)	-
2	Water temperature sensor	-	1	20 Nm (14.75 lbf ft)	-
3	Thermostat cover flanged hex fixing screw	M5	5	6 Nm (4.43 lbf ft)	-
4	Secondary air cover fixing screws	M5x16	3	6 Nm (4.43 lbf ft)	-
5	Stud bolts	M10	4	10 Nm (7.38 lbf ft)	-
6	Flanged nut fixing cylinder head	M10	6	30 Nm (22.12 lb ft)	Pre-tightening
6	Flanged nut fixing cylinder head	M10	6	180°	Tightening

Removing the chain tensioner

To proceed with the removal of the chain tensioner, proceed as described:

- Remove the cap (1).



- Remove the copper washer (2).



- Remove the fitting (3).



- Remove the metal washer (4).



- Remove the chain tensioner (5) complete with O-ring (6).



Chain removal

To proceed with the removal of the timing chain, proceed as described:

- Remove the chain from the timing gear on the crankshaft.



- Remove the chain from the head.



Removing the chain sliders

To proceed with the removal of the slider, it is necessary to remove the complete head and then proceed as described:

- Remove the fixed slider (1) from its seat in the crankcase.



- Remove the fixing screw (2) of the mobile slider.



- Remove the mobile slider (3).



Installing the chain tensioner

To proceed with the installation of the chain tensioner, proceed as described:

- After verifying correct operation, use a rubber hammer to arm the chain tensioner.



- Insert the chain tensioner (1) complete with O-Ring (2).



- Insert the fitting (3) complete with metal washer (4).



- Tighten the fitting to the specified torque.



- Disarm the chain tensioner by using a punch through the hole in the fitting.



- Insert the plug (5) complete with copper washer (6).



- Tighten the plug to the prescribed torque.



Cam timing

Timing

NOTE

IF TIMING IS FORESEEN FOLLOWING THE VALVE CLEARANCE ADJUSTMENT OPERATION (WITH THE ENGINE ASSEMBLED ON THE VEHICLE), REFER TO THE PROCEDURE DESCRIBED IN THE "MAINTENANCE" CHAPTER IN PARAGRAPH "TIMING CHECK".

To carry out engine timing proceed as described:

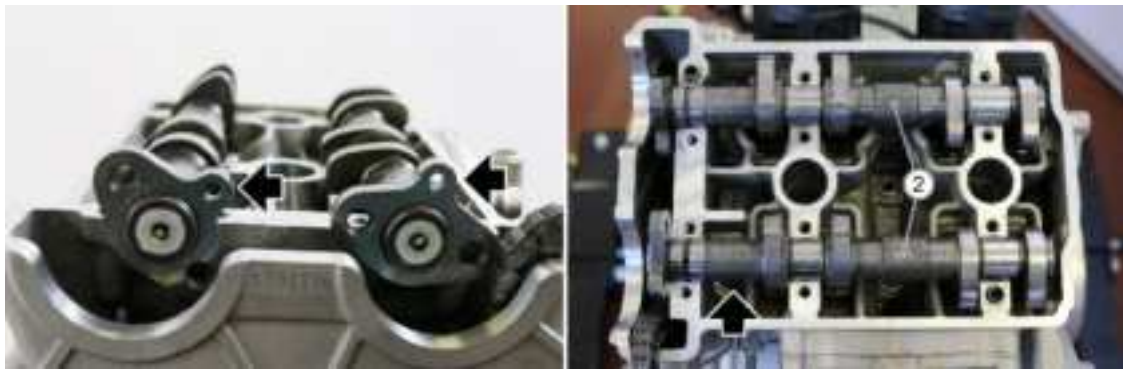
- After positioning the timing chain, rotate the crankshaft and identify, in the point indicated, the hole in the crankcase to insert the first centring pin (1)



Special tools

020851Y Camshaft timing pin

- Position the cam shafts (2) on the head. The exhaust camshaft has two grooves in the indicated point.
- The correct positioning is determined by the holes, for the insertion of the pins, facing upwards.



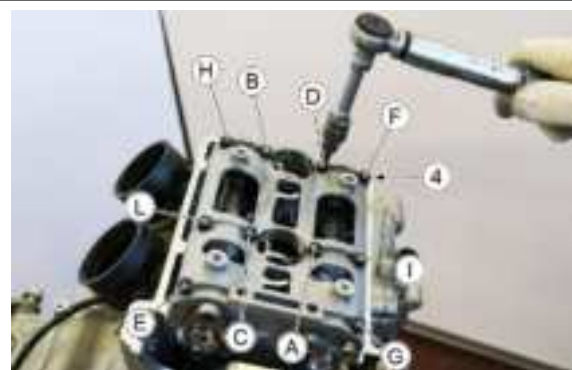
- Generously lubricate the camshafts at the pivot points in contact with the head/cam tower.



- Position the cam tower (3).



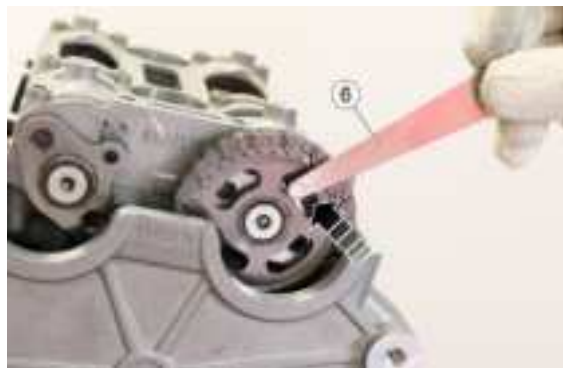
- Position the ten fixing screws (4) of the cam tower with the exception of the two screws which also fix the plate with the chain slider.
- Tighten the screws to the prescribed torque following the indicated sequence.



- Position the timing gear (5) complete with chain on the exhaust camshaft, centring the slotted holes with respect to the fixing points of the gear itself.



- Insert the second centring pin (6) on the exhaust camshaft at the point shown.



Special tools

021043Y Camshaft timing pin (2 pieces)

- Insert and hand tighten one screw (7) of the timing gear onto the exhaust camshaft.



- Position the specific tool on the intake camshaft as indicated.



- Using the specific tool (8) rotate the intake camshaft to intercept the insertion point of the third pin (9) on the cam tower.



Special tools

021044Y Intake camshaft disarming lever

021043Y Camshaft timing pin (2 pieces)

- Remove the pin, position the timing gear (10) complete with chain on the intake camshaft, centring the slotted holes with respect to the fixing points of the gear itself and reposition the pin.



Special tools

021043Y Camshaft timing pin (2 pieces)

- Using a punch, simulate the tension of the transmission chain and check that the holes of the fixing screws of the timing gears are centred with respect to the slotted holes of the gears themselves.



- Insert and hand tighten one screw (11) of the timing gear onto the intake shaft.



- Position the plate (12) complete with the chain slider and after inserting the screws, tighten them to the prescribed torque.



- After verifying correct operation, use a rubber hammer to arm the chain tensioner.



- Insert the chain tensioner (13) complete with O-Ring (14).



- Insert the fitting (15) complete with metal washer (16).



- Tighten the fitting to the specified torque.



- Disarm the chain tensioner by using a punch through the hole in the fitting.



- Insert the plug (17) complete with copper washer (18).



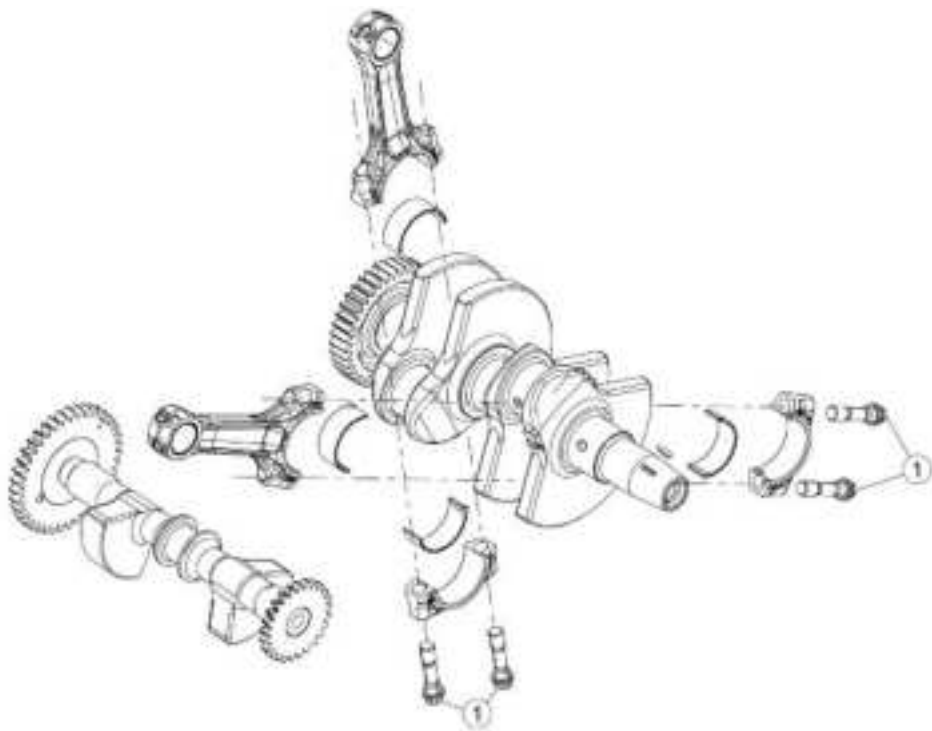
- Tighten the plug to the prescribed torque.



- After correctly inserting the chain tensioner and tensioning the timing chain, insert the two missing screws in the timing gears, tightening them all to the prescribed torque.



Cylinder-piston assembly



CRANKSHAFT

Pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	M	4	1) 15 Nm (11,06 lbf ft) - 2) 20 Nm+110° (14,75 lbf ft+110°)	Lubricate with Pankl oil

Installing the cylinder head

To proceed with the installation of the head, proceed as described:

- Insert the gasket (1).



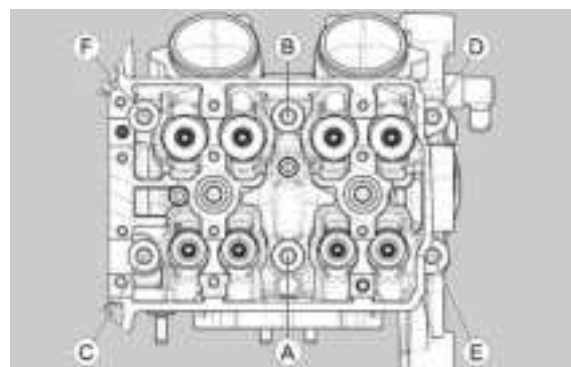
- Insert the head (2).



- Insert the washers (3) in correspondence with the stud bolts.



- Position the six head fixing nuts and tighten them to the prescribed torque in the order indicated.



- Insert the two external screws (4) and tighten them to the specified torque.



Installing the head cover

For the installation of the head cover, proceed as described:

- Position the membrane (1).



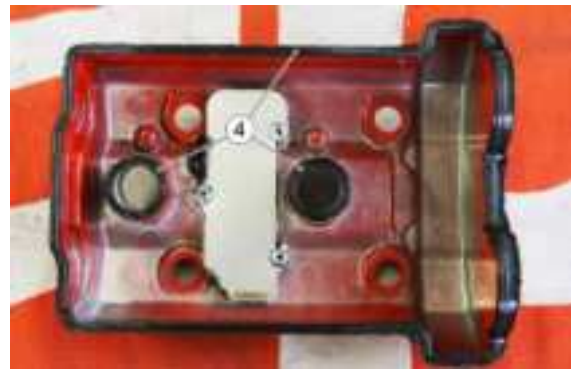
- Position the metal plate (2).



- Insert and tighten the fastening screws (3) of the metal plate to the prescribed torque.



- Position the gaskets (4) of the cover.



- Fit the cover (5).

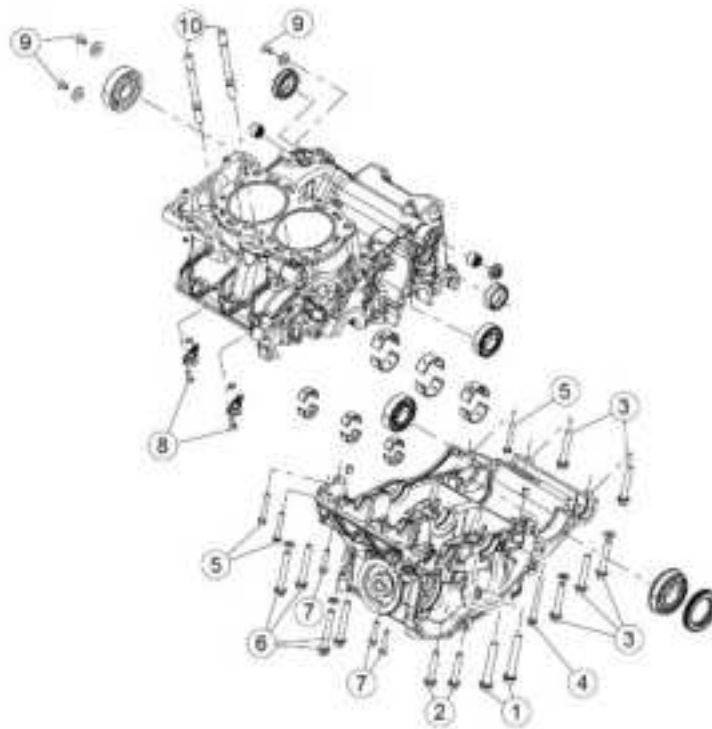


- Position the four fixing screws (6) of the head cover and the relative damper pads (7).



- Tighten the four fixing screws of the head cover to the prescribed torque.
-

Crankcase - crankshaft



CRANKCASE

Pos.	Description	Type	Quantity	Torque	Notes
1	Crankcase halves mating screws	M10x65	6	1) 15 Nm (11,06 lbf ft) - 2) 20 Nm+30° (14,75 lbf ft+30°) - 3) 30° (resulting torque approx 65 Nm (47,94 lbf ft)	Lubricate with oil
2	Crankcase halves mating threaded hex screws	M8x45	2	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
3	Crankcase halves mating screws	M8x50	9	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
4	Crankcase halves mating screws	M6x70	1	10,8-13,2 Nm (7,97-9,74 lb ft)	-
5	Crankcase halves mating flanged hex screws	M6x40	3	10,8-13,2 Nm (7,97-9,74 lb ft)	-
6	Crankcase halves mating flanged hex screws	M8x60	4	22,5-27,5 Nm (16,60-20,28 lb ft)	Lubricate with oil
7	Crankcase halves mating threaded hex screws	M6x30	4	10,8-13,2 Nm (7,97-9,74 lb ft)	-
8	Pistons lubrication jets SHC fixing screw	M5x14	2	5,4-6,6 Nm (3,98-4,87 lb ft)	-
9	Bearings stopper countersunk hex head screws	-	3	9-11 Nm (6.64-8.11 lb ft)	Pre-impregnated
10	Stud bolts	M10	6	18-22 Nm (13.28-16.23 lbf ft) - H 63,5 +/-0,5 mm (2.50 +/- 0.02 in)	Pre-impregnated

Splitting the crankcase halves

To proceed with the opening of the crankcase, it is necessary to remove the head complete with timing system, clutch, rotor, filter and oil pan. At this point, proceed as described:

- Remove the cap (1) complete with washer (2), to allow to unscrew the fastening screw of the crankcase located inside.
- Remove the seven external M6 screws (3).
- Remove the thirteen M8 screws (4) and recover the copper washers where present.



- Remove the six M10 screws (5).



- Remove the lower crankcase (6).



Removing the countershaft

To proceed with the removal of the counter-shaft it is necessary to remove the upper crankcase, then remove it from its seat.



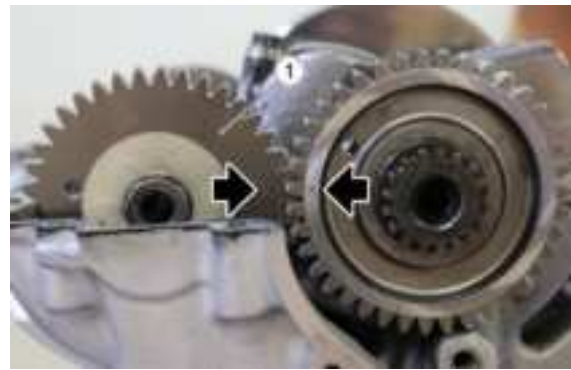
Refitting the crankcase halves

To proceed with the coupling of the crankcases after having inserted all gearbox components, the crankshaft complete with connecting rods/pistons, proceed as described:

- Generously lubricate the counter-shaft bushings.



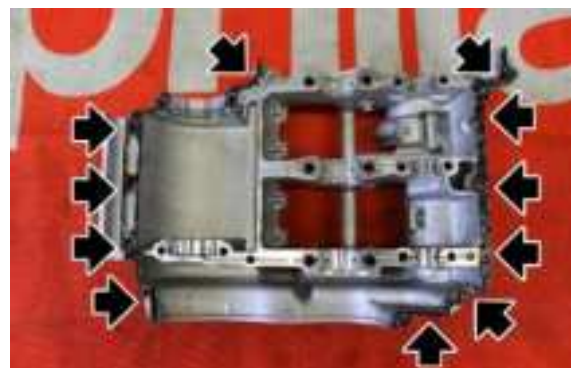
- Insert the counter-shaft (1) on the crankcase checking the correct position determined by the references visible on the gears.



- Generously lubricate the crankshaft and counter-shaft at the rotation points of the bushings.



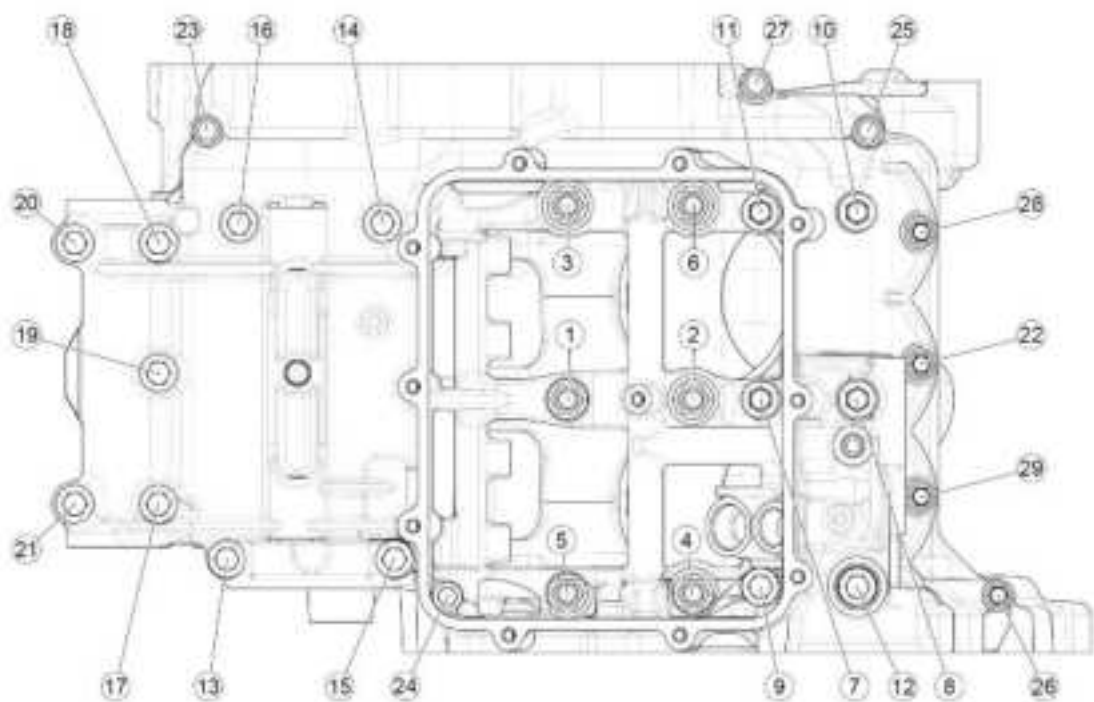
- Apply a layer of threebond at the points indicated on the lower crankcase.



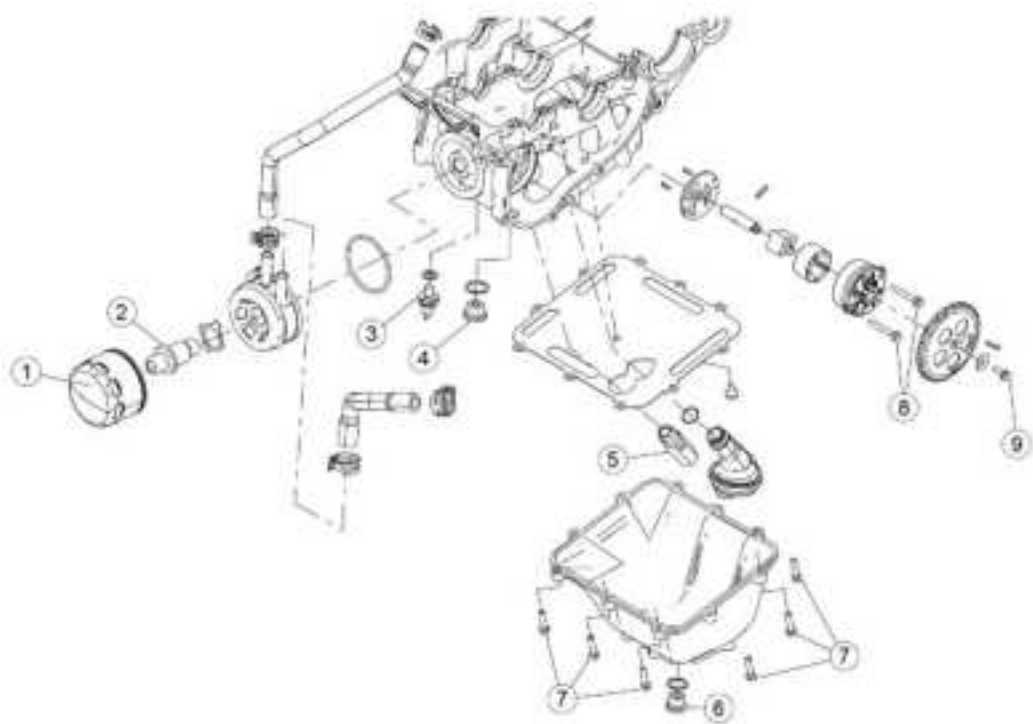
- Position the lower crankcase (2) on the upper crankcase.



- Tighten the six internal M10 screws, the M8 screws and the M6 screws crosswise to the prescribed torque, following the alphabetical order.



Lubrication



LUBRICATION					
Pos.	Description	Type	Quantity	Torque	Notes
1	Oil filter	-	1	15 Nm (11.06 lbf ft)	-
2	Oil filter joint	-	1	28.5 Nm (21.02 lbf ft)	-
3	Oil pressure sensor	-	1	13 Nm (9.59 lbf ft)	-
4	Crankcase cap	-	1	20 Nm (14.75 lbf ft)	-

Pos.	Description	Type	Quantity	Torque	Notes
5	Oil pressure regulation valve	-	1	42 Nm (30.98 lbf ft)	-
6	Drainage plug	-	1	20 Nm (14.75 lbf ft)	-
7	Sump fixing flanged hex screw	M6	10	12 Nm (8.85 lbf ft)	-
8	Oil pump fastening screws	M5	2	6 Nm (4.43 lbf ft)	-
9	Oil pump gear fastener screw	-	1	12 Nm (8.85 lbf ft)	-

Oil pump

Removing

To proceed with the removal of the oil pump, it is necessary to first remove the flywheel cover, the rotor and the starter ring gear. Then proceed as described:

- Place a rag or piece of paper under the oil pump gear (1) and unscrew the fixing screw.
- Remove the gear fixing screw (2) and recover the spring washer (3).
- Remove the gear (1) of the oil pump paying attention to recover the pin (4).



- Undo the two screws used to fasten the oil pump (5) and remove them.



- Remove the oil pump (6).



Installing

To proceed with the installation of the oil pump, proceed as described:

- Position the oil pump (1) in its seat, checking the alignment with the holes in the crankcase.



- Insert and tighten the two oil pump fixing screws (2) to the prescribed torque.



- Place a rag or piece of paper under the oil pump to prevent the plug from falling into the engine.
- Then insert the gear (3) of the oil pump, aligning the hole with the machining on the pump shaft and insert the pin (4).



- Position the screw (5) complete with spring washer (6).



- Tighten the fixing screw of the oil pump to the prescribed torque.



Coppa olio

Smontaggio coppa olio

To proceed with the disassembly of the oil sump, proceed as described:

- Remove the ten fixing screws (1) of the oil sump.



- Remove the oil sump (2).



- Remove the fixing screw (3) of the oil sump gasket.



- Extract the rose pipe (4) and remove it at the same time as the gasket (5).



- Check the presence of the O-ring on the rose pipe and that it has not remained in its seat.

Montaggio coppa olio

To proceed with the assembly of the oil sump, proceed as described:

- Check and, if necessary, replace the O rings (1) on the rose pipe (2) before inserting it at the same time as the gasket (3), as indicated.



- Block the movement of the gasket by temporarily positioning two opposite screws as shown and after inserting the fixing screw (4), tighten it to the prescribed torque



- After removing the gasket centring screws, position the sump (5).



- Insert the ten screws (6) and tighten them to the specified torque.



- If removed, insert the engine oil drain plug and tighten it to the prescribed torque.

Pressure reducer valve

To proceed with the disassembly of the overpressure valve it is necessary to first remove the oil sump and then proceed as described:

- Remove the overpressure valve by unscrewing it from its seat.



INDEX OF TOPICS

FUEL SUPPLY

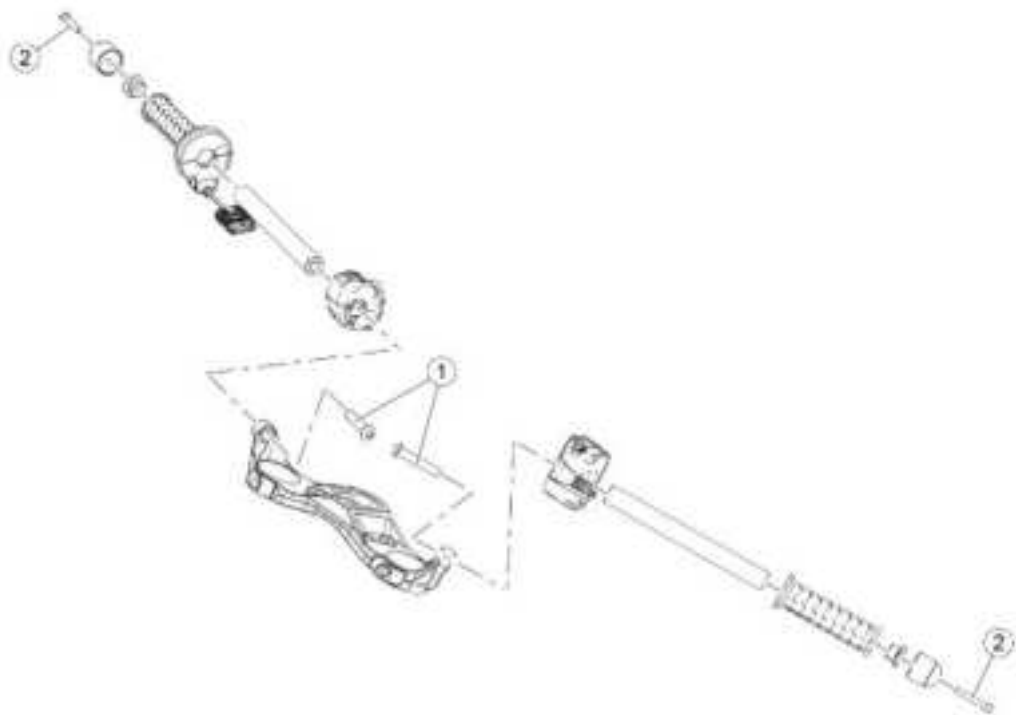
FUE

INDEX OF TOPICS

SUSPENSION SYSTEM	SUS
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Front

Handlebar



HANDLEBAR-CONTROLS

Pos.	Description	Type	Quantity	Torque	Notes
1	Domed head torx screw fastening semi-handlebar	M10x55	2	46 Nm (33.92 lbf ft)	-
2	SHC screw fastening anti-vibration weight	M5x50	2	... Nm (... lb ft)	-
-	Right hand light switches fixing screw	M5	1	4 Nm (2.95 lb ft)	-
-	Left hand light switches fixing screw	M5	1	4 Nm (2.95 lb ft)	-

Removing

The motorcycle is equipped with semi-handlebars and for the removal, operate as described:

RIGHT SEMI-HANDLEBAR:

- Unscrew the fixing screw (1) and remove the anti-vibration weight (2).



- Loosen the locking screw (3) of the throttle control.



- Loosen the locking screw (4) of the light switch.



- After unscrewing the locking screws (5) of the U-bolt (6), move the brake pump away and secure it to the top fairing, so that the oil inside the filling tank remains horizontal.



- Keeping the semi-handlebar (7) still, remove the locking screw (8).



- Slide off the light switch and the throttle control from the semi-handlebar and remove it.



LEFT SEMI-HANDLEBAR:

- Unscrew the fixing screw (1) and remove the anti-vibration weight (2).



-
- Using compressed air helps to easier remove the hand grip (3) from the semi-handlebar.



-
- Loosen the locking screw (4) of the light switch.



-
- Loosen the locking screw (5) of the clutch control.



-
- Keeping the semi-handlebar (6) still, remove the locking screw (7).

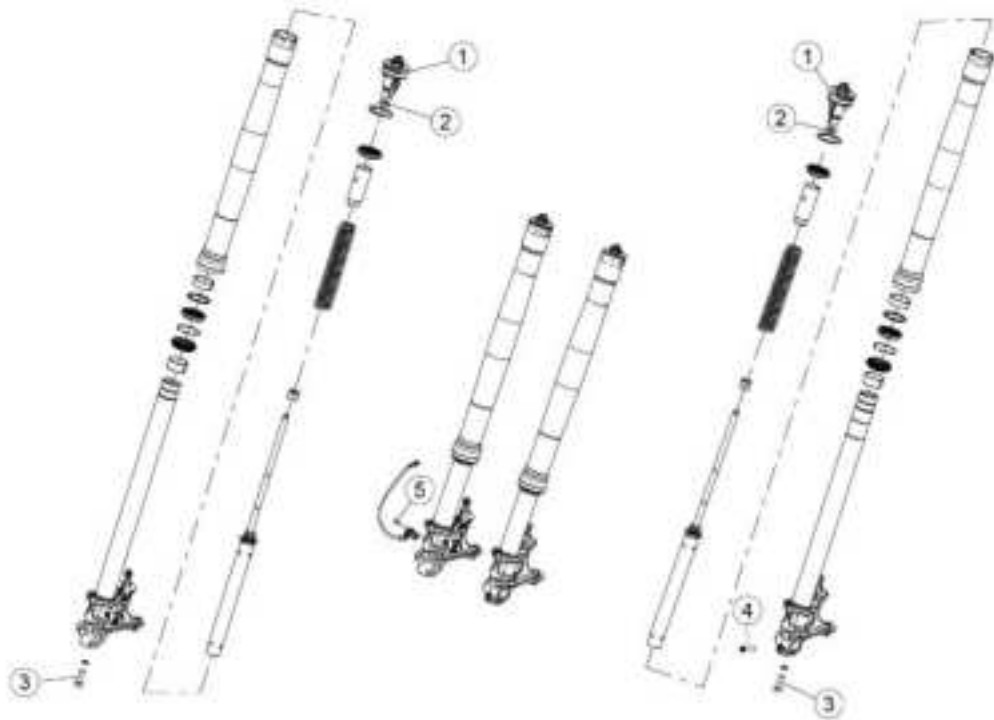


-
- Slide off the light switch and the clutch control from the semi-handlebar and remove it.



- To fit the semi-handlebar, repeat the procedures previously described in reverse order and finally tighten the six semi-handlebar screws to the specified torque.
-

Front fork



FRONT FORK

Pos.	Description	Type	Quantity	Torque	Notes
1	Cap	-	2	22.5 Nm (16.60 lbf ft)	-
2	Cap locknut	-	2	15 Nm (11.06 lbf ft)	-
3	Plunger fastening screw	-	2	22.5 Nm (16.60 lbf ft)	-
4	Wheel pin safety locking screw	M8	1	18 Nm (13.27 lbf ft)	-
5	ABS sensor screw	M5	1	6 Nm (4.42 lb ft)	-

Adjustment

The standard front fork setting is adjusted to suit most high and low speed riding conditions, whether the vehicle is partially or fully loaded.

However, the setting can be modified for specific needs according to vehicle use.

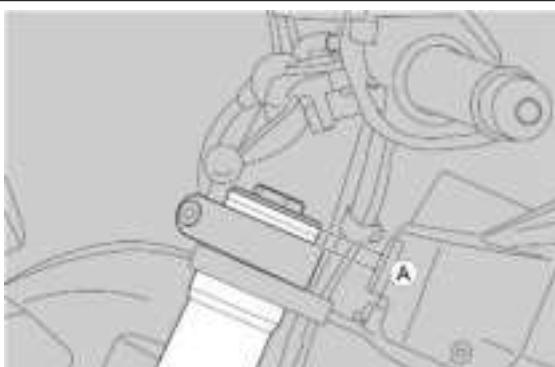
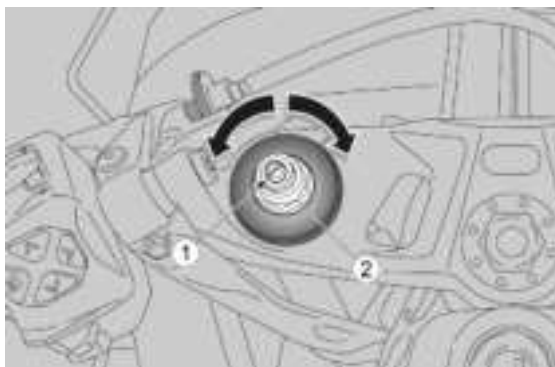
- Each fork is equipped with an upper adjustment adjuster (1) to set the rebound damping and an upper nut (2) to adjust the spring pre-loading.



TO AVOID DAMAGE, DO NOT FORCE THE ADJUSTERS BEYOND THE MAXIMUM SETTING POSITION IN EITHER DIRECTION. SET THE SAME SPRING PRE-LOAD AND HYDRAULIC DAMPING SETTING FOR BOTH STANCHIONS: RIDING THE VEHICLE WITH DIFFERENT SETTINGS FOR THE TWO STANCHIONS REDUCES STABILITY. WHEN SPRING PRE-LOAD IS INCREASED, REBOUND DAMPING MUST ALSO BE INCREASED TO PREVENT EXCESSIVE SUSPENSION KICK-BACK WHEN RIDING.



TO COUNT THE NUMBER OF CLICKS AND/OR REVOLUTIONS OF ADJUSTMENT SETTINGS ALWAYS START FROM THE MOST RIGID SETTING (WHOLE CLOCKWISE ROTATION OF THE SETTING).



STANDARD ADJUSTMENT (FOR ROAD USE)

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 18 clicks from fully closed (*)
Spring pre-loading, nut (2)	Fully loosened (**)
Stems (A) protrusion from top plate (excluding cover)	2 notches

SETTING FOR SPORTS USE

Specification	Desc./Quantity
Rebound damping adjustment, screw (1)	Unscrew (**) 10 clicks from fully closed (*)
Spring pre-loading, nut (2)	Fully loosened (**)
Stems (A) protrusion from top plate (excluding cover)	2 notches

(*) = clockwise

(**) = anticlockwise

Removing the fork legs

- After positioning the motorcycle on the front stand under the headstock (1), to remove the stanchions it is necessary to first remove the front wheel, the mudguard and disconnect the brake callipers.



THE FOLLOWING OPERATIONS REFER TO A STANCHION BUT APPLY TO BOTH.

(IF AVAILABLE)

- Remove the internal fixing screw (2) of the ABS cable grommet.



- Remove the fixing clamp (3) of the ABS wiring harness.



- After removing the fixing screw of the ABS sensor (4), extract it internally from the stanchion as indicated.



- Working from below, as shown, unscrew the screws (5) securing the stanchion to the lower triple clamp.



- Use a support to prevent the fork from falling as a result of unscrewing the fixing screw (6) on the upper triple clamp.



- Extract and remove the stanchion (7).



- During reassembly, pay attention to the adjustment of the stanchion protrusion, referring to the "Adjustment" paragraph in the "Suspensions" chapter.

Draining oil

NOTE

THE FOLLOWING OPERATIONS REFER TO A SINGLE STANCHION BUT APPLY TO BOTH.

- Clamp the forks in a vice with protected jaws, taking care not to damage them.
- Fully tighten the adjustment screw (1) of the rebound damping.

Special tools

AP8140149 Guard for assembly operations



- Set the spring pre-loading to minimum, by completely unscrewing the adjuster (2).



- Loosen the cap (3).



- Lower the sleeve completely and using the specific tool (4), fixed to the pre-loading pipe (5), compress the spring.
- With the help of a second worker, insert the separator plate (6) under the cap retaining nut (7).



Special tools

020888S Pre-load tube clamp

AP8140148 Plunger-spacer separator plate

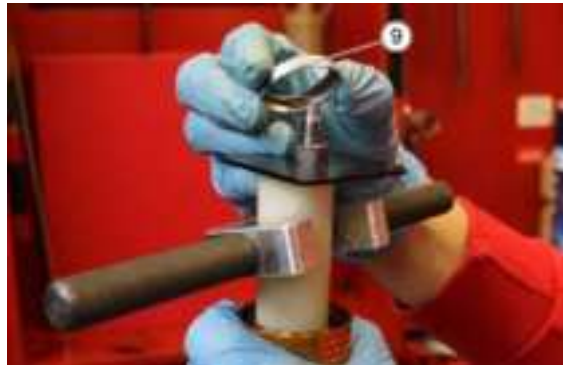
- Ensure that the cap (8) cannot rotate, and then loosen the nut (7).



- Unscrew and remove the cap (8).



- Remove the upper plate (9).



- Release the pressure on the tool (4) and remove it together with the pre-load pipe (5).



- Remove the spring (11) allowing the oil inside the stanchion to drip out.



- Drain the oil into a container having sufficient capacity, extending the stanchion several times in order to ensure the oil is drained completely.



DO NOT DISPOSE OF OIL IN THE ENVIRONMENT. DISPOSE OF ENGINE OIL IN A SEALED CONTAINER AND TAKE IT TO YOUR SUPPLIER OR TO THE NEAREST USED OIL COLLECTION CENTRE.



Disassembling the fork

- Using the special protective jaws, block the stanchion horizontally in a vice.
- Extract the dust guard (12).



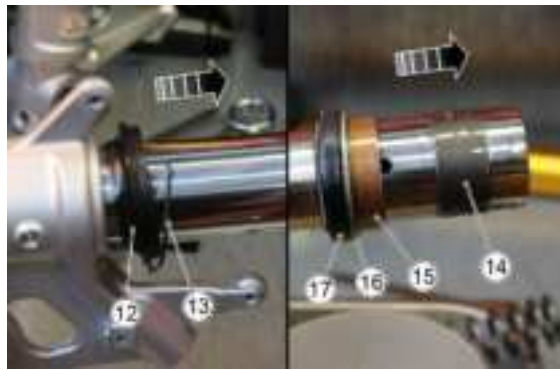
- Remove the seeger ring (13) from inside the sleeve.



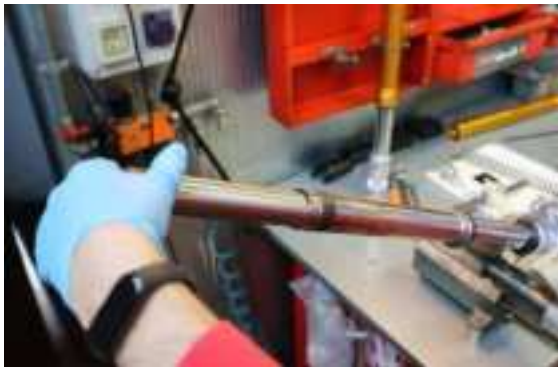
- Pull the sleeve repeatedly towards yourself in order to remove it from the stanchion.



- Observing the indicated sequence, extract and remove the slider bushing (14), the guide bushing (15), the ring (16), the oil seal (17), the seeger ring (13) and the dust guard (12).



- Loosen the screw on the foot of the fork and using the special Kajaba tool, unscrew the plunger without removing it.
- DO NOT REMOVE THE PLUNGER STOP SCREW.



- Keeping the plunger fixing screw pressed in order to maintain the oil seal, release the stanchion from the vice and stand over the container where the oil was previously collected.
- At this point, completely unscrew the plunger (18) and remove it, allowing the screw with its copper washer to fall inside the container and allowing the residual oil left inside the stanchion to drain completely.



Checking the components

stanchion

Check that the sliding surface is not scratched or scored.

Any scoring can be removed by sanding with damp sandpaper (grain 1).

If the scratches are deep, replace the stanchion .

Using a dial gauge, check than any bending of the stanchion is below the limit value.

If it is over the limit, replace the stanchion .

IMPORTANT

A BENT STANCHION SHOULD NEVER BE STRAIGHTENED SINCE ITS STRUCTURE WOULD BE WEAKENED MAKING THE VEHICLE DANGEROUS TO USE.

Characteristic**Bending limit:**

0.2 mm (0.00787 in)

Sleeve

Check for damage and/or cracks; if it is damaged, replace it.

Springs

Check the condition of the springs, making sure that the length is within the acceptable limits.

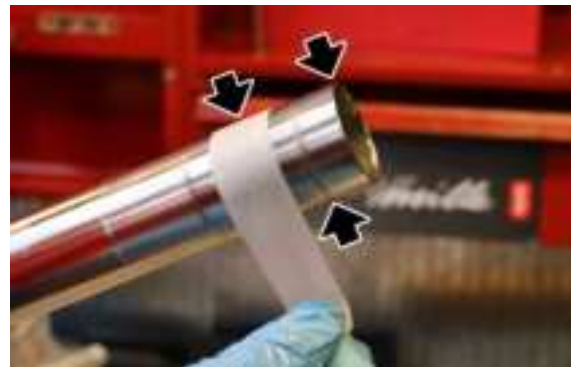
If not, replace the springs.

MINIMUM LENGTH OF FREE SPRING: 720.2 +/- 3 mm (28.35 +/- 0.12in)

Reassembling the fork**NOTE**

THE FOLLOWING OPERATIONS REFER TO A SINGLE STANCHION BUT APPLY TO BOTH.

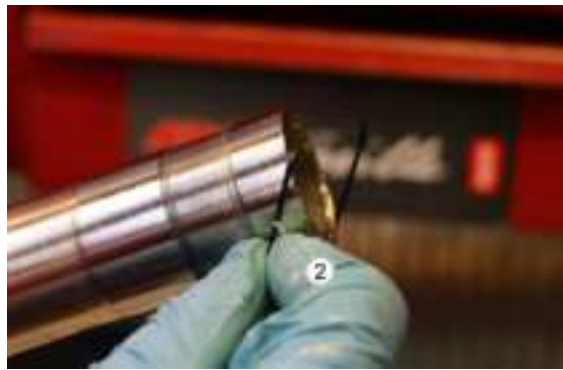
- Block the stanchion in the vice, and using appropriate protections and paper tape, protect the cutting edges of the machining so as not to damage the dust cover and the seal when inserted.



- Insert the dust cover (1).



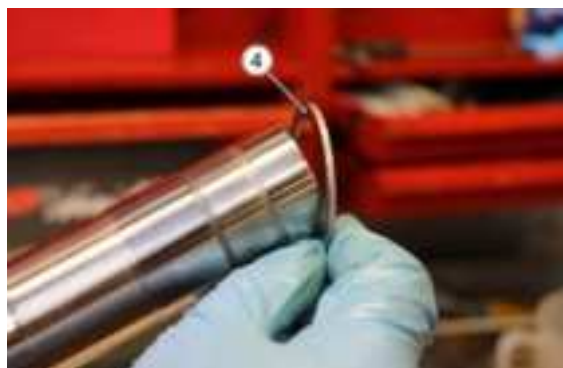
- Insert the seeger ring (2).



- Insert the oil seal (3).



- Insert the ring (4).



- Insert the guide bush (5).



- Insert the sliding bush (6).



- Insert the plunger (7).



- Insert the screw (8) complete with copper washer (9) to secure the plunger on the foot of the fork.



- Using the special Kajaba tool (10), manually screw the plunger while keep the screw on the foot of the fork still.
- Then tighten the plunger locking screw to the prescribed torque.



- Block the sleeve in the vice with the special protective jaws and insert the complete stanchion.

Special tools**AP8140149 Guard for assembly operations**

- Using the special tool complete with striking weight, insert the oil seal correctly in its seat.

Special tools**AP8140145 Tool oil seal installation tool****AP8140146 Weight**

- Position the safety seeger ring in its seat.



- Insert the dust guard into its housing correctly.

**Filling oil****NOTE****THE FOLLOWING OPERATIONS REFER TO A SINGLE STANCHION BUT APPLY TO BOTH.**

- Place the sleeve upright in a vice fitted with protection shoes.
- Compress the sleeve in the stanchion. Place a support under the stanchion in order to leave it compressed.
- Pour part of the fork oil into the sleeve.
- Wait a few minutes until the oil fills all the ducts.
- Pour the remaining oil.
- Pump out oil a few times.
- Measure the air gap between the oil level and the rim.



THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STANCHIONS.

Special tools

AP8140149 Guard for assembly operations

Oil level: 98 mm (3.86 in) (from the edge of the sleeve, without spring or pre-loading tube).

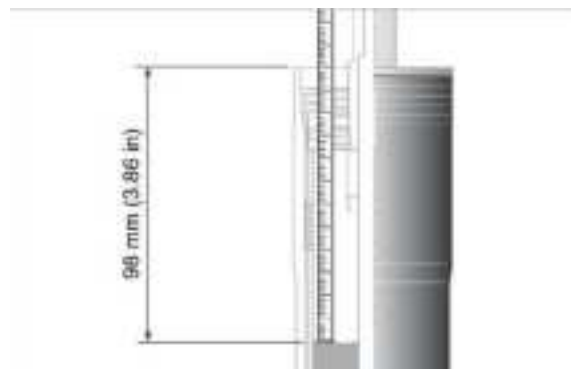


THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STANCHIONS.

Characteristic

Fork oil

468 cm³ (28.56 cu.in) (for each stanchion)



- Insert the spring (11), making sure that it is aligned correctly. The end where the spirals are more compressed should be facing upwards.



- Insert the pre-load pipe (12) complete with special tool (13), making sure that it is aligned correctly. The narrower part must be inserted into the spring.

**Special tools****020888S Pre-load tube clamp**

- After positioning the support rod (14) of the plunger, with the help of a second worker, raise the plunger to allow the plate (15) to be inserted under the cap stop nut.

**Special tools****AP8140150 Bored shaft for bleeding plunger air****AP8140148 Plunger-spacer separator plate**

- Position the upper plate (16) as shown.

**Special tools****AP8140150 Bored shaft for bleeding plunger air****AP8140148 Plunger-spacer separator plate**

- Before positioning the cap, adjust the hydraulic regulator screw so that the internal distance is as close as possible to 13 mm (0.51 in).



- Screw the cap (17) onto the plunger as far as it will go.

IMPORTANT

CHECK THE O-RING PRESENT ON THE FILLING CAP AND REPLACE IF DAMAGED.



- Ensure that the cap (17) cannot rotate, and then tighten the nut (18).



- Compress the spring and remove the plate (15).



- Lift the sleeve and screw it on the cap manually.
- Position the stanchion in the vice provided with adequate protections and tighten the cap to the prescribed torque.



Upper steering plate

Removal

To remove the upper triple clamp it is necessary to first remove the semi-handlebars complete with grips, throttle control, light switches, clutch lever and front brake master cylinder.



- To perform this operation after removing the left hand grip, the front brake master cylinder, loosening the fixing screws of the light switches, the throttle control and the clutch control, keeping the semi-handlebar (1) still, unscrew the screws (2).

- Remove the fixing bearing (3).



- Remove the washer (4).



- Loosen the locking screws (5) of the forks.



- Extract the upper triple clamp (6) from the pin.



Steering bottom yoke

Removing

To remove the lower triple clamp it is necessary to previously remove the front wheel complete with mudguard, the upper triple clamp, the stanchions and the lower fairings to position a centre stand on the sump.



Then proceed as described:

- Remove the steering safety plate (1).



- Remove the upper steering ring nut (2) using the special tool.



- Remove the rubber shim (3).



- Remove the lower steering ring nut (4) using the special tool, supporting the lower clamp.

Special tools

AP8140190 Steering tightening tool



- Extract the lower triple clamp (5) from below.



Installing

- Insert the lower triple clamp (1) from below.



- Position the lower steering ring nut (2) and use the special tool to pre-tighten to a torque of 60 Nm (44.25 lbf ft).
- Turn the handlebar to the left and right as far as it will go to seat the bearings.
- Unscrew the ring nut and tighten it to a torque of 40 +/- 5 Nm (29.50 +/- 3.68 lbf ft).
- Rotate the steering yoke all the way to the left and right to check that the rotation is smooth and without jamming.
- In the event of particular resistance or jamming, remove the steering yoke and check the integrity of the bearings inside the steering headstock.



Special tools

AP8140190 Steering tightening tool

- Insert the rubber shim (3).



- Screw the upper steering ring nut (4) and align the grooves to be able to insert the safety plate.



- Insert the safety plate (5).



Steering bearing

Adjusting play

- Place the vehicle so that the front wheel is off the ground.
- Carry out a handlebar rotation test, using a dynamometer at the hand grip external end.
- The handlebar resistance to rotation must be of 250 +/- 100 g (0.55 +/- 0.22 lb) in both directions.
- Adjust if clearance is detected.

NOTE

THE STEERING COLUMN RESISTANCE TO ROTATION MUST BE PERFORMED IN THE TWO OPPOSITE ROTATION DIRECTIONS.

- Loosen the fixing screws (1) of the stanchions.



- Unscrew and remove the fixing bush (2) of the upper clamp.



- Remove the washer (3).



- After having adequately protected the instrument cluster, remove the plate (4) complete with semi-handlebars and rest it on the instrument cluster support.



- Remove the safety plate, unscrew the counter-lock ring, remove the rubber shim and then unscrew the lower ring nut using the special tool in order to repeat the steering assembly tightening procedure in the correct way.
- Pre-tighten the ring nut (5) to 60 Nm (44.25 lbf ft).
- Turn the handlebar to the left and right as far as it will go to seat the bearings.
- Unscrew the ring nut and tighten it again to 40 +/- 5 Nm (29.50 +/- 3.68 lbf ft).
- Reassemble the previously removed components and check the handlebar resistance to rotation that must be 250 +/- 100 g (0.55 +/- 0.22 lb) in both directions.



Disassembling

Place the motorcycle on a lifting jack in correspondence of the oil sump and secure it with straps to the footrest.

Remove the upper triple clamp, front wheel, mud-guard and stanchions beforehand.

Then proceed as described:

- Unscrew and remove the safety plate (1).
- Unscrew and remove the counter-lock ring (2) using the appropriate tool.



- Remove the rubber shim (3).



- Unscrew and remove the ring nut (4) using the special tool, supporting the lower triple clamp.



Special tools

AP8140190 Steering tightening tool

- Remove the complete lower triple clamp (5).



- Remove the dust seal ring (6).



- Remove the bearing upper seat (7).



- Remove the inner ring of the bearing (8) complete with balls.



- Remove the lower seat of the bearing (9) using a standard bearing extractor



- Remove the dust seal ring (10).



To remove the lower steering bearing:

- After removing the inner bearing ring (11) complete with balls from the headstock tube, heat the lower bearing seat (12) with a hot air gun to remove it and then slide off the dust cover (13).



- Remove the upper seat of the lower bearing (14) from below using a standard bearing extractor.



- Remove the dust seal ring (15).



Assembling

To assemble the steering assembly, proceed as described:

- Place the dust cover (1) on the steering headstock.
- Insert the lower seat of the bearing (2) and the inner ring of the bearing (3) complete with balls, sprinkling them with grease
- Working both on the upper and lower part of the steering headstock, insert the dust seals (4) up to the stop using the appropriate punch.



Special tools

020376Y Adaptor handle

020359S 42 x 47 mm Adaptor



- Working both on the upper and lower part of the steering headstock, insert the rotation seats of the bearings (5) up to the stop using the appropriate punch.
- Lubricate the inserted seats with grease.



Special tools

020376Y Adaptor handle

020360S Adaptor 52x54 mm

- Insert the complete triple clamp (6) into the headstock.



- Supporting the lower triple clamp, insert the inner ring of the bearing (7) complete with balls on the headstock and lubricate it.



- Supporting the lower triple clamp, lubricate the upper seat (8) of the bearing and insert it on the headstock.



- Supporting the lower triple clamp, insert the dust seal ring (9) on the headstock.



- Supporting the lower triple clamp, insert the ring nut (10) on the headstock and tighten it fully by hand.



- Using the special tool, pre-tighten the ring nut to ... Nm (... lbf ft) and then tighten it to ... Nm (... lbf ft).



Special tools

AP8140190 Steering tightening tool

- Screw the upper steering ring nut (11) and align the grooves to be able to insert the safety plate.

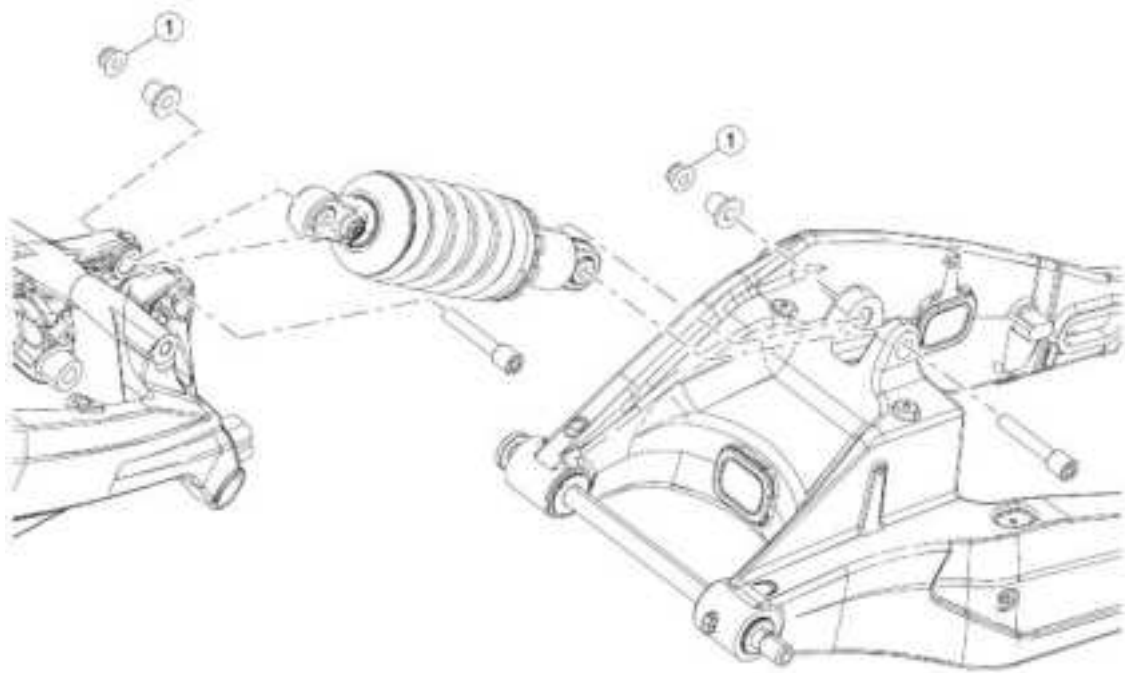


- Insert the safety plate (12).



Rear

Shock absorbers



SHOCK ABSORBER

Pos.	Description	Type	Quantity	Torque	Notes
1	Flanged, self-locking shock absorber fastening nuts	M10	2	50 Nm (36.87 lb ft)	-

Adjusting

The rear suspension consists of a spring-shock absorber unit connected to the frame by uniball joints.

To adjust the setting, the shock absorber has an adjuster screw (1) for adjusting the rebound hydraulic braking, a ring nut for adjusting the spring pre-load (2) and a locking ring nut (3).

IMPORTANT

CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS RECOMMENDED IF THE VEHICLE IS USED IN WET OR DUSTY AREAS, OFF ROAD OR FOR SPORTING APPLICATIONS.

CHECK AND IF NECESSARY, ADJUST THE REAR SHOCK ABSORBER.

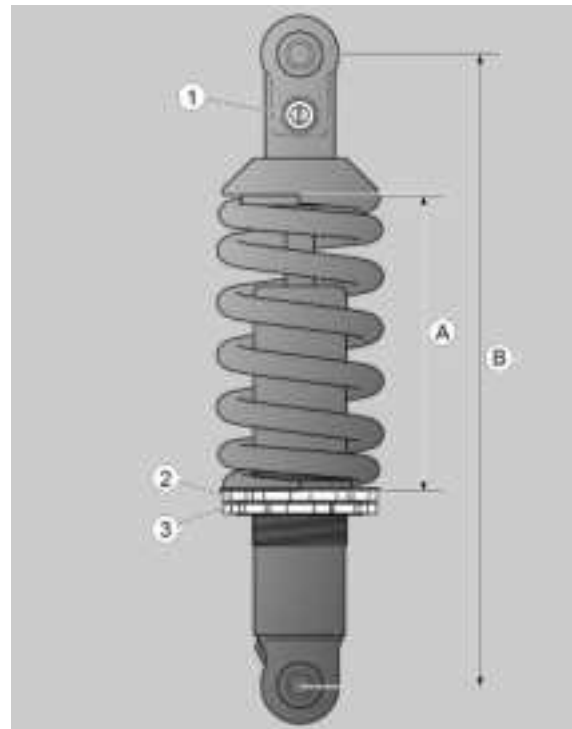
THE STANDARD REGULATION OF THE REAR SHOCK ABSORBER IS INTENDED TO SATISFY NORMAL TOUR DRIVING CONDITIONS.

IN ANY CASE IT IS POSSIBLE TO INSERT PERSONAL SETTINGS, DEPENDING ON VEHICLE UTILIZATION.



TO COUNT THE NUMBER OF CLICKS OF THE ADJUSTER (1) ALWAYS START FROM THE MOST RIGID SETTING (COMPLETE CLOCKWISE ROTATION).

TO PREVENT DAMAGE TO THE ADJUSTER SCREWS (1), NEVER FORCE THEM BEYOND THE END OF TRAVEL IN EITHER DIRECTION.



To access the adjuster (1), remove the side fairing as follows:

- Remove the passenger saddle and the rider saddle, and then remove the upper fastener screw (4).



- Remove the lower fastener screw (5).



- Remove the left hand side fairing panel (6).



- Using the specific spanner, unscrew the locking ring nut (3).
- Use the adjuster ring nut (2) to adjust the pre-load of the spring (A).
- Once the adjustment is done, screw the ring nut (3).
- Use the screw (1) to adjust the shock absorber rebound hydraulic braking.



SET SPRING PRE-LOADING AND SHOCK ABSORBER REBOUND DAMPING ACCORDING TO THE VEHICLE USE CONDITIONS.

IF THE SPRING PRE-LOADING IS INCREASED, IT IS NECESSARY TO INCREASE THE REBOUND DAMPING ACCORDINGLY TO AVOID SUDDEN JERKS WHEN RIDING. IF NECESSARY, CONTACT AN OFFICIAL APRILIA DEALER. TRY RIDING THE VEHICLE ON THE STREET UNTIL THE OPTIMUM ADJUSTMENT IS OBTAINED.



SPORT SETTINGS MAY BE USED ONLY FOR OFFICIAL COMPETITIONS TO BE CARRIED OUT ON TRACKS, AWAY FROM NORMAL ROAD TRAFFIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.

STANDARD ADJUSTMENT (FOR ROAD USE)

Specification	Desc./Quantity
Spring length (A)	145.5 +/- 2 mm (5.72 +/- 0.078 in)
Shock absorber length (B)	306 +/- 2 mm (12.04 +/- 0.078 in)
Rebound adjustment, adjuster (1)	open (**) 5 clicks from fully closed (*)

SETTING FOR SPORTS USE

Specification	Desc./Quantity
Spring length (A)	with standard adjustment 145.5 mm (5.72 in) screw (*) 2 turns
Shock absorber length (B)	306 +/- 2 mm (12.04 +/- 0.078 in)
Rebound adjustment, adjuster (1)	open (**) 2 clicks from fully closed (*)

(*) = clockwise

(**) = anticlockwise

Removing

To remove the shock absorber, it is necessary to remove the weight from the shock absorber using a lifting jack, fastening the motorcycle as indicated.



- After removing the crankcase cover and the rear mudguard, keeping the screw (2) still, unscrew the nut (3) and remove the screw.



- Keeping the screw (4) still, unscrew the nut (5) and remove the screw.



- Remove the shock absorber (6).



- Take care in recovering the 4 bushings (7).



Installing

To install the shock absorber, proceed as described:

- If removed during disassembly, reposition the T-shaped bushes (1), both on the swingarm and on the frame.
- The bushes must be inserted on the right side of the motorcycle.



- Reposition the 4 bushings (2) on the shock absorber.



- Place the shock absorber (3) back in its seat, paying attention to the adjuster which must face towards the left side of the motorcycle.



- After inserting the screw (4), keeping it still, and tighten the nut (5) to the prescribed torque.



- After inserting the screw (6), keeping it still, and tighten the nut (7) to the prescribed torque.



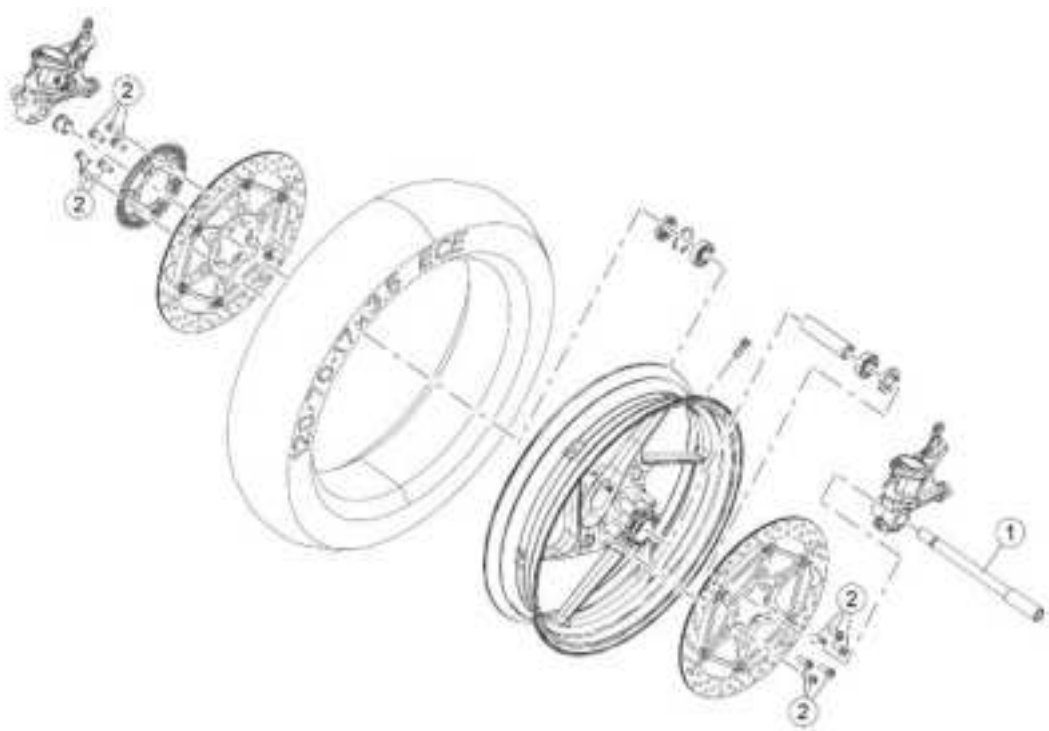
INDEX OF TOPICS

CHASSIS

GEA

Ruote

Ruota anteriore



FRONT WHEEL					
Pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle	M16	1	65 Nm (47.94 lb ft)	-
2	Front brake disc flanged hex fixing screw	M8x20	12	25 Nm (18.43 lb ft)	-

Rimozione

To proceed with the removal of the front wheel, lift the motorcycle using an appropriate centre stand, remove the brake callipers and proceed as described:

- Loosen the screw (1) on the clamp of the left stanchion.



- Remove the wheel pin (2).



- Keeping the wheel raised, extract the wheel pin (2).



- Remove the complete wheel (3).



- Remove the spacer (4) on the right side of the wheel.



REMOVAL OF INTERNAL WHEEL COMPONENTS

To proceed with the removal of the internal wheel components, proceed as described:

- Working on the right side of the wheel, remove the oil seal (5).



- Using special pliers, remove the circlip (6).



- Using a generic puller, proceed with the extraction of the bearing as described:
- Insert the first part of the tool (A) on the bearing and screw the pin (B).



- Insert the second part (C) by adjusting the two pins (D) identifying the best point of contact.



- Insert the nut (E) and screw it keeping the pin (A) still, to extract the bearing (7).



- Remove the bearing (7).

**NOTE**

REPEAT THE OPERATION DESCRIBED ABOVE, TO REMOVE THE BEARING ON THE OPPOSITE SIDE OF THE WHEEL.

- Remove the internal spacer (8).

**REMOVAL OF EXTERNAL WHEEL COMPONENTS**

To proceed with the removal of the external wheel components, proceed as described:

- Remove the six fixing screws (9) of the tone wheel / front disc.



- Remove the tone wheel (10) (if present).



Installazione

To mount the front wheel, proceed as follows:

INSTALLATION OF EXTERNAL COMPONENTS

- Position the tone wheel (1) (if present) on the rim.



- Tighten the six fastener screws of the tone wheel to the specified torque / brake disc, as shown.



INSTALLATION OF INTERNAL COMPONENTS

- Position the bearing (2) on the left side of the rim.



- Using the appropriate punch, insert the bearing as far as it will go.

**Special tools**

020376Y Adaptor handle

020358Y 37 x 40 mm Adaptor

- Fit the left oil seal (3).



- Using the appropriate punch, insert the oil seal as far as it will go.

**Special tools**

020376Y Adaptor handle

020358Y 37 x 40 mm Adaptor

- Insert the spacer (4) on the right side of the rim.



- Fit the bearing (5).



- Using the appropriate punch, insert the bearing as far as it will go.

Special tools**020376Y Adaptor handle****020358Y 37 x 40 mm Adaptor**

- Insert the circlip (6).



- Fit the right oil seal (7).



- Using the appropriate punch, insert the oil seal as far as it will go.

Special tools**020376Y Adaptor handle****020358Y 37 x 40 mm Adaptor**

- Fit the spacer (8).



- Position the wheel (9) and insert the pin (10).



- Tighten the pin to the prescribed torque

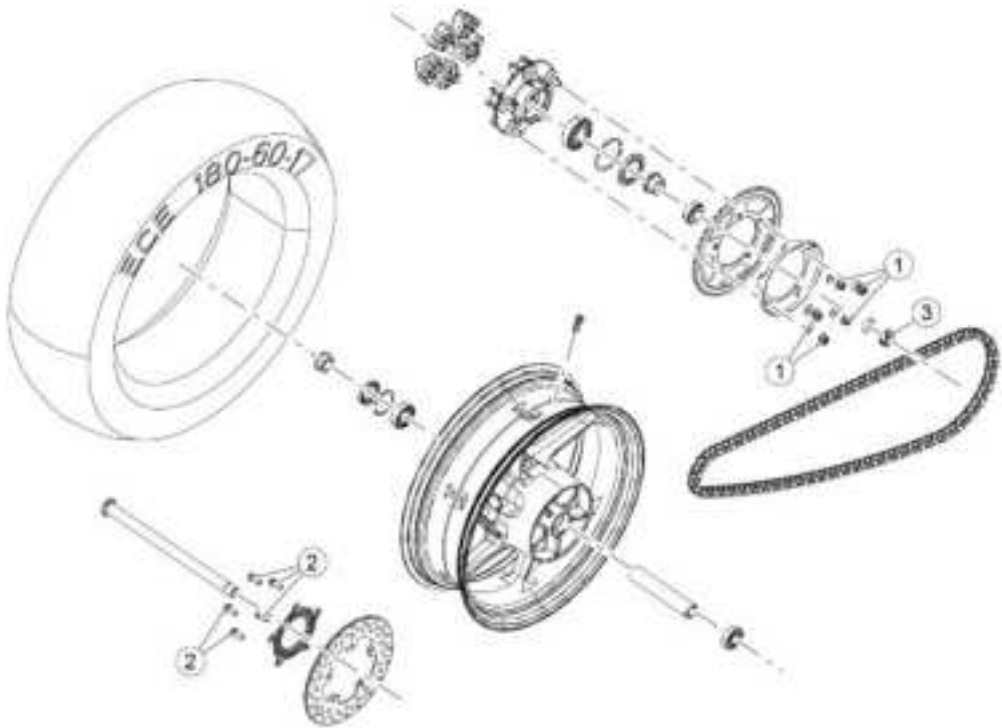


- Tighten the screw on the right stand-chion clamp to the specified torque.



- Rotate the wheel a few times to check that it does not stick.

Ruota posteriore



REAR WHEEL

Pos.	Description	Type	Quantity	Torque	Notes
1	Sprocket fixing nuts	M10	5	50 Nm (36.87 lb ft)	-
2	TE flanged screws fastening rear brake disc	M8x20	5	25 Nm (18.43 lb ft)	-
3	Rear wheel axle nut	M20	1	120 Nm (88.50 lbf ft)	-

Rimozione

To proceed with the removal of the rear wheel, lift the motorcycle using an appropriate rear stand, and proceed as described:

- Working from both sides, loosen the locking nut (1) of the adjuster (2) and then screw the adjuster to eliminate tension on the chain tensioner.



- Undo the fastening nut (3) of the wheel.



- Remove the nut (3).



- Remove the washer (4).



- Supporting the wheel and working from the right side, remove the wheel pin (5) complete with both chain tensioners (6).



- Remove the chain (7) from the sprocket and remove the rear wheel (8).



REMOVAL OF EXTERNAL WHEEL COMPONENTS

To proceed with the removal of the external wheel components, proceed as described:

- Remove the sprocket support (9) from the wheel (8).



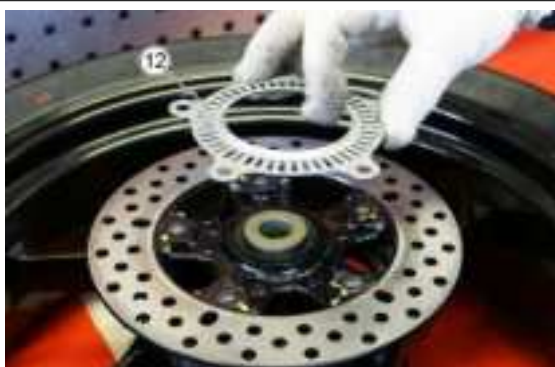
- Remove the flexible coupling rubber inserts (10).



- Remove the five fixing screws (11) of the tone wheel / front disc.



- Remove the tone wheel (12).

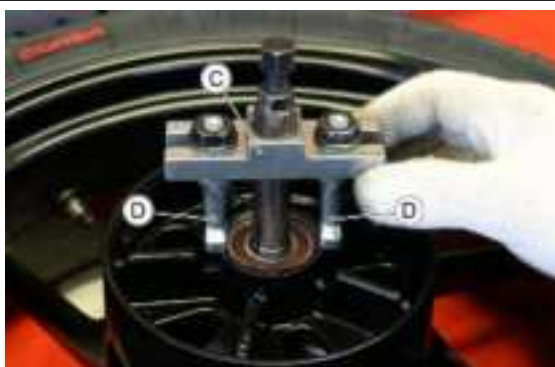


REMOVAL OF INTERNAL WHEEL COMPONENTS

To proceed with the removal of the internal wheel components, proceed as described:

Using a generic puller, extract the bearing as follows:

- Insert the first part of the tool (A) on the bearing and screw the pin (B).
- Insert the second part (C) by adjusting the two pins (D) identifying the best point of contact.



- Insert the nut (E) and screw it keeping the pin (A) still, to extract the bearing (13).



- Remove the bearing (13).



- Remove the internal spacer (14).



- Working on the right side of the wheel, remove the spacer (15).



- Remove the oil seal (16).



- Remove the seeger ring (17).



- Remove the bearing following the procedure described above.

REAR SPROCKET SUPPORT DISASSEMBLY

- Having removed the sprocket support from the wheel, remove the external spacer (18).



- Remove the internal spacer (19).



- Block the sprocket support in a vice provided with protective jaws and remove the five fixing screws (20) of the chain/sprocket guard.



- Remove the five spring washers (21).



- Remove the chain guard (22).



- Remove the sprocket (23).



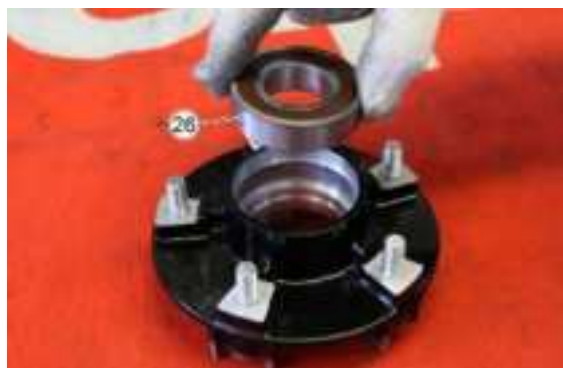
- Remove the oil seal (24).



- Remove the seeger ring (25).



- Following the procedure described above for bearing removal, and remove the bearing (26) present in the sprocket support.

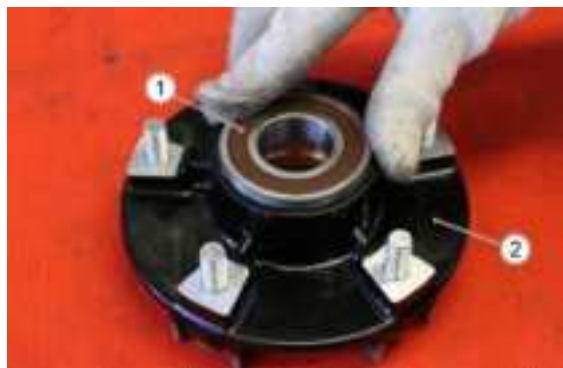


Installazione

To mount the rear wheel, proceed as described:

REAR SPROCKET SUPPORT ASSEMBLY

- Position the bearing (1) on the sprocket support (2).



- Using the appropriate punch, insert the bearing as far as it will go.

Special tools**020376Y Adaptor handle****020655S Adaptor 62x68 mm**

- Insert the circlip (3).



- Position the oil seal (4) on the sprocket support.



- Using the appropriate punch, insert the oil seal as far as it will go.

Special tools**020376Y Adaptor handle****020655S Adaptor 62x68 mm**

- Position the sprocket (5) on the sprocket support.



- Position the chain guard (6) on the sprocket support.



- Position the five spring washers (7) on the sprocket support.



- Tighten the five fastening nuts of the chain/sprocket guard to the prescribed torque, as indicated.



- Insert the internal spacer (8).



- Insert the external spacer (9).



INSTALLATION OF INTERNAL WHEEL COMPONENTS

To proceed with the installation of the internal wheel components, proceed as described:

- Fit the bearing (10) in the seat.
- Using the appropriate punch, insert the bearing as far as it will go.

Special tools

020376Y Adaptor handle

020359S 42 x 47 mm Adaptor



- Insert the circlip (12).



- Fit the internal spacer (11) from the opposite side.



- Fit the bearing (13) in the seat.



- Using the appropriate punch, insert the bearing as far as it will go.

Special tools

020376Y Adaptor handle

020359S 42 x 47 mm Adaptor

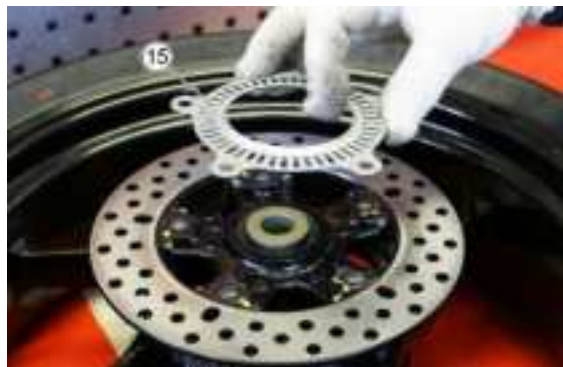
INSTALLATION OF EXTERNAL WHEEL COMPONENTS

To proceed with the installation of the internal wheel components, proceed as described:

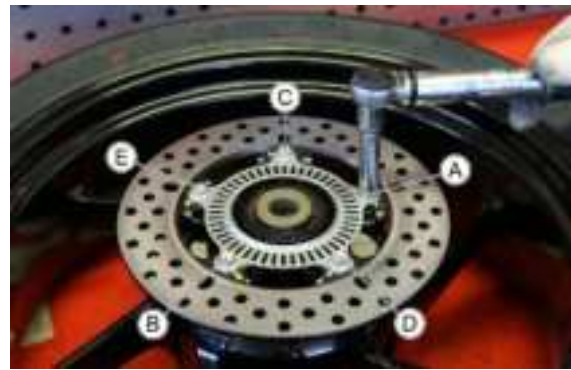
- Place the brake disc (14) on the rim.



- Place the phonic wheel (15) on the rim.



- Position the five fixing screws of the phonic wheel / brake disc and tighten them to the prescribed torque in the order indicated.



- Position the flexible coupling rubber inserts (16) on the rim.



- Position the complete sprocket support (17) on the rim.



- Position the wheel (18) in its seat inserting the chain (19) on the sprocket.



- Working from the right side of the motorcycle, lift the wheel and insert the pin (20) complete with the chain tensioner (21).



- Insert the left chain tensioner (22).



- Insert the washer (23).



- Insert the nut (24) and tighten it by hand.



- Working from both sides, act on the adjustment register (25) to bring the chain to the correct tension and tighten the locking nuts (26).



- Check that the vertical deflection of the bottom section of the chain, measured at a distance of 250 mm (9.84 in) from the centre of the rear wheel axle (along imaginary line between centres of front and rear sprockets), is approximately 30 mm (1.18 in).

**IMPORTANT**

WHEN CHECKING THE DEFLECTION OF THE CHAIN, THE CHAIN MUST NOT BE ABLE TO TOUCH THE UNDERSIDE PART OF THE SWINGARM IN THE POSITION INDICATED BY THE ARROW.

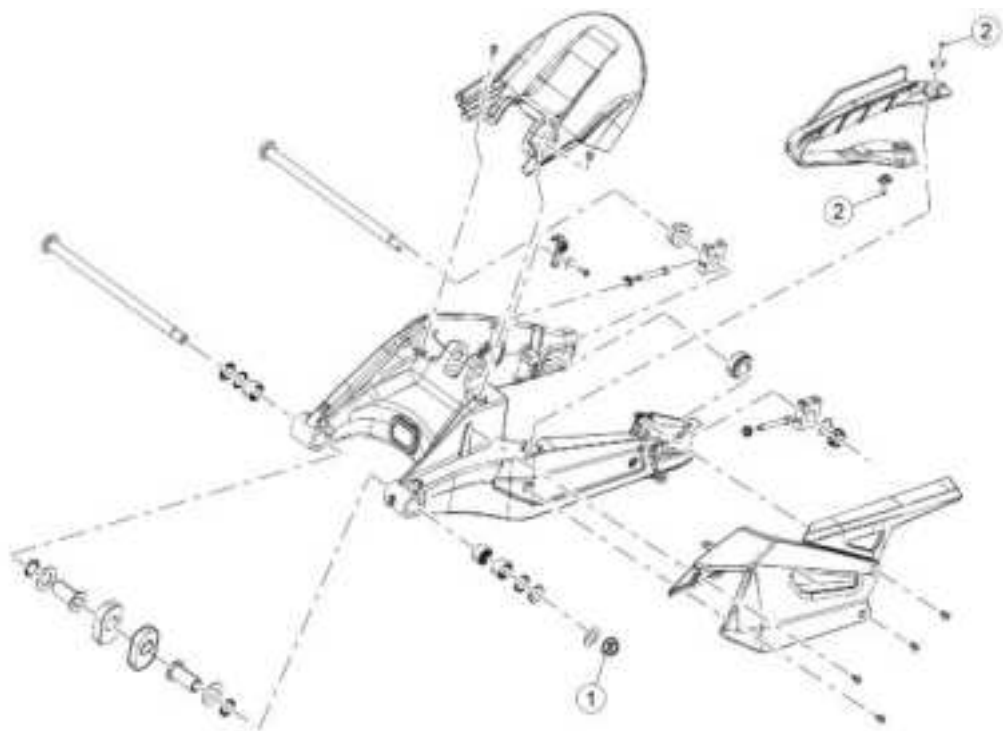
- Check that the distance set is the same on both sides.



- Tighten the rear wheel locking nut to the prescribed torque.



Swinging arm



SWINGARM					
Pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pivot bolt self-locking nut	M16	1	110 Nm (4.33 lbf ft)	-
2	Chain feeder shoe SHC flanged fastening screws	M5x16	2	2 Nm (1.47 lb ft)	-

Removing

Place the motorcycle on the central stand and secure it using a lifting jack, in order to be able to keep the rear part raised when removing the swingarm.

To proceed with the removal of the swingarm, it is necessary to first remove the rear wheel, rear mudguard and crankcase cover.

- Then remove the screw (1), with its spring washer, which fixes the left rider footrest support to the engine.



- Remove the nut (2), with its washer, which fixes the left rider footrest support to the swingarm.



- Remove the complete footrest support (3) from the swingarm pin.



- Remove the flat washer (4) from the swingarm pin.



- Remove the cable gland (5) that fastens the ABS sensor wiring harness and the rear brake hose to the frame.



- Release the brake calliper complete with support from the guide on the swingarm.



- Remove the screw (6) complete with nut (7) that blocks the shock absorber to the swingarm.



- Using rubber bands, support the shock absorber (8) to help the subsequent removal of the swingarm.



- Remove the "T" bush (9) from the seat in the swingarm.



- Remove the swingarm pin (10) from the right side of the vehicle, taking care to recover the spacer (11) which is located between the swingarm and the right rider footrest support.



- Remove the complete swingarm (12).



- If necessary, to check or eventually replace the roller bearings in the swingarm, remove the bushes (13) and the thrust washers (14).
- Remove the 4 gaskets (15).



- Using a suitable punch, remove the roller bearings.

Special tools

020376Y Adaptor handle

020441S 26 x 28 mm adaptor



Checking

IMPORTANT

**CONTROLLARE CHE TUTTI I COMPONENTI NON PRESENTINO DEFORMAZIONI, ROTTURE, INCRINAZIONI E / O AMMACCATURE EVIDENTI.
SOSTITUIRE TUTTI I COMPONENTI DANNEGGIATI.**

ASTUCCI A RULLINI

Girare manualmente gli astucci a rullini che devono ruotare dolcemente, senza impedimenti e / o rumorosità'.

Non si devono riscontrare giochi assiali.

Gli astucci a rullini che presentano questi inconvenienti devono essere sostituiti.

Applicare del grasso sui rullini.

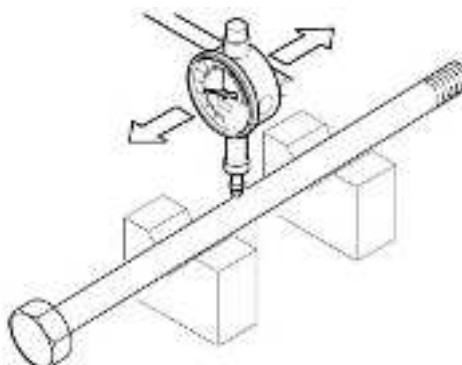
GUARNIZIONI

Controllare l'integrità' delle guarnizioni; se presentano danneggiamenti o eccessiva usura sostituirle.

PERNO FORCELLONE

Con un comparatore controllare che l'eccentricità' del perno non superi il valore limite. In caso contrario sostituire il perno.

**Eccentricità' massima del perno: 0,2 mm
(0.0078 in).**



Installing

To proceed with the installation of the swingarm, proceed as described:

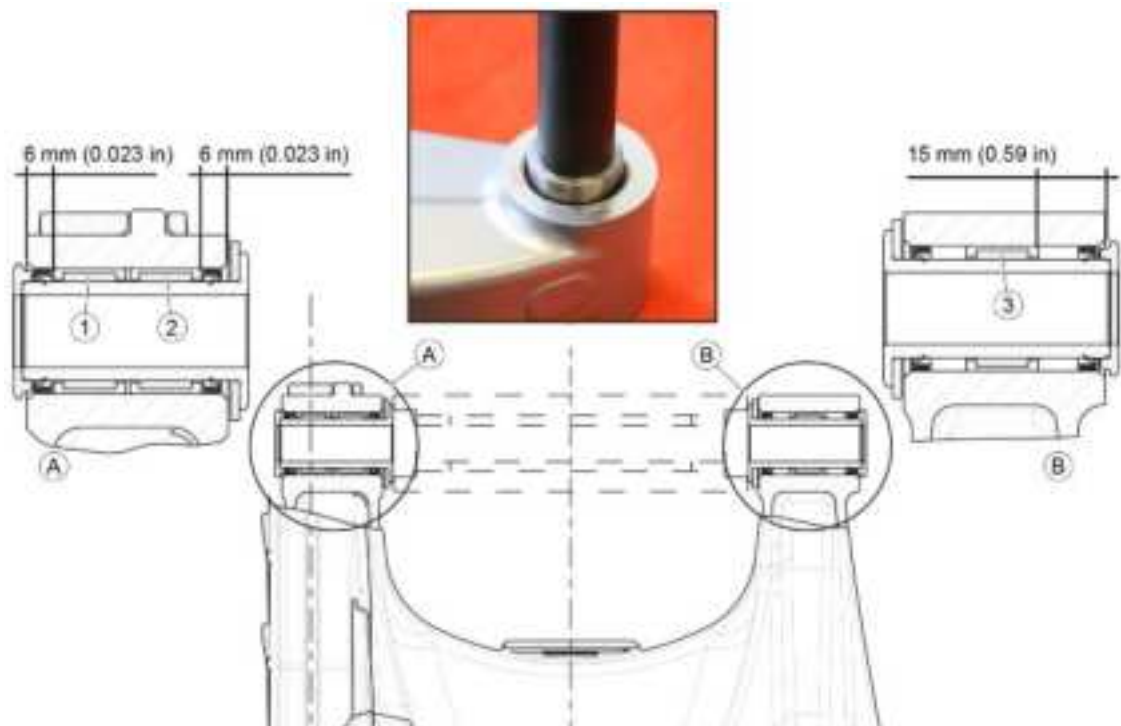
- If the roller bearings have been removed during the disassembly phase for a check or replacement, proceed with the insertion by means of a special punch, respecting the following measurements, after having greased the contact parts:

LEFT SIDE:

- The roller bearing (1) must be positioned at a depth of 6 mm (0.023 in) from the outer surface.
- The roller bearing (2) must be positioned at a depth of 6 mm (0.023 in) from the inner surface.

RIGHT SIDE:

- The roller bearing (3) must be positioned at a depth of 15 mm (0.59 in) from the outer surface.



- Position the 4 gaskets (4) on the swingarm to the level of the internal machining as shown in the image.



- Place the complete swingarm (5) in its seat.



- Working from the right side of the vehicle, insert the swingarm pin (6) and the spacer (7) making sure of the correct orientation.
- The machined part must be facing the swingarm.



- Insert the "T" bush (8) in the swingarm.



- Check the correct positioning of the two bushings (9) on the shock absorber and after having positioned it in its seat, keeping the screw (10) blocked, tighten the nut (11) to the prescribed torque.



- Position the complete brake calliper on the guide on the swingarm.



- Position the cable gland (12) that fastens the ABS sensor wiring harness and the rear brake hose to the frame.



- Insert the flat washer (13) on the swingarm pin with the machined part facing the swingarm itself.



- After positioning the washer and the nut (14) on the swingarm pin, tighten it to the prescribed torque.



- Position the fixing screw (15) of the footrest support to the engine and tighten to the prescribed torque.
- Proceed to refit the rear mudguard, the crankcase cover and the rear wheel.



Pignone

Rimozione

To proceed with the removal of the front sprocket, after having loosened the tension of the final drive chain, it is necessary to first remove the left foot-rest support complete with linkages.

Then proceed as described:

- Remove the three fixing screws (1) of the front sprocket cover (2) taking care to recover the "T" bushes (3).



- Remove the front sprocket cover (2) disconnecting the breather pipe (4) from it.



- Remove the fixing screw (5) of the front sprocket along with the "T" bush (6) and the spring washer (7).



- Remove the front sprocket (8) from the transmission shaft and free it from the drive chain.



- Remove the spacer (9) from the transmission shaft.



Verifica

To check the state of wear of the front sprocket, simply check that the teeth of the sprocket are not worn or damaged. In this case, replace the rear sprocket and the final drive chain also.

Installazione

To proceed with the installation of the front sprocket, proceed as described:

- Remove the spacer (9) from the transmission shaft.



- Assemble the front sprocket (2) with the drive chain (3) and insert it on the transmission shaft.



- Having positioned the fixing screw (4) of the front sprocket, along with the "T" bush (5) and the spring washer (6), tighten it to the prescribed torque.



- Position the breather pipe (7) in the sprocket cover (8) as indicated.



- After positioning the sprocket cover (8), insert the three screws (9) complete with "T" bushes (10) and tighten them to the prescribed torque.



- Restore the drive chain to the correct tension, following the specific procedure described in the "Adjustment" paragraph.

Drive chain

Removing

The transmission chain, although "closed", has a different coloured hammerlock (where provided), which should be used to perform opening / disassembling procedures.

NOTE

WHERE PRESENT, THE HAMMERLOCK (1) MAY ALSO BE IDENTIFIED BY A SIGN (2) APPLIED IN THE MOUNTING LINES DURING MANUFACTURING.



To dismantle and remove the chain, proceed as follows:

- Partially remove the pins (3) using a generic chain breaker.



- Remove the outer plate (4).



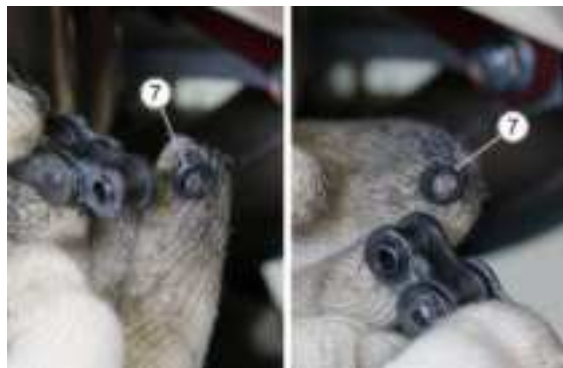
- Remove the outer O-ring rings (5).



- Remove the inner plate (6).



- Collect the inner O-ring rings (7) and completely remove the transmission chain.



inspection

To check the wear of the drive chain, use the chain checking instrument, P/N: **Ognibene - 529510001**.

The different chain pitches which may be checked with the instrument are indicated on the instrument itself. There are three reference markings for each chain pitch indicated on the instrument. These indicate (from right to left) the correct measurements for:

1. New chain with length near nominal value;
2. Chain with chain stretch of 1.5%;
3. Chain with chain stretch of 3%, which must therefore be replaced in accordance with applicable legislation.



Perform the procedure described as follows to check chain wear:

- Tauten the chain.
- Place the jaws of the tool on the rollers at the opposite ends of a STRAIGHT length of chain consisting of 8 chain links.
- Check that the notch on the sliding jaw matches the correct marking on the instrument.



Installing

- After fitting the chain on the pinion and on the crown, put the inner O-rings (1) back onto the hammerlock pins (2) and connect the two ends of the transmission chain.



- Place the outer O-rings (3) on the pins.



- Compress the outer plate (4) using the appropriate generic tool.

IMPORTANT

BE CAREFUL NOT TO COMPRESS TOO THE OUTER PLATE TOO MUCH AS THIS COULD SEIZE THE CHAIN.



- Check that the links in the transmission chain are not seized and that it can move in both directions.



- Use a generic clincher to re-tighten the pins of the link (checking riveting at points "A").



- Turn the pin of the specific tool 90° and re-engage the link pin again (checking riveting at points "B").
- Grease the chain and record the clearance.



Adjusting

To check the clearance:

- Shut off the engine.
- Rest the vehicle on the side stand.
- Select neutral.
- Check that the vertical deflection of the bottom section of the chain, measured at a distance of 250 mm (9.84 in) from the centre of the rear wheel axle (along imaginary line between centres of front and rear sprockets), is approximately 30 mm (1.18 in).

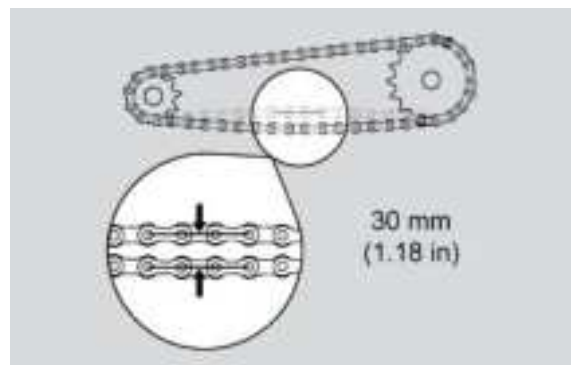


IMPORTANT

WHEN CHECKING THE DEFLECTION OF THE CHAIN, THE CHAIN MUST NOT BE ABLE TO TOUCH THE UNDERSIDE PART OF THE SWINGARM IN THE POSITION INDICATED BY THE ARROW.

- Move the vehicle forwards to check the vertical deflection of the chain in other positions; the chain deflection must be constant throughout the entire rotation of the wheel.

if the clearance is uniform, but greater or less than **30 mm (1.18 in)**, carry out the adjustment.



IMPORTANT

IF THE CLEARANCE IS GREATER IN SOME POSITIONS IT MEANS THAT SOME ELEMENTS OF THE CHAIN ARE CRUSHED OR HAVE SEIZED UP. IN THIS CASE THE CHAIN SHOULD BE REPLACED. LUBRICATE THE CHAIN REGULARLY TO PREVENT THE RISK OF SEIZURE.

For the adjustment of the chain tension:

- Place the vehicle on its rear service stand.
- After completely loosening the nut (1), operating from both sides, loosen the two locknuts (2).



- Use the adjuster screw (3) to adjust the chain clearance checking that the references (4) match on both sides of the vehicle.
- Using a gauge make sure that the distance is the same on both sides.



- Tighten the two lock nuts (2).
- Tighten the nut (1).
- Check the chain clearance.

Chain sliders

- Place the vehicle on the specific rear support stand (optional).
- Check that the pad (1) is not worn or damaged. Replace it with a new one if it is.
- Also check the wear of the chain guide (2).

- To proceed with the removal of the chain slider, remove the upper screw (3) which secures the crankcase cover to the rear mudguard.



- Remove the four side fixing screws (4).



- Remove the crankcase cover (5).



- Undo the lower fixing screw of the rider footrest support to the engine.



- Remove the lower fixing screw (5) of the rider footrest support to the engine, complete with washer (6).



- Unscrew the fixing nut of the rider footrest support to the frame.



- Remove the nut (8).



- Remove the washer (9).



- Remove the fixing screw (10) of the gear shift lever.



- Remove the rider footrest support (11) complete with linkages.



- Remove the three fixing screws (12) of the front sprocket cover taking care to recover the bushes.



- Remove the front sprocket cover (13).



- Remove the two screws (14) and the chain slider fixing caps.



- Remove the chain skid (15).



- Remove the chain guide (16).



- To assemble the chain sliders, carry out the procedures described above in reverse order.

Pedaline

Rimozione

LEFT RIDER FOOTREST

- Remove the seeger ring (1).



- Extract the pin (2).



- Remove the pedal (3) complete with spring (4).



- Ensure that the pin (5) cannot rotate and unscrew the nut (6), taking care not to lose the washer (7).



- Turn the tie-rod safety retainer (8) and then extract it as indicated in order to remove the lever (9).



- If necessary, the fitting (10) complete with protective rubber (11) can be removed.



- Remove the washer (12).
- Remove the pin (13), complete with O-Ring (14).



- Remove the seeger ring (15) from the peg.



- Remove the screw (16) used to fasten the peg.
- Extract the peg (17) and if necessary remove the rubber block (18).



- To remove the complete rider footrest support, after disconnecting the tie-rod from the gear lever, remove the screw (19) and collect the spring washer (20).



- Remove the nut (21) complete with flat washer (22).



- Remove the complete footrest support (23).



- If removed, be careful to refit the spacer (24) during the refit phase.



RH RIDER FOOTREST

- Remove the seeger ring (1).



- Extract the pin (2).



- Remove the pedal (3) complete with spring (4).



- Remove the safety O-ring (5) from the pin that blocks the brake pump control rod.



- Rotate the pin (6) to release the brake pump control rod and slide it out in order to remove it.



- Remove the two rear brake pump fastener screws (7).



- Remove the cable clamps (8) fastening the wiring of the brake switch to the rear brake pipe.



- Operating on the left side of the motorcycle, remove the screw (9) and collect the spring washer (10).



- Remove the nut (11) complete with flat washer (12).



- Remove the screw (13) and collect the spring washer (14) and the spacer bushing (15).



- Using a pin with adequate dimensions (length greater than 350 mm and diameter less than/equal to 30 mm), push the swingarm pin from left to right out of its seat so that the pin used replaces the swingarm pin.



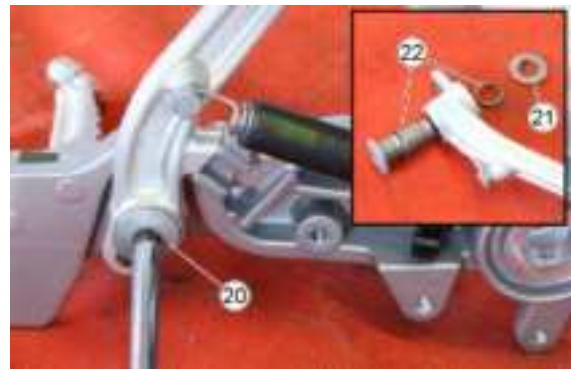
- Remove the fixing screw (16) of the rear stop switch (17) and after releasing the wiring from the cable grommet, separate the protective cover (18) from the switch (17).



- Release the brake lever return spring (19) and remove it.



- Remove the fixing screw (20) of the brake lever, taking care to collect the washer (21) and the O-rings (22).



- Remove the seeger ring (23) from the peg.



- Remove the screw (24) used to fasten the peg.
- Extract the peg (25) and if necessary remove the rubber block (26).

PASSENGER FOOTRESTS

THE OPERATIONS DESCRIBED BELOW REFER TO A SINGLE PASSENGER FOOTREST, BUT ARE VALID FOR BOTH.

- Remove the seeger ring (1).



- Extract the pin (2).



- While pressing the side plates, remove the complete pedal (3).



- Check that the plates (4) are aligned correctly before dismantling the pedal, taking care not to lose the spring (5) and the ball (6).

- To remove the footrest support, remove the two screws (7).



- Remove the footrest support (8).



Stand

Side stand

REMOVAL

To remove the side stand, proceed as described:

- Unscrew the fixing screw (1) of the gear lever.



- Remove then nut (2) from the swing-arm pin and the relative washer (3).



- Remove the lower screw (4) used to fasten the rider footrest support, taking care to collect the spring washer (5) and the spacer (6) placed behind the stand plate.



- Remove the rider footrest support complete with linkages of the gear.



- Undo and remove the three sprocket cover fastening screws (7) taking care to recover the "T" bushes (8).



- Remove the sprocket cover (9) releasing the breather pipe (10).



- Remove the screw (11) used to fasten the stand sensor in order to disconnect it from the plate.



- Remove the two return springs (12) from the centre stand.



- Remove the fastening nut (13) from the centre stand screw taking care to collect the washer (14).



- Remove the special screw (15) used to fasten the centre stand and then separate it from the plate.



- Undo the screw (16) to remove the centre stand plate (16) and the spacer (17).



NOTES FOR THE REFIT PHASE:

- Check the correct positioning of the side stand sensor, in particular that the sensor pin is engaged in the hole on the stand.

IMPORTANT

INCORRECT POSITIONING OF THE SIDE STAND SENSOR CAN GENERATE THE "STAND OPEN" SIGNAL, THEREFORE INHIBIT THE START.



Exhaust

Removing the manifold - tail pipe

To remove the manifold - exhaust terminal it is necessary to first remove the side fairings, the lower fairings and the radiator. Then proceed as described:

- After disconnecting the lambda probes connectors, remove the four nuts from the stud bolts.



- Ensure that the pin on the right side of the motorcycle cannot rotate and unscrew the nut on the opposite side.
- Take care to collect the washers on both sides.



- Remove the complete exhaust.



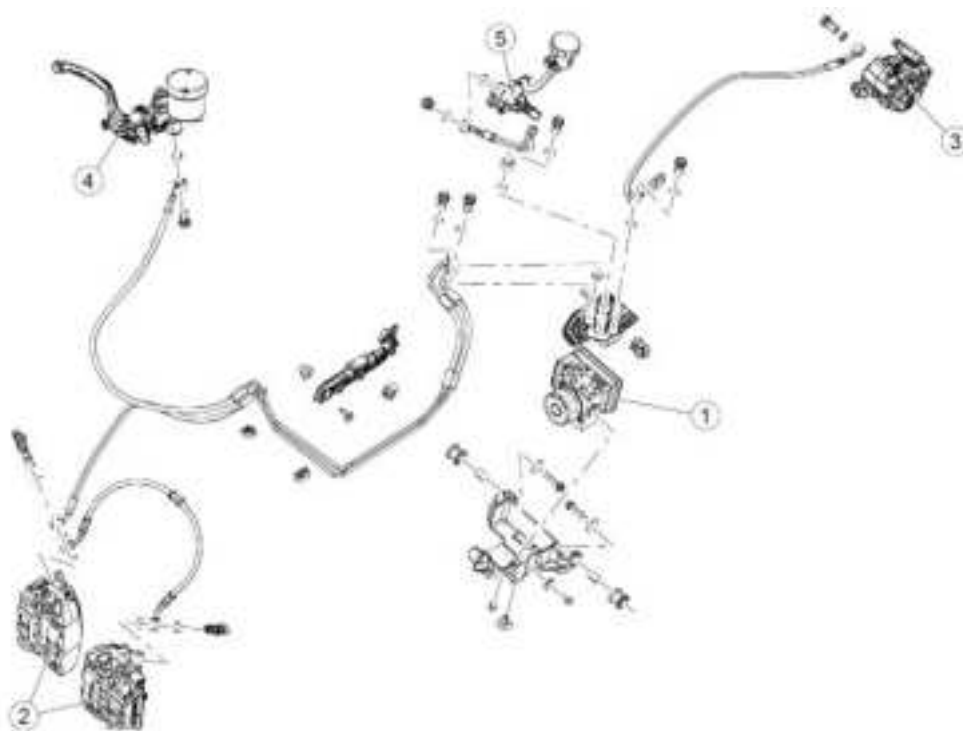
INDEX OF TOPICS

B RAKING SYSTEM

BS

ABS

Foreword



The ABS system consists of the following elements:

1. ABS Modulator.
2. Front brake callipers.
3. Rear brake calliper.
4. Front brake master cylinder.
5. Rear brake master cylinder.

ABS

The ABS with CORNERING is a device to avoid the wheels locking in case of emergency braking also when cornering, thus increasing vehicle stability when braking when compared with a traditional braking system.

The CORNERING mode takes into account the motorcycle's lean angle, so as to maximise efficiency without endangering the rider.

The ABS system improves vehicle control provided that the physical limits of vehicle grip on the road are not exceeded. The rider is fully responsible for riding at a suitable speed based on weather and road conditions, always leaving an appropriate safety margin.

Under no circumstances can the ABS system compensate for the rider's misjudgement or improper use of brakes.

The ABS system may be set to three different levels from 1 (minimum slip control) to 3 (maximum slip control), from the specific setting screen (see paragraph in the "SELECTING MAPS").

Level 1 is suitable for performance use by expert riders only. At this level the lifting control of the rear wheel is not active and neither is the cornering system. ABS is effective on the front wheel only.

Level 2 is suitable for performance use in good grip conditions. Rear wheel lift control is active, but at a more performance-biased setting, allowing a certain degree of rear wheel lift in specific braking conditions

Level 3 is suitable for day-to-day usage in all conditions - e.g. on urban or extra-urban roads, in wet or dry surface conditions. It does not allow, in most cases, for the lifting of the rear wheel.

IMPORTANT

BEFORE RIDING OFF, CHECK THE ABS LEVEL OF INTERVENTION SELECTED. SHUTTING DOWN THE VEHICLE RETURNS THE ABS SYSTEM'S FUNCTIONALITY TO THE LAST ABS LEVEL UTILISED.

NOTE

WHEN THE ABS STARTS WORKING, A PULSING IS FELT ON THE BRAKE LEVER.



THE ANTI-WHEEL LOCK SYSTEM DOES NOT PREVENT FALLS ON A BEND WHEN LEVEL "1" IS USED.

AN EMERGENCY BRAKING WITH THE VEHICLE INCLINED, HANDLEBAR TURNED, ON UNEVEN OR SLIPPERY ROADS, OR WITH POOR GRIP, CREATES A LACK OF STABILITY DIFFICULT TO HANDLE. RIDE CAREFULLY AND SENSIBLY AND ALWAYS BRAKE GRADUALLY.

DO NOT SPEED RECKLESSLY. THE VEHICLE GRIP ON THE ROAD IS SUBJECT TO LAWS OF PHYSICS WHICH NOT EVEN THE ABS SYSTEM CAN ELIMINATE.

When the vehicle is started, after the initial instrument panel check cycle, the ABS warning lamp flashes until the vehicle reaches a speed of 3.1 mph (5 km/h), after which it goes out.

If with the ABS activated (level 3, 2, 1) the ABS warning light turns on permanently, or continues to flash even when exceeding 5km/h (3.1 mph), a failure has been detected and the ABS has been deactivated.

In this case carry out the following operations:

- stop the vehicle;
- Key OFF-ON;
- ride the vehicle to a speed above 5 km/h (3.1 mph): the ABS warning light must be turned off;
- the ABS system is working.

If the ABS disabled indication remains:

NOTE



IN THE EVENT OF A PROLONGED ROTATION OF THE REAR WHEEL WITH THE FRONT ONE LOCKED (BURNOUT, MOTORCYCLE PLACED ON MIDDLE STAND, ETC.) THE SYSTEM CAN BE AUTOMATICALLY DEACTIVATED WHEN THE ABS and a-PRC INDICATOR LIGHT IS ON AND STEADY.

TO REACTIVATE, TURN THE IGNITION SWITCH OFF AND THEN ON AGAIN AND SELECT THE REQUIRED SETTING.

NOTE



THE SAFETY PROVIDED BY THE ABS DOES NOT, IN ANY CASE, JUSTIFY RISKY MANOEUVRES. EVEN THOUGH THE ABS SYSTEM ENSURES GREATER VEHICLE CONTROL IN THE EVENT OF EMERGENCY BRAKING, ALWAYS OBSERVE THE CORRECT MINIMUM SAFETY DISTANCE FROM THE VEHICLE IN FRONT OF YOU.



THE ABS SYSTEM ACTS ON BOTH THE FRONT AND REAR WHEELS BY OBTAINING INFORMATION FROM THE ROTATION/ LOCKING TONE WHEELS. ALWAYS CHECK THAT THE TONE WHEEL IS CLEAN, AND REGULARLY CHECK THAT THE DISTANCE FROM THE SENSOR IS CONSTANT ON ALL 360 DEGREES. SHOULD THE WHEELS BE REMOVED AND REFITTED, IT IS VERY IMPORTANT TO CHECK THAT THE DISTANCE BETWEEN TONE WHEEL AND SENSOR IS THE ONE SPECIFIED.



WHERE THE MOTORCYCLE HAS AN ABS SYSTEM, NON-APPROVED BRAKE PADS AND TYRES COMPROMISE SMOOTH BRAKING, DRASTICALLY REDUCING DRIVING SAFETY.

NOTE

THE SYSTEM'S SENSORS, HAVING A SIGNIFICANT ACCURACY OF READING THE TONE WHEELS, MAY GENERATE, A MOTORCYCLE STOPPED AND THE ENGINE RUNNING, INDICATION OF SPEED OF SOME km / h (mph) ON THE DIGITAL DISPLAY. SUCH BEHAVIOUR IS TO BE CONSIDERED NORMAL AND DOES NOT CREATE MALFUNCTIONS IN THE SYSTEM.

Characteristic

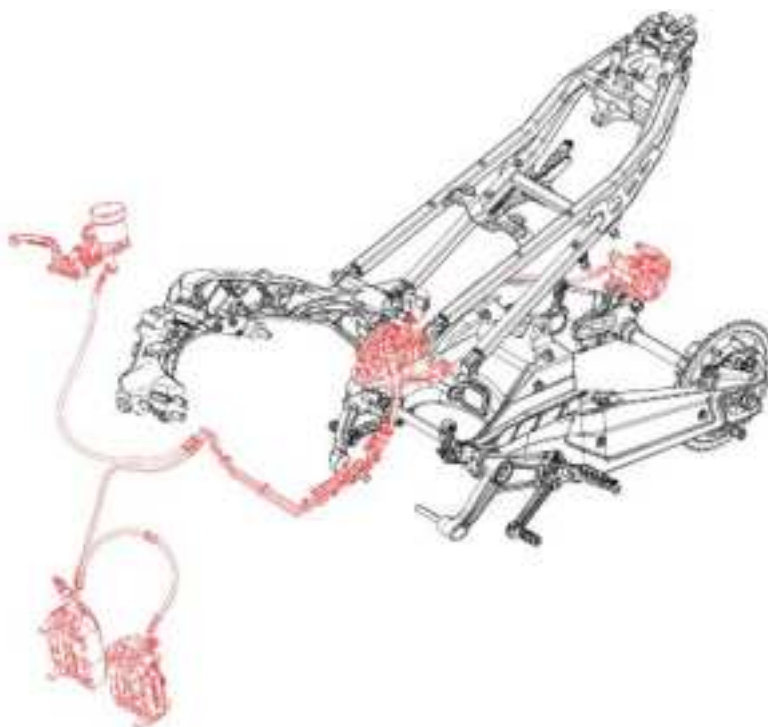
Distance between tone wheel and front sensor

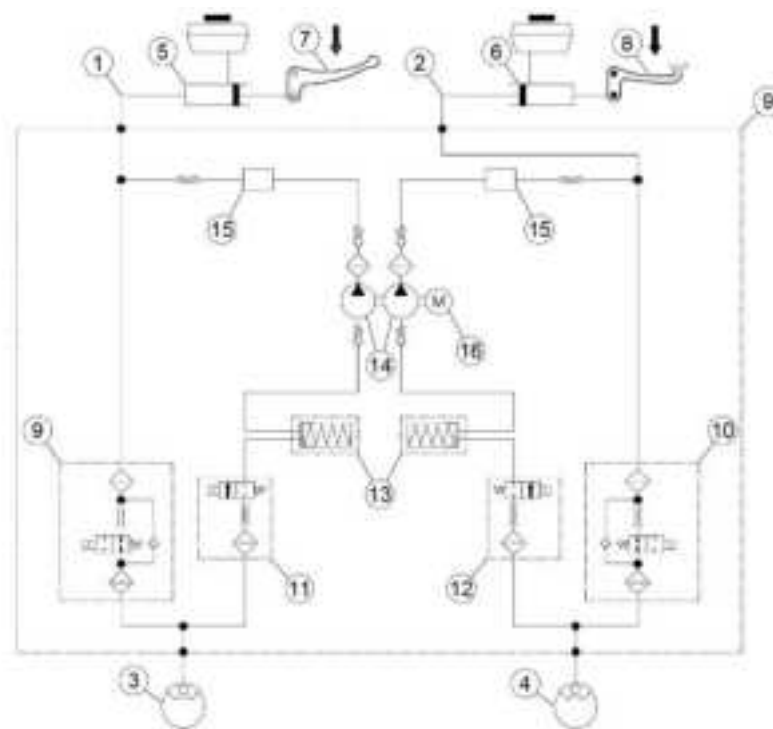
0.5 - 2.00 mm (0.020 - 0.079 in)

Distance between tone wheel and rear sensor

0.5 - 2.00 mm (0.020 - 0.079 in)

Operating diagram



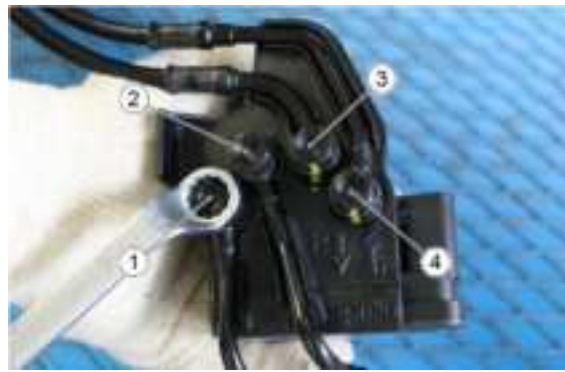


ABS functional diagram key

1. Front system circuit
2. Rear system circuit
3. Front brake callipers
4. Rear brake calliper
5. Front brake master cylinder
6. Rear brake pump
7. Front brake control lever
8. Rear brake pedal
9. Front brake circuit inlet solenoid valve (normally open)
10. Rear brake circuit inlet solenoid valve (normally open)
11. Front brake circuit outlet solenoid valve (normally closed)
12. Rear brake circuit outlet solenoid valve (normally closed)
13. Rear/front brake circuit low pressure accumulator
14. Dual hydraulic circuit pump (ABS)
15. Hydraulic circuit motor
16. DC electric motor

Inlets and outlets:

1. Supply to the rear brake calliper.
2. Intake from the rear brake pump.
3. Inlet from front brake master cylinder.
4. Outlet to front brake calliper.

**ABS OPERATION****General specifications:**

The front circuit is the same as the rear one.

- The ABS inlet valve (9 - 10) is normally open and it is closed only when the system intervenes to avoid wheel locking.
- The exhaust valve (11 - 12) is normally closed and it is opened only when the system intervenes to avoid wheel locking.
- With the system in stand-by mode, the ABS processor controls the wheel speed instant by instant to assess any slippage of the wheels.
- When in standby, the system does not intervene at all when the rider brakes; the braking system is the same as the one without ABS.

ABS Cycle phases (the following operations refer to the front circuit but they are also valid for the rear):

A - Brake activation: the rider starts braking as he would usually do.

B - Pressure reduction: coincides with the recognition of the dangerous situation (wheel slippage exceeds the threshold): the system closes the inlet valve (9-10) and opens the outlet valve (11-12) temporarily.

At this stage the rider cannot increase the pressure on the callipers (3-4) and the system reduces the pressure on the callipers partially. Excess fluid temporarily fills the "reservoir" located inside the ABS modulator until the ABS pump (14) automatically activates to direct the fluid to the brake master (5 -6).

C - Maintaining pressure: the pressure in the callipers (3-4) remains low until total recovery of speed / wheel grip.

The system restores the fluid taken from the calliper (3-4) in the section of the system between the brake pump (5-6) and the ABS inlet valve (9-10).

D - Pressure restoration: by opening the inlet valve (9-10) momentarily, the pressure of the callipers (3-4) is increased until maximum deceleration is reached. Then, the system gives the control over the braking back to the rider.

E - If the wheel does not reach complete grip, the system continues operating as before until complete grip is obtained or until the vehicle stops. An error may be generated, however, if the pressure reduction stage persists for longer than a predetermined limit.

ABS SYSTEM DESCRIPTION

The ABS system is a device to avoid wheels locking in case of emergency braking, increasing vehicle braking stability when compared to a traditional braking system.

The ABS system improves vehicle control provided that the physical limits of vehicle grip on the road are not exceeded. The rider is fully responsible for riding at a suitable speed based on weather and road conditions, always leaving an appropriate safety margin. Under no circumstances can the ABS system compensate for the rider's misjudgement or improper use of brakes.

Sometimes when the brake is operated, the tyre locks with a consequent loss of grip, which makes it difficult to control the vehicle.

A position sensor (3) on the tone wheel (2), forming an integral unit with the vehicle wheel, "reads" the status of the vehicle wheel spotting any possible lock.

A control unit (1) signals this out and adjusts the pressure in the braking circuit accordingly.

IMPORTANT

WHEN THE ABS STARTS WORKING, A VIBRATION IS FELT ON THE BRAKE LEVER.



THE WHEEL ANTILOCK BRAKING SYSTEM DOES NOT PREVENT FALLS WHILE ON A BEND. AN EMERGENCY BRAKING WITH THE VEHICLE INCLINED, HANDLE BAR TURNED, ON UNEVEN OR SLIPPERY ROADS, OR WITH POOR GRIP CREATES LACK OF STABILITY DIFFICULT TO HANDLE. THEREFORE, RIDE CAREFULLY AND SENSIBLY AND ALWAYS BRAKE GRADUALLY. BRAKING WHILE TURNING A CORNER IS SUBJECT TO LAWS OF PHYSICS WHICH NOT EVEN ABS CAN ELIMINATE.



Modulator

ABS MODULATOR REPLACEMENT

To replace the ABS modulator it is necessary to remove the fuel tank, the radiator, the side panels, the internal side panels, the side fairings, the rear mudguard, the control unit and its support. Then proceed as described:



- Keeping the screw (1) still, unscrew the locking nut (2) of the rear brake reservoir (3) disconnecting it from the frame.
- Remove the two rear brake pump fastener screws (4).



- Remove the two rubber clamps (5).



- Unclip the rear brake switch (6) and rear ABS sensor (7) wiring harness from the cable grommet.



- Remove the brake master cylinder (8) from the pumping element (9).



- Remove the three plastic cable grommets (10) and the rubber cable grommet (11) to release the brake hose from the ABS sensor wiring.



- Remove the two screws (12) fastening the rear brake calliper.



- Extract the rear brake calliper (13) releasing the brake hose from the cable grommet (14).



- Unscrew the two screws (15) and remove the closing bracket (16) of the radiator support which holds the front brake hoses.



- Disconnect the front brake hoses (17) from the special support.



- Remove the two screws (18) fastening the ABS modulator support to the frame.



- Turn the ABS modulator slightly to facilitate the disconnection of the connector (19).



- Rotate the ABS modulator again to access the screw (20) that locks it to the support and remove it.



- Remove the ABS modulator support (21) from the rear.



- Working from the left side of the vehicle, remove the ABS modulator (22) from the frame.



- Unscrew the four fixing screws (23) of the brake pipes and remove the modulator.



In case the complete ABS system needs to be removed, leave the brake pipes connected, remove the steering plate lower closure and proceed with the following operations:

- Remove the calliper and rear brake master cylinder from the left side of the vehicle as shown.



- After disconnecting all the rubber and plastic cable grommets that constrain the front brake pipes, remove the fixing screws (24) of the front brake callipers from both sides.



- Disconnect the cable grommet (25) from the front mudguard.



- Unscrew the two screws (26) fixing the U-bolt (27) and disconnect the complete front brake master cylinder (28).



- Remove the pump and the two front brake callipers in order to proceed with the complete removal of the ABS system.



If replacing the pipes or the modulator, it is necessary to bleed the entire ABS system.

To bleed the ABS system optimally, it is advisable to use devices such as vacuum pumps or similar.

WARNING

WE RECOMMEND MARKING THE PIPES SO THAT THEY ARE REFITTED CORRECTLY ON THE NEW MODULATOR/CONTROL UNIT.

AFTER REPLACING THE MODULATOR/CONTROL UNIT, THE ABS SYSTEM MUST BE BLED.

MORE OIL IS REQUIRED TO BLEED THE ABS SYSTEM THAN A CONVENTIONAL SYSTEM. FOR THIS REASON, CAREFULLY CHECK THE OIL LEVEL IN THE BRAKE TANK.

- If even after bleeding, the front brake lever feels "spongy", the secondary circuit in the ABS control unit must be bled. To do this, perform a road test and repeatedly activate the ABS system.
- Bleed and using the diagnostic tool, delete any errors on the ABS and on the "vehicle" control unit.
- Before handing back the vehicle, perform a functional road test.

REPLACING/ACTIVATING NEW ABS CONTROL UNIT

In case of replacement of the ABS control unit, ensure that the new one has caps on all four hydraulic connections and then proceed as follows:

- After connecting the new ABS control unit hydraulically and electrically, it must be activated/recognised.
- Do a "KEY ON".
- Check that the ABS warning light flashes rapidly.
- Do a "KEY OFF" followed by a "KEY ON".
- If activation has been successful, the warning light should come on and flash slowly.
- In the event of a fault, with the diagnostic tool disconnected, the warning light should be permanently lit.
- Connect the diagnostic tool and check for errors.

ABS CONTROL UNIT CONNECTOR INSERTION PROCEDURE

- The initial position of the connector coupling lever must be as indicated in the figures.



- Place the connector on the opposite side of the control unit and lower the driving lever until the "click" that signals the end of the stroke is heard.



- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm.



- If the initial position of the connector and of the driving lever is not as shown in the "A1" image, the connector will not engage properly and the measured distance will be greater (approximately 12 mm).
- In this case, repeat the operation as described in the A2/A3 images.
- We recommend creating a template in order to ensure that the connector is inserted correctly.



Rear brake calliper

Removal

To remove the rear brake calliper, it is necessary to previously drain the braking system.

- Remove the protection cap (1) of the bleed valve and free the wiring harness (2) of the rear ABS sensor.



- Make sure you have a container with adequate capacity to recover the oil and after connecting a pipe to the breather valve (3), unscrew it to allow the oil to drain out and empty the system.



- Remove the rubber grommet (4).



- After having adequately protected the brake calliper, remove the pipe fixing screw (5) and plug the pipe itself.



- Remove the two brake calliper fixing screws (6).



- Remove the brake calliper (7).



Installing

To install the rear brake calliper, proceed as described:

- Position the rear brake calliper (1) on the disc.



- Insert and tighten the two brake calliper fixing screws (2) to the prescribed torque.



- After having adequately protected the calliper, connect the brake hose, the special screw (3) and tighten it to the prescribed torque.



- Fill with oil and bleed the system.
- Check the correct functioning of the braking system

Front brake calliper

Removal

NOTE

THE FOLLOWING OPERATIONS REFER TO A SINGLE BRAKE CALLIPER BUT ARE VALID FOR BOTH.

To remove the front brake calliper, it is necessary to previously drain the braking system.

- Remove the protection cap (1) of the bleed valve and free the wiring harness of the front ABS sensor (if present).



- Make sure you have a container with adequate capacity to recover the oil, suitably protect the brake calliper and after connecting a pipe to the breather valve (2), unscrew it to allow the oil to drain out and empty the system.



- Remove the tube fixing screw (3) and plug the pipe.



- Remove the two brake calliper fixing screws (4).



- Remove the brake calliper (5).



Installing

NOTE

THE FOLLOWING OPERATIONS REFER TO A SINGLE BRAKE CALLIPER BUT ARE VALID FOR BOTH.

To install the front brake calliper, proceed as described:

- Position the front brake calliper (1) on the disc.



- Insert and tighten the two brake calliper fixing screws (2) to the prescribed torque.



- After having adequately protected the calliper, connect the brake hose, the special screw (3) and tighten it to the prescribed torque.



- Fill with oil and bleed the system.

Rear brake disc

Removal

To remove the rear brake disc, after removing the wheel, proceed as described:

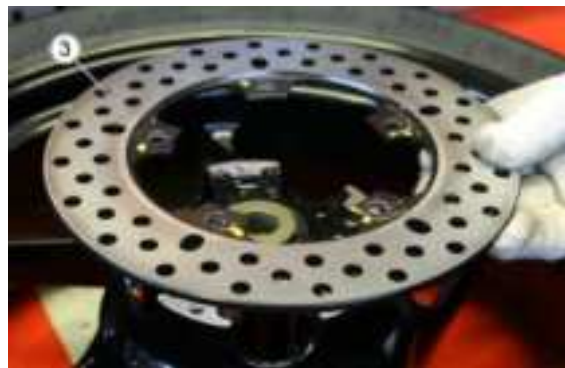
- Remove the five fixing screws (1) of the tone wheel and of the brake disc on the rim.



- Remove the phonic wheel (2)



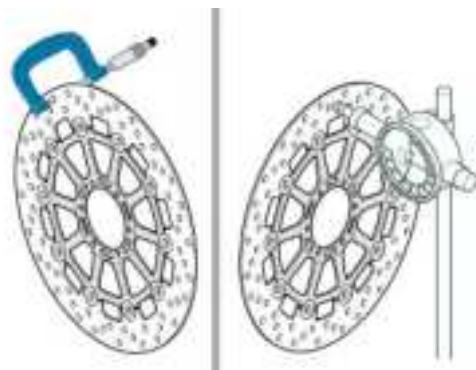
- Remove the brake disc (3).



Disc Inspection

This procedure must be performed with the brake disc installed on the wheel.

- Check the disc for wear by measuring the minimum thickness with a micrometer in different points.
- If the minimum thickness, even in a single point of the disc, is less than the minimum value, replace the disc.



Disc thickness minimum value: 4.5 mm (0.18 in)

- Using a dial gauge, check that the maximum oscillation of the disc does not exceed the tolerance; otherwise, replace it.

Disc oscillation tolerance: 0.1 mm (0.0039 in)

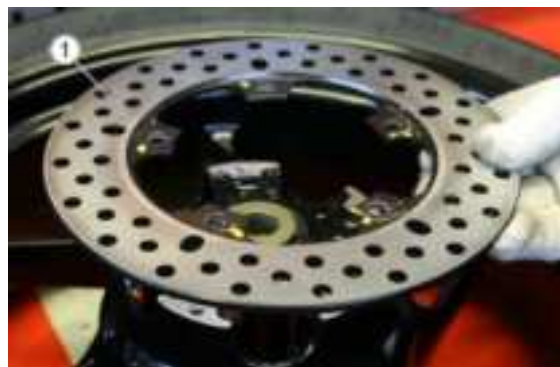
Installing

After checking the integrity and the state of wear of the brake disc, if it is not replaced with a new disc, proceed as described to carry out the fitting:

- Position the brake disc (1) on the rim, making sure it is in the correct direction of installation.

WARNING

THE FLAT SURFACE MUST SUPPORT THE RIM WHILE THE UNLOADED AND PAINTED SURFACE MUST BE FACING OUTSIDE.



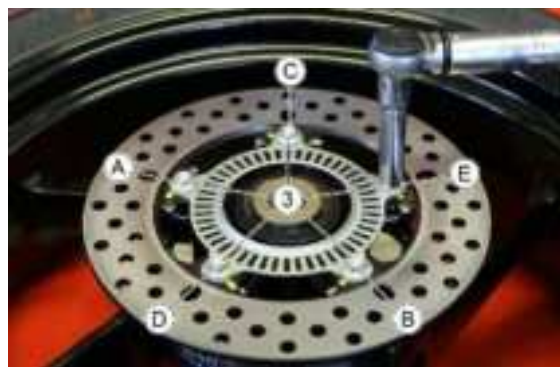
- Position the tone wheel (2) on the rim, making sure it is in the correct direction of installation.

WARNING

THE CURVED SURFACE ON THE INSIDE MUST BE FACED OUTSIDE AS INDICATED.



- Insert the five screws (3) and tighten them to the specified torque in the indicated order (A-B-C-D-E).



Front brake disc

Removal

To remove the front brake disc, after removing the wheel, proceed as described:

THE FOLLOWING OPERATIONS REFER TO ONE DISC BUT APPLY TO BOTH

- Remove the six fixing screws (1) of the tone wheel (if applicable) and of the brake disc on the rim.



- Remove the tone wheel (2) (if applicable).

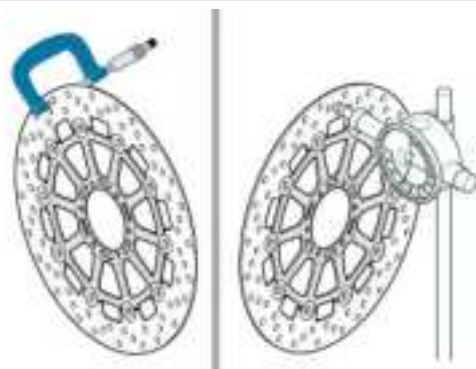


- Remove the brake disc (3).



Disc Inspection

- The following operations must be carried out with the brake discs fitted on the wheel; they refer to a single disc, but are valid for both.
- Check the disc for wear by measuring the minimum thickness with a micrometer in different points. If the minimum thickness, even in a single point



of the disc, is less than the minimum value, replace the disc.

Disc thickness minimum value: 4 mm (0.16 in)

- Using a dial gauge, check that the maximum oscillation of the disc does not exceed the tolerance; otherwise, replace it.

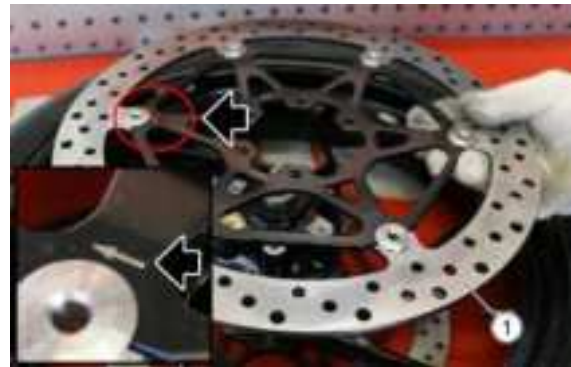
Disc oscillation tolerance: 0.15 mm (0.0059 in)

Installing

After checking the integrity and the state of wear of the brake discs, if they are not replaced with new discs, proceed as described to carry out the fitting:

THE FOLLOWING OPERATIONS REFER TO A SINGLE DISC BUT APPLY TO BOTH.

- Position the brake disc (1) on the rim, making sure it is in the correct direction of installation.



IMPORTANT

IN CORRESPONDENCE WITH ONE OF THE LATCHES OF THE FLOATING DISC, AN ARROW IS SHOWN THAT INDICATES THE WHEEL'S ROTATION DIRECTION AND CONSEQUENTLY THE CORRECT POSITIONING ON THE RIM.

- Position the tone wheel (2) on the rim (if present), making sure it is in the correct direction of installation.



- Insert the six screws (3) and tighten them to the specified torque in the indicated order (A-B-C-D-E-F).



Front brake pads

Removal



THIS VEHICLE IS FITTED WITH A DOUBLE DISC FRONT BRAKING SYSTEM (RIGHT AND LEFT SIDE).

ALWAYS REPLACE ALL THE PADS FROM BOTH FRONT BRAKE CALLIPERS.

REPLACING THE PADS OF ONLY ONE FRONT CALLIPER MAY JEOPARDISE THE VEHICLE STABILITY AND SAFETY, POSING SERIOUS DANGER FOR PEOPLE, OBJECTS AND THE VEHICLE ITSELF.

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE CALLIPER, BUT APPLY TO BOTH.

To remove the front brake pads proceed as described:

- Remove the cotter pin (1) from the pin.



- Remove the pin (2).



- Remove the spring (3).



- Remove the two brake pads (4).



Installing



THIS VEHICLE IS FITTED WITH A DOUBLE DISC FRONT BRAKING SYSTEM (RIGHT AND LEFT SIDE).

ALWAYS REPLACE ALL THE PADS FROM BOTH FRONT BRAKE CALLIPERS.

REPLACING THE PADS OF ONLY ONE FRONT CALLIPER MAY JEOPARDISE THE VEHICLE STABILITY AND SAFETY, POSING SERIOUS DANGER FOR PEOPLE, OBJECTS AND THE VEHICLE ITSELF.

IMPORTANT

THE FOLLOWING OPERATIONS REFER TO A SINGLE CALLIPER, BUT APPLY TO BOTH.

To fit the front brake pads proceed as described:

- Insert the brake pads (1) in the calliper.



- Position the spring (2) and insert the locking pin (3).



- Tighten the locking pin to the specified torque.



- Insert split pin (4) in the pin.
- Check the correct operation of the brake system.



Rear brake pads

Removal

To remove the rear brake pads, remove the rubber grommet, freeing the ABS sensor wiring harness from the brake hose and then proceed as described:

- Remove the two brake calliper fixing screws (1).



- Remove the brake calliper (2).



- Remove the stop ring (3).

IMPORTANT

BEFORE DISCONNECTING THE PIN (4), CHECK THE POSITION OF THE SAFETY SPRING (5); IT MUST BE POSITIONED IN THE SAME WAY ON REASSEMBLY.



- Remove the pin (4).



- Remove the safety spring (5).



- Remove the pads (6).



AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKAGE.



Installing

To fit the rear brake pads proceed as described:

- With the brake calliper in hand and then removed from its position, insert the brake pads (1) into the calliper.



- Position the spring (2).



- Insert the pin (3).



- Insert the stop ring (4).



- After having refit the brake calliper and inserting the two fixing screws (5), tighten them to the prescribed torque.



- Check the correct functioning of the braking system.

Bleeding the braking system

PREPARATION OF THE VEHICLE

- It is important to ensure that there is always a sufficient quantity of brake fluid in the tank.
- These operations may be simplified by using a bleeding device when carrying out the "Replacing the brake fluid" operations.
- In this case, when performing the bleeding procedure, it is also necessary to operate the brake pedal a few times with the bleeder device connected (approximately five times for each wheel circuit).

Front

TRADITIONAL BLEEDING SYSTEM

Any air trapped in the hydraulic circuit acts as a cushion, absorbing much of the pressure applied by the brake pump and minimising the braking power of the calliper.

The presence of air is signalled by the "sponginess" of the brake and by poor braking.



CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING THE BRAKE CALLIPERS AND RESTORING THE BREAKING SYSTEM TO ITS REGULAR USE CONDITIONS, SO THAT THE HYDRAULIC CIRCUIT IS AIR PURGED.

NOTE

THE FOLLOWING OPERATIONS REFER TO ONE FRONT BRAKE CALLIPER ONLY, BUT ARE VALID FOR BOTH. THE VEHICLE MUST BE ON LEVEL GROUND TO BE BLED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Remove the rubber protection cover of the bleed valve.
- Insert the transparent plastic pipe in the front brake calliper bleed valve and slide the other end of this pipe in a container to collect the fluid.
- Remove the front brake fluid reservoir cap.
- Quickly press and release the front brake lever several times and then keep it fully pressed.
- Loosen the bleed valve by a 1/4 turn so that the brake fluid flows into the container, this will release the tension on the brake lever and it will make it arrive at the end stop.
- Close the bleed valve before arriving at the end of the stroke with the lever.
- Repeat the operation until there are no air bubbles in the fluid going into the container.

**NOTE**

WHILE BLEEDING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleeding valve and remove the pipe.
- Top-up the reservoir until the correct brake fluid level is obtained.
- Refit and block the front brake oil reservoir cap.
- Refit the rubber protection cover.

**BLEEDING SYSTEM WITH DIAGNOSTIC INSTRUMENT**

If the brake lever still feels "spongy" after completing all checks, it is necessary to bleed the brakes using this type of procedure.

- With the diagnostic tool properly connected, select the function "FRONT BLEEDING" in the section "SETTINGS".
- The pump starts running.
- While the pump is performing a rotation cycle, operate and release the front brake lever until the message diagnostic tool cycle completion is received.
- This procedure allows the air to circulate and accumulate.
- Once the procedure with diagnostic tool is finished, perform again the REGULAR PURGING to remove the air from the system completely.

Rear

TRADITIONAL BLEEDING SYSTEM

Any air trapped in the hydraulic circuit acts as a cushion, absorbing much of the pressure applied by the brake pump and minimising the braking power of the calliper.

The presence of air is signalled by the "sponginess" of the brake and by poor braking.



CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING THE BRAKE CALLIPER TO RESTORE THE BRAKING SYSTEM TO ITS REGULAR USE CONDITIONS, SO THAT THE HYDRAULIC CIRCUIT IS AIR PURGED.

NOTE

THE VEHICLE MUST BE ON LEVEL GROUND TO BE BLED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Remove the rubber protection cover of the bleed valve.
- Insert the transparent plastic pipe in the rear brake calliper bleed valve and insert the other end of this pipe into a container to collect the fluid.
- Remove the rear brake fluid reservoir cap.
- Repeatedly and quickly press and release the rear brake pedal, then keep it fully pressed.
- Loosen the bleed valve by a 1/4 turn so that the brake fluid flows into the container, this will release the tension on



the brake pedal and it will make it arrive at the end stop.

- Close the bleed valve before arriving at the end of the stroke with the pedal.
- Repeat the operation until there are no air bubbles in the fluid going into the container.

NOTE

WHILE BLEEDING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleeding valve and remove the pipe.
- Top-up the reservoir until the correct brake fluid level is obtained.
- Refit and block the front brake oil reservoir cap.
- Refit the rubber protection cover.

**BLEEDING SYSTEM WITH DIAGNOSTIC INSTRUMENT**

If the brake lever still feels "spongy" after completing all checks, it is necessary to bleed the brakes using this type of procedure.

- With the diagnostic tool properly connected, select the function "REAR BLEEDING" in the section "SETTINGS".
- The pump starts running.
- While the pump is performing a rotation cycle, operate and release the rear brake pedal until the message of diagnostic tool cycle completion is received.
- This procedure allows the air to circulate and accumulate.
- Once the procedure with diagnostic tool is finished, perform again the REGULAR PURGING to remove the air from the system completely.

Front brake pump

Removal

To remove the front brake pump it is necessary to previously empty the oil from the system. Then proceed as described:

- Undo the fastener screw (1) of the oil pipe



- Unscrew and remove the two fastening screws (2) of the U-bolt (3) and remove it supporting the brake pump.



- Remove the brake pump complete (4).



Checking

- Remove the master cylinder and check for scratches, rust or holes in the master cylinder wall and the external wall of each piston.
- Check that the anti-dust covers are not damaged, if damaged replace them.
- Check the condition of the piston, replace it if damaged.



- Check the condition of the pipe that goes from the reservoir to the brake pump, for cracks or cuts, replace it if damaged.

NOTE

IF THERE IS ANY DAMAGE TO THE MASTER CYLINDER OR THE PISTON, REPLACE IT.

Pompa freno posteriore

Rimozione

To remove the rear brake pump it is necessary to previously empty the oil from the system. Then proceed as described:

- Remove the safety O-ring (1) from the pin that blocks the brake pump control rod.
- Rotate the pin (2) to release the brake pump control rod and slide it out in order to remove it.
- Undo the fastener screw (3) of the oil pipe.
- Ensure that the screw (4) cannot rotate and unscrew the nut (5) to release the oil reservoir from the frame.



- Remove the two rear brake pump fastener screws (6) at the rider footrest support.



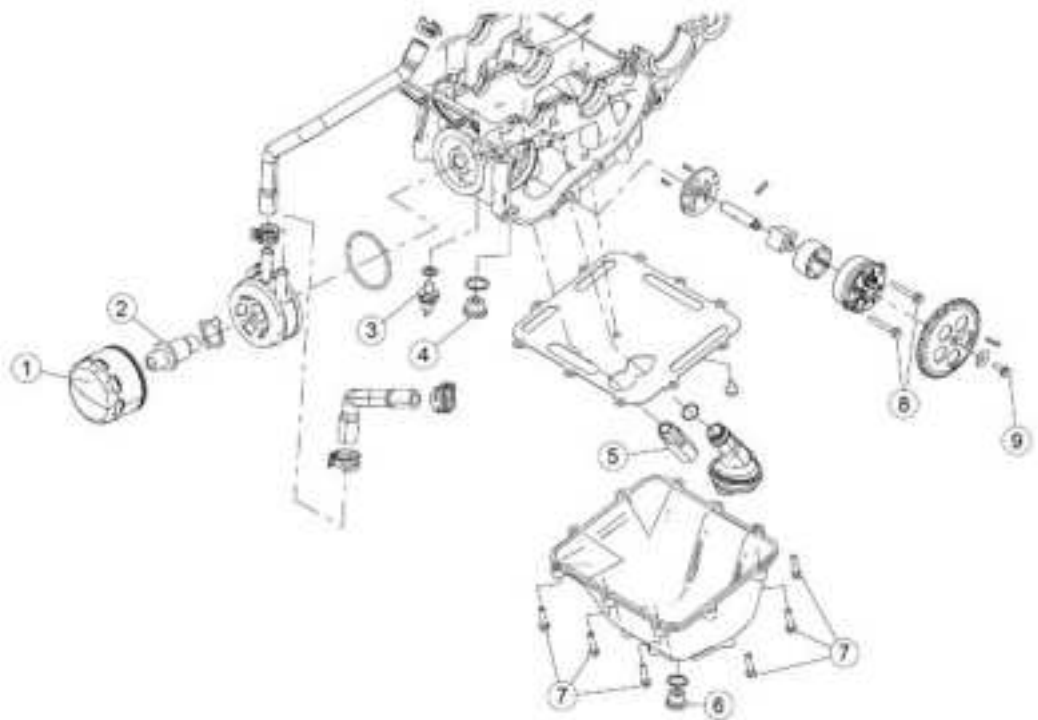
- Remove the brake pump (7) complete with reservoir.
-

INDEX OF TOPICS

COOLING SYSTEM

CS

Water pump



LUBRICATION

Pos.	Description	Type	Quantity	Torque	Notes
1	Oil filter	-	1	15 Nm (11.06 lbf ft)	-
2	Oil filter joint	-	1	28.5 Nm (21.02 lbf ft)	-
3	Oil pressure sensor	-	1	13 Nm (9.59 lbf ft)	-
4	Crankcase cap	-	1	20 Nm (14.75 lbf ft)	-
5	Oil pressure regulation valve	-	1	42 Nm (30.98 lbf ft)	-
6	Drainage plug	-	1	20 Nm (14.75 lbf ft)	-
7	Sump fixing flanged hex screw	M6	10	12 Nm (8.85 lbf ft)	-
8	Oil pump fastening screws	M5	2	6 Nm (4.43 lbf ft)	-
9	Oil pump gear fastener screw	-	1	12 Nm (8.85 lbf ft)	-

Removal

To proceed with the removal of the water pump, proceed as described:

- Remove the five fixing screws (1) of the water pump cover.



- Remove the water pump cover (2) complete with gasket (3).



- Unscrew the rotor (4) and remove it.



- Remove the flywheel cover (5) complete with gasket (6).



- Using a rubber hammer, remove the gear of the water pump (7) complete with washer (8).



- From the outside of the cover, using a punch remove the sealing ring (9).



- Remove the oil seal (10).



Installing

To proceed with the installation of the water pump, proceed as described:

- Apply a light coat of grease to the inside of the oil seal (1).



- Using the special punch, fully seat the oil seal on the cover.

Special tools

020376Y Adaptor handle

020414Y 28 mm punch



- Apply a light coat of grease to the sliding surface of the oil pump gear (2).



- Insert the flat washer (3) on the water pump gear.



- Apply a light coat of grease to the surface of the flat washer.



- Screw the first component of the seal ring installation tool (A) onto the gear of the water pump.



Special tools

021037Y Water pump seal insertion tool

- Insert the gear complete with tool on the cover.



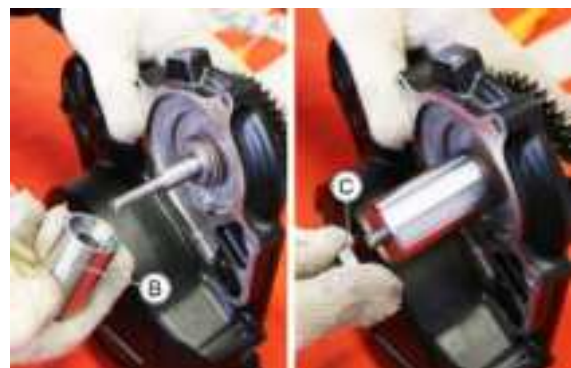
- Insert the sealing ring (4).



- Insert the second part of the tool (B) and the nut (C).

Special tools

021037Y Water pump seal insertion tool



- Ensure that the pin (A) cannot rotate, and then tighten the nut until the sealing ring is fully seated.



- Insert the impeller (5) and tighten it to the prescribed torque.



Removing the radiator

To remove the radiator it is necessary to remove the side and lower fairings. Then proceed as described:

- Remove the expansion tank cap (1).



- Remove the radiator cap (2).



- Operating on the left side of the motorcycle, remove the screw (3) to completely drain the cooling system, taking care to collect the metal washer.



- Operating on the right side of the motorcycle, after having released the hose clamp, disconnect the pipe (4) from the radiator.



- Empty the filler tank of any coolant left inside.



- After unscrewing the three screws (5) remove the internal fairing complete with filler tank.



- Release the hose clamp (6) and disconnect the pipe (7).



- Release the hose clamp (8) and disconnect the pipe (9) from the water pump cover.



- Release the hose clamp (10) and disconnect the pipe (11) from the thermostatic valve fitting.



- Ensure that the screw (12) cannot rotate and unscrew the nut (13) fastening the radiator to the support bracket, taking care to collect the "T"-bushing.



- Release the hose clamp (14) and disconnect the pipe (15).



- Unscrew the two upper fastening screws (16), taking care to collect the "T"-bushing and support the radiator.



- Remove the complete radiator (17) sufficiently to be able to access the electric fan connector (18) and disconnect it.



Removing the expansion tank

To remove the expansion tank it is necessary to remove the side and lower fairings. Then proceed as described:

- Remove the expansion tank cap (1).



- Remove the radiator cap (2).



- Operating on the left side of the motorcycle, remove the screw (3) to completely drain the cooling system, taking care to collect the metal washer.



- Operating on the right side of the motorcycle, after having released the hose clamp, disconnect the pipe (4) from the radiator.



- Empty the filler tank of any coolant left inside.



- Remove the vent tube (5) from the cable grommet located on the internal fairing.



- Release the expansion tank (6) at the point indicated from the internal fairing and remove it.



NOTES FOR INSTALLATION

- To refit the expansion tank, first insert the tab (7) on the tank in the appropriate slot on the internal fairing and then hook the tank in the centre in the point indicated.



- After reconnecting all pipes and filling the system with the indicated quantity of coolant, check that there are no leaks in the coupling points of the pipes.

See also

[Capacities](#)

Thermostatic valve

Removing

To remove the thermostatic valve, it is necessary to previously drain the cooling system. Then proceed as described:

- After disconnecting the pipe from the cover, remove the two screws (1) fastening the cover itself.



- Remove the cover (2).



- Remove the thermostatic valve (3).



Installing

To install the thermostatic valve, proceed as described:

- After checking the integrity and effective operation, insert the thermostatic valve (1) in its seat, taking care of its correct positioning.



- Fit the cover (2).



- Insert the two screws (3) and tighten them to the specified torque.



- Connect the pipe (4) to the fitting and refit the metal clamp (5).



- Fill the system with the indicated quantity of coolant and check that there are no leaks in the coupling points of the pipes.

See also[Capacities](#)

INDEX OF TOPICS

BODYWORK

BOD

Seat

To remove the saddles, proceed as described:

- After inserting the key (1) into the lock located under the tail fairing on the left side of the motorcycle, turn it clockwise and release the passenger seat (2).



- Lift the rear part of the rider saddle (3) and remove it as indicated.



Devioluci

To remove the light switches it is necessary to first remove the entire front part of the motorcycle, in order to allow the instrument cluster support to be opened in order to access the various connectors. Then proceed as described:

REMOVAL

Left light switch

- Operating on the left side of the motorcycle, first remove the four fixing screws (1) that join the left support with the right and then the two screws (2) that fasten the left support to the frame.



- Separate the left support and before removing it completely disconnect the connector (3) of the left arrow.



- Remove the clamp (4) that locks the left light switch wiring.



- Undo the fastening screw (5) of the anti-vibration weight (6) and remove it.



- Using compressed air, blow at the point indicated to facilitate the removal of the grip (7).



- Remove the rubber clamps (8) to release the wiring.



- Loosen the torx screw (9) fastening the light switch.



- Disconnect the two connectors (10) of the light switch.



- Slide the light switch (11) off the semi-handlebar to remove it completely.



Right light switch

- Operating on the left side of the motorcycle, first remove the four fixing screws (1) that join the left support with the right.



- Operating on the right hand side of the motorcycle and remove the two screws (2) fastening the right support to the frame.



- Move the right instrument cluster support to access the internal part and to be able to remove the clamp (3) that locks the left light switch wiring to the other ones inside.



- After unscrewing the screw, remove the metal cable clamp (4) from the right instrument cluster support.
- Remove the right instrument cluster support.



- Separate the right support and before removing it completely disconnect the connector (5) of the left arrow.



- Undo the fastening screw (6) of the anti-vibration weight (7) and remove it.



- Unscrew the throttle control locking screw (8).



- Remove the rubber clamps (9) to release the wiring.



- Disconnect the throttle control connector (10).



- Remove the throttle control (11) from the semi-handlebar.



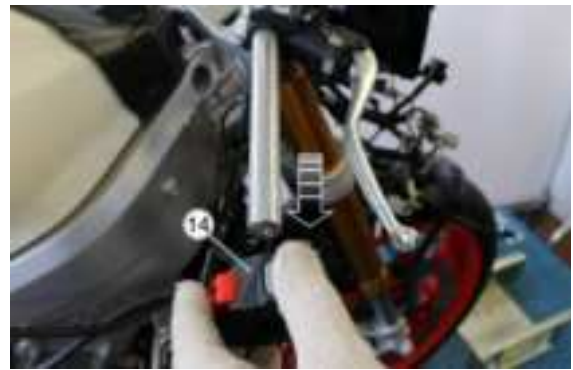
- Loosen the torx screw (12) fastening the light switch.



- Disconnect the right-hand light switch connector (13).



- Slide the light switch (14) off the semi-handlebar to remove it completely.



Driving mirrors

Depending on the target market, the rear-view mirrors can be equipped with integrated arrows, therefore before proceeding with the removal it is necessary to disconnect the connectors from the fixed connectors on the instrument cluster support.

Then proceed as described:

THE FOLLOWING OPERATIONS REFER TO A SINGLE REAR-VIEW MIRROR, BUT APPLY TO BOTH.

- Remove the two rear-view mirror lock nuts.



- Remove the rear-view mirror and, if applicable, slide the arrow wiring off the fairing.



Instrument panel

To remove the instrument panel, first the fairing complete with light assembly must be removed. Then proceed as described:

- After unscrewing the two screws (1) fastening the cover (2), remove it



- Disconnect the connector (3) from the instrument cluster.



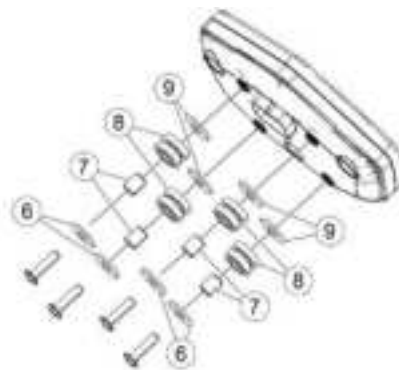
- Lift the instrument cluster (4) sufficiently to allow the rubber blocks to be removed from the slotted holes.



- Undo the four screws (5).



- Remove the washers (6), the spacers (7) the rubber blocks (8) and the washers (9).



Headlight assy.

To remove the headlight unit, first remove the side fairings, the internal covers, and the internal fairings. Then proceed as described:

- Remove the two screws (1) fastening the lower front closure (2).



- Remove the two screws from the lower front closure (2).



- Remove the nuts (3) fastening the rear-view mirrors.



- Remove the rear-view mirrors (4).



- Remove the four fastening screws (5) of the headlight unit to the instrument cluster support.



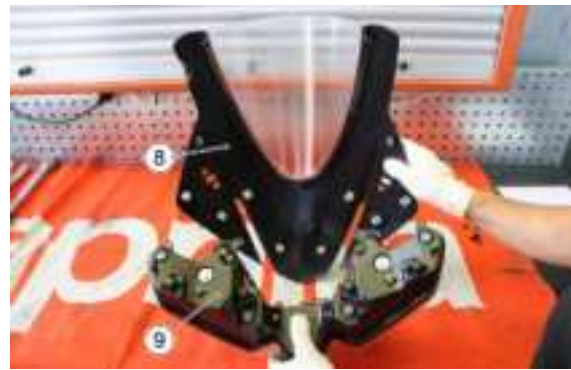
- Move aside as required the top fairing complete with light unit to allow to disconnect the connector (6).



- Remove the eight screws (7) fastening the light unit to the front fairing (8).



- Separate the front fairing (8) from the headlight unit (9).



- At the end of the refitting phase, check the correct orientation of the light beams.

Headlight fairing

- To remove the top fairing, remove the four fixing screws (1) paying attention to collect the washers.



- Slide off the top fairing (2) and remove it.



Disassembling the lock

To disassemble the lock it is necessary to first remove the handle, the internal tail fairing and the left side tail fairing. Then proceed as described:

- Unhook the cable (1) from the lock block (2).



- Remove the fork spring (3).



- Remove the ignition switch assembly (4) downwards and collect the cable support plate (5).



- Remove the two fixing screws (6) of the lock coupling plate.



- Remove the lock coupling plate (7) complete with cable.



Front wheelhouse

REMOVING THE LOWER STEERING YOKE CLOSURE

- To remove the lower steering yoke closure, remove the central screw (1) complete with "T" bushing (2).



- Remove the two side fixing screws (3) and the corresponding washers (4).



- Collect the spacer (5) present on the right hand side.



- Release the rubber cable grommet (6) from the brake hose from the lower steering plate closure.



- Remove the lower steering yoke closure (7).



Taillight assy.

To disassemble the tail light unit it is necessary to first remove the handle, the internal tail fairing and the side tail fairings. Then proceed as described:

- Disconnect the tail light unit connector (1).



- Remove the two side fastening screws (2) of the tail light unit.



- While supporting the tail light unit, remove the upper screw (3).



- Before proceeding with the removal and releasing the wiring harness, check its correct positioning which must be restored during the refitting phase.

- Remove the rear light assembly (4).



License plate light

To remove the license plate light, proceed as follows:

- Unscrew the screw (1) and remove the closure (2) of the license plate holder.



- Disconnect the license plate light connector (3).



- Remove the two fixing screws (4) and extract the license plate light (5) by removing the wiring harness from the license plate holder.



Side body panels

To disassemble the side panels it is necessary to first remove the saddles. Then proceed as described:

The operations described refer to a side panel but are valid for both

- Remove the upper fastener screw (1).
- Remove the lower fastener screw (2).



- Move the front part (A) to the outside, then by moving the side panel backwards (B) it is possible to release it (C).



Side fairings

The following operations refer to one side of the vehicle, but are valid for both sides.

- To remove the side fairings, start disassembly from the inside of the dashboard by removing the three screws (1) fastening the internal cover.



- Remove the internal cover (2).



- Remove the two internal screws (3).



- Remove the two clips (4).



- Remove the screw (5) present under the headlight unit.



- Remove the four outer screws (6) from the side fairing.



- Remove the complete side fairing (7).



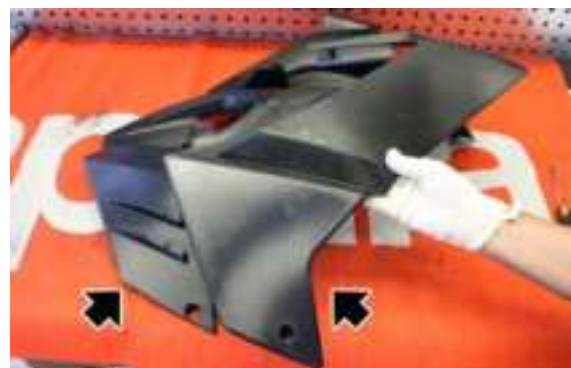
- It is possible to separate the two parts that make up the side fairing by removing the lower screws (8).



- Remove the upper screws (9).



- Separate the two parts that make up the side fairing.



Fairing mounting panels

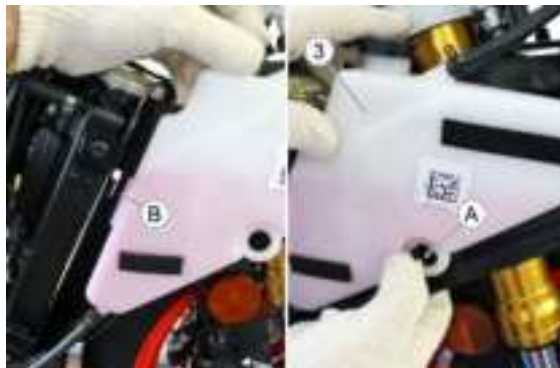
To remove the under fairings, the side fairings must first be removed. Then proceed as described:

RIGHT SIDE

- Release the vent pipe (2) of the expansion tank from the cable grommet (1).



- Unhook the expansion tank (3) from point (A) and then from point (B) in order to move it away without removing it, taking care not to let the coolant leak out.



- Remove the three screws (4) fastening the inner fairing.



- Remove the inner fairing (5).



LEFT SIDE

- Remove the clamp (1).



- Keeping the screws on the inside still, unscrew the fixing nuts (2) of the voltage regulator.



- Remove the "T" bushes (3) and collect the screws (4) complete with washers.



- Disconnect the connectors (5) from the voltage regulator (6) and remove it.



- Remove the three screws (7) fastening the inner fairing.



- Remove the inner fairing (8).



License plate holder

To remove the license plate support, proceed as follows:

- Disconnect the connector (1) of the rear license plate support wiring harness.



- Undo the central screw (2).



- Remove the two side screws (3), complete with "T" bushings.



- Remove the complete license plate holder (4) by removing the wiring harness from the vehicle.



During refitting, pay attention to the passage of the wiring harness in the vehicle.

Rear mudguard

To remove the rear mudguard proceed as follows:

- Remove the two mudguard fixing screws.



- Remove the mudguard.



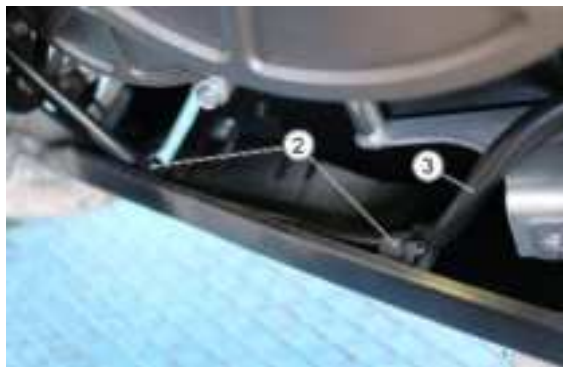
Lower cowl

To remove the fairing lug, proceed as described:

- Working from both sides of the vehicle, remove the eight fixing screws (1) of the fairing lug.



- Before completely removing the fairing lug, disconnect the wiring harness (3) of the side stand sensor from the cable grommets (2).



- Remove the vent pipe (4) from the expansion tank and remove the fairing lug.



Fuel tank

To disassemble the fuel tank, remove the rider seat and then proceed as described:

- Unscrew the two screws (1) fastening the front cover (2) of the tank.



- Remove the front cover (2) of the tank.



- Unscrew and remove the two front screws (3) and the bushes (4).



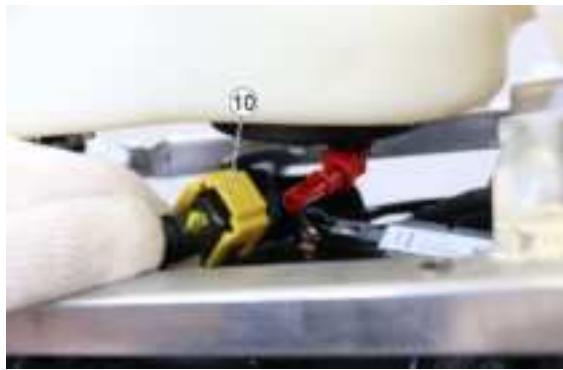
- Undo and remove the rear screw (5) and the bushing (6).



- Lift the tank slightly, just enough to gain access to the vent pipes.
- Remove the clip (7), release the metal clamp (8) and disconnect the vent pipes (9).



- Disconnect the fuel pipe (10) from the pump.



- Disconnect the fuel pump connector (11).



- Remove the fuel tank (12).



During refitting, make sure that the screws that secure the fuel pump are tightened correctly.

Rear wheelhouse

To remove the rear wheel arch, it is necessary to first remove the battery, the fuel tank, the saddles, the handle, the bodies that make up the tail fairing, the license plate holder and the side panels. Then proceed as described:

- Remove the two fixing screws (1) of the inertia platform (2) with corresponding washers.



- Move aside the inertial platform to remove the two washers below (3).
- Disconnect the connector (4) and remove the inertia platform.



- Remove the clamp (5) that binds the main wiring harness to the wheel arch.



- Disconnect the quick-shift connector (6) and remove the wiring harness from the rear subframe.



- Disconnect the relays (7) from the holders.



- After unscrewing the two screws (8), remove the protective cover (9) of the main relay.



- Disconnect the main relay (10) from the holders.



- Release the connector (11) from the cable grommet.



- Disconnect the corrugated pipe (12) from the two cable grommets.



- Disconnect the two secondary fuse boxes (13) from the holders.



- Unhook the two wiring harnesses (14) from the cable grommet.



- Disconnect the connector (15) of the rear ABS sensor.



- Unclip the other part of the rear ABS sensor connector from the slide and remove the wiring harness.



- Unhook the cable from the support plate.



- Disconnect the saddle opening cable (16) from the bracket connected to the ignition switch assembly.



- Unscrew the four screws (17) fastening the passenger pedals supports to remove them.



- Remove the four screws (18).



(if applicable)

- If the vehicle is equipped with the APRILIA MIA control unit (located on the right side), it is necessary to disconnect the connector and the control unit itself before proceeding with the removal of the wheel arch.

- Working from both sides, remove the screws (19).



- Slide off the wheel arch (20) from the rear to remove it.



Front mudguard

- To remove the front mudguard, working from both sides of the vehicle, remove the four screws (1) with corresponding washers.



- Unhook the cable guide (2) connected to the brake hose from the rear part of the mudguard.



- Remove the mudguard (3).



The following operations refer to a single reflector but are valid for both

- Remove the lock nut (4).



- Remove the reflector (5).



- Pay attention when refitting, as the pin (A) on the reflector must fit into the hole (B) on the mudguard.



Rear grab rail

- To remove the rear handle, remove the four fixing screws (1).



- Remove the rear hand grip (2), taking care to collect the "T" bushes (3) in correspondence with the three upper fixing points.



Instrument cluster cover

- To remove the instrument panel cover, after removing the top ring, remove the two fixing screws of the instrument panel cover.



- Remove the instrument panel cover.



Instrument cluster support

To remove the instrument panel support, it is necessary to first remove the front fairing complete with the light unit, the side fairings (external / internal) and the instrument panel. Then proceed as described:

- Remove the seven screws (1) fastening the left side instrument panel support.
- Separate the left part (2) of the support.



- Disconnect the connector (3) for connecting the left arrow (only for the American market) and then remove the left instrument support.



- Remove the two screws (4) fastening the right side instrument panel support.



- Partially extract the right support to allow removal of the clamp (5).



- Remove the cable grommet (6).



- Disconnect the connector (7) for connecting the right arrow (only for the American market) and then remove the right instrument support.



Battery

- Ensure that the ignition switch is turned to "OFF".
- Remove the passenger and rider saddles.
- Unscrew the two screws (1) and remove the document compartment (2).



- Unscrew and remove the screw (3) from the negative terminal (-).
- Move the negative lead (4) aside.
- Unscrew and remove the screw (5) of the positive terminal (+).
- Move the positive lead (6) aside.



TAKE UTMOST CARE AND DO NOT MAKE CONTACT BETWEEN THE BATTERY TERMINALS AND ANY METALLIC OBJECT IN ORDER TO PREVENT THE RISK OF SHORT CIRCUIT.



- Grip the battery (7) firmly and remove it from its seat, lifting it.
- Put the battery away on a level surface, in a cool and dry place.
- Refit the rider saddle.



CHECK THAT THE CABLE TERMINALS AND BATTERY LEADS ARE:

- IN GOOD CONDITION (NOT CORRODED OR COVERED BY DEPOSITS);
- COVERED BY NEUTRAL GREASE OR PETROLEUM JELLY.

IMPORTANT

UPON REFITTING, CONNECT THE LEAD TO THE POSITIVE TERMINAL (+) FIRST AND AFTERWARDS THE LEAD TO THE NEGATIVE TERMINAL (-).

Tail guard

To remove the parts that make up the tail fairing, remove the side fairings, the saddles and the handle. Then proceed as described:

- Operating from the left side of the vehicle, remove the three side screws (1).



- Remove the two top screws (2).



- Remove the left tail fairing (3).



- Operating from the right side of the vehicle, remove the three side screws (4).



- Remove the two top screws (5).



- Remove the right tail fairing (6).



- Remove the central tail fairing (7).



Copertura terminale

To disassemble the terminal covers, proceed as described:

LEFT TERMINAL COVER

- Remove the front fixing screw (1) paying attention to collect the washer and the bushing.
- Remove the cover (2) from the rear to allow it to be detached from the exhaust terminal at the points indicated.



RIGHT TERMINAL COVER

To remove the right side terminal cover it is necessary to partially extract the right side rider footpeg support as described:

- Remove the nut (3) with its washer.
- Slightly unscrew the screw (4) without removing it.
- Slightly remove the swingarm pin together with the right rider footpeg support, paying attention not to drop the spacer on the left side of the vehicle, located between the footpeg support and the swingarm.
- Remove the front fixing screw (5) paying attention to collect the washer and the bushing.
- Remove the cover (6) from the rear to allow it to be detached from the exhaust terminal at the points indicated.



MOVE THE RIGHT RIDER FOOTPEG SUPPORT OUTWARDS TO AVOID SCRATCHING THE TERMINAL COVER

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